U.S. ENVIRONMENTAL PROTECTION AGENCY

EPA REGION 1 – NEW ENGLAND

RECORD OF DECISION
OPERABLE UNITS 1, 2, and 3

OLIN CHEMICAL SUPERFUND SITE

WILMINGTON, MASSACHUSETTS

MARCH 2021

Record of Decision

Table of Contents

Table of Contents

PART 1: THE DECLARATION FOR THE RECORD OF DECISION

A. SITE NAME AND LOCATION

Olin Chemical Superfund Site
Wilmington, Middlesex County, Massachusetts
CERCLIS ID#: MAD001403104

B. STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected final remedial action for Operable Units (OUs) 1 and 2 (OU1 and OU2, respectively) and an interim remedial action for OU3 for the Olin Chemical Superfund Site (Site), in Wilmington, Massachusetts, which were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA, also commonly referred to as "Superfund"), 42 U.S.C. § 9601 *et seq*., and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), as amended, 40 CFR Part 300 *et seq*. The Region 1 Director of the Superfund and Emergency Management Division (SEMD) has been delegated the authority to approve this Record of Decision (ROD).

This decision was based on the Administrative Record for the Site, which has been developed in accordance with Section 113(k) of CERCLA, 42 U.S.C. § 9613(k), and which is available for review online at: www.epa.gov/superfund/olin. The Administrative Record Index (**Appendix G** of this ROD) identifies each of the items comprising the Administrative Record upon which the selection of the remedy is based.

The Commonwealth of Massachusetts, Department of Environmental Protection (the Commonwealth), as the support agency, concurs with the selected remedy (see **Appendix A** of this ROD for a copy of the concurrence letter).

C. ASSESSMENT OF SITE

The remedial action selected in this ROD is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment. The *June 2019 Draft OU3 Remedial Investigation (RI) Report* (Wood, 2019), the *July 2015 Final OU1/OU2 RI Report* (AMEC, 2015a), and the *November 2014 Jewel Drive Dense Aqueous Phase Liquid (DAPL) Extraction Pilot Report* (AMEC, 2014a) summarize the nature and extent of contamination at OU1, OU2, and OU3 of the Site.[1] These documents, supplemented by two August 2020 memoranda prepared by EPA entitled *Updates to OU1/OU2 RI Report Conclusions* (USEPA, 2020a) and

[1] The Remedial Investigation (RI) for Operable Unit 3 (OU3) is currently ongoing. A Feasibility Study (FS) report for the final OU3 remedy addressing Site-wide groundwater will be issued in the future.

Updates to Draft 2019 OU3 RI Report Conclusions (USEPA, 2020b) were used to prepare a Feasibility Study (FS) Report that identified all the remedial options considered for final cleanup of OU1 and OU2 and interim cleanup of OU3 of the Site. The FS Report consists of three volumes entitled *Volume 1, Operable Unit 1 & Operable Unit 2 Feasibility Study, Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts* (*FS Report Volume I*, Olin, 2020a), *Volume II, Interim Action Feasibility Study, Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts* (*FS Report Volume II*, Olin, 2020b), and *Volume III – Comparative Analyses, Feasibility Study Report, Olin Chemical Superfund Site, Wilmington, Massachusetts* (*FS Report Volume III*, USEPA, 2020c).

D. DESCRIPTION OF SELECTED REMEDY

This ROD sets forth the selected remedy for the Site, which is based on a combination of remedial alternatives set out in a Proposed Plan issued for public comment in August 2020. The interim OU3 (groundwater) remedy will prevent unacceptable risks from exposure to contaminated groundwater and remove principal threat waste (source material containing Dense Aqueous Phase Liquid [DAPL]). The interim remedy will also begin to restore the aquifer while additional information is gathered to support selection of a final remedy for OU3. The final OU1/OU2 remedy will address all current and potential future risks caused by contaminated soil, sediments, and surface water, Light Non-Aqueous Phase Liquid (LNAPL), and the subsurface-to-indoor air vapor intrusion (VI) pathway (OU1 and OU2).

The interim and final remedies selected in this ROD include the following:

Interim Action – DAPL and Groundwater Hot Spots (GWHS)

- Construction and operation of new extraction and treatment systems to remove DAPL and hot spot groundwater targeting 5,000 nanograms/Liter (ng/L) n-nitrosodimethylamine (NDMA) contour to reduce the mass and further migration of Site contaminants of concern (Site COCs or COCs) in groundwater and prevent contaminated groundwater from flowing into surface water;
- Pre-design investigations (PDIs) to determine the final number, location, and configuration of extraction wells and other remedial components; and
- Institutional Controls to 1) prohibit the use of groundwater in the OU3 groundwater study area unless it can be demonstrated to EPA, in consultation with the Commonwealth, that such use will not pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy; and 2) prevent disturbance of any engineered systems and any other new and existing remedy infrastructure components. Examples of Institutional Controls include Notice of Activity and Use Limitation (NAUL), Grant of Environmental Restriction and Easement (GERE),[2] town ordinance, advisories, building permit requirements, and other administrative controls.

[2] NAULs and GEREs are approved forms of Massachusetts land use restrictions established under the Massachusetts Contingency Plan (MCP).

Final Action – LNAPL and Surface Water (SW)

- Construction and operation of a new multi-phase extraction system to capture LNAPL and associated contaminated groundwater and soil vapor. Construction and operation of new treatment systems to treat the recovered LNAPL via oil/water separation, the soil vapor via granular activated carbon (GAC), and the captured groundwater via the same treatment system(s) as for hot spot groundwater;
- Construction and operation of a new groundwater extraction and treatment system(s), with extraction wells sited based on PDIs, to intercept and treat the overburden groundwater contaminant plume that impacts Site surface water; and
- Institutional Controls to prevent disturbance of any engineered systems and any other new and existing remedy infrastructure components.

Final Action – Soil and Sediments (SED)

- Construction and maintenance of caps and cover systems on areas of soil contamination on the Olin Corporation (Olin) property (Property), including a multi-layer, low-permeability cap over the Containment Area that meets Resource Conservation and Recovery Act (RCRA) Subtitle D and Massachusetts solid waste landfill performance standards, the design and footprint of which will be determined during the Remedial Design (RD) phase;
- Excavation of approximately 4,000 cubic yards (cy) of contaminated wetland soil and sediment and disposal off-site at an appropriate approved facility; backfilling of excavated areas with clean, hydric (wetland-type) soil, regrading, and revegetation with native vegetation to control erosion; and
- Institutional Controls to 1) prevent residential, school, and daycare uses of the Property; 2) prevent contact with soil beneath caps and cover systems; 3) prevent disturbance of any engineered systems and any other new and existing remedy infrastructure components; and 4) prevent future exposure to trimethylpentenes (TMPs) in soil that may pose inhalation risks via the VI pathway. Institutional Controls will require VI evaluations and/or mitigation measures such as vapor barriers or sub-slab depressurization systems (SSDSs) for new building construction or building alterations on the Property.

Included with the three cleanup actions above are the following:

- PDIs and/or treatability studies during the RD process to:
    a. determine the final number, location, and configuration of extraction wells and other remedial components;
    b. determine appropriate locations for discharge of treated groundwater to surface water; and
    c. facilitate the implementation of the selected remedial alternatives and map the precise extent of both excavation limits and the extent of caps and cover systems;
- Minimization of potential harm and avoidance to the extent practicable of adverse impacts to wetlands and floodplains; restoration and/or replication nearby to address unavoidable impacts

from remedial activities, including proper regrading, restoration with native vegetation and to address any diminishment of flood storage capacity, erosion control, monitoring, and maintenance;

- Long-term operation, maintenance, and monitoring of any new and existing remedy infrastructure components, including the Calcium Sulfate Landfill (CSL);
- Identification and evaluation of existing wells (*e.g.*, potable, irrigation, and process wells) in the Site groundwater study area (see **Figure 11** in **Appendix C** of this ROD) to determine whether their use will pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy;
- Long-term monitoring of the groundwater plume and surface water, to evaluate remedy effectiveness; and
- Five Year Reviews to assess protectiveness of the remedy.

In parallel to the selected remedy, the following activities will continue:

- Continued studies as part of the OU3 RI/FS to close remaining data gaps, including to improve the characterization of bedrock topography and fractures and further delineate the horizontal and vertical extent of groundwater contamination; and
- Evaluation of long-term groundwater remedial alternatives, leading to the selection of a final cleanup plan for the Site.

A Baseline Human Health Risk Assessment (BHHRA) for OU1 and OU2 was prepared on July 24, 2015, as Appendix M to the *July 2015 Final OU1/OU2 RI Report* (OU1/OU2 BHHRA). A Baseline Ecological Risk Assessment (BERA) for OU1 and OU2 was also prepared in July 2015, as Appendix N to the *July 2015 Final OU1/OU2 RI Report* (OU1/OU1 BERA). Appendix K to the *June 2019 Draft OU3 RI Report* includes a Revised Draft BHHRA for OU3 (Draft OU3 BHHRA). An evaluation of the potential human health and ecological risks mitigated by the operations of Plant B was completed on August 27, 2019 (*August 27, 2019 Plant B Risk Calculations*; Nobis, 2019). A residential human health risk evaluation for OU1 and OU2 soil was prepared on January 17, 2020 (*January 17, 2020 OU1/OU2 Residential Human Health Risk Evaluation*; Bluestone, 2020). A set of risk calculations were prepared on May 15, 2020 to document the basis for ecological risk-based Preliminary Remediation Goals (PRGs) for soil, sediments, and surface water (*May 15, 2020 Ecological Risk Calculations*; Wood, 2020b). A revised set of human health risk calculations for the Site was completed on May 21, 2020 for potable use of private residential well water (*May 21, 2020 OU3 Human Health Risk Calculations*; Olin, 2020c). A set of risk calculations were prepared on July 1, 2020 (*July 1, 2020 Risk Calculations*) to document the basis for human health risk-based PRGs for upland soil (including Containment Area soil) and surface water (Wood, 2020c).

E. STATUTORY DETERMINATIONS

The selected interim remedy for OU3 is protective of human health and the environment in the short term and is intended to provide adequate protection until a final remedy is selected; complies with those federal and state requirements that are applicable or relevant and appropriate for this limited-scope action; and is cost effective. Although this interim action is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does utilize treatment and thus supports that statutory mandate. Because this action does not constitute the final remedy for groundwater, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final remedial action.

The selected final remedy for OU1 and OU2 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.

Based on implementability considerations, EPA determined that it was impracticable to excavate and treat the Site COCs in upland soil, including the Containment Area, and wetland soil and sediments in a cost-effective manner. However, the final OU1/OU2 remedy includes treatment of the following: recovered LNAPL and soil vapor; captured groundwater; excavated soil or sediments that exhibit a hazardous waste characteristic or that are excavated from below the water table to reduce contaminant mobility prior to off-site disposal; and water generated from dewatering excavated soil prior to off-site disposal to reduce toxicity prior to discharge to surface waters. By using treatment as a significant portion of the interim remedy and partially for the final remedy, the statutory preference for remedies that employ treatment as a principal element is partially satisfied.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that would allow for unlimited use and unrestricted exposure (and because groundwater and land use restrictions are necessary), a review will be conducted within five years after initiation of remedial actions to ensure that the remedy continues to provide adequate protection of human health and the environment. Five Year Reviews will continue as long as waste remains at the Site and unlimited use is restricted.

F. SPECIAL FINDINGS

Issuance of this ROD embodies the following specific determinations:

Wetlands Impacts

Pursuant to Section 404 of the Clean Water Act (CWA), 44 CFR Part 9, and Executive Order 11990 (Protection of Wetlands), EPA has determined that there is no practicable alternative to conducting work that will impact wetlands of the United States because significant levels of contamination exist within or under wetlands of the United States and these areas are included within the Site's cleanup areas.

For those areas impacted by cleanup activities, EPA has also determined that the selected remedy is the Least Environmentally Damaging Practicable Alternative (LEDPA), as required by the CWA, for protecting federal jurisdictional wetlands and aquatic ecosystems at the Site under these standards, because the remedy will permanently remove contaminants that are impairing the wetlands and any wetland resources altered by the remediation will be restored to the original grade and with native vegetation.

EPA will minimize potential harm and avoid adverse impacts to wetlands, to the extent practicable, by using best management practices to minimize harmful impacts on wetlands, wildlife, or habitat. Any wetlands affected by remedial work will be restored and/or replicated consistent with the requirements of federal and state wetlands protection laws with native wetland vegetation, and any restoration efforts will be monitored. Mitigation measures will be used to protect wildlife and aquatic life during remediation, as necessary. EPA's selected remedy balances the need to address the contamination that poses an ecological risk to the wetlands and waterways with the ability to restore any (temporarily or permanently) altered wetland resources and aquatic habitats impacted by the remediation. EPA's responses to comments regarding wetland issues are located in the Responsiveness Summary (see **Part 3** of this ROD).

Floodplain Impacts

The selected remedy includes activities that result in the occupancy and modification of the 100-year and 500-year floodplains. Pursuant to Federal Emergency Management Agency (FEMA) regulations at 44 CFR Part 9, which set forth the policy, procedure, and responsibilities to implement and enforce Executive Order 11988 (Floodplain Management), EPA has determined that there is no practicable alternative to altering floodplain resources.

EPA will avoid or minimize potential harmful temporary or permanent impacts to floodplain resources to the extent practicable at the areas impacted by remediation. EPA has determined that the selected remedy will likely result in temporary occupancy of the 100-year and 500-year floodplains in the Maple Meadow Brook (MMB) wetlands, but after completion of work there will not be any net loss of flood storage capacity. Additionally, based on the available data, EPA has determined that the selected remedy will not result in the occupancy and modification of floodplains, specifically, the 500-year floodplain, at the Property. A stormwater study will be undertaken as part of the PDI phase to confirm that this is the case. If impacts to the 500-year floodplain at the Property are found to be unavoidable, in addition to the likely temporary impacts to the 100-year and 500-year floodplains in the MMB wetlands while implementing the remedy, appropriate measures will be incorporated into the RD and subsequently implemented during the RA phase to ensure that current flood storage capacities and any adjacent wetlands are not diminished after completion of the remedial actions. Best management practices will be used during construction to minimize temporary impacts to floodplains, and excavated areas will be returned to original grade to avoid diminishing flood storage capacity. Restoration and monitoring activities are included in the remedial actions. As required under applicable federal wetlands regulations, EPA solicited public comment regarding the remedy's potential impacts on floodplain resources and received no negative comments (see **Part 3** of this ROD).

G. DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for the Site:

1. The Site COCs and their respective concentrations;

2. Baseline risk represented by the Site COCs;
3. Cleanup levels established for the Site COCs and the basis for the levels;
4. How source materials constituting principal threats will be addressed;
5. Current and future land and groundwater use assumptions used in the baseline risk assessment and ROD;
6. Land and groundwater use that will be available at the Site as a result of the selected remedy;
7. 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; and
8. Decisive factors that led to the selection of the remedy.

H. AUTHORIZING SIGNATURES

This ROD documents the selected remedy for a final action for soil, sediments, LNAPL, and surface water and an interim action for groundwater at the Olin Chemical Superfund Site. This remedy was selected by EPA with concurrence of the Massachusetts Department of Environmental Protection (MassDEP). A copy of the Commonwealth's concurrence letter is attached to this ROD in **Appendix A**.

U.S. Environmental Protection Agency

By: BRYAN OLSON Digitally signed by BRYAN OLSON Date: 2021.03.30 08:55:34 -04'00'

Bryan Olson, Director
Superfund and Emergency Management Division
Region 1

PART 2: THE DECISION SUMMARY

A. SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The Olin Chemical Superfund Site (CERCLIS ID# MAD001403104) is located in Wilmington, Middlesex County, Massachusetts (see **Figure 1** in **Appendix C** of this ROD for Site locus and features). EPA is the lead agency and MassDEP is the support agency.

The Site is comprised of the Property, an approximately 50-acre parcel located within an industrial park at 51 Eames Street in Wilmington, Massachusetts and adjoining off-Property areas that have been impacted by releases from manufacturing and waste disposal activities formerly conducted at the Property (see **Figures 2** and **2a** in **Appendix C** of this ROD for current and historical Site features and a historical photograph, respectively). The Property is located in a general industrial zone, however, the 20-acre southern portion of the Property remains wooded and has been preserved in a predominately natural, undeveloped condition by a conservation restriction (Environmental and Open Space Restriction, recorded with the Middlesex North Registry of Deeds on November 7, 2006, Book 20680, Page 234). The Property is bounded to the north by Eames Street and to the south by a closed municipal solid waste landfill (Woburn Sanitary Landfill [WSL]) in the City of Woburn. The Property is bounded to the east by an active rail line operated by the Massachusetts Bay Transportation Authority (MBTA) and a stream called "East Ditch Stream" and to the west by an inactive Boston and Main rail line ("PanAM Railways") and a stream called "Off-Property West Ditch Stream."

Industrial/commercial properties are located to the north and further east and west of the Property, including a landfill located to the northwest of the Property known as the "Spinazola Landfill."[3] Residential properties are located to the west and southwest of the Property along Border Avenue, Butters Row, Chestnut Street, Cook Avenue, Hillside Way, and Mill Road. The Property is not in active industrial use. The northern half of the Property is mainly unused and contains a vacated office building, a small metal butler building, a former guard shack, two vacant warehouses, paved and grassed areas, and concrete slabs from other former buildings. In 2006, Olin installed a forty-foot office trailer and two metal storage trailers in the northeast quarter of the Property near Plant B, which houses a groundwater treatment system.

Portions of the Site are within the 100-year and 500-year floodplains (see **Figure 5** in **Appendix C** of this ROD for FEMA flood hazard areas). The Site includes the following wetland areas:

- "Central Wetlands," "Ephemeral Drainage" wetland complex, and "West Ditch Stream Wetlands" located on the Property;
- Wetland and wooded areas located immediately to the east, south, and west of the Property; and
- A wetland complex called the "MMB wetlands" located approximately a quarter of a mile to the west of the Property.

[3] The Spinazola Landfill accepted municipal solid waste from the 1956 until 1976. On July 24, 2000, MassDEP ordered that the landfill be closed and capped (MassDEP, 2000).

To manage investigation and cleanup of the Site, EPA initially divided the Site into three OUs. OU1 consists of the Property, including all media (soil, sediments, and surface water), except for groundwater. OU1 includes the area in the southern portion of the Property preserved in a predominantly natural, undeveloped condition by a conservation restriction (see **Section B**, **Site History and Enforcement Activities**, *History of Site* in **Part 2** of this ROD, below), the on-Property stream system (East, South, and On-Property West Ditch Streams), the Calcium Sulfate Landfill, and the Containment Area (see **Figure 2** in **Appendix C** of this ROD for current and historical Site features). Wastes disposed of on the Property caused surface water, sediment, and groundwater contamination both on- and off-Property.

OU2 consists of approximately three acres of soil, surface water, and sediment areas off-Property. This OU includes portions of East and South Ditch Streams, Off-Property West Ditch Stream, portions of the MMB wetlands, Landfill Brook, and North Pond.

OU3 consists of all groundwater, both on- and off-Property, and includes soil located below the water table (see **Figure 3** in **Appendix C** of this ROD for the contaminant plume in shallow overburden groundwater and **Figures 4**, **4a**, and **4b** in **Appendix C** of this ROD for two views of the contaminant plume in deep overburden groundwater and a transect of the deep overburden plume and DAPL pools, respectively). This OU includes groundwater beneath the Property, groundwater north, south, and east of the Property, groundwater west and northwest of the Property, including the MMB aquifer, and private residential wells in the overburden and bedrock aquifers.

Groundwater is found both in the overburden and bedrock formations; however, area groundwater is affected by the groundwater divide that crosses the Property and separates the Ipswich River and Aberjona River Watersheds (see **Section B**, *Site History and Enforcement Activities* in **Part 2** of this ROD, below). Shallow groundwater at the Property flows to Site surface waters, which remain consistent with shallow groundwater flow patterns, as both flow to the south and east.

The Commonwealth has classified portions of the Site to be within a Zone II – an area of an aquifer that contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (MassDEP, 2010a).[4] The Zone II area extends from the Site north and west. In addition, the Commonwealth identified three MCP classifications at the Site (see 310 CMR 40.0974(2)): GW-1 (groundwater that is or could be used for drinking water); GW-2 (shallow groundwater near buildings that could pose a vapor concern to indoor air); and GW-3 (groundwater at all disposal sites is considered to be a potential source to surface water and shall be categorized, at a minimum, as GW-3).

Because a portion of the Site falls within a GW-1 area (the Zone II to the north), and due to the close proximity of private drinking water wells and the GW-1 "Potential Drinking Water Source Area" to the south, and additionally in light of the factors contained in EPA's Final Ground Water Use and Value Determination Guidance (USEPA, 1996a), the Commonwealth determined that there is a high use and value for the Site area aquifer (see MassDEP, 2010a).

---

[4] Per the MCP, Current or Potential Drinking Water Source Areas are classified as GW-1. A Current Drinking Water Source Area includes groundwater within Zone II and within 500 feet of a private water supply well. A Potential Drinking Water Source Area includes groundwater within a Potentially Productive Aquifer that has not been excluded as a Non-Potential Drinking Water Source Area.

A more complete description of the Site can be found in the *Site Description* sections of the *July 2015 Final OU1/OU2 RI Report* (AMEC, 2015a) and *June 2019 Draft OU3 RI Report* (Wood, 2019).

B. SITE HISTORY AND ENFORCEMENT ACTIVITIES

1. History of Site

The Site is comprised of the Property, an approximately 50-acre parcel located within an industrial park at 51 Eames Street in Wilmington, Massachusetts and adjoining off-Property areas that have been impacted by contaminant releases from manufacturing and waste disposal activities formerly conducted at the Property (see **Figure 2** in **Appendix C** of this ROD for current and historical Site features). The former manufacturing facility (Facility) was located within the 30-acre northern portion of the Property, which manufactured specialty chemicals for the rubber and plastics industries beginning in 1953 until the Facility ceased operations in 1986. Construction at the Facility began in 1952 by National Polychemicals, Inc. (NPI), and operations by NPI commenced in 1953, around which time natural drainage features, streams, and the wetland drainage complex were modified. From 1953 to 1968, the business conducted by NPI was owned by three different corporations: American Biltrite Rubber Co., Fisons Limited, and Fisons Corporation, which became known as NOR-AM Agro LLC. In 1968, Stepan Chemical Company bought the business and continued to operate the Facility until 1980, when the Facility was purchased by Olin. Olin submitted closure plans for the Facility to MassDEP and EPA in April 1986 and closed the Facility in the same year. Olin remains the current owner of the Property.

Manufacturing activities were conducted at the Property from 1953 until 1986. From 1953 onward, the Facility expanded incrementally (additional buildings were constructed) as additional products and processes were added and as processes were modified.[5] Products produced included the following:

- nitrogen blowing agents
    - Opex (dinitrosopentamethylenetetramine);
    - Kempore (azodicarbonamide);
    - Nitropore OT (4,4’ oxybisbenzenesulfonylhydrazide or OBSH); and
    - Nitropore 5PT (5-phenyltetrazole);
- blowing agent activators;
- polymerization initiators;
- antioxidants/stabilizers
    - dioctyldiphenylamine or Wytox ADP;
    - trosnonylphenyl phosphite or Wytox 312; and
    - alkylated phenol or Wytox Pap;
- retarders (N-nitrosodiphenylamine);
- processing aids;
- phthalate plasticizers
    - di-n-octylphthalate; and
    - dibutyl phthalate;

[5] See, for example, Smith, 1997, Olin, 2002a, and Olin, 2002b for information on raw materials used, products manufactured, and chemical wastes disposed of at the Property.

- chemical intermediates (such as hydrazine); and
- phenolic resins (phenol-formaldehyde resin).

The nitrogen blowing agents – Opex and Kempore – were the largest volume products manufactured at the Facility; both products were manufactured from the 1950s through 1986.

Raw materials utilized during the operating history of the Property included the following:

- diphenylamine;
- di-n-octylphthalate;
- bis-2-ethylhexylphthalate (BEHP);
- diisobutylene/TMP mixture used at Plant B in the manufacture of Wytox ADP;
- #415 process oil;
- phenol;
- nonylphenol;
- formaldehyde (formalin);
- dimethylformamide;
- dinonylphenol;
- sodium nitrite;
- 2-ethylhexoic acid;
- butanol;
- anhydrous ammonia;
- hydrazine;
- sodium dichromate;
- chlorosulfonic acid;
- diphenyl oxide;
- ammonium hydroxide;
- benzonitrile;
- hydrochloric acid;
- sulfuric acid; and
- sodium dichromate (used as a catalyst in the manufacture of Kempore until 1967, when its use was discontinued).

Between 1953 and approximately 1970, all liquid wastes generated at the Facility were disposed of in unlined pits on the northern half of the Property. These pits included Lake Poly, East and West Pits, and the three Acid Pits. After 1972, liquid wastes were pretreated and sent to the Metropolitan District Commission (MDC) sewer connection. However, significant disposal of liquid wastes continued due to leaking lined lagoons until at least 1983.[6] On-Property waste disposal practices resulted in soil, sediment,

[6] See USEPA, 2020a, Attachment A. Acidic waste streams were neutralized with lime and discharged to the lined lagoons, which were located almost entirely within the footprint of the Containment Area…According to monitoring data from the late 1970s, the lined lagoons were leaking at that time. Evaluation of sludge and inspection of the Lagoon I liner in the fall of 1981 confirmed that the liner was perforated and allowed leakage of fluids from the lagoon. A 1982 hydrogeologic investigation determined that between 52,900 and 240,000 gallons of

and groundwater contamination both on- and off-Property. Constituents in liquid waste streams and in releases to the environment included the following:

- chromium;
- BEHP;
- n-nitrosodiphenylamine (NDPhA);
- n-nitrosodipropylamine (NDPrA);
- diisobutylene (mixture of 2,4,4-trimethyl-1-pentene and 2,4,4-trimethyl-2-pentene);
- formaldehyde;
- dimethylformamide;
- Opex;
- Kempore;
- sulfuric acid;
- hydrochloric acid;
- numerous salts of sodium and ammonia (sulfates, chlorides, nitrates, and nitrites);
- calcium sulfate (gypsum), produced and precipitated when wastewaters were neutralized with lime (calcium hydroxide), after the use of sodium dichromate had been discontinued;
- polychlorinated biphenyls (PCBs), used in electrical transformers at OU1 and released to soil; and
- processing oil, released to soil and the subsurface in the area of the Plant B tank farm, discussed further below.

NDMA – a semi-volatile organic compound (SVOC) found in DAPL and groundwater – is the primary Site COC, as it is the most toxic contaminant and most mobile in the aquifer. COCs in DAPL and groundwater also include other SVOCs and volatile organic compounds (VOCs; associated with chemical processes used at the Facility) and inorganic compounds.

Inorganic compounds found in DAPL and groundwater generally include the following:

- sodium;
- calcium;
- chloride;
- iron;
- magnesium;
- sulfate;
- ammonia or ammonium ion;
- aluminum; and
- chromium.

---

wastewater…leaked through Lagoon I in approximately one month…Similar volumes of wastewater were speculated to be leaking from Lagoon II because it was receiving the same sludges and operating in the same fashion as Lagoon I…A 1979 study determined that sludge had also been dumped in an emergency unlined lagoon located adjacent to the lined lagoons (and within the Containment Area) when the lined lagoons were filled to capacity…Accordingly, significant disposal of wastes in the Containment Area through leaks in the lined lagoons and disposal in the emergency lagoon likely occurred until at least 1983.

VOCs found in DAPL and groundwater generally include the following:

- acetone;
- bromoform;
- 2-butanone;
- 2-hexanone;
- toluene; and
- TMPs.

SVOCs found in DAPL and groundwater generally include the following:

- benzoic acid;
- BEHP;
- phenols;
- napthalene;
- NDPhA; and
- NDMA; and
- other nitrosamines.

The chemicals identified in the preceding paragraphs are considered to be COCs, and have been released to one or more environmental media. Additional COCs, including inorganic compounds, VOCs, and SVOCs, have been detected in DAPL and groundwater (see **Table B-1** in **Appendix B** of this ROD; see also summary in Table 4-3.1 and full detected results in Appendix E of the *June 2019 Draft OU3 RI Report*). The releases included process waters and liquid wastes, discharged to unlined excavations in the native soil (lagoons) and later released from leaking lined lagoons. The discharged liquids percolated into the soil and groundwater or overflowed into the on-Property stream system until at least 1983. The liquid wastes had high concentrations of dissolved inorganic constituents and fluid densities greater than water, allowing these dense liquids (as DAPL) to penetrate the underlying overburden water table and migrate vertically downward to the bedrock surface. Once at the bedrock surface, the DAPL migrated by a combination of gravity flow and due to the pumping influence from the Town of Wilmington's public water supply wells (see discussion in **Section E**, **SITE CHARACTERISTICS**, ***Hydrogeology***, *Pumping Impacts* in **Part 2** of this ROD, below) and pooled in a series of cascading bedrock depressions. A groundwater divide is present west of the Property and DAPL migrated by gravity to the west and northwest across the groundwater divide, opposite to the easterly direction of overburden groundwater flow.

The Site, including the Property, is bisected by surface water and groundwater divides which are broadly co-located (however, the groundwater divide varies significantly both historically and seasonally). between the Ipswich River Watershed to the north and west, and the Aberjona River Watershed to the south and east (see **Figure 1** in **Appendix C** of this ROD for watershed delineations). The location of the divides result in the former source areas, with the exception of Plant B and the currently known areas of TMP contamination, being generally within the Aberjona River Watershed, while significant groundwater contamination is spread over both the Aberjona and Ipswich River Watersheds.[7] RI data collection efforts for OU3 show that shallow groundwater across the OU1-portion of the Site is generally level, and that the location of the watershed divide varies seasonally and has varied historically.

Under natural and pumping-influenced conditions, the DAPL migrated within a sloping bedrock valley – the Western Bedrock Valley (WBV) – and generally remains as three pools in bedrock depressions located both on- and off-Property. The DAPL contains constituents that are water soluble and continue to migrate from the bedrock depressions into the overlying groundwater, acting as a continuing, uncontrolled source of contamination. The layer of groundwater overlying DAPL, into which contamination from DAPL continues to migrate, is part of the area of the aquifer termed "groundwater hot spots" or "hot spot groundwater" (see further discussion below in **Part E**, **SITE CHARACTERISTICS**, **Section 2**, **Conceptual Site Model**, ***Nature and Extent of Contamination***, *OU3 Groundwater* in **Part 2** of this ROD). The full extent of DAPL present in bedrock fractures is unknown at this time and is currently under investigation.

The Site was listed on the NPL primarily due to the presence of NDMA in groundwater within the MMB aquifer in proximity to the Town of Wilmington's municipal water supply wells (see discussion in the *History of Federal and State Investigations and Removal and Remedial Actions* section, below). However, NDMA has not been identified as a raw material, a manufactured product, or a waste stream constituent at the Site. NDMA has been identified in DAPL, groundwater, and surface water. The precise formation mechanism for NDMA at the Site has not been identified, however, it is believed to have formed in the aquifer as liquid wastes migrated downwards through the subsurface (see discussion in the *Conceptual Site Model* section, below).

Currently, the northern half of the Property is mainly unused and contains a vacated office building, a small metal butler building, a former guard shack, two vacant warehouses, paved and grassed areas, and concrete slabs from other former buildings. In 2006, Olin installed a forty-foot office trailer and two metal storage trailers in the northeast quarter of the Property near Plant B, which houses a groundwater treatment system.

The Plant B groundwater recovery/treatment system has been in operation since 1981. The system was installed to prevent seepage of LNAPL into East Ditch Stream, which was released to soil and the subsurface in the form of a processing oil in the area of the Plant B tank farm.[8] Groundwater extracted by the system is treated to remove iron and ammonia, as well as dissolved organic compounds. The treated groundwater is discharged to on-Property surface water in compliance with a Remediation General Permit (RGP).

---

[7] The *June 2019 Draft OU3 RI Report* (USEPA, 2020b) provides a more in-depth examination of this issue and detailed, watershed-specific discussions of the nature and extent of DAPL and groundwater contamination.

[8] According to the *Comprehensive Site Assessment Phase II Field Investigation Report* (CRA, 1993), interviews with former workers at Plant B indicate that multiple spills occurred in the Plant B area. Materials allegedly spilled included diisobutylene, diphenylamine, dioctylphthalate, dioctyldiphenylamine, and fuel oil. According to the *Supplemental Phase II Report* (Smith, 1997), as early as 1973, MassDEP contacted the Facility about a seep of oily material in East Ditch Stream, adjacent to the Plant B tank farm. A 1973 analysis of the oil (from well IW-11) indicated that the oil contained a high percentage of BEHP and lesser amounts of NDPhA, dioctylphthalate, and TMPs.

The Property contains a slurry wall containment structure with a temporary cap – the "Containment Area" – that was constructed in 2000/2001 as a Release Abatement Measure (RAM) under the oversight of MassDEP. This source control action was not ultimately successful; however, its intent was to eliminate the on-Property DAPL source material as a source of dissolved constituents to groundwater. The Containment Area structure is comprised of a perimeter slurry wall installed to the bedrock surface and a temporary cap to minimize infiltration of precipitation. The temporary cap is a scrim-reinforced polyethylene sheet cover with sewn seams, held in place by sandbags and gravel ballast along the edges. A water table equalization window within the slurry wall allows the groundwater surface within and outside the slurry wall to equilibrate.

With the exception of the Calcium Sulfate Landfill (CSL) feature in the southernmost end of the Property, the 20-acre southern portion of the Property remains wooded. This portion of the Property has been restricted by a conservation restriction – an Environmental and Open Space Restriction – that, among other things, preserves this area in its predominantly natural, undeveloped condition.[9] The CSL feature is approximately 2.5 acres in size and was capped in 1988. MassDEP issued a determination on January 7, 2009 that the CSL had been capped in conformance with the landfill design plans and was deemed closed in accordance with the Massachusetts Solid Waste Management Facility Regulations (310 CMR 19.000), subject to conditions, including monitoring in accordance with a December 2006 post closure monitoring plan. On March 3, 2011, MassDEP issued an approval of a modification of the post closure monitoring plan (MassDEP, 2011).

To facilitate investigation of the Site, EPA subdivided the Site into three OUs, briefly described as follows:

OU1: On-Property soil, sediments, and surface water;

OU2: Off-Property soil, sediments, and surface water; and

OU3: All on- and off-Property groundwater areas that have been affected by contamination from the Property, including DAPL.

A more detailed description of the Site history can be found in the *Site Description and Site History* section of the *July 2015 Final OU1/OU2 RI Report* (AMEC, 2015a) and the *Site Background* section of the *June 2019 Draft OU3 RI Report* (Wood, 2019). For further details on the scope of each OU, see **Section D**, **SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION** in **Part 2** of this ROD, below.

2. History of Federal and State Investigations and Removal and Remedial Actions

Table B-2 provides a summary of Federal and State Site investigations and response actions.

[9] The Environmental and Open Space Restriction, recorded in the Middlesex North Registry of Deeds on November 7, 2006, Book 20680, Page 234, was negotiated by and between Olin, MassDEP, and the Town of Wilmington, acting by and through its Conservation Commission, in full settlement and satisfaction of the requirements for the imposition of a land use restriction as provided in MassDEP's 401 Water Quality Certification, dated July 27, 2000, and Wilmington Conservation Commission's Order of Conditions, dated July 25, 2000.

Table B-2					
Date	**Action**	**Legal Authority**	**Performing Party**	**Results**	**Related Documents**
1975 to 1986	Response Action		PRP	Treatment plant constructed to treat liquid wastes; creation and operation of the CSL to receive sediments from Facility settling ponds	
1980	Site Assessment (SA)	CWA and Resource Conservation and Recovery Act (RCRA)	EPA	*Site Inspection (SI) Report* (Ecology, 1980)	
1981	Response Action		PRP	Installation and operation of Plant B groundwater recovery/treatment for LNAPL to prevent impacts to East Ditch Stream	
1986	Preliminary Assessment/ Site Inspection (PA/SI)	Massachusetts General Laws (MGL) Chapter 21E and MCP, 310 CMR 40.000	Massachu-setts Department of Environ-mental Quality Engineering (Mass DEQE)	*Phase I SI Report* (Wehran, 1986)	*EPA Potential Hazardous Waste Site SI Report* (Wehran, 1986)
1987	Response Action	Massachusetts Solid Waste Management Facility Regulations, 310 CMR 19.000	PRP	Dismantling of the lined lagoons and capping and closure of CSL	*Completion of Closure* (MassDEP, 2009)
1990	Response Action	MCP, 310 CMR 40.000	PRP	Olin begins to sample certain Cook Ave and Border Ave private residential wells located near the Olin property for VOCs, SVOCs, pesticides, PCBs, metals, and general	*Comprehensive SA Phase II Field Investigation Report* (CRA, 1993)

Table B-2					
Date	**Action**	**Legal Authority**	**Performing Party**	**Results**	**Related Documents**
				chemistry. After initial sampling, the samples were analyzed for a more limited suite of analytes.	
1991 to 1993	Site Investig-ation	MCP, 310 CMR 40.000	PRP	Olin collects samples for full-suite analysis from Town of Wilmington public water supply wells in the MMB aquifer, additional residential wells on Main St, and monitoring wells, including NDMA as part of the SVOC analysis; detection limits were extremely high (approx. 10,000 ng/L) and NDMA was not detected.	*Comprehensive SA Phase II Field Investigation Report* (CRA, 1993)
1992	Notice of Responsib-ility	MGL Chapter 21E and MCP, 310 CMR 40.000	MassDEP	*Notice of Responsibility* (MassDEP, 1992)	
1994	Response Action	MCP, 310 CMR 40.000	PRP	Flocculant (floc) precipitate removed from Off-Property West Ditch Stream via vacuum truck	
1997	Site Investig-ation and Risk Assessments	MCP, 310 CMR 40.000	PRP	*Supplemental Phase II Investigation Report and Human Health and Ecological Risk Assessments* (Smith, 1997)	
2000 to 2001	Response Action	MCP, 310 CMR 40.000	PRP	Construction of Containment Area slurry wall and cap; excavation and off-site disposal of contaminated on-	*Part 1 RAM Approval* (June 2000); *Part 2 RAM Approval* (August 2000); *Conditional Approvals of RAM*

Table B-2					
Date	**Action**	**Legal Authority**	**Performing Party**	**Results**	**Related Documents**
				Property soil and sediments	*Modifications* (September and November 2000); *Status Report No. 1, Part 2 Construction Related RAM* (GEI, 2000b)
2000 to 2004	Response Action	MCP, 310 CMR 40.000	PRP	Excavation and off-site disposal of contaminated soil from Lake Poly area	*Field Activity Report, Former Lake Poly Area* (GEI, 2004a)
2000 to 2005	Response Action	MCP, 310 CMR 40.000	PRP	Air Sparging/Soil Vapor Extraction (AS/SVE) to remove more than 2,000 pounds TMPs from subsurface soils near Plant B; excavation and removal of drums, debris, and contaminated soil from Drum Areas A and B and the Buried Debris Area	*Immediate Response Action (IRA) Status Reports* (Shaw, 2005)
2002	Response Action	MCP, 310 CMR 40.000	PRP	First sampling for NDMA at the Site with lower detection limits (approx. 2 ng/L); NDMA first detected in Town of Wilmington's municipal wells in MMB aquifer; wells taken off-line and Town meets water demand using other municipal wells	
2003 to 2006	Response Action	MCP, 310 CMR 40.000	PRP	Testing of additional private wells within the OU3 groundwater study area with lower detection limits for NDMA (approx. 2 ng/L)	

Table B-2					
Date	**Action**	**Legal Authority**	**Performing Party**	**Results**	**Related Documents**
2004			MassDEP	Requests that EPA list Site on the NPL	
2006	NPL Listing	CERCLA	EPA		*Hazard Ranking System (HRS)* documentation, available at: https://semspub.epa.gov/work/01/75001014.pdf
2007 to 2015	Remedial Investigation (OU1/OU2)	CERCLA	PRP	*July 2015 Final OU1/OU2 RI Report* (AMEC, 2015a)	*Draft Focused RI Report* (MACTEC, 2007); *Final RI/FS Work Plan* (MACTEC, 2009); *Preliminary RI Report OU1* (MACTEC, 2011)
2007 to present	Remedial Investigation (OU3)	CERCLA	PRP	*Revised June 2019 Draft OU3 RI Report* (Wood, 2019)	*Draft Focused RI Report* (MACTEC, 2007); *Final RI/FS Work Plan* (MACTEC, 2009); *OU3 Data Gaps Work Plan* (AMEC, 2014b); *Final OU3 Data Gaps Work Plan* (AMEC, 2015b); *Focused RI Report – DAPL* (AMEC, 2017); *Data Gaps Work Plan* (Geomega, 2019); *Approval of Data Gaps Phase 1A Seismic Work* (USEPA, 2020d)
2008 to 2009	Response Action	CERCLA	PRP	EPA requires Olin sample 11 private wells near the Olin property for NDMA; NDMA detected for the first time in two private wells on Cook Ave at low concentrations; EPA requests that Olin	

Table B-2					
Date	**Action**	**Legal Authority**	**Performing Party**	**Results**	**Related Documents**
				repeat and expand the sampling; construction of drinking water line extension to Town of Wilmington public water distribution system for residences near the Olin property	
2008 to 2012	Interim Response Action	CERCLA	PRP	Design and construction of the Jewel Drive DAPL field pilot extraction system	*Final Interim Response Steps Work Plan* (MACTEC, 2008)
2008 to present	Response Action	CERCLA	PRP	Quarterly testing of private wells within the OU3 groundwater study area	*Residential Water Supply Results* (Nobis, 2020)
2010	Ground-water Use and Value Determin-ation	1998 Memorandum of Agreement between EPA and MassDEP	MassDEP	Determination of high use and value for the Site area aquifer	*Groundwater Use and Value Determination* (MassDEP, 2010a)
2010	Interim Measure	CERCLA	PRP	Provision of bottled water to two private well owners on Cook Ave	*NDMA in Private Wells – Recommendation to Discontinue Consumption* (USEPA, 2010); *Approval to Perform an EE/CA for a Non-Time Critical Action* (USEPA, 2011); *Response Alternatives Evaluation Report* (AMEC, 2012a)
2012 to present	Interim Response Action	CERCLA	PRP	Operation of the DAPL pilot extraction system	*Final O&M Plan, DAPL Extraction Pilot Test* (AMEC, 2012b); *Jewel Drive DAPL Extraction Pilot Report* (AMEC, 2014a)

Table B-2					
Date	**Action**	**Legal Authority**	**Performing Party**	**Results**	**Related Documents**
2015	Baseline Human Health Risk Assessment (OU1/OU2)	CERCLA	PRP	Final Baseline Human Health Risk Assessment OU1/OU2	*Appendix M, July 2015 Final OU1/OU2 RI Report* (AMEC, 2015a)
2015	Baseline Ecological Risk Assessment (OU1/OU2)	CERCLA	PRP	Baseline Ecological Risk Assessment OU1/OU2	*Appendix N, July 2015 Final OU1/OU2 RI Report* (AMEC, 2015a)
2019	Baseline Human Health Risk Assessment (OU3)	CERCLA	PRP	Revised Draft Baseline Human Health Risk Assessment OU3	*Appendix K, Revised June 2019 Draft OU3 RI Report* (Wood, 2019)
2020	Remedial Investig-ation Addendum (OU1/OU2)	CERCLA	EPA	*Updates to OU1/OU2 RI Report Conclusions* (USEPA, 2020a)	
2020	Remedial Investig-ation Addendum (OU3)	CERCLA	EPA	*Updates to June 2019 Draft OU3 RI Report Conclusions* (USEPA, 2020b)	
2020	Feasibility Study Report	CERCLA	EPA/PRP	*Evaluation of Remedial Alternatives – Volume 1* (Olin, 2020a); *Volume 2* (Olin, 2020b); *Volume 3* (USEPA, 2020c)	*Plant B/East Ditch Risk Evaluation* (Nobis, 2019); *Residential Human Health Risk Evaluation – Olin OU1/OU2 Soils* (Bluestone, 2020); *Revised Human Health Risk Calculations for Potable Use of Private Residential Wells* (Olin, 2020c); *PRGs to Address Ecological Risks in Soils, Sediments, and Surface Water* (Wood, 2020b) *PRGs to Address Human Health Risks*

Table B-2					
Date	**Action**	**Legal Authority**	**Performing Party**	**Results**	**Related Documents**
					in DAPL, Groundwater Hot Spots, Upland Soil (Including Containment Area Soil), and Surface Water (Wood, 2020c)

Additional information on prior investigations and response actions can be found in the *Study Area Investigations (OU1/OU2) and Response Actions (OU1/OU2)* section of the *July 2015 Final OU1/OU2 RI Report* (AMEC, 2015a) and the *Study Area Investigations* section of the *June 2019 Draft OU3 RI Report* (Wood, 2019).

3. History of CERCLA Enforcement Activities

EPA has performed a number of PRP search related activities, including sending information requests pursuant to CERCLA Section 104(e), reviewing files, and performing record searches. As a result of those PRP search activities, EPA issued notice of potential liability letters to: American Biltrite, Inc., Biltrite Corp., Olin Corporation, and Stepan Company on January 12, 2006, and Fisons Limited and NOR-AM Agro LLC on May 24, 2006. These parties either owned or operated the Facility at a time when hazardous substances were disposed of there or are a successor to an entity that was the owner or operator of the Facility at a time when hazardous substances were disposed of there. Olin Corporation is also the current owner and operator of the Facility.

On June 19, 2006, EPA issued special notice letters pursuant to Section 122(e) of CERCLA requesting participation in negotiations for performance of an RI/FS to these PRPs. On July 3, 2007, American Biltrite, Inc., Olin Corporation, and Stepan Company entered into an Administrative Settlement Agreement and Order on Consent for RI/FS (U.S. EPA Docket No. CERCLA 01-2007-0102) for the Site, (referred to herein as the "AOC for RI/FS").

On August 12, 2020, EPA issued Potentially Interested Party (PIP) letters to two parties, Bayer Corporation and Sanofi U.S. Services, Inc.

The AOC RI/FS Respondents (Olin Corporation, American Biltrite, Inc., and Stepan Company) have been active in the remedy selection process for the Site. The Respondents funded and/or performed the studies and investigations upon which the *FS Report* and Proposed Plan were based. One PRP submitted comments on the Proposed Plan. The PRP comment letter (as well as other comments received during the comment period) are included in the Administrative Record. The comments are summarized and responded to in the Responsiveness Summary in **Part 3** of this ROD.

C. COMMUNITY PARTICIPATION

Throughout the Site's history, community concern and involvement has been consistent. EPA has kept the community and other interested parties apprised of Site activities through informational meetings, fact sheets, press releases, and public meetings. Below is a brief chronology of public outreach efforts.

- In 2006, EPA conducted the first public meeting for the Site. Public meetings were subsequently conducted in 2007, 2008, 2009, 2010, 2011, 2014.

- On November 12, 2009, EPA initiated consultation with the National Oceanic and Atmospheric Administration, Coastal Protection and Restoration Division, the Department of Interior, Office of Environmental Policy and Compliance, and the Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Department of Environmental Protection, Natural Resource Damages Program to provide notification concerning the upcoming RI/FS activities at the Site.

- In 2010, EPA conducted door-to-door in-person outreach with an official from the Town of Wilmington's Board of Health to verify the location of private wells (potable and irrigation) and obtain access for the private well testing program.

- In 2019 and 2020 during the period leading up to the release of the Proposed Plan, EPA participated in conference calls and meetings with officials from the Town of Wilmington and MassDEP and members of the Wilmington Environmental Restoration Committee (WERC) to provide updates on the RI/FS work and discuss and coordinate public outreach for the Proposed Plan.

- On September 11, 2019, EPA met with officials from the Town of Wilmington and MassDEP to discuss the ongoing RI/FS at the Site, plan for the upcoming open house and informational meeting, and discuss next steps including the release of the Proposed Plan.

- On October 22, 2019, EPA held an open house and informational meeting in Wilmington, MA to update the community about the ongoing RI/FS at the Site, provide information on the Site background and history, answer questions, and explain next steps. Prior to the meeting, EPA provided notice to residents in the Town of Wilmington and City of Woburn via a "Save-the-Date" postcard mailing, and issued a press release and informational fact sheet.

- On August 12, 2020, EPA's Proposed Plan was uploaded to the Site webpage along with instructions on how community members could participate in the virtual public informational meeting on August 25, 2020 and virtual formal public hearing on September 22, 2020. An Eventbrite pre-registration link was also added to track the number of participants and facilitate the question-and-answer portion of the informational meeting and the provision of oral comments during the formal hearing.

- On August 12, 2020, EPA made the Administrative Record for the Proposed Plan, including the RI and FS reports, available for public review on the Site webpage. The Administrative Record is the primary Site information repository for residents and other community members and has been kept up to date by EPA.

- On August 12, 2020, EPA issued a press release announcing the availability of the Proposed Plan and the dates of the virtual public informational meeting and virtual formal public hearing. Additionally, EPA provided notice to residents in the Town of Wilmington and City of Woburn via a "Save-the-Date" postcard mailing. EPA also sent notification to the Site e-mail distribution list. Town officials in the neighboring towns of Woburn, Reading, and Burlington were also notified.

- On August 12, 2020, EPA published a legal notice in the Wilmington Town Crier announcing the availability of the Proposed Plan, identifying EPA's proposed remedy for the Site, and including a link to the Proposed Plan on the Site webpage.

- On August 25, 2020, EPA held a virtual public informational meeting via the Adobe Connect platform to provide information on the Site background and history, summarize the activities and findings of the RI/FS, present EPA's proposed remedy for the Site, explain next steps, and answer questions. The event was held virtually due to the COVID-19 pandemic and state and local government restrictions on large gatherings. The meeting was recorded and closed captioning was made available.

- From August 26, 2020 through October 26, 2020, EPA held a 60-day public comment period to accept public comments on EPA's proposed remedy for the Site, as presented in the Proposed Plan. EPA accepted comments via mail and e-mail during the comment period, as well as via a dedicated voice mailbox.

- On September 22, 2020, EPA held a virtual formal public hearing via the Adobe Connect platform to provide the community with an opportunity to provide oral comments on EPA's Proposed Plan for the Site for the official record. Oral comments received during the virtual hearing were transcribed by a stenographer and included as part of the Administrative Record for the ROD.

- On January 19, 2021, EPA initiated consultation with the Massachusetts Historical Commission and the Mashpee Wampanoag Tribe, pursuant to EPA's obligations under Section 106 of the National Historic Preservation Act of 1966, as amended, to provide notification concerning EPA's preparation of the ROD. EPA's correspondence to the Massachusetts Historical Commission was received on January 27, 2021. In a telephone call with EPA on February 19, 2021, Massachusetts Historical Commission staff identified the Middlesex Canal as a historic and cultural resource located within the off-Property area of the Site.

D. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

As with many Superfund sites, the problems at the Olin Chemical Superfund Site are complex. As a result, EPA has organized the work into three OUs:

- OU1: Includes on-Property soil, sediments, and surface water; vadose-zone soil (soil above the water table); and VI. Includes the Property, including the Facility and Facility area, the approximately 20-acre southern area that is restricted by a conservation restriction, on-Property stream system, CSL, and Containment Area.
- OU2: Includes off-Property soil, sediments, and surface water. Includes East Ditch Stream, a portion of South Ditch Stream, Off-Property West Ditch Stream, portions of the MMB wetlands, and North Pond.
- OU3: The OU3 groundwater study area was designed to investigate the nature and extent of contamination in the Ipswich River and Aberjona River Watersheds. Includes the MMB aquifer, groundwater beneath the Property, and groundwater to the north, south, east, and west of the Property that has been affected by contamination associated with the Property.

RI work at the three OUs was conducted pursuant to an AOC signed in July 2007. RI work was undertaken by Olin on behalf of the Respondents (Olin, American Biltrite Inc., and Stephan Company). RI work for OU1/OU2 culminated in the submittal to EPA of the *July 2015 Final OU1/OU2 RI Report* in 2015 (AMEC, 2015a). This report included a BHHRA for OU1/OU2 as Appendix M, and a BERA for OU1/OU2 as Appendix N. RI work for OU3 was also conducted beginning in 2007 and is still ongoing. In 2019, Olin submitted the *June 2019 Draft OU3 RI Report* to EPA (Wood, 2019), which included a Revised Draft BHHRA for OU3 as Appendix K. Together with a report on the outcome of the Jewel *Drive DAPL extraction pilot (AMEC, 2014a), the July 2015 Final OU1/OU2 RI Report* and the *June 2019 Draft OU3 RI Report* summarize the nature and extent of contamination at the Site. EPA supplemented these three documents with RI addenda (USEPA, 2020a and USEPA, 2020b) and additional risk evaluations (Nobis, 2019, Bluestone, 2020, Olin, 2020c, Wood, 2020b, and Wood, 2020c).

Based on the findings presented in these reports, EPA determined that sufficient information was available to evaluate alternatives to address soil, sediments, and surface water contamination in OU1 and OU2 and to evaluate alternatives to initiate source control actions for groundwater (OU3). However, there were several data gaps regarding the full extent of contamination in groundwater. Therefore, EPA proceeded with the development of the *FS Report* for the Site, issued as three volumes (Olin, 2020a, Olin, 2020b, and USEPA, 2020c). The *FS Report* provides the basis for the selected final remedy for OU1/OU2 to mitigate risks from soil, sediments, and surface water and an interim remedy for OU3 to initiate source control for groundwater. Additional investigation activities are still ongoing for OU3 and a final remedy will be selected following completion of the OU3 RI/FS.

E. SITE CHARACTERISTICS

The findings of the *Final July 2015 OU1/OU2 Report* and the *June 2019 Draft OU3 RI Report* are summarized below. An overview of the RI activities may also be found in Section I of the *FS Report Volume I* and *FS Report Volume II*.

1. Physical Setting

The Site is in the southern part of Wilmington, Massachusetts and includes the approximately 50-acre Property and surrounding areas to the north, south, east, and west where contaminants have migrated by surface water and/or groundwater transport. The location of the Property and other Site features are shown on **Figure 1** in **Appendix C** of this ROD. Features specific to the Property, including former disposal areas, infrastructure, and remedial features are shown on **Figure 2** in **Appendix C** of this ROD.

The northern portion of the Property, also known as the industrial area, includes the former administration office building and laboratory, a small butler building, a guard shack, the East and West warehouses, the Plant B Treatment Building, and an office trailer. These structures, except for Plant B and the office trailer, are unoccupied with "Do Not Enter" signs posted. Most of the former plant buildings and other structures have been demolished with only concrete slabs remaining. The Plant B treatment building and office trailer have electric service and are served by municipal water. The northern industrial area of the Property and the industrial areas surrounding the Property are partially covered in concrete and pavement.

The southern half of the Property is undeveloped and consists largely of wetlands and mature forest, except in the southwestern corner where the closed CSL is located. As discussed above in **Section B(1)**, *History of Site* in **Part 2** of this ROD, approximately 20 acres within this forested area (including the CSL) is subject to the terms of an Environmental and Open Space Restriction.

On- and off-Property surface water bodies are shown in **Figures 1** and **2** in **Appendix C** of this ROD. The Property is bounded to the north by Eames Street; to the south by the Woburn/Wilmington town line and the WSL (currently closed); to the east by the MBTA railroad tracks and East Ditch Stream; and to the west by the PanAM Railways railroad spur and Off-Property West Ditch Stream. Intensive industrial land use occurs on the eastern, northern, and western sides of the Property. Residential properties are located along Main Street and Cook Avenue to the west of the Property and along Eames Street before it intersects with Woburn Street.

Site Topography

The developed, northern portion of the Property is essentially flat (see **Figure 6** in **Appendix C** of this ROD for Site topography); the undeveloped, southern portion of the Property has slightly more topographic relief. The MBTA rail line creates a topographic low along the eastern side of the Property. A low ridge runs along the southern boundary of the Property. The WSL is a prominent topographic high immediately south of the Property; beyond the WSL the land becomes flatter and lower in elevation.

On-Property topographic features include an east-west trending low-lying area that forms South Ditch Stream and Ephemeral Drainage, and includes Central Pond and a stormwater detention basin located between the Containment Area and South Ditch Stream. This low-lying area is bounded by East and West Ditch Streams and railroad tracks on either side of the Property. Elevations just beyond East and West Ditch Streams and the railroad tracks are similar and relatively flat. The area immediately west of the northern portion of the Property is relatively flat. The area immediately west of the southern portion of the Property features a small hill that includes several residences along Cook Avenue and Border Avenue. To the northwest of the Property, on the western side of Main Street in Wilmington, the topography drops to lower elevations near and within the MMB wetlands. The MMB wetlands are bordered by upland areas to the west of Chestnut Street, and to the north by a broad ridge that runs parallel to Butters Row.

Site Geology

The unconsolidated overburden stratigraphy of the Property includes unconsolidated organic materials and quaternary glacial deposits (ice contact deposits, outwash deposits, and glacial till). These unconsolidated deposits are overlain by fill. The area surrounding the Property is characterized by bedrock knobs and basins, with generally shallow bedrock that drops off in a series of basins that extend westward to the MMB wetlands. The MMB wetlands are underlain by a major fracture zone that forms the WBV. The bedrock surface in the WBV reaches depths of over 120 feet bgs.

The geologic units are identified as follows (in descending order from the ground surface):

- Fill: Fill was identified over the developed portion of the Property ranging in thickness from 1–12 feet. Fill consists of uniform sand that appears to be a reworked native soil. Unless debris or foreign materials were present in this material, it was often difficult to distinguish fill from undisturbed native material.
- Peat/organic silts: Peat deposits were encountered in the formerly industrial portion of the Property. The organic peat layer is typically encountered at or just below the ground surface. In some low-lying drainage swales, the peat is encountered at the ground surface but more typically the peat layer, where present, is overlain by fill material and/or sandy alluvial material and encountered at depths of 2–11 foot (ft) bgs. Thick layers of peat and silt/clay are also located in the interior of the MMB wetlands complex.
- Ice contact and outwash deposits: At the Property, these materials are present below the peat and in some areas directly below the fill. These deposits consist of layers of fine, clean sand interbedded with sand, gravel, and cobbles ranging from 2–10 feet thick. Thick sand and gravel deposits are also located within upland areas adjacent to the MMB wetlands complex.
- Glacial till: both basal and ablation till are present; till deposits appear to be thickest in the deepest incised portions of the WBV.
    - Ablation till deposits are generally loose and poorly sorted and consist of well graded sands and gravels with relatively less silt and clay. The ablation till encountered at the Property was characterized by the presence of cobbles and silt and was well graded compared to the relatively uniform ice contact and outwash deposits. The depth to the top of the ablation till varied from 5–32 ft bgs across the Property.
    - The basal till consists of well graded fine to coarse sand and gravel and may contain appreciable amounts of silt and clay. Basal till is located directly over the bedrock and may have a lower transmissivity than the ablation till. The interpreted basal till encountered at the Property was distinguished from the ablation till by the higher fines content, with enough silt to appear as a cohesive soil. The basal till underlies the ablation till over much of the Property and was typically encountered in thicknesses of 1–6 feet.
- Bedrock: Generally, bedrock is associated with the Composite Platform of Southeast New England or more specifically the Milford-Dedham Zone. This zone includes late Proterozoic and early Paleozoic rocks (also called the Avalon Zone) that lie between the Bloody Bluff Fault and the Northern Boundary Fault of the Boston Basin. The igneous rocks are predominantly gabbro

and diorite complexes, with gabbro-diorites that are moderately resistant to weathering and erosion; cataclastic gabbro-diorites that are more easily weathered, and in turn are found in the topographically lower terrain with more gentle slopes; and granitic intrusions which are most competent bedrock and outcrop at the elevated areas near the CSL and near Cook Avenue.

Extensive bedrock fractures are present between the WBV and the Bloody Bluff Fault to the northwest and along the axis of the WBV. The bedrock at the WBV and closer to the Bloody Bluff fault within the Burlington Mylonite Zone appears to be more fractured and contains larger fracture apertures. Bedrock closer to and within the Property may be less fractured, particularly in the vicinity of bedrock knobs and outcrops. Borings installed in siliceous units such as quartzite showed limited to sparse fracturing.

Hydrogeology

Groundwater generally flows to the northwest and southeast along a groundwater divide that crosses the northern portion of the Property and separates the Aberjona and Ipswich River Watersheds. Shallow overburden groundwater interacts with surface water, while bedrock groundwater does not directly impact surface water.

Overburden Groundwater Hydrogeology and Hydrology

Figures 7, **8**, and **9** in **Appendix C** of this ROD show the interpreted potentiometric surface across the Site in shallow overburden, deep overburden, and bedrock groundwater, respectively. These figures also show the estimated location of the groundwater divide between the two watersheds, which is the dominant hydrologic feature that separates groundwater flow between the Ipswich River Watershed to the north and west and the Aberjona River Watershed to the south and east.

The groundwater divide cuts across the northern portion of the Property, slightly south of and parallel to Eames Street, and continues to the southwest between Main Street and Jewel Drive. The groundwater divide is influenced by both topography and the location of surface water drainage patterns. Groundwater elevation changes in the vicinity of the divide are very small and sensitive to seasonal differences in the groundwater surface; therefore, the location of the divide will shift based on hydrologic conditions.

The hydraulic conductivity (K) of the Site aquifers vary widely depending on location and soil type:

- Glacial tills exhibit K values from less than 1 to 3 feet/day.
- Finer sandy and silty fine sand deposits typical of on-Property areas and areas to the southeast range from 3–15 feet/day.
- Coarser sand and gravel deposits encountered in the thicker overburden to the west (including ice contact deposits) range up to 75 feet/day.
- Coarser sand and gravel deposits with cobbles, which predominate in the middle section of the MMB aquifer, vary widely with K values reported of over 500 feet/day, but probably averaging 140–250 feet/day.

Groundwater flow rates are estimated to range from 15–45 feet per year (or more) in the MMB aquifer. Groundwater flow rates are higher in the area of the Property due to steeper gradients despite lower K values.

Vertical gradients within the Ipswich River Watershed are small (0.0002 to 0.005 feet/feet) and varied, indicating that the predominant flow component is lateral. Closer to Off-Property West Ditch Stream, gradients are generally upward. Most wells within the upland portion of the Property typically exhibit downward vertical gradients between shallow and deep overburden groundwater and generally exhibit upward gradients within or bordering wetland areas. South Ditch Stream is predominantly a gaining surface water body that receives shallow groundwater contributions.

Bedrock Groundwater
Bedrock groundwater elevation contours are like those of the overburden groundwater system, and similarly impacted by the groundwater divide (see **Figure 9** in **Appendix C** of this ROD). Bedrock hydraulic conductivities measured at the Site range from 0.00032 to 1.3 feet/day, which is typical of New England metamorphic rock. The K values for bedrock are considered a bulk K value representative of both solid rock and fractures within the tested zone, and are several orders of magnitude lower than K values measured in overburden wells. Horizontal gradients within the bedrock groundwater system are small and comparable to the deep overburden with values in the range of 0.000057 feet/feet in the Ipswich River Watershed to 0.0033 feet/feet in the Aberjona River Watershed. Calculated bulk groundwater flow rates range from 0.1 feet/year in the Ipswich River Watershed to 8 feet/year in the Aberjona River Watershed. Vertical gradients in bedrock are generally small and comparable to those measured in the overburden.

Pumping Impacts
The Town of Wilmington formerly operated five municipal wells, located in the aquifer underlying the MMB wetlands approximately three quarters of a mile northwest of the Property in the Ipswich River Watershed. The municipal wells operated at a rate of approximately 2.5 million gallons per day until they were shut down in 2003. The former Altron/Sanmina facility, located close to the Property at 1 Jewel Drive, used two wells for industrial purposes from 1992 to 2004. Pumping of the municipal and Altron/Sanmina extraction wells may have influenced groundwater flow, resulting in contaminant transport from the Aberjona River Watershed across the groundwater divide into the Ipswich River Watershed.

Surface Water Hydrology

The Site contains both on- and off-Property surface water bodies (see **Figures 1** and **2** in **Appendix C** of this ROD). On-Property surface water includes a stream system of natural drainages that was modified in the early 1950s, and a natural wetland drainage complex in the southern portion of the Property. Additional surface water bodies include a stormwater detention basin and pond south of the Containment Area. The on-Property stream system is connected to two off-Property streams (East and Off-Property West Ditch Streams). These features are all part of the Aberjona River Watershed. Other surface water bodies at the Site include MMB and Sawmill Brook (SMB) to the west. MMB and SMB are located on the other side of the groundwater/surface water divide, within the Ipswich River Watershed.

Surface Water Features:

- On-Property West Ditch Stream begins along the northwest border of the Facility and drains to South Ditch Stream. Sediments in much of On-Property West Ditch Stream and the associated West Ditch Stream wetlands were remediated and relocated in 2000 and the portion beneath the Containment Area was reconstructed as a concrete culvert in 2000, which changed the natural course of the stream channel (MACTEC, 2007).
- The "Ephemeral Drainage" is a low-lying, intermittent surface water feature located just south of and parallel to South Ditch Stream and represents the floodplain for South Ditch Stream. During prolonged wet periods and following large precipitation events, flow may develop and join South Ditch Stream in the vicinity of the eastern boundary of the Property.
- South Ditch Stream (on-Property) begins at the western Property boundary and receives surface flow from Off-Property and On-Property West Ditch Streams. South Ditch Stream flows east across the Property and discharges into East Ditch Stream. During high groundwater conditions, constant base flow within South Ditch Stream indicates that it is a gaining stream that receives groundwater flow. However, during drier periods, the middle of South Ditch Stream may go dry, indicating that the water table falls below the stream bottom. South Ditch Stream has an annual flow of approximately 1.6 million cubic feet per year.
- "Central Pond" is a shallow, 100-foot wide pond with high banks located north of South Ditch Stream. The pond elevation of Central Pond matches the water table elevation.
- The "Detention Basin" is a shallow, 50-foot wide pond located north of South Ditch Stream that receives drainage from the Containment Area cap. The Detention Basin was constructed as part of the 2000 RAM to manage stormwater runoff from the Containment Area cap (GEI, 2000a). The Detention Basin has an outlet control structure that controls the hydraulic gradient in that area.
- Off-Property West Ditch Stream is a small, well defined drainage that includes channels constructed to manage stormwater runoff at the time of the development of Jewel Drive. The stormwater runoff channels are perpendicular to Jewel Drive at the boundaries of adjacent private properties. A small culvert under Jewel Drive allows surface water from a small stormwater sedimentation pond to be conveyed to the channel south of 8 Jewel Drive. Off-Property West Ditch Stream passes under the PanAM Railways railroad track in a stone culvert and becomes the headwaters of South Ditch Stream. Off-Property West Ditch Stream is separated topographically from the Property and does not receive stormwater runoff from the Property.
- East Ditch Stream lies within the railroad ditch east of the Property. This stream flows to the southeast from the Eames Street overpass bridge, parallel to the MBTA railroad tracks and the eastern Property boundary. East Ditch Stream receives stormwater runoff from abutting developed properties and adjacent wetlands. South of the Property, East Ditch Stream enters and exits a series of culverts eventually flowing into Halls Brook, which flows to the Halls Brook Holding Area and eventually to the Aberjona River. East Ditch Stream is owned by or occupies rights-of-way controlled by the MBTA and is regularly maintained to remove vegetation and debris from ballast that lines the channel. Access to East Ditch Stream is restricted for public safety reasons due to railroad operations.

- MMB and SMB are located within the MMB wetlands complex, which is located approximately 2,000 feet west and north of the Property. These water bodies have not been shown to have been impacted by the Site.[10]
- Landfill Brook is located to the south of the Property in Woburn and flows from west to east, south of the WSL. This brook is approximately 2,600 feet long, ranges from 6–10 feet in width, and varies from 6 inches–1 foot deep. Landfill Brook has not been shown to have been impacted by the Site.[11]

Surface water conforms to the groundwater watershed boundaries and flows. Portions of the surface water bodies described above are located within 100- and 500-year floodplains (see **Figure 5** in **Appendix C** of this ROD for FEMA flood hazard areas).

2. Conceptual Site Model

The sources of contamination, release mechanisms, exposure pathways to receptors for groundwater, surface water, soil, sediments, indoor air, as well as other site-specific factors, are considered while developing a Conceptual Site Model (CSM). The CSM illustrates contaminant sources, release mechanisms, exposure pathways, migration routes, and potential human and ecological receptors. It documents current and potential future site conditions and shows what is known about human and environmental exposure through contaminant release and migration to potential receptors. The risk assessment and response actions for all environmental media for the Site are based on this CSM.

The Site has been impacted by SVOCs from past releases (principally phthalates, phenols, and nitrosamine compounds), VOCs (principally TMPs), and metals (principally chromium, sodium, and calcium). In addition, the manufacturing processes included use of inorganic constituents including chloride, sulfate, calcium, and ammonia.

Sections 4 and 5 of both the *July 2015 Final OU1/OU2 RI Report* and the *June 2019 Draft OU3 RI Report*, Sections 1.4 and 1.5 of the *FS Report Volume I,* and Section 1.5 of the *FS Report Volume II* contain a more detailed discussion of the sources of contamination, nature and extent of contamination, and contaminant fate and transport. The COCs include, but are not limited to, the following:

- The DAPL source material is a highly acidic brine that is dark green in color with a specific gravity greater than or equal to 1.025, with a pH typically around 3.5. DAPL contains chromium and a high concentration of total dissolved solids. Several constituents are used to define DAPL empirically in the absence of reliable specific gravity measurements. These constituents include ammonia, chloride, magnesium, sodium, sulfate, and specific conductance. DAPL also contains

[10] See AMEC, 2015a. Executive Summary (p. ES-14). Metals and VOCs detected in surface water samples from the MMB wetland area are not associated with the Olin Site, and SVOC concentrations are consistent with background concentrations.
[11] See AMEC, 2015a. Section 4.3. The Calcium Sulfate Landfill (CSL), located northwest of the Woburn Sanity Landfill (WSL), has no measurable impact on Landfill Brook's water quality when compared to that caused by the WSL and other potential sources (including automotive businesses in proximity to the Landfill Brook headwaters and the former Merrimac Chemical Company)

low concentrations of other metals, TMPs, SVOCs (mostly phthalates), and NDMA, with concentrations of up to 50,000 ng/L (see additional discussion of COCs, below).

- NDMA is the primary COC associated with DAPL, is the most mobile of the groundwater contaminants, and is the primary COC that drives human health risks. There is no record of NDMA being used at the Site. NDMA is an SVOC that is thought to have formed in-situ from precursor chemicals including acetaldehyde, formaldehyde, and hydrazine. NDMA is present in elevated concentrations in groundwater and in DAPL, at levels of over 20,000 ng/L.
- Ammonia is an inorganic compound, manufactured industrially and also produced naturally from bacterial processes and the breakdown of organic matter. Ammonia is present in groundwater and surface water at the Site.
- Metals naturally occur as minerals in soil and rock and are often present in wastewaters from industrial activities. Metals in environmental media may also be mobilized by industrial activities or releases. Metals present in groundwater, soil, and sediments at the Site that contribute to potential human health and/or ecological risks include arsenic, chromium, cobalt, iron, and manganese, of which chromium is the most widespread.
- Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, and other organic substances like tobacco or charbroiled meat. Several PAHs, including benzo(a)pyrene, are present in soil and surface water at the Site and contribute to potential human health risks.
- TMPs, which are a type of VOC, were detected in soil in certain areas and in groundwater and surface water at the Site. They are also a component of the LNAPL present at the Property. VOCs are types of chemicals that can easily evaporate and are generally used in products such as glues, paints, and solvents.
- BEHP is a phthalate chemical detected in on-Property soil and sediments and has been identified as a component of the LNAPL present at the Property.
- The LNAPL is a mixture of process oil and other raw materials historically stored and used at the Facility that contains various contaminants, including TMPs and BEHP. LNAPL is present in soil and groundwater in the Plant B area in the northeastern portion of the Property.

Sources of Contamination

Sources of contamination are related to former manufacturing operations and waste disposal practices. Groundwater impacts have been identified from former releases of TMP and processing oils at the former Plant B production area and tank farm, as well as liquid waste disposal practices. The sources of surface water impacts include impacts from groundwater containing COCs and historical impacts from waste disposal practices that resulted in sediment contamination within the on-Property stream system. These sources include specific areas of waste disposal and infrastructure at the Facility (see **Figure 2** in **Appendix C** of this ROD).

Many contaminant sources were investigated and addressed through response actions under the MCP. These sources and other potential sources of contamination are identified below:

- Former Lake Poly, East and West Pits, and the three Acid Pits: Each of these unlined pits received liquid wastes during Facility operations between 1953 and approximately 1970. The liquid wastes contained sulfuric acid, sodium chloride, sodium sulfate, ammonium chloride, ammonium sulfate, chromium sulfate, and other constituents. Sodium dichromate was used in the Kempore (azodicarbonamide) process and acidic wastes containing chromium were discharged until 1967.
- Leaks from Lined Lagoons I and II and Emergency Lagoon: In approximately 1972, two lined lagoons (Lagoons I and II) and an acid treatment and neutralization system were added to the facility to replace the unlined Acid Pits and Lake Poly for the disposal of acidic wastewaters. Significant disposal of wastes in the Containment Area through leaks in the Lined Lagoons and disposal in the Emergency Lagoon likely occurred from 1972 until at least 1983, based on hydrogeologic evaluations of the lagoons conducted in 1981 and 1982. In 1986, the sludge and liners from the lagoons were excavated and disposed of in the CSL located in the southern portion of the Property (USEPA, 2020a).
- Liquid Waste Disposal Practices: Management of liquid wastes on the Property resulted in the formation of the DAPL pools, located within bedrock depressions. These pools include the Main Street DAPL pool and the Upper DAPL pool, which is divided into an on-Property portion (the Containment Area DAPL pool) and an off-Property portion (the Jewel Drive DAPL pool). The Main Street DAPL pool is further to the northwest of the Containment Area and Jewel Drive DAPL pools. A soil source for NDMA has not been identified.
- Manufacturing and Wastewater Treatment: Former manufacturing facilities include the laboratory, Plant A, Plant B, Plants C-1, C-2, and C-3, and Plant D. A wastewater treatment plant was installed in the early 1970s.
- TMPs: TMPs were released in the vicinity of the Plant B production area and TMP-containing processing oils were released in the vicinity of the Plant B tank farm.
- Transformers: Five transformers were formerly located across the Facility. The transformers were evaluated for potential releases of PCBs during the OU1/OU2 RI.
- Former Buried Debris Area: The Buried Debris Area included materials similar to those found in Lake Poly and was partially excavated in 2000-2001.
- Former Drum Areas: Drum Areas A and B were located near the three Acid Pits and to the southeast of the Buried Debris Area and were excavated in 2000.
- Calcium Sulfate Landfill: The CSL, which was created to receive sediments from settling ponds on the Property, was capped in 1988. The CSL received a closure determination from MassDEP on January 7, 2009, which included requirements for post closure monitoring plan (MassDEP issued an approval of a modification of the post closure monitoring plan on March 3, 2011).
- On-Property Stream System: The On-Property stream system, consisting of East, South, and On-Property West Ditch Streams, was used for liquid waste disposal between 1953 until approximately 1970.

- Fuel Oil USTs: Former fuel oil USTs were located on the east side of the Facility, beside the Broiler House.
- Subsurface Utilities/Septic Systems: Subsurface utilities and septic systems may have had leaks or cracks that released discharges into the subsurface. On-site sewers may have transported wastes from the Facility to septic leach fields.

Olin conducted a variety of response actions to date, including the following:

- Installation and operation of the groundwater recovery/treatment system at Plant B in 1981 to address LNAPL and contaminated groundwater that poses a risk to East Ditch Stream;
- The installation of a temporary cap and slurry wall (the "Containment Area" feature) from 2000 to 2001 to address the on-Property portion of the Upper DAPL Pool, the three Acid Pits, and a portion of the former drum disposal areas;
- Sediment and soil removal from Central Pond, On-Property West Ditch Stream, and South Ditch Stream from 2000 to 2001;
- Soil removal at the former Lake Poly, the former drum disposal areas, and the former Buried Debris Area from 2000 to 2004;
- SVE near the former Plant B production area from 2000 to 2005 to address a large area of TMP-impacted soils (extractable petroleum hydrocarbons/volatile petroleum hydrocarbons [EPH/VPH] area); and
- A DAPL extraction pilot test at a well near Jewel Drive between 2012 and 2014 in order to assess the feasibility of recovering DAPL from the subsurface. The pilot test ended in 2014, however, the DAPL recovery system has been re-started multiple times (between 2015 and 2016, and in 2017 and continuing through the present). Approximately 20,000 gallons of DAPL were recovered in 2020; the extraction system has recovered more than one million gallons of DAPL to date since system start-up.

Nature and Extent of Contamination

The following sections present the nature and extent of contamination – subdivided by OU and media – based on the following data sets:

- Historical data that are representative of current Site conditions;
- OU1/OU2 RI data from 2009 to 2013;
- OU3 RI data from 2010 to 2017; and
- Additional groundwater and soil data from 2019 sampling events.

Background Samples
Soil samples for the OU1/OU2 RI were collected from six unimpacted locations in the approximately 20-acre southern area that is restricted by a conservation restriction to characterize background conditions. A site-specific background concentration (95% Upper Predictive Limit) was developed for metals/inorganics and PAH compounds based on this data set.

Two background off-Property surface water/sediment locations (upstream of MMB and East Ditch Stream)[12] were sampled to create the background concentrations for surface water and sediment. No OU1 streams were sampled for background conditions since OU1 stream locations all have headwaters either entirely within the Property or on adjacent property and do not have upstream conditions suitable as a reference location.

OU1 Soil
Parameters detected most frequently in soil samples include SVOCs (BEHP and other phthalates, NDPhA, and higher molecular weight PAHs), metals and inorganics (chromium, calcium, sodium, sulfate, chloride, and ammonia), many of which are naturally occurring, and oil constituents or fractions (primarily C11-C22 aromatic hydrocarbons). In general, VOCs were not frequently detected. However, TMPs, a type of VOC, were detected frequently in soil samples collected in the vicinity of the former Plant B and the Plant B tank farm.

Site-related contaminants in soil were delineated at the perimeter and in the interior of the Property for surface soil, shallow subsurface soil (1-10 ft bgs), and deep subsurface soil. Chemicals with maximum concentrations that exceeded their corresponding EPA Industrial Regional Screening Levels (RSLs; triggering comparison to background and/or evaluation of risks) include the following:

- Surface soil: BEHP, NDPhA, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, Aroclor-1260, arsenic, and hexavalent chromium. EPA Industrial RSLs were not available for several detected parameters including 3&4-methylphenol, acenaphthylene, benzo(g,h,i)perylene, carbazole, dimethylphthalate, diphenyl ether, phenanthrene, alpha chlordane, delta-BHC, endosulfan I, endosulfan II, endrin ketone, calcium, magnesium, potassium, sodium, chloride, sulfate, and ammonia.
- Shallow subsurface soil: TMPs, BEHP, NDPhA, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, hydrazine, arsenic, hexavalent chromium, and C11-C22 aromatic hydrocarbons. Industrial RSLs were not available for several detected parameters, including 4-isopropyl toluene, sec-butylbenzene, 3&4-methylphenol, 4-chlorophenyl phenyl ether, acenaphthylene, benzo(g,h,i)perylene, carbazole, diphenyl ether, phenanthrene, calcium, magnesium, potassium, sodium, chloride, ammonia, and sulfate.
- Deep subsurface soil: TMPs, BEHP, arsenic, and hexavalent chromium. Industrial RSLs were not available for several detected parameters including 4-isopropyl toluene, 4-bromophenyl phenyl ether, 4-chlorophenyl phenyl ether, benzo(g,h,i)perylene, diphenyl ether, diphenylmethanone, phenanthrene, calcium, magnesium, potassium, sodium, chloride, ammonia, and sulfate.

[12] See AMEC, 2015a. Figure 2.5-1. Background Surface Water and Sediment Sampling Locations. Remedial Investigation Report – OU1 and OU2. Olin Chemical Superfund Site. Wilmington, Massachusetts.

Elevated concentrations of the aforementioned constituents were identified in the vicinity of former disposal and operations areas that have since been remediated. These areas include the area near former Lake Poly and the adjacent former Drum Storage Area; the area east of and adjacent to the former Plant B tank farm; and an area of TMPs in soil under the administrative building parking lot near the former Plant B production area. The unremediated portion of lower South Ditch Stream both on the Property (OU1) and just off the Property (OU2) also contain elevated concentrations of certain COCs (see *OU2 Soil,* below).

NDMA was not detected in any soil samples from OU1. The only primary COCs that were detected in soil, and for which EPA Industrial RSLs (or equivalent risk-based values) are not available, are ammonia, calcium, sulfate, sodium, and chloride.

Aroclor-1260 was detected in the area of a historical pole-mounted transformer formerly in the northwest quadrant of the Property. Olin completed a process of staged collection and analysis of PCBs in soil to determine the areal extent and depth of PCB contamination. The depth of detected concentrations ranged from surface soil to 4 ft bgs.

Although arsenic was detected in most soil samples at concentrations above the corresponding Industrial RSL (1.6 milligrams per kilogram [mg/kg]), most of the reported concentrations were less than the Site-specific background value. Furthermore, concentrations that exceeded the Site-specific background value were not located in a cluster or clusters. Information from the operational history of the Facility does not indicate that arsenic was a raw material, waste product, or manufactured product at the Facility; therefore, the *July 2015 Final OU1/OU2 RI Report* concluded that arsenic is not a COC.

While soil in the Containment Area has not been identified as RCRA hazardous waste, it is possible that hazardous waste may be present. Historical disposal practices in this area suggest that unsaturated soil within the Containment Area contains waste materials. Pre-RI soil samples were primarily collected from the Containment Area between the surface and 10 feet bgs. During the OU1/OU2 RI, characterization of Containment Area soil was limited to surface samples from beneath the temporary cap, which were collected by cutting slits in the cap and using a hand-held spatula. Deeper samples were not collected at that time to avoid potential damage to the temporary cap that may have resulted from the presence of the drill rig. In 2019, twelve soil samples were collected at a variety of depths from the Containment Area to determine if Containment Area soil meets the definition of characteristic hazardous waste (Wood, 2020a). Each boring was drilled through overburden soil and advanced 5 feet into the top of bedrock. Analytical results from the soil samples collected from these borings showed elevated concentrations of TMPs, BEHP, and total chromium; none of the samples exceeded the criteria for RCRA hazardous waste characteristics. However, the sampling data was limited and additional sampling would be necessary to demonstrate the absence of non-hazardous wastes (*i.e.*, solid wastes) within the Containment Area.

OU1 Wetland Soil and Sediments

OU1 sediment samples were collected from South Ditch Stream, the On-Property West Ditch Stream wetlands, the Detention Basin, and Central Pond.

The most frequently detected parameters in sediment from South Ditch Stream include BEHP, TMPs, three extractable petroleum hydrocarbon (EPH) fractions, 3&4-methylphenol, formaldehyde, metals, and inorganics including: aluminum, chromium, iron (that has been associated with floc in South Ditch Stream), as well as hexavalent chromium, sulfate, and ammonia.

On-Property West Ditch Stream wetland sediment samples had similarly detected constituents as South Ditch Stream sediment samples, including chromium (and most other metals), BEHP, and TMPs (at low frequency).

For the Detention Basin, detected analytes in sediment samples include TMPs, BEHP, phenols, NDPhA, and one PAH, in addition to metals and inorganic constituents; detected analytes appear to be consistent with potential impacts from groundwater.

For Central Pond, detected analytes in sediment samples include TMPs, phenols, and four PAHs, in addition to metals and inorganic constituents.

OU1 Surface Water

OU1 surface water samples were collected from South Ditch Stream, the Detention Basin, and Central Pond.

South Ditch Stream is a gaining stream with very limited headwaters. The most frequently detected metals and inorganics include aluminum, barium, chloride, chromium, cobalt, copper, iron, magnesium, manganese, nickel, sodium, potassium, calcium, sulfate, and ammonia. NDMA, NDPhA, NDPrA, and low concentrations of several SVOCs, including BEHP, 2-nitrophenol, 4-nitrophenol, benzoic acid, diphenyl ether, bromoform, and diphenylmethanone were also detected in South Ditch Stream surface water samples. TMPs were detected frequently, but at trace concentrations.

Chromium and ammonia concentrations in South Ditch Stream surface water have declined substantially over time, with some fluctuations observed that may be related to the changes in the pumping of the Sanmina industrial water supply wells located across Jewel Drive (see *Pumping Impacts* in the *Hydrogeology* section, above).

The Detention Basin likely receives seasonal groundwater flow depending on the water elevation in the basin relative to surrounding groundwater elevations. Detected parameters in Detention Basin surface water include metals and inorganics including aluminum, barium, chloride, chromium, hexavalent chromium, copper, iron, lead, manganese, magnesium, sodium, vanadium, zinc, potassium, calcium, chloride, sulfate, and ammonia, at relatively low concentrations. NDPrA was also detected.

Central Pond has no surface water inlet or outlet, and the surface water present is an expression of the overburden groundwater table. The analytes detected in Central Pond are limited to metals and inorganics including aluminum, barium, chloride, chromium, iron, lead, magnesium, manganese, sodium, nickel, potassium, calcium, sulfate, and ammonia at concentrations lower than South Ditch Stream but higher than the Detention Basin. NDMA was not detected.

OU2 Soil

OU2 soil samples were collected from the area located between the eastern boundary of the Property and East Ditch Stream from locations north and south of South Ditch Stream. This low-lying area was investigated historically to delineate concentrations of chromium in soil. It was postulated that chromium had been deposited (as floc and sediment particulates) on soil during historical flooding of South Ditch Stream. OU2 soil samples were also collected from areas immediately to the west of the western boundary of the Property (the PanAM Railways property).

The most frequently detected VOCs in OU2 soil samples collected from areas immediately to the east of the Property along South Ditch Stream were acetone, methylene chloride, and toluene. Trimethyl-2-pentene (TM-2-P) was detected in soil samples, with a detected concentration well below the calculated Industrial RSL. Among SVOCs, BEHP and several high molecular weight PAHs, NDPrA, diphenyl ether, and phenol were most frequently detected. Maximum concentrations of BEHP, benzo(a)anthracene, benzo(a)pyrene, and NDPrA were greater than corresponding Industrial RSLs. The maximum concentration of C11–C22 Aromatics was greater than the MassDEP MCP S-2 soil standard (relevant for industrial/commercial land use). Among specialty compounds, formaldehyde was the most frequently detected compound. In addition, maximum concentrations of arsenic and hexavalent chromium in surface soil samples were also greater than corresponding Industrial RSLs. No specific sources of arsenic in soils at OU1 have been identified. The large majority of arsenic concentrations are consistent with background conditions, and are considered background.

OU2 Wetland Soil and Sediments
Sediment samples were collected from Off-Property West Ditch Stream, East Ditch Stream, Landfill Brook and the MMB wetlands (including MMB and SMB).

Off-Property West Ditch Stream sediment samples had detections of metals, SVOCs, and VOCs. Metals detected included aluminum, calcium, chromium, copper, nickel, potassium, sodium, and vanadium. VOCs detected included TMPs, 1,2,4-trichlorobenzene, and 2-butanone. SVOCs detected included PAHs, BEHP, NDPhA, diphenyl ether, benzoic acid, and 4-chlorophenyl phenyl ether.

Very little natural sediment is currently present in East Ditch Stream. Metals and inorganic compounds detected, where present, include aluminum, arsenic, barium, calcium, chromium, cobalt, copper, hexavalent chromium, iron, lead, manganese, mercury, nickel, vanadium, zinc, and ammonia. VOCs detected include TM-2-P, 2-butanone, acetone, 1,1,2-trichloro-1,2,2-trifluoroethane, and trichloroethene (TCE). SVOCs detected include 2-methylnaphthalene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzoic acid, benzo(k)fluoranthene, BEHP, chrysene, dibenz(a,h)anthracene, dibenzofuran, diphenyl ether, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, phenol, and pyrene.

Metals and inorganics were detected in all three sediment samples from Landfill Brook. VOCs detected in sediment samples from Landfill Brook are associated with the WSL. SVOCs detected included several chlorinated PAHs, BEHP, and NDPhA, of which BEHP and NDPhA are associated with the WSL.

For the MMB wetlands, the concentrations and distribution of metals and other inorganics in MMB and SMB sediment samples are consistent with naturally occurring concentrations and are not indicative of Site-related impacts.

OU2 Surface Water
Off-Property surface water sampling locations included Off-Property West Ditch Stream, East Ditch Stream, Landfill Brook, and the MMB wetlands (including MMB and SMB).

For Off-Property West Ditch Stream, metals and inorganics detected in surface water include ammonia, chromium, hexavalent chromium, calcium, sulfate, and chloride. NDMA was detected in five of six surface water samples collected. Phenols and benzoic acid were also detected. Several PAH compounds detected in surface water samples may be from deteriorated railroad ties.

For East Ditch Stream, Site-related inorganics and metals detected in surface water samples include ammonia, chromium, hexavalent chromium, calcium, sulfate, and chloride. SVOCs including NDMA, NDPrA, PAHs, BEHP, benzoic acid, and caprolactam were detected, as well as VOCs including TMPs.

NDMA-containing groundwater flows to South Ditch Stream. South Ditch Stream then flows into East Ditch Stream, and NDMA subsequently attenuates as it flows southward towards the Halls Brook Holding Area. NDMA detections in surface water are infrequent. Surface water samples collected in East Ditch Stream immediately downstream from Plant B contained non-detectable and/or low concentrations of NDMA, ammonia, TMPs, and BEHP.

Landfill Brook is an off-Property wetland/surface water body located south of the WSL. Landfill Brook was investigated as part of the OU2 RI; the brook was found to be impacted by the WSL and, based on the data collected, does not show impacts from the Site. Landfill Brook surface water samples contained fuel-related compounds and 1,1-dichloroethane (1,1-DCA) at low concentrations. Neither NDMA, NDPrA, or NDPhA were detected in surface water samples from Landfill Brook. An assessment of hydrologic and geochemical conditions surrounding Landfill Brook is included in the *July 2015 Final OU1/OU2 RI Report*, and concludes the surface water quality in Landfill Brook reflects its immediate proximity to the WSL and adjacent commercial automotive businesses.

For the MMB wetlands (which include MMB and SMB), the concentrations of chromium, hexavalent chromium, and calcium in surface water are consistent with background sample concentrations and do not indicate Site-related impacts. MMB and SMB do not appear to be impacted by inorganic compounds or VOCs associated with the Site. While there was one detection of NDMA in MMB surface water, the NDMA detection was isolated and the concentration was significantly lower than the ecological screening benchmark concentration.

OU3 Groundwater
The COCs for groundwater include metals, VOCs, and SVOCs.

The primary risk contributors in groundwater related to the Site are NDMA, arsenic, chromium, cobalt, iron, and manganese. The distribution of cobalt in deep overburden groundwater is similar to the distribution of NDMA, which is discussed in more detail below. Iron, arsenic, and manganese have a larger footprint in deep overburden groundwater than NDMA, while chromium has a smaller footprint. Iron, manganese, and cobalt levels are elevated in DAPL and decrease two or more orders of magnitude at shallower depths.

While these metals are highest in DAPL and groundwater in the core of the portion of the plume located within the Ipswich River watershed, they remain at or above RSLs (for Hazard Index [HI] =1) in groundwater downgradient of the DAPL pools. Based on the distribution of COCs in groundwater, the highest COC concentrations are in the vicinity of the DAPL pools, and metals are co-located with NDMA; therefore, NDMA is considered an indicator parameter for the purposes of the *FS Report Volume II*.

The full extent of groundwater impacts continues to be investigated as part of the ongoing OU3 RI. Some downgradient migration of NDMA has occurred in the deep overburden groundwater and bedrock groundwater systems within the Ipswich River watershed since shut-down of the Town of Wilmington's five municipal wells.

Arsenic concentrations are elevated in groundwater, likely the result of mobilization of naturally-occurring arsenic bound to iron hydroxides in the aquifer matrix due to the presence of DAPL. The low pH of DAPL further accentuates the dissolution of iron oxyhydroxide minerals present in the saturated soil, thereby releasing sorbed arsenic. Arsenic is present at concentrations of up to 260 micrograms per Liter (µg/L), which exceeds the Maximum Contaminant Level (MCL) of 10 µg/L in several areas.

Within the Ipswich River watershed, the highest arsenic concentrations are associated with DAPL in the Main Street DAPL pool and with groundwater at the Spinazola Trust landfill (see **Part A, *Site Name, Location, and Brief Description***, above). Elevated arsenic also occurs within groundwater in the portion of the plume core in the Ipswich River watershed and in bedrock underlying that corresponding portion of the WBV. Slightly downgradient of the portion of the plume in the Ipswich River watershed, arsenic concentrations are below the MCL.

NDMA in groundwater is the defining contaminant. The extent of other COCs is generally contained within and co-located with the boundaries of the observed extent of NDMA in overburden and bedrock groundwater.

The highest NDMA concentrations (greater than 20,000 ng/L) are in deep overburden groundwater in the vicinity of the Main Street DAPL pool. Overburden shallow groundwater and bedrock groundwater have similar plume outlines that show increased lateral distribution of NDMA as well depths increase.

The NDMA plumes have primarily spread to the west/northwest of the Property into the Ipswich River watershed, while the spread to the east/southeast into the Aberjona River watershed is undetermined. An area of hot spot groundwater under the MMB wetlands in the deep overburden aquifer encompasses the core of the overburden groundwater plume.

The core of the bedrock plume follows a similar geometry as the core of the overburden plume, extending from the Main Street DAPL pool under the WBV beneath the MMB aquifer. DAPL migrated beyond the Main Street DAPL pool along the WBV, but the degree of geologic faulting in the valley may have precluded the formation of a DAPL pool under the MMB wetlands area. DAPL is observed in one well in the MMB wetlands that is partially screened in bedrock. Hot spot groundwater is typically co-located with the DAPL pools and is also present in bedrock underlying the core of the overburden groundwater plume in the MMB aquifer.

Chromium is present in deep overburden groundwater at concentrations of up to 1.2 milligrams per Liter (mg/L) and in shallow overburden groundwater at concentrations of up to 0.021 mg/L. The primary source of chromium in groundwater is DAPL, specifically, the three DAPL pools located in bedrock depressions (the Containment Area DAPL pool on the Property, and the Jewel Drive and Main Street DAPL pools located off the Property). There is flow of low concentration chromium-containing water from overburden groundwater to South Ditch Stream.

Based on the data collected during the OU3 RI (two rounds of sampling performed in May 2010 and September 2010) and the May 2019 comprehensive groundwater sampling effort, the extent of groundwater impacts within the Aberjona River watershed has remained relatively consistent between the three sampling events. Some downgradient migration of NDMA has occurred in the deep overburden groundwater and bedrock groundwater systems within the Ipswich River watershed since shutdown of the Town of Wilmington's municipal water supply wells. The extent of downgradient migration of the plume will be evaluated more fully during the ongoing OU3 RI.

The terms "groundwater hot spots" or "hot spot groundwater" refer to groundwater containing a large portion of the overall mass of contaminants relative to the overall plume. Groundwater hot spots are areas of highly contaminated groundwater containing significantly elevated concentrations of NDMA and other COCs as compared to downgradient groundwater. This layer of groundwater contamination is formed under current hydrogeologic conditions primarily via the transfer of COCs from DAPL via chemical diffusion. The DAPL material acts as an ongoing source; the constituents in DAPL are water soluble and continue to migrate from the DAPL pools located in bedrock depressions into the overlying groundwater, acting as a continuing, uncontrolled source of contamination. COCs in groundwater hot spots may also be migrating into bedrock. The presence of DAPL, groundwater hot spots, and LNAPL (which is discussed further below) in the aquifer continue to cause continued downgradient mass transport. The removal of groundwater hot spots would facilitate remediation of the entire plume by reducing the extent and further migration of the plume, as groundwater hot spots contain significantly elevated concentrations of NDMA and other COCs.

The core of the overburden groundwater plume is represented by the extent of hot spot groundwater in deep overburden wells. Some downgradient migration of NDMA has occurred in the deep overburden groundwater and bedrock groundwater systems since shutdown of the Town of Wilmington's municipal wells. The plume core is represented by the region of hot spot groundwater surrounding and downgradient of the DAPL pools and along the water course of South Ditch Stream.

OU3 DAPL

DAPL has been identified in pools residing in bedrock depressions beneath the Property (the On-Property or Containment Area DAPL pool), immediately west of the Property (the Off-Property or Jewel Drive DAPL pool), and further to the west near Main Street (the Main Street DAPL pool). The extent of DAPL in bedrock continues to be evaluated as part of the ongoing OU3 RI. The areal extent of the three DAPL pools, as is currently understood, is shown on **Figure 1** in **Appendix C** of this ROD.

DAPL is a highly acidic brine that is dark green in color with a specific gravity greater than or equal to 1.025. DAPL is also defined by an empirically derived set of chemical concentrations in the absence of specific gravity data:

- **Ammonia** concentration greater than 1,250 mg/L;
- **Chloride** concentration greater than 2,800 mg/L;
- **Magnesium** concentration greater than 270 mg/L;
- **Sodium** concentration greater than 1,700 mg/L;
- **Sulfate** concentration greater than 16,000 mg/L; or
- **Specific conductance** greater than 20,600 microohms per centimeter (μmhos/cm)

The major risk drivers for DAPL include NDMA, arsenic, hexavalent chromium, dibromochloromethane, and chloroform (cancer risk), and unsymmetrical dimethylhydrazine (UDMH), cobalt, manganese, and iron (non-cancer risk). Among these, NDMA stands out as the largest risk contributor.

NDMA has not been identified as a raw material, a manufactured product, or a waste stream constituent in any of the operational history documentation for the Facility. The generally accepted mechanisms for NDMA formation occur at low pH via nitrosation, which involves the formation of nitrosyl cation or similar nitrogen-containing species, during acidification of nitrite. The nitrosyl cation then reacts with an amine, such as dimethylamine, to form NDMA.

The highest concentrations of NDMA have been detected in DAPL samples. Calculations of NDMA mass within DAPL are based on the volume of DAPL present; however, the volume estimates for DAPL vary due to the uncertainty of the bedrock geometry/topography and difficulty measuring the exact elevation of the DAPL pools. Based on the available data, the range of NDMA mass estimates developed by EPA and Olin range from 996 to 4,747 grams (g).

Many of the discharged chemicals at the Property were denser than the surrounding groundwater, and therefore sunk through the aquifer to the top of bedrock to form DAPL. From there, DAPL migrated via gravity flow into lower depressions, independent of the overlying groundwater. DAPL may have also migrated into the large fracture network beneath the MMB wetlands.

Although DAPL is no longer being formed, the pooled DAPL serves as a continuing source of contamination as the DAPL contains constituents that are water soluble and continue to migrate into adjacent groundwater and possibly via vertical intrusion into bedrock fractures. NDMA, which is the primary COC and the most toxic and mobile in the aquifer, is believed to have formed *in-situ* in the waste liquid lagoons and/or within the aquifer as liquid wastes migrated downwards as DAPL.

OU3 LNAPL

A spill in the northeast corner of the Property resulted in a release of LNAPL to East Ditch Stream that abuts the Property to the east. To address this discharge, Plant B was converted into a groundwater recovery and treatment system in 1981, tied to three extraction wells, and continues to operate today as an IRA under the MCP. Operation of the extraction system prevents groundwater containing COCs from impacting East Ditch Stream. Operation of the extraction system has also resulted in a large smear zone of LNAPL in soil in this area.

Currently, only three monitoring wells (GW-23, IW-11, and P5, located on the north side of Plant B; see **Figure 10** in **Appendix C** of this ROD) regularly contain a significant amount of LNAPL, ranging from non-detect to 0.3 feet. Residual LNAPL appears to be limited to an isolated area near the northeast corner of the Plant B building. The LNAPL consists of a mixture of process oil and dissolved organic contaminants, including BEHP, TMPs and NDPhA.

Contaminant Fate and Transport

NDMA does not readily undergo biological degradation under natural conditions, is highly soluble, has a low organic carbon-water partition coefficient, and does not readily absorb to organic carbon or reactive mineral surfaces in the aquifer. Its primary attenuation mechanisms in groundwater are diffusion, advection, and dispersion.

NDMA is susceptible to oxidation by ultra-violet (UV) light at wavelengths found in natural sunlight. The published half-life for NDMA in clear water is on the order of seven minutes; therefore, it will degrade efficiently in surface water depending on the clarity of the water and its light-transmitting properties.

TMPs are highly volatile and have high Henry's Law constants, so TMPs present in subsurface soils represent potential risks via the VI pathway. TMPs were sporadically detected in surface soils, and concentrations are highest in the capillary zone where they volatilize in the vadose zone and may migrate as vapor in response to changes in atmospheric pressure gradients. TMPs are minimally soluble in water.

Elevated detections of TMPs were found in groundwater and in LNAPL in the area of the former Plant B tank farm and in a small area west of the Containment Area. Leaching of residual TMPs from subsurface soil to groundwater is a significant concern. The Plant B groundwater extraction and treatment system was constructed to control migration of LNAPL to East Ditch Stream. The system is effective in doing so, and there have been only sporadic, trace concentrations of TMPs detected in East Ditch Stream surface water.

Chromium is present in soil primarily in the trivalent form. Trivalent chromium in soil is virtually insoluble in water under typical environmental conditions (precipitation, ambient surface water, and ambient groundwater). Therefore, trivalent chromium in soil is generally not of concern with respect to leaching from soil on the banks of or in close proximity to nearby streams. Chromium has been identified in soil samples from the Containment Area and Lake Poly, where the possibility of the metal leaching to groundwater cannot be refuted with certainty.

In groundwater, the distribution of chromium attenuates rapidly downgradient from the DAPL pools due to precipitation with sulfate and with aluminum hydroxides on ferric iron nucleation sites in the aquifer. Downgradient from the core of the plume, chromium is below detection limits with few exceptions.

One cause of the elevated concentrations of chromium in sediments and streambank soil in South Ditch Stream is the historical acidic liquid waste discharges to On-Property West Ditch Stream that flowed to South Ditch Stream, where the chromium partitioned from the surface water to sediments and streambank soil during high water conditions. Another potential contributor to sediments and streambank soil chromium is dissolved-phase chromium in DAPL and groundwater. Chromium in sediments and streambank soil in South Ditch Stream are not believed to be mobile. The trivalent chromium is not soluble and is therefore not leaching from either sediments or streambank soil into the channels.

DAPL is acidic and has high concentrations of chromium, sodium, calcium, potassium, sulfate, chloride, and NDMA. These dissolved constituents (including chromium, which is more soluble at the low pH of this groundwater) migrate from DAPL into the overlying groundwater and are carried with groundwater as it migrates away from the DAPL pools.

Groundwater migrates from the DAPL areas toward South Ditch Stream, mixing with other groundwater and resulting in gradual increases in pH. When the groundwater flows into South Ditch Stream and mixes with the higher pH surface water of the stream, the surface water pH conditions favor flocculation of chromium as well as aluminum and iron, and the substantial reduction in concentrations of dissolved chromium, aluminum, and iron. Likewise, elevated concentrations of metals in groundwater migrating to the northwest (toward the MMB wetlands) decrease as groundwater migrates to the northwest and away from the core of the plume.

BEHP from on-Property operational releases impacted soil and sediments, including upland soil in the area of Plant B and Lake Poly, and wetland soil and sediments in and around South Ditch Stream. BEHP sorbs strongly to soil and organic sediments and has very low water solubility under typical environmental conditions, which limits its potential to migrate in groundwater or surface water at substantial concentrations or to leach to groundwater or surface water. Elevated concentrations of BEHP in sediments and streambank soil in South Ditch Stream are primarily the result of historical acidic liquid waste discharges to On-Property West Ditch Stream, which flowed to South Ditch Stream, where the BEHP partitioned from the surface water to the sediments and streambank soil during high water conditions. There is no evidence of any substantial input of BEHP to South Ditch Stream under current conditions.

The principal source of ammonia in groundwater and therefore surface water is believed to be migration from DAPL to groundwater. Other potential sources of ammonia present in surface water may include leakage from the Containment Area[13] and/or residual contamination in soil outside of the Containment Area that leaches to groundwater.

Ammonia is soluble in water but is not stable in most environments. It is easily transformed to nitrate in waters that contain oxygen and can be transformed to nitrogen gas in waters that are low in oxygen. The most important attenuation mechanism is likely to be sorption to organic substrates and dilution by surface water downstream.

---

[13] The Containment Area feature, which includes a concrete slurry wall that was installed in a trench excavated into the top of weathered bedrock, was constructed in an attempt to contain the DAPL pool on the Property. EPA believes the weathered bedrock underlying the Containment Area DAPL Pool is not competent. Given the weathered nature of the bedrock surface and based on a preliminary review of hydraulic data collected from inside and outside the Containment Area that indicates groundwater elevation changes that are regional and unabated by the slurry wall, leakage through the bedrock/slurry wall interface appears possible, resulting in some degree of communication between the interior of the Containment Area and the exterior environment.

Cobalt remains elevated around the plume core within and immediately surrounding the hot spot groundwater within the MMB aquifer in the WBV. Cobalt, like aluminum, appears to have been solubilized from clay minerals within the aquifer matrix as the result of acidic conditions in DAPL and groundwater within the WBV.

Manganese and iron have similar geochemical behaviors, though they have different valence states and properties. Manganese becomes more soluble with decreasing pH, so in areas of low pH, manganese concentrations increase. Iron changes from an insoluble (ferric) to a soluble (ferrous) form under reducing conditions and lower pH. Thus, as pH declines to acidic conditions or when oxygen is consumed and oxidation-reduction potential becomes negative, dissolved iron concentrations increase.

Metals complexed with ferric iron, notably arsenic, are released when iron is converted to ferrous iron. Metals also partition to manganese hydroxides, and as manganese dissolves with decreasing pH, those metals are also released. Metals released in this manner will typically re-sorb or re-complex as groundwater moves downgradient and geochemical conditions return to those of ambient groundwater.

Routes of Exposure and Potential Receptors

Human Health

Exposure occurs when humans or other living organisms eat, drink, breathe, or have direct skin contact with a hazardous substance or waste material. Further, if there is no exposure to a hazardous substance, there is no risk to human health. Based on existing or reasonably anticipated future land use at a site, EPA develops different exposure scenarios to determine potential human health risks, appropriate cleanup levels for contaminants, and potential remedial alternatives.

Environmental media evaluated for OU1 and OU2 include surface soil (and airborne dust), subsurface soil (and airborne dust if excavated), outdoor air, indoor air, surface water, and sediments. Environmental media evaluated for OU3 include groundwater and DAPL as drinking water. Additionally, shallow groundwater was also evaluated for potential indoor air impacts through the VI pathway.

The potential human health routes of exposure for the Site (OU1, OU2, and OU3) include:

- Direct contact (incidental ingestion and dermal contact) with soil, surface water, and sediments;
- Inhalation of airborne soil dust;
- Potable use of groundwater (ingestion, dermal contact, and inhalation of vapors released from groundwater);
- Non-potable use of groundwater (ingestion, dermal contact, and inhalation of vapors released from groundwater);
- Inhalation of VOCs from shallow groundwater via the VI pathway; and
- Hypothetical potable use of DAPL (ingestion, dermal contact, and inhalation).

The potential human health receptors for soil, sediments, and surface water (OU1 and OU2) include:

- Current and future on-Property outdoor workers;
- Future off-Property outdoor workers;
- Current and future on-Property trespassers;

- Current and future off-Property trespassers;
- Future on-Property indoor workers;
- Future on-Property construction workers;
- Future off-Property construction workers; and
- Future on-Property residents.

The potential human health receptors for groundwater and DAPL (OU3) include:

- Current and future off-Property residents;
- Future on-Property residents;
- Current and future off-Property daycare employees and clients;
- Current and future off-Property commercial workers;
- Current and future on-Property commercial workers;
- Future off-Property construction workers; and
- Future on-Property construction workers.

A complete list of exposure pathways evaluated for each OU can be found in Table 1.2-1 for OU1 and Table 1.2-2 for OU2 in the OU1/OU2 BHHRA (Appendix M of the *July 2015 Final OU1/OU2 RI Report* [AMEC, 2015a]), and Table 1.2-1 for OU3 in the Draft OU3 BHHRA (Appendix K of the *July 2019 Draft OU3 RI Report* [Wood, 2019]).

Ecological

The BERA evaluated potential ecological exposure pathways for OU1 and OU2. No BERA was performed for OU3 because it is assumed that the current surface water data (evaluated in OU1/OU2) reflect potential influences from groundwater flowing into surface water.

Chemicals may move from environmental media to ecological receptors through several major biological exposure mechanisms:

- Uptake of chemicals from soil or sediments through roots (plants);
- Ingestion of chemicals bound to soil (terrestrial invertebrates, birds, and mammals);
- Ingestion of chemicals bound to sediments (benthic invertebrates, amphibians, semi-aquatic birds, and mammals);
- Ingestion of dissolved and particulate chemicals in surface water (aquatic invertebrates, amphibians, semi-aquatic birds, and mammals);
- Ingestion of chemicals through consumption of contaminated plants (herbivores and omnivores); and
- Ingestion of chemicals through consumption of contaminated prey (all predators).

Although inhalation and dermal absorption pathways are possibly complete for some receptors, these pathways are considered to be minor compared to dietary ingestion and are not evaluated. A complete list of exposure pathways evaluated can be found in Table 3.8-1 of the OU1/OU2 BERA, which is included as Appendix N of the *July 2015 Final OU1/OU2 RI Report* (AMEC, 2015a).

3. Principal Threat Waste

The NCP at 40 C.F.R. Section 300.430(a)(l)(iii) states that EPA expects to use "treatment to address the principal threats posed by a site, wherever practicable" and "engineering controls, such as containment, for waste that poses a relatively low long-term threat" to achieve protection of human health and the environment. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would pose significant risks to human health or the environment should exposure occur. Low-level threat wastes are source materials that generally can be reliably contained and that would present only a low risk in the event of exposure.

The concept of principal threat and low-level threat wastes is applied on a site-specific basis when characterizing source material. Source material is defined as material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, air, or acts as a source for direct exposure.

Although EPA has not established a threshold level of toxicity/risk for identifying a principal threat waste, generally where toxicity and mobility of source material combine to pose a potential risk of 10^{-3} (1 in 1,000) or greater, the source material is considered to be a "principal threat waste." NDMA-containing DAPL and groundwater hot spots pose an estimated cancer risk of 10^{-2} (1 in 100) and act as a continuing source of contamination to groundwater, and thus are considered principal threat wastes.

Table E-1 provides a summary of the principal threat wastes addressed in this ROD.

Table E-1		
Principal Threat Wastes	**Contaminant**	**Action to be Taken**
DAPL and Groundwater Hot Spots	NDMA	DAPL and Groundwater Extraction and Treatment

Low-level threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. Wastes that are generally considered to be low-level threat wastes include non-mobile contaminated source material of low to moderate toxicity, surface soil containing COCs that are relatively immobile in air or groundwater, low-leachability contaminants, or low toxicity source material. Low-level threat wastes include soil impacted with chromium and BEHP. These materials will be addressed by installing a permanent, low-permeability cover over the Containment Area and installing soil and/or asphalt cover systems for contaminated upland soil.

F. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The Property and surrounding properties are used for various purposes. Predominant physical features include streets, paved areas, commercial and industrial properties, residential properties, open space, surface water, and wetland areas.

1. Land Uses

The current and reasonably anticipated future land uses of the Site form the basis for the exposure assumptions that are used for the risk assessment, are considered in the development of remedial objectives and remedial alternatives, and are considered in the selection of the appropriate remedial action.

The Property is currently zoned as industrial/commercial (General Industrial Zone). The Property is not currently in use, except for activities to operate and maintain the Plant B groundwater recovery/treatment system and the Jewel Drive DAPL extraction program. Industrial/commercial properties are located to the immediate north of the Property and to the east and west of the Property. Residential properties are located along Main Street and Cook Avenue to the west of the Property, and along Eames Street before it intersects with Woburn Street.

Based on discussions with Town of Wilmington officials, the reasonably anticipated future use of the Property is expected to remain industrial/commercial, with the exception of the southern 20 acres of the Property that are currently restricted by a conservation restriction and will remain as such. Future residential use is unlikely, and the remedy will include Institutional Controls to prohibit future residential use. Future land use of the areas surrounding Property is expected to remain unchanged.

2. Groundwater/Surface Water Uses

OU3 spans the groundwater divide between the Aberjona and Ipswich River watersheds. Groundwater movement and associated plume migration varies within each watershed based on differences in hydrogeology and the locations of historical contaminant releases. Each watershed has different characteristics based on land use and hydrogeology.

In 2003, the Town of Wilmington ceased use of their five municipal drinking water supply wells in the MMB aquifer due to contamination from the Site. Olin and the other Respondents funded the construction of a new pipeline to the MWRA system in 2008. However, groundwater at the Site continues to be used for drinking water purposes. Site groundwater to the north and west of the Property is classified as a public drinking water supply. There are 81 private wells (potable and irrigation) on file with the Town of Wilmington within the Site (see **Figure 11** in **Appendix C** of this ROD for the currently established boundaries of the Site groundwater study area). Of these 81 wells, 38 are residential drinking water wells, 40 are irrigation wells, and three (3) wells are of unknown use. Twenty-eight (28) of the 38 residential drinking water wells have been sampled at least once, and 20 are monitored on a quarterly basis to confirm that levels of NDMA do not exceed the upper end of EPA's health-protective cancer risk range of 0.47 ng/L to 47 ng/L (see also **Section G**, **SUMMARY OF SITE RISKS**, Section 1 – Human Health Risk Assessment, *Risk Characterization*, Future Potable Use of Groundwater and DAPL in **Part 2** of this ROD, below), which would result in unacceptable risk to human health based on cancer health effects. NDMA detections in 18 of these wells fall within EPA's health-protective range, with 72% of samples (438 out of 608 samples) showing non-detectable levels of NDMA. Two of the 20 wells have shown consistently higher levels of NDMA over time, with detections in one well ranging from 9.4

to 24 ng/L and detections in the second well ranging from non-detectable to 56 ng/L.[14] Olin has provided bottled water to these two residences since 2010, and is in the process of working with the Town of Wilmington to voluntarily extend a waterline to these two households. A third well had an NDMA detection of 57 ng/L in 2017, but previous and subsequent sampling results for this well were all within EPA's health-protective range.[15]

Consistent with EPA's 1996 Final Groundwater Use and Value Determination Guidance and EPA's endorsement of the Commonwealth's Comprehensive State Groundwater Protection Program (CSGWPP), MassDEP developed a Groundwater Use and Value Determination[16] for the Site in September 2010. The purpose of the Use and Value Determination was to identify whether the aquifer(s) beneath the Site are of "high," "medium," or "low" value. The evaluation was performed in accordance with criteria for groundwater classification promulgated in the MCP. A Current or Potential Drinking Water Source Area (Zone II) for the five Wilmington municipal water supply wells in the MMB aquifer is north of the groundwater divide between the Ipswich and Aberjona watersheds; therefore, MassDEP classifies groundwater in this area as GW-1 (drinking water). Other groundwater designated GW-1 include areas within 500 feet of private water supply wells (including the private wells located on Cook Avenue) and a Potential Drinking Water Source Area to the south. Other remaining areas were considered as GW-2 (potential for VI to indoor air) and GW-3 (groundwater flowing to surface water). Because a portion of the Site falls within a GW-1 designated area, MassDEP concluded that the Site area aquifer is a "high use and value" aquifer. The selected remedy, which includes an interim action for groundwater, will be followed by a final remedy for groundwater in the future.

G. SUMMARY OF SITE RISKS

Baseline Risk Assessments (BRAs) for OU1, OU2, and OU3 – consisting of a BHHRA and BERA – were performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to COCs, assuming no remedial actions were to be taken. These provide the basis for taking remedial action and identify the contaminants and exposure pathways that need to be addressed by the remedy.

The BHHRAs were conducted pursuant to EPA Risk Assessment Guidance for Superfund (RAGS) and followed a four-step process including:

1. Hazard identification, which identified those hazardous substances which (given the specifics of OU1, OU2, and OU3) were of significant concern;
2. Exposure assessments, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure;

[14] Prior to the 2017 sampling event which yielded an NDMA sampling result of 56 ng/L for one of the two residences on bottled water, sampling data for this well between 2008 and 2016 ranged from non-detectable to 33 ng/L (20 sampling events). Subsequent to the 2017 NDMA result of 56 ng/L, six sampling events were conducted between 2017 and June 2020. These sampling events yielded NDMA results ranging from 0.34 to 2.9 ng/L.

[15] Prior to the 2017 sampling event for this well which yielded an NDMA sampling result of 57 ng/L, sampling data for this well between 2015 and 2016 ranged from 1.2 to 8.1 ng/L (five sampling events). Subsequent to the 2017 NDMA result of 57 ng/L, three sampling events were conducted between 2018 and June 2020. These sampling events yielded NDMA results ranging from 0.6 to 7.9 ng/L.

[16] MassDEP, 2010a. Groundwater Use and Value Determination, Olin Chemical Superfund Site, September.

3. Toxicity assessments, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances; and
4. Risk characterizations and uncertainty analyses, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the Site, including carcinogenic and non-carcinogenic risks and a discussion of the uncertainty in the risk estimates.

The objective of the BERA was to characterize risk to ecological receptors that are assumed to be potentially exposed to contaminants associated with historical operations at the Site, in the absence of any additional remedial measures. The BERA was completed using a process consistent with the framework for risk assessment described in Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (USEPA, 1997a). The BERA consists of a problem formulation, exposure and effects assessment, risk characterization, and conclusions.

The complete OU1/OU2 BHHRA and OU1/OU2 BERA are included as Appendix M of the *July 2015 Final OU1/OU2 RI Report*. Updates to the 2015 BRAs are presented in technical memoranda to address PRGs and update OU1/OU2 RI conclusions (USEPA, 2020a). The Draft OU3 BHHRA is included as Appendix K to the *June 2019 Draft OU3 RI Report*. Updates to the OU3 RI are presented in a technical memorandum that updates the OU3 RI conclusions (USEPA, 2020b).

The *August 27, 2019 Plant B Risk Calculations* evaluated the potential human health and ecological risks mitigated by the operations of Plant B (Nobis, 2019). The *January 17, 2020 OU1/OU2 Residential Human Health Risk Evaluation* evaluated residential human health risks for OU1 and OU2 soil (Bluestone, 2020). The *May 15, 2020 Ecological Risk Calculations* documented the basis for ecological risk-based PRGs for soil, sediments, and surface water (Wood, 2020b). The *May 21, 2020 OU3 Human Health Risk Calculations* evaluated the risks associated with the potable use of private residential well water (Olin, 2020c). The *July 1, 2020 Risk Calculations* document the basis for human health risk-based PRGs for upland soil (including Containment Area soil) and surface water (Wood, 2020c).

1. Human Health Risk Assessment

Hazard Identification

<u>OU1 and OU2</u>

Sixty-two (62) of the 64 chemicals detected at the Site were selected for evaluation in the BHHRA as Contaminants of Potential Concern (COPCs) for surface soil, subsurface soil, surface water, and sediments. The COPCs were selected based on toxicity, concentration, and mobility and persistence in the environment. The COPCs are summarized in the *July 2015 Final OU1/OU2 RI Report*, Appendix M, Tables 2.3-1 through 2.3-6 and, for the Containment Area, in Tables 1 through 3 of the Technical Memorandum, *Documentation of Preliminary Remediation Goals (PRGs) to Address Human Health Risks in Dense Aqueous Phase Liquid (DAPL), Groundwater Hot Spots, Upland Soil (including Containment Area Soil), and Surface Water at the Olin Chemical Superfund Site* (Wood, 2020c), which was not evaluated in the OU1/OU2 RI. **Tables G-1** through **G-4** in **Appendix B** summarize the COPCs for OU1 and OU2.

COPCs were selected based on the following risk-based selection criteria, which is consistent with the EPA Region I Risk Update Number 3 (USEPA, 1995a):

- Selected as a COPC in soil if the maximum detected concentration is greater than the EPA RSL (adjusted) for industrial soils (USEPA, 2013a).
- Selected as a COPC in surface water if the maximum detected concentration is greater than the National Recommended Water Quality Criteria (NRWQC) for consumption of organisms only (USEPA, 2009d) or the EPA RSL (adjusted) for tap water (USEPA, 2013a).
- Selected as a COPC in sediments if the maximum detected concentration is greater than the EPA RSL (adjusted) for industrial soils (USEPA, 2013a).
- Chemicals for which no screening value is available are retained as COPCs unless they are essential nutrients.

OU3

Summaries of groundwater analytical results, including frequency of detection and exceedances of MCLs, are presented in Table 4.3-1 of the *June 2019 Draft OU3 RI Report*. No media of concern have been identified for current land and groundwater use scenarios (use of private wells for potable or non-potable use and the Millbrook Country Day School, Inc. public water supply [17]).

The Draft OU3 BHHRA conducted a screening level evaluation for VI impacts associated with VOCs (in particular TMPs). The VI evaluation used chemical data from shallow groundwater samples collected during the RI phase (*June 2019 Draft OU3 RI Report*, Appendix G, Table 2.1). The maximum concentration of 16 chemicals exceeded corresponding Residential Vapor Intrusion Screening Levels (VISLs): 2,4,4-trimethyl-1-pentene (TM-1-P), TM-2-P, benzene, biphenyl, C5-C8 aliphatics, C9-C12 aliphatics, C9-C10 aromatics, C11-C22 aromatics, decane, ethylbenzene, hydrazine, naphthalene, NDMA, TCE, vinyl chloride, and m & p xylenes (*June 2019 Draft OU3 RI Report*, Appendix G, Table 2.3 and Table 2.4). Chlorinated VOCs and petroleum-related chemicals exceeded Residential VISLs off-Property.

COPCs have been selected for each of the components of the groundwater system (overburden and bedrock, Ipswich and Aberjona Watersheds, private wells, town wells, Millbrook Country Day School Inc. water supply, and for DAPL). The procedure used to select COPCs for the Draft OU3 BHHRA is summarized as follows, and the risk-based selection criteria are consistent with EPA guidance (USEPA, 1989):

- Compound selected as a COPC in groundwater if the maximum detected concentration is greater than the EPA Tapwater RSL with a target hazard quotient of 0.1 (USEPA, 2018b).
- Chemicals for which no risk-based screening value is available are selected as COPCs.

A list summarizing the selected COPCs by medium and exposure scenario for groundwater can be found in the *June 2019 Draft OU3 RI Report*, Appendix K, Table 2.3-9.

Exposure Assessment

---

[17] Millbrook Country Day School Inc. Water Supply is registered in the Commonwealth of Massachusetts as a transient non-community public water supply system. This school is located approximately 1 mile to the west of the Site in the Ipswich River watershed. Despite being a public water supply, this facility has been sampled during the quarterly residential well monitoring program.

OU1 and OU2

Exposures to COPCs were estimated quantitatively or qualitatively through the development of several exposure scenarios. Exposure scenarios were developed considering the nature and extent of contamination, the location of the Exposure Area (EA), current and future potential use of the EA, and identification of potential receptors and exposure pathways.

The EAs for OU1 include EA-1, EA-2, EA-3, EA-4, EA-6, EA-7, the Containment Area, South Ditch Stream, On-Property West Ditch Stream, the Stormwater Detention Basin, and Central Pond (see **Figure 12** in **Appendix C** of this ROD for human health EAs). The EAs for OU2 include EA-5, Off-Property West Ditch Stream, East Ditch Stream, the MMB wetlands, and North Pond. Landfill Brook is not impacted by COCs released from OU1; therefore, Landfill Brook was evaluated only through the COPC selection step of the OU1/OU2 BHHRA.

The exposure media evaluated quantitatively in the OU1/OU2 BHHRA include surface and subsurface soil, surface water, and sediments. The selection of exposure pathways is summarized in Tables 1.2-1 and 1.2-2 of the OU1/OU2 BHHRA. Based on the current and assumed future land uses for the EAs, receptors evaluated include the following:

- Current Land Use – OU1/OU2
  - Outdoor worker – surface soil at EA-1, EA-2, EA-3, EA-5, EA-6, and EA-7; and
  - Trespasser – surface soil, surface water, and sediments at EA-1, EA-2, EA-3, EA-4, EA-5, EA-6, and EA-7; South Ditch Stream; Central Pond and the Stormwater Detention Basin; On-Property West Ditch Stream; Off-Property West Ditch Stream; East Ditch Stream; the MMB Wetlands; and North Pond.
- Future Land Use – OU1/OU2
  - Indoor worker – surface soil and subsurface soil at EA-1, EA-3, and EA-7;
  - Outdoor worker – surface and subsurface soil at EA-1, EA-2, EA-3, EA-5, EA-6, EA-7, and the Containment Area;
  - Construction worker – surface and subsurface soil at EA-1, EA-2, EA-3, EA-5, EA-6, and EA-7; and
  - Trespasser – surface soil, subsurface soil, surface water, and sediments at EA-1, EA-2, EA-3, EA-4, EA-5, EA-6, EA-7, and the Containment Area; South Ditch Stream; Central Pond and the Stormwater Detention Basin; On-Property West Ditch Stream; Off-Property West Ditch Stream; East Ditch Stream; MMB; and North Pond.

OU3

The following current exposure scenarios were evaluated in the Draft OU3 BHHRA (*June 2019 Draft OU3 RI Report*, Appendix K):

- Sixteen residential wells within the extent of NDMA groundwater impacts;
- Millbrook Country Day School, Inc. public water supply; and
- One residential well used for non-potable purposes (irrigation);

The following future exposure scenarios were evaluated in the Draft OU3 BHHRA:

- Future irrigation use of groundwater;
- Future construction worker exposure to shallow groundwater (on-Property and off-Property);
- Future resident potable use of groundwater (including Ipswich River watershed overburden and bedrock aquifers, and Aberjona River watershed overburden and bedrock aquifers); and
- Future resident – DAPL as a medium of concern for potable use.

Toxicity Assessment

Carcinogenic Effects

EPA has assigned each contaminant a "weight-of-evidence" category that represents the likelihood of the contaminant being a human carcinogen. Additionally, the cancer potency estimate is a quantitative measure of a compound's ability to cause cancer and is generally expressed as either a cancer slope factor (CSF) or an Inhalation Unit Risk (IUR) value.

CSF and IUR values are toxicity estimates developed by EPA based on epidemiological and/or animal studies, and they reflect a conservative "upper bound" estimate of the potency of the carcinogenic compound. That is, the true potency is unlikely to be greater than the potency described by EPA. The *July 2015 Final OU1/OU2 RI Report*, Appendix M Tables 4.1-1 and 4.1-2 and the *June 2019 Draft OU3 RI Report*, Appendix K Tables 4.1-1 and 4.1-2 present the cancer toxicity values and cancer classifications for the COCs used in the BHHRAs. **Tables G-5** and **G-6** in **Appendix B** provide cancer and non-cancer toxicity data summaries. EPA's Cancer Guidelines and Supplemental Guidance (USEPA, 2005a and USEPA, 2005b) have been used as the basis for analysis of carcinogenicity risk assessment.

On January 19, 2017, EPA issued revised cancer toxicity values (less carcinogenic) and new non-cancer toxicity values for benzo(a)pyrene. The cancer potency of other carcinogenic PAHs is adjusted by the use of Relative Potency Factors (RPFs), which are expressed relative to the potency of benzo(a)pyrene. The non-cancer effects of benzo(a)pyrene were not evaluated in the past due to the absence of non-cancer values. The revised toxicity values for benzo(a)pyrene were used to develop PRGs for Off-Property West Ditch Stream.

Non-Carcinogenic Effects and Non-Linear Carcinogenic Effects

For addressing non-carcinogenic effects and effects of carcinogenic compounds that exhibit a threshold, it is EPA's policy to assume that an exposure level exists which is unlikely to result in adverse health effects. This threshold exposure level is described by the reference dose (RfD) or reference concentration (RfC). RfDs and RfCs have been developed by EPA as estimates of a daily exposure that is likely to be without an appreciable risk of an adverse health effect when exposure occurs over the duration of a lifetime. RfDs and RfCs are derived from epidemiological and/or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The RfDs and RfCs used in the BHHRAs are presented in the *July 2015 Final OU1/OU2 RI Report*, Appendix M Tables 4.2-1 and 4.2-2 and *June 2019 Draft OU3 RI Report*, Appendix K Tables 4.2-1 and 4.2-2.

The November 2019 RSL Table for Industrial Soil (USEPA, 2019) lists an oral non-cancer RfD of 0.01 milligrams per kilogram per day (mg/kg/day) for 2,4,4-TMP (CAS# 25167-70-8) but the RSL tables do not list an Inhalation RfC for TMPs. This suggests that sufficient, definitive inhalation toxicity information is not available for deriving an air concentration that would be without appreciable risk of adverse effects for long-term exposure. Instead, route-to-route extrapolation was employed to estimate a concentration analogous to an Inhalation RfC. The underlying assumption of the approach is that a "safe" dose for oral exposure, expressed as mg/kg/day, can be assumed to be a "safe" dose for inhalation exposure. Using this approach, an air concentration was calculated using standard inhalation exposure assumptions and bodyweights that would yield a dose equal to the Oral RfD (Wood, 2020c).

Risk Characterization

The risk characterization combines the exposure estimate with the toxicity information to estimate the probability or potential that adverse health effects may occur if no action were to be taken at a site. Cancer risks are generally expressed as a probability whereas the potential for adverse non-cancer effects are described in relation to a threshold dose, below which adverse health effects would not be expected to occur.

Potential cancer risk was calculated by multiplying the estimated lifetime average daily dose (LADD) that is calculated for a COPC through an exposure route by the CSF or IUR. The LADD is expressed as intake averaged over a 70-year lifetime as mg-COPC/kg-body weight per day. Typically, cancer risk estimates are expressed in scientific notation as a probability (*e.g.*, 1×10^{-6} or 1E-06 for 1/1,000,000) and indicate (using this example), that an average individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of site-related exposure (as defined). EPA generally views site-related cancer risks in excess of 10^{-4} as unacceptable. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

The 2005 Children's Supplemental Cancer Risk Guidelines were used to describe heightened susceptibility among potentially exposed children where applicable (USEPA, 2005b).

To estimate the potential for adverse non-carcinogenic effects (and carcinogenic effects resulting from non-linear Mode of Action [MOA] compounds), a hazard quotient (HQ) is calculated, which is the ratio of the estimated daily intake (averaged over exposure duration) for a given exposure route to the appropriate reference value (RfD or RfC) for each compound. An HQ ≤ 1 indicates that a receptor's exposure to a single contaminant is unlikely to result in adverse non-carcinogenic effects. Conversely, an HQ > 1 indicates that adverse effects as a result of exposure to the contaminant are possible.

To account for additive effects resulting from exposure to more than one compound, an HI is generated by adding the HQs for all COPCs that affect the same organ or system (*e.g.*, liver or nervous system). An HI < 1 indicates that adverse effects are unlikely whereas an HI > 1 indicates adverse effects are possible. Generally, EPA views site-related non-cancer risks as unacceptable if HI > 1. It should be noted that the magnitude of the HQ or HI is not proportional to the likelihood that an adverse effect will be observed.

The following is a summary of the media and exposure pathways that were found to present a significant risk exceeding EPA's cancer risk range and non-cancer threshold at the Site. Only those exposure pathways deemed relevant to the remedy being proposed are presented in this ROD. The remedy for groundwater is an interim action to begin restoration of groundwater and to prevent unacceptable human health risks from exposure to Site groundwater while gathering additional information to select a final cleanup plan for groundwater in the future. Readers are referred to Appendix M, Section 5.2, and

Attachments 11 and 12 of the *July 2015 Final OU1/OU2 RI Report* and Appendix K of the *June 2019 Draft OU3 RI Report* for a more comprehensive risk summary of all exposure pathways evaluated for all COPCs, and for estimates of central tendency risk for OU1 and OU2. **Table G-7** through **Table G-16** present the risk characterization summaries for OU1/OU2 and **Table G-17** through **Table G-28** present the risk characterization summaries for OU3 for all receptors with carcinogenic risks greater than 10^{-6} or non-carcinogenic HI greater than 1.

<u>Current/Future Trespasser, Off-Property West Ditch Stream – Surface Water</u>
Tables G-10 and **G-11** in **Appendix B** of this ROD depict the carcinogenic risk and non-cancer hazard summaries for the current/future trespasser. COCs in surface water were evaluated to reflect potential current and future adult and adolescent trespasser ingestion and dermal exposure corresponding to the RME scenario. For the current and future adolescent trespasser, carcinogenic risks exceeded the EPA acceptable risk range of 10^{-6} to 10^{-4}. The largest contributor to cancer risk is dermal exposure to surface water for benzo(a)pyrene (8×10^{-5} for the adult trespasser and 2×10^{-4} for the adolescent trespasser).

<u>Current/Future Potable Use of Groundwater and DAPL</u>
Calculated risks for potential current and future exposure scenarios exceed the EPA cancer risk range and the calculated non-cancer HI limit of 1 for the following:

- Three of the current private residential wells had calculated risks at or above 1×10^{-4}. The risks are primarily attributable to hexavalent chromium. The *June 2019 Draft OU3 RI Report* indicates that hexavalent chromium detections likely represent anomalous results[18]. Without including the risk attributable to hexavalent chromium, all risk results for private potable wells are within the CERCLA risk range.[19]

- Future potable use of groundwater from the Ipswich River watershed overburden aquifer resulted in risks above the EPA acceptable cancer risk range (10^{-6} to 10^{-4}) and non-cancer HI limit of 1. The predominant cancer risk contributors are NDMA (2×10^{-2} and 86% of the total), vinyl chloride (2×10^{-3} and 11% of the total), and arsenic (5×10^{-4} and 2.6% of the total). The predominant HI contributors (HI>1) are NDMA (49), manganese (46), cobalt (17), TCE (17), diphenyl ether (4.9), arsenic (4.4), iron (3.3), cis-1,2-dichloroethene (3.2), antimony (1.9), and vinyl chloride (1.4).

- Future potable use of groundwater from the Ipswich River watershed bedrock aquifer resulted in risks above the EPA acceptable cancer risk range (10^{-6} to 10^{-4}) and non-cancer HI limit of 1. The predominant cancer risk contributors are NDMA (3×10^{-2} and 98.66% of the total) and TCE (2 x

---

[18] The *June 2019 Draft OU3 RI Report* concluded that groundwater conditions are not favorable for the presence of hexavalent chromium, but rather are favorable to the presence of trivalent chromium. Hexavalent chromium can be a predominant form (high reduction potential) when pH is high (9-12); however, the pH of DAPL is typically around 3.5. Therefore, hexavalent chromium is not expected to be stable in the geochemical environment of DAPL, hot spot groundwater, or other groundwater at the Site.
[19] See *June 2019 Draft OU3 RI Report*. Appendix K. Revised Draft Baseline Human Health Risk Assessment, Operable Unit 3. Table 5.2-1. *Summary of Potential Carcinogenic Risk and Hazard Index: Baseline Scenario. Baseline Human Health Risk Assessment, Olin OU3, Wilmington, MA.*

10^{-4} and 0.48% of the total). The predominant HI contributors (HI>1) are NDMA (100), cobalt (85), manganese (67), TCE (23), diphenyl ether (7.7), iron (3.1), and antimony (1.5).

- Future potable use of groundwater from the Aberjona River watershed overburden aquifer resulted in risks above the EPA acceptable cancer risk range (10^{-6} to 10^{-4}) and non-cancer HI limit of 1. The predominant cancer risk contributors are hydrazine (1 x 10^{-2} and 56% of the total), NDMA (8 x 10^{-3} and 41% of the total), and arsenic (5 x 10^{-4} and 2.7% of the total). The predominant HI contributors (HI>1) are hydrazine (33), diphenyl ether (24), UDMH (22), NDMA (13), cobalt (9.5), manganese (4.9), TMPs (4.8), arsenic (2.6), thallium (2.3), biphenyl (2.0), 4-chlorophenyl phenyl ether (2.0), and 4-bromophenyl phenyl ether (1.7).

- Future potable use of groundwater from the Ipswich River watershed bedrock aquifer resulted in risks above the EPA acceptable cancer risk range (10^{-6} to 10^{-4}) and non-cancer HI limit of 1. The predominant cancer risk contributors are NDMA (7 x 10^{-3} and 94% of the total) and arsenic (2 x 10^{-4} and 2.7% of the total). The predominant HI contributors (HI>1) are cobalt (130), manganese (51), NDMA (21), iron (19), thallium (6.5), aluminum (6.0), silver (5.2), zinc (4.2), nickel (2.1), diphenyl ether (2.0), TMPs (2.0), and arsenic (1.7).

- Future potable use of DAPL resulted in risks above the EPA acceptable cancer risk range (10^{-6} to 10^{-4}) and the non-cancer HI limit of 1. The predominant cancer risk contributors are NDMA (3 x 10^{-2} and 83.75% of the total), arsenic (3 x 10^{-3} and 9.99% of the total), hexavalent chromium (1 x 10^{-3} and 2.88% of the total), dibromochloromethane (4 x 10^{-4} and 1.17% of the total), and chloroform (3 x 10^{-4} and 0.86% of the total). The predominant HI contributors are UDMH (1,952 adult, 1,195 child), cobalt (955), manganese (391), iron (236), chromium (110), silver (109), aluminum (95), NDMA (83), tin (73), arsenic (29), thallium (29), TCE (16), nickel (12), diphenyl ether (8.8), cadmium (7.2), copper (5.9), beryllium (4.1), biphenyl (3.1), vanadium (2.9), and zinc (1.5).

On-Property Construction Worker

Calculated risks for potential future exposure scenarios exceed the calculated non-cancer HI limit of 1 for the following:

- The *Construction Worker Plant B* HIs are above 1 and are predominantly driven by groundwater concentrations of diphenyl ether (HI = 9.6), TMPs (HI = 3.1), biphenyl (HI= 1.6), and naphthalene (HI= 1.5).

- The *on-Property Construction Worker* (remainder of the Property) HI (10 for both surface and subsurface soil) is above 1 and is predominantly driven by UDMH (HI=6) and hydrazine (HI = 2.3).

Uncertainties

Numerous raw materials, components of liquid waste streams, and products of the Facility do not have commercially available and EPA-approved analytical methods. Because there are not analytical methods for these specific compounds, environmental media were analyzed for components of these compounds as per RI procedures and protocols.

Certain contaminants selected as COPCs have no readily available toxicity values from Tier I, II, or III data sources (USEPA, 2003b). As identified in Table 5.3-1 of the *July 2015 OU1/OU2 RI Report*, these COPCs include ammonia, sulfate, bromide (detected in surface water only), chloride, nitrate, lead (COPC in surface water only), Kempore or azodicarbonamide (detected in surface water only), urea, nonylphenol (detected in surface water only), diphenylether, dimethylphthalate, delta-hexachlorocyclohexane (delta-BHC), 4-isopropyltoluene, 4-chlorophenyl phenyl ether, 2-nitrophenol, 3 & 4 methylphenol, 4-nitrophenol, and diphenylmethanone (detected in surface water and sediment only).

Other compounds without toxicity values that were detected but not selected as COPCs because they are essential nutrients include calcium, magnesium, potassium, and sodium. Since the lack of toxicity values prevents calculation of risks, the OU1/OU2 BHHRA and Draft OU3 BHHRA may underestimate risk.

A ratio was used to estimate hexavalent chromium concentrations at EAs with less than three measured hexavalent chromium samples. The total chromium concentration was used with an OU1 and OU2 media-specific ratio to estimate hexavalent chromium concentrations. Hexavalent chromium was reported to be present in some groundwater samples collected for OU3. However, the *June 2019 Draft OU3 RI Report* concluded that groundwater conditions are not favorable for the presence of hexavalent chromium and that the hexavalent chromium detections in groundwater samples represent false positive results. Nevertheless, the Draft OU3 BHHRA uses a conservative approach and evaluated hexavalent chromium as it was reported to be detected in the samples.

The screening evaluation of a future VI pathway (future scenarios that cannot be measured under current conditions), which compared VOC concentrations in groundwater to the appropriate VISLs, has indicated that there may be potential for a VI pathway. However, the screening evaluation provides a qualitative evaluation only and does not indicate whether potential risks from VI are acceptable.

The OU1/OU2 BHHRA identified that TMPs in soil and LNAPL could potentially result in unacceptable VI risks to indoor workers and building occupants in a future scenario if commercial/industrial-type buildings were to be constructed and occupied on the Property. However, VI risks were only qualitatively evaluated because currently there are no occupied buildings on the Property.

2. Ecological Risk Assessment

Olin developed the OU1/OU2 BERA as part of the *July 2015 Final OU1/OU2 RI Report*. The OU1/OU2 BERA evaluated soil and on-Property surface water and sediments (OU1) including the former Facility area, the 20-acre southern portion of the Property restricted by a conservation restriction, the on-Property stream system, the CSL, and the Containment Area, and off-Property surface water and sediments including off-Property portions of the East Ditch Stream, South Ditch Stream, and West Ditch Stream (see **Figure 13** in **Appendix C** of this ROD for ecological EAs). The OU1/OU2 BERA also addressed Landfill Brook, North Pond, and the MMB wetlands which includes MMB, SMB, and surrounding areas. The *August 27, 2019 Plant B Risk Calculations* evaluated the ecological risks mitigated by the operations of Plant B. The *May 15, 2020 Ecological Risk Calculations* documented the basis for ecological risk-based PRGs for soil, sediments, and surface water. The OU1/OU2 BERA, as well as the *August 27, 2019*

Plant B Risk Calculations and *May 15, 2020 Ecological Risk Calculations*, were developed in accordance with EPA ecological risk assessment guidance (USEPA, 1997a).

Identification of Chemicals of Potential Concern

Available data were selected for use in the OU1/OU2 BERA using the criteria established by EPA in "*Guidance for Data Usability in Risk Assessment*" (USEPA, 2002). Sample collection and handling, laboratory analyses, and data Quality Assurance/Quality Control (QA/QC) procedures were performed in accordance with EPA methods, as described in the project Quality Assurance Project Plan (QAPP).

Samples used in the OU1/OU2 BERA include the following:

- Soil samples from 0-1 ft bgs collected during the OU1/OU2 RI;
- Historical soil samples from 0-2 ft bgs collected from 1991-2012;
- Surface water samples collected from 2009 to 2013; and
- Sediment samples collected from 0-6 inches from 2000 to 2013.

As per EPA guidance, ecological screening benchmarks for chemicals detected in surface water, sediments, and soil were obtained from published regulatory sources and peer-reviewed scientific literature using a multi-tiered hierarchy. Contaminants of Potential Ecological Concern (COPECs) were selected by comparing maximum detected concentrations to screening benchmarks by EA and media. Constituents with maximum concentrations above their corresponding screening benchmarks were identified as COPECs. Depending on EA and medium, COPECs identified for further evaluation consisted of VOCs, SVOCs (including PAHs), EPH, pesticides, metals, other inorganics, and miscellaneous specialty compounds (*e.g.*, hydrazine). **Tables G-Eco1** through **G-Eco3** in **Appendix B** of this ROD provide a summary of COPECs for surface water, sediments, and soil, respectively.

Exposure Assessment

Habitat Description

The northern portion of the Property and properties to the east, north, and west are heavily developed and industrial. The southern portion of the Property is forested except for the area of the CSL. This southern portion is south of South Ditch Stream and is preserved in a predominantly natural, undeveloped condition by a conservation restriction (Environmental and Open Space Restriction, recorded with the Middlesex North Registry of Deeds on November 7, 2006, Book 20680, Page 234).

Surface water bodies and associated habitats on or potentially impacted by the Property include the drainage systems and ponds located on-Property (including On-Property West Ditch Stream, South Ditch Stream, the Ephemeral Drainage, Central Pond, and the Storm Water Detention Basin), adjacent to the Property (Off-Property West Ditch Stream and East Ditch Stream), to the southeast (Off-Property South Ditch Stream, Landfill Brook, and North Pond) and to the northwest (MMB and SMB). The MMB wetlands are a 750-acre wetland complex located west of Main Street and bordered by primarily residential properties.

Landfill Brook is included in the OU1/OU2 BERA through COPEC selection only as the RI nature and extent evaluation determined that Landfill Brook is not impacted by the Site.

Complete Exposure Pathways
The OU1/OU2 BERA evaluated risk to ecological receptors from exposure to COPECs by:

- Comparing concentrations in environmental media to effects benchmarks and reference concentrations;
- Sediment toxicity tests (Lower South Ditch Stream only); and
- Food chain modeling and Toxicity Reference Value (TRV)-based risk calculations.

Table G-Eco4 in **Appendix B** of this ROD presents the exposure pathways and receptors evaluated by EA.

EPCs
The OU1/OU2 BERA evaluated risk to ecological receptors using RME and Central Tendency Exposure (CTE) EPCs. The RME EPC provides an upper estimate of exposure concentrations. In accordance with EPA guidance (USEPA, 2002), RME EPCs used in the OU1/OU2 BERA are based on the lesser of the 95% upper confidence limit (UCL) on the arithmetic mean concentration and the maximum detected concentration.

The CTE represents the concentration to which a population of receptors would most likely be exposed across an EA and over time. CTE EPCs are average (arithmetic mean) concentrations calculated using half the sample quantitation limit for non-detects. If the average concentration of a COPEC in an EA is greater than the maximum concentration, as occurs where the frequency and magnitude of detections is minimal, the lower of the maximum or RME EPC was used as the CTE EPC.

Ecological Effects Assessment

An HQ approach was used to compare exposure concentrations to benchmarks or TRVs. The HQ approach simplifies the comparison process and allows for a more standardized interpretation of the results (*i.e.*, the HQ reflects the magnitude by which the sample concentration exceeds or is less than the guideline, benchmark, or TRV). In general, if an HQ exceeds 1, some potential for risk is expected (USEPA, 1993). Although the quotient method does not measure risk in terms of likelihood of effects at the individual or population level, it does provide a functional benchmark for judging potential risk (USEPA, 1994).

Benchmark Comparisons
Effects benchmarks represent concentrations at or above which adverse effects are likely to occur. Effects benchmarks are typically based on toxicity tests and experimental observations published and summarized in the scientific literature. Effects benchmarks are typically reported based on the degree of measured response observed. Effects benchmarks differ from screening benchmarks that identify concentrations below which adverse effects are not expected to occur.

Ecological effects benchmarks for chemicals detected surface water, sediments, and soil (identified for plant and invertebrate) were obtained from published regulatory sources and peer-reviewed scientific literature using a multi-tiered hierarchy. In soil, separate effects benchmarks were identified for terrestrial plant and soil invertebrate receptors.

HQs were calculated by comparing EPCs to effects benchmarks, as shown:

Hazard Quotient = EPC / Benchmark (Equation 1)

Where:

EPC = RME EPC or CTE EPC
Benchmark = Effects Benchmark

An RME EPC coupled with a screening benchmark provides a conservative estimate of risk; whereas, a CTE EPC coupled with an effects benchmarks provides a more realistic estimate of risk. Therefore, an HQ less than 1 based on an RME and an effects screening benchmark indicates that the contaminant alone is unlikely to cause adverse ecological effects; whereas, an HQ greater than 1 based on a CTE and an effects benchmark suggests that a COPEC may be present at a concentration at which adverse effects may occur.

The risk characterization also includes an evaluation of incremental risks that account for the contribution of reference area concentrations to the overall site risks. Incremental risk was calculated as shown in Equation 2:

Incremental Risk HQ = Site HQ – Reference HQ (Equation 2)

For the OU1/OU2 BERA, reference area data were available for terrestrial EAs (EA-2, EA-4, and EA-5) and for the MMB wetlands. No reference data were available for the other aquatic EAs.

<u>Food Chain Modeling Methods</u>
Exposure of terrestrial and semi-aquatic wildlife (*i.e.*, birds and mammals) to COPECs was estimated using food chain models. Soil, sediments, and surface water EPCs were entered into the food chain model to calculate an Estimated Daily Intake (EDI) to which the receptor may be exposed. EPCs for prey items (tissue) were estimated using literature-based Bioaccumulation Factors (BAFs), except for estimates of chromium concentrations in invertebrate tissue.

Chromium is a frequently detected COC; however, the scientific literature indicates there is no meaningful positive correlation between soil/sediment concentration and invertebrate tissue concentrations (Sample et al., 1998; USEPA, 1999). Because no defensible soil- or sediment-to-invertebrate chromium BAFs are available in the scientific literature, a fixed value of invertebrate tissue dry is used instead.

EDIs for individual COPECs were compared to wildlife TRVs to evaluate the effect of exposure on representative species. The comparison was quantified using the HQ approach, as shown:

Hazard Quotient = EDI / TRV (Equation 3)

Where:

EDI = Estimated daily intake calculated from the food chain model
TRV = Toxicity Reference Value

TRVs were obtained from studies published in primary literature resources or review articles that reported No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) with survival, growth, or reproductive endpoints. Chronic studies were generally selected over acute or sub-chronic studies. EPA-derived TRVs established to calculate Ecological Soil Screening Levels (Eco-SSLs) were used preferentially when available. NOAEL and LOAEL TRVs are roughly analogous to screening and effects benchmarks used for other media, except that they represent screening and effects doses, rather than concentrations. Wildlife TRVs used in the food chain model are presented and discussed in greater detail in Appendix N of the *July 2015 OU1/OU2 RI Report*, Attachment 5.

The details of food chain models, including exposure assumptions, BAFs, and TRVs, are provided in Attachment 5 of the OU1/OU2 BERA, along with the food chain modeling spreadsheets. Results of the food chain modeling are presented in Appendix N of the *July 2015 OU1/OU2 RI Report*, Tables 4.5-1 through 4.5-11. Incremental risks (Equation 2) were also calculated for food chain models.

Ecological Risk Characterization

<u>Ecological Risk Presented in the *July 2015 OU1/OU2 RI Report*</u>

The HQs calculated by comparing RME and CTE EPCs to effects benchmarks are presented in Appendix N of the *July 2015 OU1/OU2 RI Report*, Tables 4.3-1 through 4.3-17; results of the food chain modeling are presented in Tables 4.5-1 through 4.5-11.

The OU1/OU2 BERA found that adverse effects associated with releases at or from OU1 and OU2 to ecological receptors are unlikely in the following EAs and media:

- EA-2 soil;
- EA-4 soil;
- Central Pond surface water and sediments;
- Storm Water Detention Basin surface water and sediments;
- On-Property West Ditch Stream surface water, wetlands, and sediments;
- Upper South Ditch Stream sediments;
- Off-Property West Ditch Stream surface water and sediments;
- MMB surface water and sediments; and
- North Pond surface water and sediments.

The OU1/OU2 BERA found that adverse effects may be possible in the following EAs and media:

- EA-5 soil, due to chromium and BEHP;
- Upper South Ditch Stream surface water, due to chromium and ammonia;
- Lower South Ditch Stream surface water due to chromium, and ammonia; and
- Lower South Ditch Stream sediments due to chromium and BEHP.

Tables G-Eco1 through **G-Eco3** in **Appendix B** of this ROD present the HQs for areas where adverse effect may be possible. **Table G-Eco5** in **Appendix B** of this ROD presents the target contaminant concentrations for protection of ecological receptors.

<u>Updates to OU1/OU2 RI Report Conclusions</u>

The conclusions and findings presented in the OU1/OU2 BERA were updated in the *Updates to OU1/OU2 RI Report Conclusions* (USEPA, 2020a). The original BERA indicated that there are no ecological risk concerns in the portions of the Property available for redevelopment. The OU1/OU2 BERA also found that adverse Site-related effects may be possible for Lower South Ditch Stream sediments and EA-5 soil due to chromium and BEHP, which is consistent with the findings of the sediment toxicity test conducted in 2011.

EPA acknowledges that the sediment toxicity test showed toxicity in Lower South Ditch Stream sediments, documenting mortality of benthic invertebrate population in these sediments. Although the test did not attribute the cause to any specific chemical(s), ammonia – a primary COC in sediments – was intentionally stripped from the *Hyalella azteca* samples prior to toxicity testing because the observed concentrations were known to cause mortality. This suggests that a COC other than ammonia – likely chromium – contributed to the observed toxic effects. However, the statement, "the BERA indicates that there are no ecological risk concerns in the portions of the Property available for redevelopment" is misleading and contains an inaccuracy. Firstly, the *FS Report* considers all risks across the Site, regardless of whether an area is available for redevelopment or not.

Secondly, documented adverse effects to plants and mammals from exposure to chromium and BEHP in soil and sediments are not confined to Lower South Ditch Stream and the EA-5 soil areas. This is because these same plant and animal habitats are present beyond these limited EAs in other areas of OU1/OU2 that contain actionable concentrations of chromium and BEHP in soil and sediments.

In addition to developing remedial alternatives to address contaminated soil and sediments in Lower South Ditch Stream and EA-5, the development of alternatives in the *FS Report* for soil and sediments was expanded to include other areas of OU1/OU2 with similar ecological risk concerns and that have actionable concentrations of chromium and BEHP. These portions of OU1/OU2 include EA-1, EA-2, EA-3, EA-4, EA-7, the Containment Area, Off-Property West Ditch Stream, and South Ditch Stream.

Surface water in Upper and Lower South Ditch Streams shows potential adverse effects to ecological receptors, primarily due to ammonia and chromium. These potential adverse ecological effects were extended to the East Ditch Stream. EPA has concerns that COCs in groundwater in the area of Plant B could potentially impact the ecological quality of East Ditch Stream should Plant B cease operation.

Uncertainties

There is uncertainty associated with any BERA result because the risk estimates are based on several assumptions regarding exposure and toxicity. More specifically, there is inherent variability and uncertainty associated with the data collected to characterize exposure concentrations and assumptions about the bioavailability of the selected COPECs (USEPA, 1997a).

Benchmarks used assess potential risk to aquatic, benthic and soil dwelling receptors are not site-specific and therefore, in general, do not incorporate site-specific environmental conditions that may affect bioavailability and subsequent toxicity. In addition, benchmarks do not address possible synergistic, antagonistic, or additive effects of contaminant mixtures; therefore, risk may be over- or under-estimated, depending on the interactions among the various chemicals present at the study area.

There are also assumptions and limitations inherent in food chain modeling, including selection of exposure and modeling parameters (*e.g.*, dietary intake, body weight, and age), uptake factors, and toxicological data (*e.g.*, TRVs). In addition, the food chain models assumed that 100% of the chemicals ingested are absorbed. In general, the conservative assumptions incorporated in the food chain models may result in an overestimate of the risk.

3. Basis for Response Action

The OU1/OU2 BHHRA, OU1/OU2 BERA, Draft OU3 BHHRA, and associated updates determined that current and future indoor workers or building occupants, current or future trespassers, future residents, or ecological receptors potentially exposed to Site COCs in soil, groundwater, sediments, or surface water via direct contact, ingestion, or inhalation may present an unacceptable human health or ecological risk.

Unacceptable human health risk was based on cancer risks exceeding the EPA acceptable risk range of 10^{-6} to 10^{-4} and/or non-carcinogenic hazards exceeding the EPA HI of 1. Unacceptable ecological risk was based on comparison of COC levels in surface water samples to acute and chronic benchmarks and toxicity testing to compare toxicity of Site surface water and sediment samples to reference locations.

The remedial action selected in this ROD is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment.

Remedial actions focused on the following media: on-Property soil, upland soil, wetland soil, streambank soil, sediments, South Ditch Stream surface water, East Ditch Stream surface water, Off-Property West Ditch Stream surface water, Site-wide groundwater, and DAPL.

Remedial actions focused on the following media/areas:

- Subsurface soil (see **Figure 14** in **Appendix C** of this ROD)
    - Plant B;
    - Human Health (HH)-EA-7;
    - HH-EA-3; and
    - Lake Poly (HH-EA-1).
- Upland surface soil (0-1 ft bgs; see **Figure 15** in **Appendix C** of this ROD)
    - Former Plant B area within Ecological (E)-EA-1;
    - Former Plant C-1 area within E-EA-1;
    - Two small areas east of the current Plant B treatment building (E-EA-3);
    - Former Lake Poly area within E-EA-1;
    - An area between the former Lake Poly and the Containment Area;
    - Small area immediately east of the East Warehouse (HH-EA-1);
    - An area between the Containment Area and the Central Wetlands within E-EA-4; and
    - Two single locations east of the former Plant D Tank Farm in E-EA-1 and at the northwest corner of the Containment Area within E-EA-2.
- Upland shallow subsurface soil (1-10 ft bgs; see **Figure 16** in **Appendix C** of this ROD)
    - Former Plant B area and immediately to the north within E-EA-1;
    - Former Plant C-1 area within E-EA-1;
    - Former Boiler House area within E-EA-1;
    - An area at and east of the current Plant B treatment building (E-EA-3);

  - Former Lake Poly area within E-EA-1;
  - An area immediately east of the East Warehouse and the area of the former Plant D (E-EA-1);
  - A small area between the Containment Area and Central Pond within E-EA-4; and
  - Two single locations at the current guard shack within E-EA-1 and beneath the East Warehouse within E-EA-1.
- Wetland surface soil (0-1 ft bgs; see **Figure 17** in **Appendix C** of this ROD)
  - A wetland area in the southern portion of E-EA-2, immediately north of the Containment Area and adjacent to On-Property West Ditch Stream;
  - A wetland area adjacent to both the north and south sides of the lower portion of South Ditch Stream that spans the eastern boundary of the Property. The upstream portion of this area is on-Property within E-EA-4 and the downstream portion of the area is off-Property and is referred to as E-EA-5;
  - Three single locations within the Central Wetlands, located within E-EA-4; and
  - Three single locations in the wetlands to the south of the upper portion of South Ditch Stream, located within E-EA-4.
- Wetland shallow subsurface soil (1-10 ft bgs; see **Figure 18** in **Appendix C** of this ROD)
  - A wetland area in the southern portion of E-EA-2, immediately north of the Containment Area and adjacent to On-Property West Ditch Stream;
  - An off-Property wetland area adjacent to both the north and south sides of the lower portion of South Ditch Stream within E-EA-5; and
  - One single location within the Central Wetlands, located within E-EA-4.
- Sediments (see **Figure 17** in **Appendix C** of this ROD)
  - Entire length of South Ditch Stream extending east from immediately downstream of the concrete weir structure beyond the eastern Property line and to the confluence with East Ditch Stream. The estimated remediation area includes aquatic sediments as well as soil located between the top of the north bank and the south bank of South Ditch Stream;
  - The northern portion of Off-Property West Ditch Stream; and
  - Central Pond.
- Surface water (see **Figure 19** in **Appendix C** of this ROD)
  - South Ditch Stream (from the western Property boundary eastward to the confluence with East Ditch Stream);
  - Off-Property West Ditch Stream; and
  - East Ditch Stream from the northern Property boundary southward to the confluence with South Ditch Stream.
- LNAPL in vicinity of Plant B (see **Figure 20** in **Appendix C** of this ROD)
- DAPL (see **Figure 21** in **Appendix C** of this ROD)
  - On-Property DAPL pool;
  - Off-Property Jewel Drive DAPL pool; and
  - Main Street DAPL pool.
- The mass of contaminants within the area of groundwater that targets the 5,000 ng/L NDMA contour (see **Figure 22** in **Appendix C** of this ROD)
- Containment Area soil (see **Figure 23** in **Appendix C** of this ROD)

H. REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are media-specific cleanup goals that define the objective of remedial actions to protect human health and the environment. Based on preliminary information relating to types of contaminants, environmental media of concern, and potential exposure pathways, RAOs were developed to aid in the development and screening of alternatives. These RAOs were developed to mitigate, restore, and/or prevent existing and future potential threats to human health and the environment and to attain Applicable or Relevant and Appropriate Requirements (ARARs). The Site COCs are presented in **Table B-1** of **Appendix B** of this ROD and the cleanup levels and performance standards are presented in **Tables L-1** and **L-2** of **Appendix B** of this ROD.

EPA determined that proposing an interim remedial action is appropriate at this Site to initiate groundwater restoration while additional information is collected to better assess the practicability of aquifer restoration prior to the determination of final cleanup levels and selection of a final remedial action for groundwater. Accordingly, interim RAOs have been developed for groundwater that prioritize reduction of exposure risk and reduction of contaminant mass through treatment. The interim RAOs will not include attainment of specific cleanup levels. The interim RAOs for DAPL and groundwater include:

- DAPL
    - Reduce the volume of DAPL and mass of Site COCs in DAPL that represent a source to groundwater, surface water, and sediments.
    - Reduce the horizontal and vertical migration of DAPL acting as a source of Site COCs, including penetration into bedrock.
    - Prevent potential human exposure to DAPL containing Site COCs above levels that are protective for residential use.

- Groundwater Hot Spots
    - Reduce the mass of Site COCs in groundwater hot spots.
    - Reduce the further horizontal and vertical migration of Site COCs in groundwater hot spots, including penetration into bedrock.
    - Prevent potential human exposure to groundwater containing Site COCs above levels that are protective for residential use.

The RAOs for the final remedy for LNAPL, surface water, soil, and sediments include:

- LNAPL
    - Prevent migration of LNAPL to East Ditch Stream to prevent exposure by current and future ecological receptors to Site COCs that would result in potential adverse impacts.
    - Prevent the migration of Site COCs in LNAPL from the subsurface to groundwater and that is a source of TMPs to indoor air vapors, via a vapor intrusion pathway, that pose an unacceptable risk to future indoor workers or building occupants.

- Surface Water
    - Prevent migration of groundwater containing Site COCs to East Ditch Stream, South Ditch Stream, and Off-Property West Ditch Stream to prevent exposure by current and

future ecological receptors to surface water containing Site COCs that would result in potential adverse impacts.
    - Prevent migration of groundwater containing Site COCs to Off-Property West Ditch Stream to prevent potential current and future human exposure to surface water containing Site COCs above levels that are protective for trespassers.

- OU1/OU2 Soil
    - Prevent potential future human exposure to soil containing Site COCs above levels that are protective for residential use.

- Upland Soil (including the Containment Area)
    - Prevent potential human exposure by a future indoor worker or building occupant to indoor air vapors, via a vapor intrusion pathway, containing COCs at levels that pose an unacceptable risk.
    - Prevent exposure by current and future ecological receptors to upland soil containing COCs that would result in potential adverse impacts.
    - Prevent leaching of COCs associated with the Containment Area into groundwater, surface water, and sediments at levels that pose unacceptable risks to human health and the environment.
- Wetland Soil and Sediments
    - Prevent exposure by current and future ecological receptors to wetland soil and sediments containing Site COCs that would result in potential adverse impacts.
    - Prevent the further migration of wetland soil and sediments containing Site COCs to nearby wetlands, surface water, drainage features, and adjoining properties that would result in potential adverse impacts.

I. DEVELOPMENT AND SCREENING OF ALTERNATIVES

1. Statutory Requirements/Response Objectives

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including: (1) a requirement that EPA's remedial action, when complete, must comply with all federal environmental and more stringent state environmental and facility siting standards, requirements, criteria, or limitations, unless a waiver is invoked; (2) a requirement that EPA select a remedial action that is cost-effective, and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (3) a preference for remedies in which treatment that permanently and significantly reduces the toxicity, mobility, or volume of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed to be consistent with these Congressional mandates.

2. Technology and Alternative Development and Screening

CERCLA and the NCP set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives were developed for the Site.

With respect to source control, the RI/FS process developed a range of alternatives for DAPL, groundwater, LNAPL, surface water, soil, soil vapor, sediments, and indoor air in which treatment that reduces the toxicity, mobility, or volume of the hazardous substances is a principal element. This range included alternatives that remove or destroy hazardous substances to the maximum extent feasible, eliminating or minimizing to the degree possible the need for long-term management. This range also included: alternatives that treat the principal threats posed by the Site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed; alternatives that involve little or no treatment but provide protection through engineering or Institutional Controls; and a no action alternative.

As discussed in Section 2.0 of the *FS Report Volumes I* and *II*, treatment technology options for DAPL, groundwater, LNAPL, surface water, soil, soil vapor, sediments, and indoor air were identified, assessed, and screened based on implementability, effectiveness, and cost.

Section 3.0 of the *FS Report Volumes I* and *II* presents the remedial alternatives developed by combining the technologies identified in the previous screening process in the categories identified in Section 300.430I(3) of the NCP. The purpose of the initial screening was to narrow the number of potential remedial actions for further detailed analysis while preserving a range of options. Each alternative was then evaluated in detail in Section 4.0 of the *FS Report Volumes I* and *II.*

Of the 34 source control and management of migration remedial alternatives screened in Section 3.0 of the *FS Report Volumes I* and *II* for all impacted media including DAPL, groundwater, LNAPL, surface water, soil, soil vapor, sediments, and indoor air, 29 were retained as possible options for the cleanup of the Site. As discussed in detail in the *FS Report Volume III*, from this initial screening, remedial options were combined to form four sets of alternatives each to address the consolidated cleanup components of DAPL/groundwater hot spots for OU3, and LNAPL/surface water and soil/sediments for OU1 and OU2. In addition to a no action alternative, three sets of source control and management of migration alternatives were developed for the interim remedial action for OU3. Similarly, in addition to two no action alternatives, six sets of source control and management of migration alternatives were developed for the final remedial action for OU1 and OU2.

Ultimately, twelve sets of alternatives for the consolidated cleanup components (four for DAPL/groundwater hot spots in OU3, four for LNAPL/surface water in OU1 and OU2, and four for soil/sediments in OU1 and OU2) were selected for detailed analysis. Although the alternatives are media-specific, the media and alternatives are interrelated such that one alternative for a particular medium may impact the remedial alternative options for other media. For example, because the surface water in East, South, and West Ditch Streams is continuously receiving flow of contaminated groundwater, it would not be practical to directly address surface water. Instead, surface water options, and consequently exceedances resulting in unacceptable risks, are addressed through groundwater options, along with evaluation of surface water to determine achievement of RAOs. Similarly, since the presence of DAPL in the aquifer results in the migration of COCs to overlying groundwater, any groundwater alternative would be dependent upon the actions taken to eliminate principal threat wastes associated with DAPL, otherwise the efficiency, effectiveness, and timeframe for implementation of the groundwater hot spot remedy could be compromised.

J. DESCRIPTION OF ALTERNATIVES

This section provides a narrative summary of each remedial alternative retained following screening and evaluated in the detailed analysis section of the FS Report. These alternatives were developed by combining response actions and technologies to address the estimated exposure risks to human health and the environment. The alternatives were also developed, to the extent practicable, to represent a range of effectiveness, duration of time required to achieve the RAO, and cost to implement.

The descriptions of each remedial alternative are conceptual and are used for costing purposes. The specific design details and costs for the selected remedy will be re-evaluated during the RD. The costs are intended to be within the target accuracy of -30 to +50% of the actual cost. All present worth costs associated with O&M and periodic expenditures are based on a 7% discount rate over 30 years.

1. Source Control Alternatives Analyzed

The OU1/OU2 source control alternatives analyzed for a final remedial action for soil and sediments include the following:

Final Action – Soil/Sediments

- SOIL/SED-1: No action
- SOIL/SED-2: Containment Area cap, upland soil covers, excavation with off-site disposal and restoration of wetland soil and sediments, limited action for TMPs (Institutional Controls, including vapor intrusion evaluation or vapor barriers/sub-slab depressurization systems)
- SOIL/SED-3: Containment Area cap, excavation with off-site disposal and clean soil cover for upland soil, excavation with off-site disposal and restoration of wetland soil and sediments, air sparging and SVE for TMPs
- SOIL/SED-4: Excavation (0-10 ft) with off-site disposal and clean soil cover for Containment Area and upland soil, excavation with off-site disposal and restoration of wetland soil and sediments, excavation and off-site disposal for TMPs

Each of the source control alternatives for soil and sediments is summarized below. With the exception of the No Action alternative (SOIL/SED-1), each of the alternatives for soil and sediments includes the following: (1) a PDI to further define the horizontal and vertical extent of soil contamination and refine the design and footprint of caps and cover systems; (2) post-excavation confirmatory sampling to document limits of soil and sediment impacts and confirm achievement of RAOs and PRGs; (3) dewatering and stabilization, as necessary, of excavated soil and sediments prior to shipment off-site; (4) restoration of excavated areas with clean, imported backfill to grade and re-vegetation with native vegetation to control erosion; (5) restoration of any wetland/floodplain habitat altered by the remedial action such that current flood storage capacities and wetlands are not diminished after completion of remedial actions; (6) all appropriate plans and specifications (*e.g.*, air monitoring plan, transportation/trucking plan, dust and odor control plan, soil management plan, restoration plan, demolition plan for existing structures, as appropriate, erosion and sedimentation control plan, and health and safety plan); and (7) all necessary preparation and mobilization activities (*e.g.*, removal of vegetation and debris, as appropriate, installation of temporary fencing, decontamination facilities, soil stockpile/management areas, trailer, and sanitation facilities). A more complete, detailed presentation of each soil and sediment alternative may be found in Section 4.0 of the *FS Report Volume I* and Section IX of the *FS Report Volume III*.

Alternative SOIL/SED-1: No Action

As required by CERCLA and the NCP, Alternative SOIL/SED-1 was developed as a baseline for comparing the effectiveness of the other remedial alternatives for soil and sediments. No further action would be taken to address contamination in the Containment Area, upland soil, wetland soil and sediments, and to address the presence of TMPs in soil. The No Action Alternative does not include active remediation or Institutional Controls and the current levels of contaminants in soil and sediments are assumed to remain unchanged. No construction would take place, and RAOs would not be achieved. As required by CERCLA, Five Year Reviews would still be performed as part of the No Action Alternative. Except for the cost of statutorily-required Five Year Reviews, there is no cost associated with this alternative – the capital cost for this alternative is $0, the annual O&M cost is $0, and the net present value is $0.

Alternative SOIL/SED-2: Containment Area cap, upland soil covers, excavation with off-site disposal and restoration of wetland soil and sediments, limited action for TMPs (Institutional Controls, including vapor intrusion evaluation or vapor barriers/sub-slab depressurization systems) (*This is EPA's Selected Alternative.*)

Alternative SOIL/SED-2 is shown on **Figure 24** in **Appendix C** of this ROD. Alternative SOIL/SED-2 includes placement of a permanent, low-permeability cap over the Containment Area that meets RCRA Subtitle D and Massachusetts solid waste landfill performance standards. The existing equalization window would be closed by grouting in place. Soil or asphalt cover systems would be placed over areas of shallow (0-1 ft) upland soil with concentrations of COCs in excess of the PRGs. The caps and cover systems would be designed to prevent direct contact with impacted soil, to prevent soil from being carried to nearby areas, including streams and wetlands, during rain events via erosion, and to prevent soil contaminants from leaching to groundwater. The caps and cover systems would be adequately designed with long-term integrity for seasonal conditions, severe storms (up to a 500-year storm event), and freeze/thaw conditions; to satisfy ARAR requirements; and to prevent contaminants leaching to groundwater (*i.e.*, meet impermeability requirements). Mitigation measures would be required to address any unavoidable short- or long-term floodplain impairment within the 500-year floodplain on the Property. Based on the available wetland soil and sediment data, PRG exceedances for the COCs are generally limited to approximately 1 ft bgs. A PDI will be conducted to further refine the extent of material to be excavated. Under this alternative, wetland soil and sediments with concentrations of COCs in excess of the PRGs would be excavated (estimated to be approximately 6,000 tons) and disposed of off-site at an appropriate permitted facility.

This alternative also includes long-term monitoring and maintenance of capped/covered areas, as well as Institutional Controls to ensure that caps and cover systems are maintained and prevent contact with the underlying soil, prohibit residential, school, and daycare use of the Property, and guard against the future vapor intrusion pathway. TMPs would be addressed via Institutional Controls that require vapor intrusion evaluations and/or vapor barriers/sub-slab depressurization systems. Five Year Reviews would be required since contamination would be left in place. The estimated construction time for this alternative is two years; the time to achieve RAOs is also estimated to be on the order of two years. The estimated capital cost for this alternative is $5.6 million, the annual O&M cost is $1.1 million, and the net present value is $6.1 million.

Alternative SOIL/SED-3: Containment Area cap, excavation (0-1 ft) with off-site disposal and clean soil cover for upland soil, excavation with off-site disposal and restoration of wetland soil and sediments, air sparging and SVE for TMPs

Alternative SOIL/SED-3 is shown on **Figure 25** in **Appendix C** of this ROD. Alternative SOIL/SED-3 includes placement of a permanent cap over the Containment Area. The existing equalization window would be closed by grouting in place. Upland soil (0-1 ft) and wetland soil and sediments with concentrations of COCs in excess of the PRGs would be excavated (estimated to be approximately 10,000 tons) and disposed of off-site at an appropriate permitted facility. A PDI would be conducted to refine the extent of upland soil and wetland soil and sediments to be excavated. Excavated soil and sediments would be dewatered and stabilized, as necessary, prior to shipment off-site. Excavated upland soil areas would be backfilled with either a 1-ft soil layer cover system or a combination 9-inch (in) soil layer and 3-in asphalt layer cover system. Soil cover systems would be re-vegetated with native vegetation to control erosion. The caps and cover systems would be designed to prevent direct contact with impacted soil, to prevent soil from being carried to nearby areas, including streams and wetlands, during rain events via erosion, and to prevent soil contaminants from leaching to groundwater. The caps and cover systems would be adequately designed with long-term integrity for seasonal conditions, severe storms (up to a 500-year storm event), and freeze/thaw conditions; to satisfy ARAR requirements; and to prevent contaminants leaching to groundwater (*i.e.*, meet impermeability requirements). Mitigation measures would be required to address any unavoidable short- or long-term floodplain impairment within the 500-year floodplain on the Property. Based on the available wetland soil and sediment data, PRG exceedances for the COCs are generally limited to approximately 1 ft bgs. A PDI will be conducted to further refine the extent of material to be excavated. Under this alternative, wetland soil and sediments with concentrations of COCs in excess of the PRGs would be excavated and disposed of off-site at an appropriate permitted facility.

This alternative also includes long-term monitoring and maintenance of capped/covered areas, as well as Institutional Controls to ensure that caps and cover systems are maintained and prevent contact with the underlying soil, prohibit residential, school, and daycare use of the Property, and guard against the future vapor intrusion pathway. TMPs would be removed and treated via installation and operation of an air sparging/SVE system. Five Year Reviews would be required since contamination would be left in place. The estimated construction time for this alternative is two years; the time to achieve RAOs is also estimated to be on the order of two years. The estimated capital cost for this alternative is $6.7 million, the annual O&M cost is $1.5 million, and the net present value is $7.5 million.

Alternative SOIL/SED-4: Excavation (0-10 ft) with off-site disposal and clean soil cover for Containment Area and upland soil, excavation with off-site disposal and restoration of wetland soil and sediments, excavation and off-site disposal for TMPs

Alternative SOIL/SED-4 is shown on **Figure 26** in **Appendix C** of this ROD. Alternative SOIL/SED-4 includes excavation of areas within the Containment Area with concentrations of COCs in excess of the PRGs. Sheet piling would be installed, as necessary, to maintain the structural integrity of the slurry wall during excavation. Upland soil (0-10 ft), wetland soil and sediments, and TMP-containing soil with concentrations of COCs in excess of the PRGs would be excavated (estimated to be approximately 130,000 tons) and disposed of off-site at an appropriate permitted facility. Based on the available upland soil data, which is very limited,[20] the majority of PRG exceedances for the COCs appear to be located between 0 and approximately 8 ft bgs. A PDI will be conducted to further refine the extent of soil and sediments to be excavated. Excavated soil and sediments would be dewatered and stabilized, as necessary, prior to shipment off-site. Excavated areas would be backfilled with clean soil to grade and re-vegetated with native vegetation to control erosion; to withstand seasonal conditions (up to a 500-year storm event), and freeze/thaw conditions; and to satisfy ARAR requirements. Mitigation measures would be required to address any unavoidable short- or long-term floodplain impairment within the 500-year floodplain on the Property.

This alternative also includes long-term monitoring and maintenance of restored areas, as well as Institutional Controls to ensure the long-term integrity of restored areas, and prohibit residential, school, and daycare use of the Property. Five Year Reviews would be required since contamination would be left in place. The estimated construction time for this alternative is two years; the time to achieve RAOs is also estimated to be on the order of two years. The estimated capital cost for this alternative is $34.0 million, the annual O&M cost is $330,000, and the net present value is $34.2 million.

2. Combined Source Control and Management of Migration Alternatives Analyzed

Elements of source control were combined with management of migration to develop alternatives for a final remedial action for LNAPL and surface water and an interim remedial action for DAPL and groundwater hot spots. Management of migration alternatives address contaminants that have migrated into and with groundwater from the original source of contamination. At the Site, contaminants have migrated from surface and subsurface releases at the Property into Site-wide groundwater, and surface water at the Site continuously receives flow of contaminated groundwater. The action alternatives to address surface water consist of remedies to intercept and treat the overburden groundwater plume to prevent continued impacts to surface water. The OU1/OU2 combined source control and management of migration alternatives analyzed for a final action for LNAPL and surface water include the following:

- Source control options to remove LNAPL that represents a source of COCs to groundwater and a source of TMPs to indoor air vapors; and
- Management of migration options to prevent the migration of LNAPL to East Ditch Stream and prevent the migration of groundwater containing COCs to East Ditch Stream, South Ditch Stream, and Off-Property West Ditch Stream.

[20] The collection of upland soil samples on the Property has been limited by the presence of concrete slabs that remained following the demolition of former plant buildings and other structures.

The OU3 combined source control and management of migration alternatives analyzed for an interim action for DAPL and groundwater hot spots include the following:

- Source control options to reduce the volume of DAPL and mass of COCs in DAPL and groundwater hot spots that represent a source of contamination to groundwater, surface water, and sediments; and
- Management of migration options to reduce the horizontal and vertical migration of (1) DAPL acting as a source of COCs; and (2) groundwater hot spots, including penetration into bedrock.

The OU1/OU2 source control and management of migration alternatives analyzed for a final remedial action for LNAPL and surface water include the following:

<u>Final Action – LNAPL/Surface Water</u>

- LNAPL/SW-1: No action
- LNAPL/SW-2: MPE for LNAPL with treatment at Plant B, groundwater extraction to prevent impacts to surface water, treatment at new treatment system(s)
- LNAPL/SW-3: Demolition of Plant B, expanded MPE for LNAPL, targeted groundwater extraction to prevent impacts to surface water, treatment at new treatment system(s)
- LNAPL/SW-4: Excavation of LNAPL with off-site disposal, targeted Permeable Reactive Barriers (PRBs) to treat groundwater before flow into surface water

Each of the alternatives for LNAPL and surface water is summarized below. With the exception of the No Action alternative (LNAPL/SW-1), each of the alternatives for LNAPL and surface water includes PDIs to: (1) determine the final number, location, and configuration of extraction wells and other remedial components; (2) determine appropriate locations for discharge of treated groundwater to surface water; and (3) map the precise extent of LNAPL remediation limits. Additionally, each of the action alternatives for LNAPL and surface water include the following: (1) restoration of any wetland/floodplain habitat altered by the remedial action such that current flood storage capacities and wetlands are not diminished after completion of remedial actions; (2) all appropriate plans and specifications (*e.g.*, air monitoring plan, transportation/trucking plan, dust and odor control plan, soil management plan, restoration plan, demolition plan for existing structures, as appropriate, erosion and sedimentation control plan, and health and safety plan); (3) all necessary preparation and mobilization activities (*e.g.*, removal of vegetation and debris, as appropriate, installation of temporary fencing, decontamination facilities, soil stockpile/management areas, trailer, and sanitation facilities); (4) long-term maintenance and monitoring of new and existing remedy infrastructure components; and (5) long-term monitoring of the groundwater plume and surface water, to evaluate remedy effectiveness. A more complete, detailed presentation of each LNAPL alternative may be found in Section 4.0 of the *FS Report Volume II*. More detailed presentations of each surface water alternative may be found in Section 4.0 of the *FS Report Volume I*. Additional details may also be found in Section VIII of the *FS Report Volume III*.

Alternative LNAPL/SW-1: No Action

As required by CERCLA and the NCP, Alternative LNAPL/SW-1 was developed as a baseline for comparing the effectiveness of the other remedial alternatives to address LNAPL and surface water. No further action would be taken to address LNAPL or surface water contamination. The No Action Alternative does not include active remediation or Institutional Controls and the current level of LNAPL contamination and level of contaminants in surface water are assumed to remain unchanged. No construction would take place, and RAOs would not be achieved. As required by CERCLA, Five Year Reviews would still be performed as part of the No Action Alternative. Except for the cost of statutorily-required Five Year Reviews, there is no cost associated with this alternative – the capital cost for this alternative is $0, the annual O&M cost is $0, and the net present value is $0.

Alternative LNAPL/SW-2: MPE for LNAPL with treatment at Plant B, groundwater extraction to prevent impacts to surface water, treatment at new treatment system(s)

Alternative LNAPL/SW-2 is shown on **Figure 27** in **Appendix C** of this ROD. Alternative LNAPL/SW-2 includes construction and operation of approximately one MPE well, located just outside the northeast corner of the Plant B building near monitoring well GW-23, where the thickest LNAPL accumulation is observed. PDIs during the PD phase will determine the final number, location, and configuration of MPE wells and other remedial components under this alternative. A skid-mounted system would likely be employed to treat the extracted materials, conceptually consisting of an extraction blower, knockout tank to separate the streams, oil/water separator to remove LNAPL, and GAC to treat vapors. Extracted groundwater would be conveyed to the existing Plant B for additional treatment. Extracted LNAPL would be stored on-site, with off-site disposal at an appropriate off-site permitted facility.

This alternative also includes the installation of a groundwater extraction and treatment system, with extraction wells sited based on PDIs, to prevent contaminant concentrations in groundwater from impacting surface water. Extracted groundwater would be treated at a newly constructed, groundwater treatment system or systems (potentially the same system(s) as for the groundwater hot spots, see below) and discharged to surface water. The treatment system(s) design would be refined during the RD phase, and would include components such as an influent equalization task, hypochlorite flash mixer for oxidation and removal of metals, breakpoint chlorination for ammonia treatment, slow mix flocculation and lamella clarifier to remove solids, filter press for solids dewatering, GAC to ensure clarity, UV transmittance, and remove VOCs, and UV photo-oxidation for NDMA destruction. O&M would include monitoring to assure that the extraction pumps are operating properly, the treatment components are in proper operation, the activated carbon is changed as needed, and compliance monitoring for air emissions and treated water are being performed. Mitigation may be required for any alteration of the 500-year floodplain and/or wetlands from the installation, operation, and maintenance of the groundwater treatment system(s). Well and piping locations, as well as the location of the treatment system or systems, would need to be designed so as to not interfere with the remedial infrastructure required for the soil and sediment components (see above) and DAPL and groundwater hot spot components (see below) of the selected remedy.

This alternative includes Institutional Controls to prohibit residential, school, and daycare use of the Property, prevent disturbance of any engineered systems and any new and existing remedy infrastructure components, and prohibit the use of contaminated groundwater unless it can be demonstrated to EPA, in consultation with the Commonwealth, that such use will not pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy. Five Year Reviews would be required since contamination would be left in place. The estimated construction time for this alternative is two to three years. A 30-year timeframe was used for O&M, monitoring, and cost estimation purposes. The estimated capital cost for this alternative is $4.6 million, the annual O&M cost is $6.5 million, and the net present value is $9.0 million.

Alternative LNAPL/SW-3: Demolition of Plant B, expanded MPE for LNAPL, targeted groundwater extraction to prevent impacts to surface water, treatment at new treatment system(s) (*This is EPA's Selected Alternative.*)

Alternative LNAPL/SW-3 is shown on **Figure 28** in **Appendix C** of this ROD. Alternative LNAPL/SW-3 includes the installation of a groundwater extraction and treatment system to prevent contaminant concentrations in groundwater from impacting surface water. Extraction wells would be installed along Off-Property West Ditch Stream and South Ditch Stream to intercept and treat the overburden groundwater contaminant plume that impacts these streams. Extraction wells would be sited and configured based upon PDIs. Extracted groundwater would be treated at a newly constructed groundwater treatment system or systems (potentially the same system(s) as for the groundwater hot spots, see below) and discharged to surface water. The treatment system(s) design would be refined during the RD phase, and would include components such as an influent equalization task, hypochlorite flash mixer for oxidation and removal of metals, breakpoint chlorination for ammonia treatment, slow mix flocculation and lamella clarifier to remove solids, filter press for solids dewatering, GAC to ensure clarity, UV transmittance, and remove VOCs, and UV photo-oxidation for NDMA destruction.

Additionally, groundwater currently treated by Plant B would be re-routed to the new groundwater treatment system(s). Following this, the Plant B groundwater treatment system would be decommissioned and demolished. An estimated three to five MPE wells, the exact number and location of which will be determined by the PDIs, would be installed within the LNAPL footprint, including beneath the Plant B building foundation following Plant B's demolition, to remediate LNAPL, the smear zone, and dissolved-phase COCs that would otherwise impact East Ditch Stream. A skid-mounted system would likely be employed to treat the extracted materials, conceptually consisting of an extraction blower, knockout tank to separate the streams, oil/water separator to remove LNAPL, and GAC to treat vapors. Extracted LNAPL would be stored on-site, with off-site disposal at an appropriate off-site permitted facility. Extracted groundwater would be conveyed to the new groundwater treatment system(s) for treatment. O&M would include monitoring to assure that the extraction pumps are operating properly, the treatment components are in proper operation, the activated carbon is changed as needed, and compliance monitoring for air emissions and treated water are being performed. Mitigation may be required for any alteration of the 500-year floodplain and/or wetlands from the installation, operation, and maintenance of the groundwater treatment system(s). Well and piping locations, as well as the location of the treatment system(s), would need to be designed so as to not interfere with the remedial infrastructure required for the soil and sediment components (see above) and DAPL and groundwater hot spot components (see below) of the selected remedy.

This alternative includes Institutional Controls to prohibit residential, school, and daycare use of the Property, prevent disturbance of any engineered systems and any new and existing remedy infrastructure components, and prohibit the use of contaminated groundwater unless it can be demonstrated to EPA, in consultation with the Commonwealth, that such use will not pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy. Five Year Reviews would be required since contamination would be left in place. The estimated construction time for this alternative is two to three years. A 30-year timeframe was used for O&M, monitoring, and cost estimation purposes. The estimated capital cost for this alternative is $2.3 million, the annual O&M cost is $7.4 million, and the net present value is $6.6 million.

Alternative LNAPL/SW-4: Excavation of LNAPL with off-site disposal, targeted PRBs to treat groundwater before flow into surface water

Alternative LNAPL/SW-4 is shown on **Figure 29** in **Appendix C** of this ROD. Under Alternative LNAPL/SW-4, Plant B would continue to operate until the new groundwater hot spot treatment system(s) has been constructed and is fully operational (see below). Current Plant B extraction wells would then be re-routed to the new treatment system(s), and Plant B would be decommissioned and demolished. LNAPL-impacted soil would be excavated to the bottom of the smear zone. The volume of soil to be excavated under this alternative is estimated to be 830 cy, with an additional 520 cy removed (for a total of 1,350 cy) if the initial excavation reveals additional LNAPL-impacted soil requiring removal. Post-excavation confirmatory sampling would be conducted to document limits of LNAPL impacts and confirm achievement of RAOs and PRGs. Excavated soil would be dewatered and stabilized, as necessary, prior to shipment off-site. The excavated area would be backfilled with clean soil to grade and re-vegetated with native vegetation to control erosion; to withstand seasonal conditions (up to a 500-year storm event), and freeze/thaw conditions; and to satisfy ARAR requirements.

This alternative also includes construction and installation of PRBs along portions of South Ditch Stream, where the majority of concentrations of COCs above PRBs are found. A grouted sheet-pile wall would be constructed to direct groundwater through the PRBs. The PRB would be constructed perpendicular to the direction of groundwater flow in the vicinity of the weir and upstream portion of South Ditch Stream where contaminated groundwater flows laterally to and into the stream. The design of the PRBs would be based on additional data obtained during the PDI phase, and might include additional segments of PRBs in other areas to address East and West Ditch Streams if PDI data indicates that groundwater impacted by COCs is resulting in unacceptable impacts to these surface waters. Reactive materials for the PRBs would consist of a mixture of zeolites to treat ammonia and activated carbon to treat chromium. The PRBs would be installed from just below ground surface to the weathered bedrock surface.

Finally, this alternative includes construction of a groundwater extraction and treatment system or systems (potentially the same system(s) as for the groundwater hot spots, see below), to which groundwater currently treated by the existing Plant B would be re-routed. The treatment system(s) design would be refined during the RD phase, and would include components such as an influent equalization task, hypochlorite flash mixer for oxidation and removal of metals, breakpoint chlorination for ammonia treatment, slow mix flocculation and lamella clarifier to remove solids, filter press for solids dewatering, GAC to ensure clarity, UV transmittance, and remove VOCs, and UV photo-oxidation for NDMA destruction. O&M for Alternative LNAPL/SW-4 would include monitoring to assure that the extraction pumps and PRB segments are operating properly, periodic replacement/regeneration of the reactive media in the PRB, and for the groundwater treatment system(s), monitoring to assure that components are in proper operation, the activated carbon is changed as needed, and compliance monitoring for air emissions and treated water are being performed. Mitigation may be required for any alteration of the 500-year floodplain and/or wetlands from the installation, operation, and maintenance of the groundwater treatment system(s). Well, piping, and PRB segment locations, as well as the location of the treatment system(s), would need to be designed so as to not interfere with the remedial infrastructure required for the soil and sediment components (see above) and DAPL and groundwater hot spot components (see below) of the selected remedy.

This alternative includes Institutional Controls to prohibit residential, school, and daycare use of the Property, prevent disturbance of any engineered systems and any new and existing remedy infrastructure components, including the PRB segments, and prohibit the use of contaminated groundwater unless it can be demonstrated to EPA, in consultation with the Commonwealth, that such use will not pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy. Long-term monitoring and maintenance would be conducted of areas that have been restored following remediation-related disturbances. Five Year Reviews would be required since contamination would be left in place. The estimated construction time for this alternative is one year. A 30-year timeframe was used for O&M, monitoring, and cost estimation purposes. The estimated capital cost for this alternative is $5.3 million, the annual O&M cost is $6.7 million, and the net present value is $9.0 million.

The OU3 source control and management of migration alternatives analyzed for an interim remedial action for DAPL and groundwater hot spots include the following:

<u>Interim Action – DAPL/Groundwater Hot Spots</u>

- DAPL/GWHS-1: No action
- DAPL/GWHS-2: DAPL extraction (approx. 5 wells), groundwater hot spot extraction targeting 11,000 ng/L NDMA contour (approx. 2-3 wells), and treatment at new treatment system(s)
- DAPL/GWHS-3: DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting 5,000 ng/L NDMA contour (approx. 6 wells), and treatment at new treatment system(s)
- DAPL/GWHS-4: DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting 1,100 ng/L NDMA contour (approx. 12 wells), and treatment at new treatment system(s)

Each of the alternatives for DAPL and groundwater hot spots is summarized below. With the exception of the No Action alternative (DAPL/GWHS-1), each of the alternatives for DAPL and groundwater hot spots includes PDIs to: (1) determine the final number, location, and configuration of extraction wells and other remedial components; (2) determine appropriate locations for discharge of treated groundwater to surface water; and (3) facilitate the implementation of the chosen cleanup alternatives. Additionally, each of the action alternatives for DAPL and groundwater include the following: (1) restoration of any wetland/floodplain habitat altered by the remedial action such that current flood storage capacities and wetlands are not diminished after completion of remedial actions; (2) all appropriate plans and specifications (*e.g.*, air monitoring plan, transportation/trucking plan, dust and odor control plan, soil management plan, restoration plan, demolition plan for existing structures, as appropriate, erosion and sedimentation control plan, and health and safety plan); (3) all necessary preparation and mobilization activities (*e.g.*, removal of vegetation and debris, as appropriate, installation of temporary fencing, decontamination facilities, soil stockpile/management areas, trailer, and sanitation facilities); (4) long-term maintenance and monitoring of new and existing remedy infrastructure components; (5) identification and evaluation of existing wells (*e.g.*, potable, irrigation, and process wells) in the Site groundwater study area (see **Figure 11** in **Appendix C** of this ROD) to determine whether their use will pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy; and (6) long-term monitoring of the groundwater plume and surface water, to evaluate remedy effectiveness.

In parallel to the implementation of each action alternative for DAPL and groundwater, OU3 RI/FS activities will continue, which include the following: (1) continued studies to close remaining data gaps, including to improve the characterization of bedrock topography and fractures and further delineate the horizontal and vertical extent of groundwater contamination; and (2) evaluation of long-term groundwater remedial alternatives, leading to the selection of a final cleanup plan for the Site.

Under each of the action alternatives discussed below, DAPL would be pumped to a storage tank(s) where it would be stored prior to treatment. Performance monitoring schedules would be evaluated as part of the RD phase, and would generally occur on a monthly basis. Monitoring would be performed to assess remedy progress, evaluate the response of the DAPL and overlying groundwater during pumping, assess trends of monitored parameters in DAPL and groundwater, and assess the specific chemical characteristics of the extracted DAPL.

The DAPL and groundwater hot spot treatment system(s) design would be refined during the RD phase. Conceptually, it is assumed that such treatment will generally include the following components: treatment for DAPL consisting of lime precipitation to remove metals, dewatering and off-site disposal of liquids and sludge materials, stripping of VOCs and ammonia, UV photo-oxidation of NDMA, and evaporation of remaining water and off-site disposal of residual solids; and additional treatment for hot spot groundwater consisting of an influent equalization task, hypochlorite flash mixer for oxidation and removal of metals, breakpoint chlorination for ammonia treatment, slow mix flocculation and lamella clarifier to remove solids, filter press for solids dewatering, off-site disposal of residual solids and sludge materials, GAC to ensure clarity, UV transmittance, and remove VOCs, and UV photo-oxidation for NDMA destruction. The waste liquids and residual solids/sludges generated during DAPL treatment are assumed to be non-hazardous waste, but would be further characterized prior to off-site disposal. DAPL would be removed to the extent practicable based on measured concentrations meeting the definition of DAPL. DAPL has been defined as having specific gravity greater than 1.025; other parameters including metals, anions, and geochemistry are also indicative of DAPL (see **Section E, Conceptual Site Model**, ***Nature and Extent of Contamination***, *OU3 DAPL* in **Part 2** of this ROD, above). This definition will be re-evaluated as part of the RD phase.

O&M would include monitoring to assure that the extraction pumps are operating properly, the treatment components are in proper operation, the activated carbon, pumps, tubing, and other consumable components are changed/replaced as needed, and compliance monitoring for air emissions and treated water are being performed. O&M would also include routine inspections of extraction system components, including pumps, pump enclosure vaults, system controls, communication equipment, piping, storage tank(s), and tanker truck loading station(s), and periodic evaluation and adjustment of pumping rates. Mitigation would be required for any alteration of the 100-year and 500-year floodplains and/or wetlands from the installation, operation, and maintenance of the DAPL and groundwater extraction and treatment system(s). Well and piping locations, as well as the location of the treatment system(s), would need to be designed so as to not interfere with the remedial infrastructure required for the soil, sediment, LNAPL, and surface water components (see above) of the selected remedy.

The three action alternatives also include Institutional Controls to prohibit residential, school, and daycare use of the Property, prevent disturbance of any engineered systems and any new and existing remedy infrastructure components, and prohibit the use of contaminated groundwater within the OU3 groundwater study area unless it can be demonstrated to EPA, in consultation with the Commonwealth, that such use will not pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy. Five Year Reviews would be required since contamination would be left in place.

A more complete, detailed presentation of each DAPL and groundwater hot spot alternative may be found in Section 4.0 of the *FS Report Volume II* and Section VII of the *FS Report Volume III*.

Alternative DAPL/GWHS-1: No Action

As required by CERCLA and the NCP, Alternative DAPL/GWHS-1 was developed as a baseline for comparing the effectiveness of the other remedial alternatives to address DAPL and groundwater hot spots. No further action would be taken to address DAPL or groundwater contamination. The No Action Alternative does not include active remediation or Institutional Controls and the current level of DAPL contamination and level of contaminants in groundwater are assumed to remain unchanged. No construction would take place, and RAOs would not be achieved. As required by CERCLA, Five Year Reviews would still be performed as part of the No Action Alternative. Except for the cost of statutorily-required Five Year Reviews, there is no cost associated with this alternative – the capital cost for this alternative is $0, the annual O&M cost is $0, and the net present value is $0.

Alternative DAPL/GWHS-2: DAPL extraction (approx. 5 wells), groundwater hot spot extraction targeting 11,000 ng/L NDMA contour (approx. 2-3 wells), and treatment at new treatment system(s)

Alternative DAPL/GWHS-2 is shown on **Figure 30** in **Appendix C** of this ROD. Alternative DAPL/GWHS-2 includes the construction and operation of a DAPL extraction system, with approximately one well in the Off-Property Jewel Drive DAPL pool, approximately one well in the Containment Area DAPL pool, and approximately three wells in the Main Street DAPL pool, the exact number, location, and configuration of which would be based on PDIs. For the Main Street DAPL pool, multiple extraction wells would be used to target bedrock low points and to provide adequate coverage across the entire DAPL pool area. It is assumed that 5% of the accessible DAPL volume would not be captured by the extraction system; to address 95% of the DAPL, the Off-Property Jewel Drive well is estimated to require on the order of 12 years of operation, the Containment Area well is estimated to require on the order of three years of operation, and the Main Street wells are estimated to require on the order of 20 years of operation. In total, Alternative DAPL/GWHS-2 is estimated to operate for 20 years, would remove 14.1 million gallons of DAPL from the aquifer, and would generate approximately 15,705 tons of sludge and soil residuals for off-site disposal as a result of DAPL treatment.

This alternative also includes construction and operation of a groundwater extraction system, with approximately two-three new, deep overburden wells targeting the 11,000 ng/L NDMA contour (the exact number, location, and configuration of which would be based on PDIs), to remove and treat the mass of contaminants in groundwater hot spots in the areas downgradient of the Main Street DAPL pool. Under this alternative, it is expected that the new wells would be installed in the general vicinity of existing wells GW-58D, GW-83D, and GW-84D. Extracted DAPL and groundwater would be treated at a newly constructed treatment system or systems (potentially the same system(s) as for Alternatives LNAPL/SW-2, -3, and -4, see above) and discharged to surface water. In order to implement this alternative, it is expected that a new access road would be constructed in the MMB wetlands to the area around GW-83D and GW-84D, and the marshy area around GW-58D. Based on a constant combined extraction rate of 20-30 gpm, Alternative DAPL/GWHS-2 is estimated to operate for approximately 1.5-2.5 years and would remove approximately 17.1 million gallons of contaminated hot spot groundwater.

In all, Alternative DAPL/GWHS-2 is estimated to remove 4,159 grams (g) of NDMA from overburden groundwater and the DAPL pools. The estimated construction time for this alternative is two to three years; the time to achieve RAOs is estimated to be on the order of 20 years. The estimated capital cost for this alternative is $10.3 million, the annual O&M cost is $21.7 million, and the net present value is $22.5 million.

DAPL/GWHS-3: DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting 5,000 ng/L NDMA contour (approx. 6 wells), and treatment at new treatment system(s) (*This is EPA's Selected Alternative.*)

Alternative DAPL/GWHS-3 is shown on **Figures 31** and **32** in **Appendix C** of this ROD. Alternative DAPL/GWHS-3 (EPA's Selected Alternative for DAPL and groundwater hot spots) includes the construction and operation of a DAPL extraction system, with approximately four wells in the Off-Property Jewel Drive DAPL pool, approximately four wells in the Containment Area DAPL pool, and approximately 12 wells in the Main Street DAPL pool, the exact number, location, and configuration of which would be based on PDIs. Multiple extraction wells in each DAPL pool would serve to minimize drawdown, provide flexibility with pumping rates, and target bedrock low points identified during the PDI activities of the RD phase. It is assumed that 5% of the accessible DAPL volume would not be captured by the extraction system; to address 95% of the DAPL, the Off-Property Jewel Drive wells are estimated to require on the order of 3.5 years of operation, the Containment Area wells are estimated to require on the order of one year of operation, and the Main Street wells are estimated to require on the order of six years of operation. In total, EPA's Selected Alternative for DAPL and groundwater hot spots is estimated to operate for six years, is expected to remove 14.8 million gallons of DAPL from the aquifer, and generate approximately 16,531 tons of sludge and soil residuals for off-site disposal as a result of DAPL treatment.

This alternative also includes construction and operation of a groundwater extraction system, with approximately six new, deep overburden extraction wells to remove and treat the mass of contaminants within the area of groundwater that targets the 5,000 ng/L contour. The exact number, location, and configuration of the extraction wells would be based on PDIs. Under this alternative, it is expected that the new wells would include approximately three new extraction wells near existing wells GW-58D, GW-83D, and GW-84D; approximately one new extraction well in the general vicinity of well GW-85D; and approximately two new extraction wells in the Main Street DAPL area, screened in the hot spot groundwater layer over the DAPL surface.

Extracted DAPL and groundwater would be treated at a newly constructed treatment system or systems (potentially the same system(s) as for Alternatives LNAPL/SW-2, -3, and -4, see above) and discharged to surface water. In order to implement this alternative, it is expected that a new access road would be constructed in the MMB wetlands to the areas around wells GW-83D, GW-84D, and GW-85D, and the marshy area around well GW-58D. Based on a constant combined extraction rate from the six wells of 60 gpm (10 gpm each), Alternative DAPL/GWHS-3 is estimated to operate for approximately 6.5 years and would remove approximately 68.4 million gallons of contaminated hot spot groundwater.

In all, EPA's Selected Alternative for DAPL and groundwater hot spots is estimated to remove 7,013 g of NDMA from overburden groundwater and the DAPL pools. The estimated construction time for this alternative is two to three years; the time to achieve RAOs is estimated to be on the order of 8 years. The estimated capital cost for this alternative is $15.6 million, the annual O&M cost is $24.6 million, and the net present value is $35.5 million.

DAPL/GWHS-4: DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting 1,100 ng/L NDMA contour (approx. 12 wells), and treatment at new treatment system(s)

Alternative DAPL/GWHS-4 is shown on **Figure 33** in **Appendix C** of this ROD. Similar to EPA's Selected Alternative for DAPL and groundwater hot spots, Alternative DAPL/GWHS-4 includes the construction and operation of a DAPL extraction system, with approximately four wells in the Off-Property Jewel Drive DAPL pool, approximately four wells in the Containment Area DAPL pool, and approximately 12 wells in the Main Street DAPL pool, the exact number, location, and configuration of which will be based on PDIs. Multiple extraction wells in each DAPL pool would serve to minimize drawdown, provide flexibility with pumping rates, and target bedrock low points identified during the PDI activities of the RD phase. It is assumed that 5% of the accessible DAPL volume would not be captured by the extraction system; to address 95% of the DAPL, the Off-Property Jewel Drive wells are estimated to require on the order of 3.5 years of operation, the Containment Area wells are estimated to require on the order of one year of operation, and the Main Street wells are estimated to require on the order of six years of operation. In total, Alternative DAPL/GWHS-4 is estimated to operate for six years, is expected to remove 14.8 million gallons of DAPL from the aquifer, and generate approximately 16,531 tons of sludge and soil residuals for off-site disposal as a result of DAPL treatment.

This alternative also includes construction and operation of a groundwater extraction system, with approximately 12 new, deep overburden extraction wells (the exact number, location, and configuration of which will be based on PDIs) to remove and treat the mass of contaminants in groundwater containing NDMA within the 1,100 ng/L contour interval. Under this alternative, it is expected that the new wells would include approximately three new extraction wells in the general vicinity of existing wells GW-58D, GW-83D, and GW-84D; approximately one new extraction well in the general vicinity of well GW-85D; approximately four new extraction wells in the Main Street DAPL area, screened in the hot spot groundwater layer over the DAPL surface; approximately two new extraction wells between the Off-Property Jewel Drive and Main Street DAPL pools; approximately one well in the general area around monitoring well GW-413D; and approximately one on-Property well in the general vicinity of well GW-55D.

Extracted DAPL and groundwater would be treated at a newly constructed treatment system or systems (potentially the same system(s) as for Alternatives LNAPL/SW-2, -3, and -4, see above) and discharged to surface water. In order to implement this alternative, it is expected that a new access road would be constructed in the MMB wetlands to the areas around wells GW-83D, GW-84D, and GW-85D, the wetland area around well GW-55D, and the marshy area around well GW-58D. Based on a constant combined extraction rate from the 12 wells of 120 gpm (10 gpm each), Alternative DAPL/GWHS-4 is estimated to operate for approximately 8 years and would remove approximately 110.3 million gallons of contaminated hot spot groundwater.

In all, Alternative DAPL/GWHS-4 is estimated to remove 7,320 g of NDMA from overburden groundwater and the DAPL pools. The estimated construction time for this alternative is two to three years; the time to achieve RAOs is estimated to be on the order of 8 years. The estimated capital cost for this alternative is $19.3 million, the annual O&M cost is $26.5 million, and the net present value is $40.5 million.

K. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that, at a minimum, EPA is required to consider in its assessment of remedial alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

A detailed analysis was performed on the DAPL, groundwater hot spots, LNAPL, surface water, soil and sediment alternatives using the nine evaluation criteria in order to select an interim site remedy for DAPL and groundwater hot spots and a final site remedy for LNAPL, surface water, soil, and sediments. The comparative analysis of alternatives was presented in the *FS Report Volume III*. The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria. These criteria are summarized as follows:

Threshold Criteria

The two threshold criteria described below must be met in order for the alternatives to be eligible for selection in accordance with the NCP.

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or Institutional Controls.

2. **Compliance with applicable or relevant and appropriate requirements (ARARs)** addresses whether or not a remedy will meet all Federal environmental and more stringent State environmental and facility siting standards, requirements, criteria, or limitations, unless a waiver is invoked.

Primary Balancing Criteria

The following five criteria are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria:

3. **Long-term effectiveness and permanence** addresses the criteria that are utilized to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

4. **Reduction of toxicity, mobility, or volume through treatment** addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site.

5. **Short-term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

6. **Implementability** addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. **Cost** includes estimated capital and O&M costs, as well as present-worth costs.

Modifying Criteria

The two modifying criteria are used as the final evaluation of remedial alternatives, generally after EPA has received public comment on the RI/FS and Proposed Plan:

8. **State acceptance** addresses the State's position and key concerns related to the preferred alternative and other alternatives described in the Proposed Plan and RI/FS, and the State's comments on ARARs or the proposed use of waivers.

9. **Community acceptance** addresses the public's general response to the alternatives described in the Proposed Plan and RI/FS.

Following the detailed analysis of each individual alternative, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted. This comparative analysis can be found in the *FS Report Volume III*, and attached to this ROD as **Table K-1** in **Appendix B**.

This section below presents the nine criteria and a brief narrative summary of the alternatives and the strengths and weaknesses according to the detailed and comparative analysis. A summary of the modifying criteria for Alternatives DAPL/GWHS-3, LNAPL/SW-3, and SOIL/SED-2 can be found at the end of this section.

Comparative Analysis of Alternatives for an Interim Action for DAPL and Groundwater Hot Spots

Overall Protection of Human Health and the Environment

The No Action Alternative (DAPL/GWHS-1) provides no protection of human health or the environment. This alternative would not reduce the potential for human exposure to DAPL or contaminated Site groundwater. No controls would be put in place to prevent human exposure to groundwater containing COCs above levels that pose an unacceptable risk. No controls would be put in place on DAPL or groundwater migration; remaining DAPL would be a continuing source of contamination to the aquifer, and hot spot groundwater would continue to migrate, causing potential plume expansion and impacts to downgradient groundwater and surface water.

Alternatives DAPL/GWHS-2 through -4 are protective of human health and the environment. These alternatives remove uncontrolled DAPL sources, a major source of contamination to downgradient groundwater, and prohibit the use of groundwater in the OU3 groundwater study area unless it can be demonstrated to EPA, in consultation with the Commonwealth, that such use will not pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy via Institutional Controls. Groundwater hot spot extraction and treatment is included in these alternatives, which reduces risk to potential downgradient receptors by capturing hot spot groundwater that would otherwise migrate uncontrolled and that acts as a source of contamination.

Alternatives DAPL/GWHS-2 through -4 will require Five Year Reviews since each will leave contamination in place that exceeds unrestricted use risk standards. The time to achieve RAOs for Alternatives DAPL/GWHS-2 through -4, ranked from longest to shortest time frames are DAPL/GWHS-2 (approximately 20 years), and DAPL/GWHS-3 and -4 (both approximately 8 years). Groundwater restrictions are expected to be in place until final groundwater cleanup levels are identified and achieved in a future, final groundwater remedy for the Site.

Compliance with ARARs

The remedial action alternatives for DAPL and groundwater hot spots are interim actions that will be evaluated against the RAOs specified in **Part 2**, **Section H** of this ROD, above. As interim actions, these alternatives are not expected to attain chemical-specific ARARs, and thus cleanup levels have not been set for these groundwater actions based on chemical-specific ARARs. The achievement of chemical-specific ARARs in groundwater within the aquifer will be addressed in a future, final remedial action that addresses the restoration of groundwater. The proposed interim remedial actions for groundwater will support the final groundwater remedial action.

No activities would be performed under the No Action Alternative (DAPL/GWHS-1), therefore, action- and location-specific ARARs do not apply. With proper implementation, it is anticipated that Alternatives DAPL/GWHS-2 through -4 would meet action- and location-specific ARARs. Alternatives DAPL/GWHS-2, -3, and -4 would all meet ARAR requirements for minimization of impacts, mitigation of any alteration of 100-year and 500-year floodplains and/or wetlands from the installation and maintenance of extraction and monitoring wells, piping systems, access roads, and staging areas, and restoration of flood storage capacities, if necessary, following completion of remedial activities. Action-specific ARARs would be met under Alternatives DAPL/GWHS-2 through -4 for the treatment and disposal/discharge of extracted DAPL and groundwater.

Long-Term Effectiveness and Permanence

The No Action Alternative (DAPL/GWHS-1) would not decrease the risks to human health and the environment. This alternative will have the highest risk due to the lack of Institutional Controls or plume containment.

Alternatives DAPL/GWHS-2 through -4 rely on Institutional Controls to prevent exposure to contaminated groundwater and use groundwater hot spot and DAPL extraction to intercept the plume and remove source material, thus reducing contaminant toxicity and mobility. Of these three alternatives, Alternatives DAPL/GWHS-3 and -4 are expected to have good long-term effectiveness and permanence and would be more effective in the long-term than Alternative DAPL/GWHS-2, as the former will achieve the removal of an estimated 5% more DAPL (an estimated 14.8 million gallons of DAPL for Alternatives DAPL/GWHS-3 or -4 as compared to an estimated 14.1 million gallons of DAPL for Alternative DAPL/GWHS-2) by using more extraction wells to reduce the number of isolated low points within the DAPL pools, which further reduces residual risk.

Alternative DAPL/GWHS-4 would be somewhat more effective in the long-term than EPA's Selected Alternative for DAPL and groundwater hot spots, which would be more effective than Alternative DAPL/GWHS-2, as Alternative DAPL/GWHS-4 targets the lowest groundwater NDMA concentrations (the 1,100 ng/L NDMA contour, versus the 5,000 ng/L NDMA contour targeted by EPA's Selected Alternative and the 11,000 ng/L NDMA contour targeted by Alternative DAPL/GWHS-2) and thus leaves the smallest mass of contamination unaddressed and provides the most control over groundwater contaminant sources and migration. All three action alternatives would provide a high degree of resilience to the long-term effects of extreme weather events, as the sources are well below ground surface and therefore insulated and it is presumed the treatment system will not be constructed within an area at risk of flooding during an extreme weather event. Treatment residuals formed under the DAPL/GWHS-2, -3, and -4 alternatives can be properly managed and pose minimal risk.

Reduction in Contaminant Toxicity, Mobility, or Volume through Treatment

The No Action Alternative (DAPL/GWHS-1) does not include any treatment, and thus provides no reduction in toxicity, mobility, or volume through treatment. All of the remaining alternatives provide for treatment of DAPL and groundwater contamination.

Alternatives DAPL/GWHS-2 through -4 provide for DAPL extraction from the subsurface, reducing its mobility and volume. DAPL treatment would remove Site COCs and reduce the volume of DAPL to a sufficient volume that it is a solid suitable for off-site transportation/disposal. The DAPL and groundwater hot spot treatment design would be refined during the RD phase. Conceptually, it is assumed that such treatment will generally include the following components: treatment for DAPL consisting of lime precipitation to remove metals, dewatering of sludges, stripping of VOCs and ammonia, UV photo-oxidation for NDMA destruction, and evaporation of remaining water and off-site disposal of the resulting residual solids; and additional treatment for hot spot groundwater (see below). Of the three action alternatives, Alternatives DAPL/GWHS-3 and -4 provide for a greater reduction of COC toxicity, mobility, or volume through treatment as compared to Alternative DAPL/GWHS-2 because more DAPL would be removed (an estimated 14.8 million gallons under Alternatives DAPL/GWHS-3 or -4 versus an estimated 14.1 million gallons under Alternative DAPL/GWHS-2), resulting in a smaller amount of DAPL remaining in the subsurface following extraction.

Alternatives DAPL/GWHS-2 through -4 also provide for extraction of hot spot groundwater, which would be treated with a hypochlorite flash mixer for oxidation and removal of metals, breakpoint chlorination for ammonia treatment, sediment removal and consolidation, GAC, UV photo-oxidation, dewatering of solids, and off-site disposal of residual solids and sludge materials. Of the three action alternatives, Alternatives DAPL/GWHS-3 and -4 provide for the best reduction of COC toxicity, mobility, or volume through treatment as compared to Alternative DAPL/GWHS-2 because a greater volume of contaminated groundwater will be removed and treated (an estimated 68.4 million gallons under EPA's Selected Alternative and an estimated 110.3 million gallons under Alternative DAPL/GWHS-4 versus an estimated 17.1 million gallons under Alternative DAPL/GWHS-2). Alternatives DAPL/GWHS-3 and -4 will remove a greater mass of NDMA (an estimated 7,320 g for Alternative DAPL/GWHS-4 and an estimated 7,013 g for EPA's Selected Alternative) than Alternative DAPL/GWHS-2 (an estimated 4,159 g) from overburden groundwater and the DAPL pools. These two alternatives address the largest volumes of groundwater, resulting in the most control over groundwater migration of all the alternatives considered, however, extraction and treatment of the largest volume of groundwater will result in the largest volume of treatment residuals requiring disposal, as compared to Alternative DAPL/GWHS-2.

Generally, the treatment technologies associated with DAPL and hot spot groundwater are well-proven and irreversible, however, for DAPL, additional design work and treatability studies will take place during the PDI stage to finalize the design of the treatment process. Overall, Alternatives DAPL/GWHS-3 and -4 provide for the highest reductions of COC toxicity, mobility, or volume through treatment, and Alternative DAPL/GWHS-2 provides for a lower reduction.

Short-Term Effectiveness

While the No Action Alternative (DAPL/GWHS-1) will not be effective in the short-term in protecting human health or the environment, because no remedial activities will occur, there will be no adverse impacts to the public or workers performing the cleanup, or the environment.

Of the three action alternatives, Alternative DAPL/GWHS-2 would be somewhat more effective in the short-term than EPA's Selected Alternative for DAPL and groundwater hot spots, which would be more effective than Alternative DAPL/GWHS-4, as the number of extraction wells increases under succeeding alternatives, with increasing impacts to the environment from well drilling and associated construction activities and piping installations (an estimated 7-8 wells, 26 wells, and 32 wells under Alternatives DAPL-GWHS-2, -3, and -4, respectively).

All of these alternatives are expected to pose minimal risk to the community from well drilling and associated general construction activities, treatment of DAPL and hot spot groundwater, and transport and disposal of residual wastes. Limited short-term impacts to the community would include an increase in traffic during construction activities, but these would be minimized as much as possible via use of best management practices. These alternatives also pose low risk to workers from exposure to collected DAPL, hot spot groundwater, and treatment residuals. While construction time for the action alternatives is estimated to be 2-3 years, generally, risks to workers and the community would be minimized via use of best management practices.

The estimated timeframe to remove DAPL under Alternative DAPL/GWHS-2 is approximately 20 years; under this alternative an estimated two to three years would be required to address the target NDMA groundwater concentration of 11,000 ng/L. The estimated timeframe to remove DAPL under Alternatives DAPL/GWHS-3 or -4 is approximately six years; under EPA's Selected Alternative an estimated 6.5 years would be required to address the target groundwater NDMA concentrations of 5,000 ng/L and under Alternative DAPL/GWHS-4 an estimated eight years would be required to address the target groundwater NDMA concentration of 1,100 ng/L. However, for the three action alternatives, the risk of human exposure to DAPL and contaminated groundwater is expected to be addressed upon implementation of Institutional Controls. Additionally, risks from exposure to treatment residuals can be readily controlled.

Construction of the DAPL and groundwater hot spot extraction and treatment system(s) is expected to have low impacts to the community and workers, as the work will be conducted on the Property and/or within the bounds of secured property nearby and best management practices will be used to mitigate any issues. Installation of new wells and infrastructure is expected to have minor, short-term impacts to the environment; no environmentally sensitive areas have been identified in the likely areas of intrusive work for DAPL, however, all of the action alternatives include one or more extraction wells and piping in MMB wetlands to collect hot spot groundwater. All of the action alternatives include piping systems in MMB wetlands, with the MMB wetlands piping systems under Alternatives DAPL/GWHS-3 and -4 the most extensive. However, for these three action alternatives, wells and piping would be installed in a manner so as to minimize impacts, and use of best management practices during the work would also serve to minimize environmental impacts in this sensitive area.

Implementability

The No Action Alternative (DAPL/GWHS-1) is the easiest to implement because it does not involve the construction, operation, or maintenance of remedial systems or enforcement of Institutional Controls. The remaining alternatives all use standard construction equipment and there are no infrastructure issues; no issues are anticipated regarding the availability of treatment, storage, and disposal facilities (TSDFs) for waste solids and other treatment residuals. Alternatives DAPL/GWHS-2, 3, and 4 would all require access to private property to install extraction wells and conveyance pipes. DAPL and groundwater extraction is a reliable technology and allows for optimization, increasing the reliability. Groundwater extraction, treatment, and discharge are relatively routine tasks and the equipment and services required for implementation are readily available.

Implementation of Alternatives DAPL/GWHS-3 and -4 would be more challenging because these alternatives require the placement of groundwater extraction wells directly above the DAPL pools to extract hot spot groundwater. Extraction strategies and well designs would be explored during the PDI phase and incorporated into the RD to optimize the performance of groundwater hot spot extraction. DAPL extraction has been implemented at the Site and proven effective and sustainable at a pumping rate of 0.25 gpm, however, the feasibility of DAPL treatment will require treatability (bench-scale) testing as part of a PDI. The DAPL treatment train may be less reliable than treatment of hot spot groundwater. Planned monitoring of the treatment system(s) and nature and extent of DAPL and groundwater hot spots will assess remedy effectiveness; however, the ability to monitor remedy effectiveness for Alternative DAPL/GWHS-4 is slightly more difficult, as there are fewer monitoring wells available north of the Property (due to barriers limiting access such as railroad corridors) which would be necessary to gauge the effectiveness of this alternative in targeting the groundwater 1,100 ng/L NDMA contour.

Institutional Controls under all three action alternatives can be administratively challenging, however, they can be implemented and completed quickly with adequate planning.

The additional extraction wells under Alternative DAPL/GWHS-4 (an estimated 32 wells total, as compared to an estimated 26 wells under EPA’s Selected Alternative for DAPL and groundwater hot spots) may pose installation challenges. Overall, of the three action alternatives, Alternatives DAPL/GWHS-2 and -3 have high implementability and the implementability of Alternative DAPL/GWHS-4 is somewhat lower.

Costs

The costs for all alternatives are presented in **Table K-1** in **Appendix B** of this ROD. The range in estimated cost for all four alternatives is from $0 for Alternative DAPL/GWHS-1 to $40.5 million for Alternative DAPL/GWHS-4. Specifically, the overall costs for Alternatives DAPL/GWHS-2, -3, and -4 are $22.5 million, $35.5 million, and $40.5 million, respectively.

Alternative DAPL/GWHS-2 has the lowest capital costs ($10.3 million, as compared to $15.6 million for EPA’s Selected Alternative and $19.3 million for Alternative DAPL/GWHS-4) but O&M costs of over $20 million, which is comparable to the O&M costs of Alternatives DAPL/GWHS-3 and -4. Of Alternatives DAPL/GWHS-2 and -3, Alternative DAPL/GWHS-2 has the lower capital costs, O&M costs, and overall costs.

Comparative Analysis of Alternatives for a Final Action for LNAPL and Surface Water

Overall Protection of Human Health and the Environment

The No Action Alternative (LNAPL/SW-1) provides no protection of human health and the environment. No action would be taken to address LNAPL, which would result in ongoing releases to East Ditch Stream. In addition, no actions would be taken to stop the overburden groundwater contaminant plume from continuing to impact East, South, and Off-Property West Ditch Streams. These releases would result in ongoing adverse impacts to the ecological habitat in and adjacent to these streams.

Alternatives LNAPL/SW-2 and -3 are protective of human health and the environment. Both utilize MPE wells to extract LNAPL and contaminated groundwater, preventing the release of LNAPL into East Ditch Stream, as well as using groundwater extraction wells to prevent the overburden groundwater plume from impacting Site surface water. Both alternatives would include treatment to remove the LNAPL material and Site COCs from groundwater to levels protective of the streams prior to discharge of extracted groundwater to surface drainage.

Alternative LNAPL/SW-4 is also protective of human health and the environment. This alternative includes excavation and off-site disposal to completely remove the LNAPL, along with continued operation of the three extraction wells along East Ditch Stream, preventing releases to East Ditch Stream. This alternative also includes the use of targeted PRBs to treat groundwater in-situ to protective levels prior to the groundwater flowing into South and Off-Property West Ditch Streams. This alternative is protective of human health and the environment. Alternative LNAPL/SW-4 would prevent exposure of current and future ecological receptors to surface water containing Site COCs that would result in potential adverse impacts. Short-term continued operation of Plant B is assumed for this alternative until the new groundwater hot spot treatment system or systems (the same as for the DAPL and groundwater hot spots, see above) is constructed and operational. At this point, groundwater extracted from the three wells along East Ditch Stream would be re-routed to the new groundwater treatment system(s). If Plant B were to be shut down prior to construction of the new treatment system(s), an evaluation of Site hydrogeology would be performed first to ensure continued protection of human health and the environment, which might result in the identification of a need for additional extraction wells and/or PRB segments along East Ditch Stream.

Alternatives LNAPL/SW-2 through -4 will require Five Year Reviews since each will leave contamination in place that exceeds unrestricted use risk standards. A 30-year timeframe was used for O&M, monitoring, and cost estimation purposes for the LNAPL and surface water final action.

Compliance with ARARs

The remedial action alternatives for LNAPL and surface water are final actions that will be evaluated against the RAOs specified in **Part 2**, **Section H** of this ROD, above. All of the alternatives, except for the No Action Alternative (LNAPL/SW-1), have been developed to comply with ARARs. There are no chemical-specific ARARs for the LNAPL/SW alternatives. Alternative LNAPL/SW-1 would not meet action- and location-specific ARARs since no removal or containment would occur to address LNAPL and Site COCs in groundwater that impact surface water. With proper implementation, it is anticipated that Alternatives LNAPL/SW-2 and -3 would meet action- and location-specific ARARs. Under these two alternatives, LNAPL would be removed to the extent practicable, and proposed site-specific surface water performance standards derived from NRWQC (to address ecological risks) and To-Be-Considered (TBC) guidance (to address human health risks) will be used to monitor surface water to ensure that the groundwater extraction and treatment are successful in reducing COC levels in surface water to be protective of sensitive receptors (benthic invertebrates). Both alternatives include treatment to remove the LNAPL material and Site COCs from groundwater. Under these alternatives, the effluent from the treatment system(s) will be treated prior to any discharges to the streams. Action-specific ARARs would be met under Alternatives LNAPL/SW-2 and -3 for the treatment and disposal/discharge of extracted LNAPL and surface water. In addition, any impacts to wetlands from the construction of the remediation systems would be mitigated, thus meeting location-specific ARARs.

With proper implementation, it is anticipated that Alternative LNAPL/SW-4 would also meet action- and location-specific ARARs. This alternative includes excavation and off-site disposal to completely remove the LNAPL, along with continued operation of the three extraction wells along East Ditch Stream, preventing releases to East Ditch Stream. Proposed site-specific ecological surface water performance standards derived from NRWQC would be used to monitor surface water to ensure that the PRBs and extraction wells are successful in reducing COC levels in surface water to be protective of ecological receptors. In addition, any impacts to wetlands from the construction of these systems would be mitigated (thus achieving location-specific ARARs).

Alternatives LNAPL/SW-2, -3, and -4 would all meet ARAR requirements for minimization of impacts, mitigation of any alteration of 100-year and 500-year floodplains and/or wetlands from the installation and maintenance of extraction and/or monitoring wells, piping systems, access roads, and staging areas, and restoration of flood storage capacities, if necessary, following completion of remedial activities.

Long-Term Effectiveness and Permanence

The No Action Alternative (LNAPL/SW-1) would not decrease the risks to human health and the environment. This alternative will have the highest risk due to the lack of Institutional Controls or removal or treatment of LNAPL and contaminated groundwater.

Alternatives LNAPL/SW-2 and -3 would be effective in the long-term as they both would utilize MPE to remove free-phase LNAPL and reduce COC levels in the smear zone. Under these alternatives, groundwater containing Site COCs that would otherwise enter the streams would be permanently removed and treated. Both alternatives would result in some residual risk as neither can remove all LNAPL from soil pores and LNAPL sorbed to soil particles. However, Alternative LNAPL/SW-3 would be more effective in the long-term than Alternative LNAPL/SW-2, with an estimated three to five MPE wells versus an estimated one well under Alternative LNAPL/SW-2, as the expanded MPE system under Alternative LNAPL/SW-3 would remove more of the LNAPL (LNAPL that is located under the Plant B building) and thus result in less residual risk. Under Alternative LNAPL/SW-3, approximately 90% of an estimated 12 gallons of mobile (floating) LNAPL would be removed. By contrast, under Alternative LNAPL/SW-2, an estimated 65% of the mobile LNAPL would be removed. The LNAPL remediation areas under the three action alternatives for LNAPL and surface water are located outside of the 100-year and 500-year floodplains – thus an evaluation of these remedial alternatives' degree of resiliency to extreme weather events is not expected to be relevant. With respect to the surface water alternatives, the groundwater extraction under Alternative LNAPL/SW-2 and EPA's Selected Alternative (LNAPL/LW-3) would have a higher degree of resilience to the effects of extreme flood events as the majority of the remedial infrastructure is located below the ground surface. Alternative LNAPL/SW-4 would also be more resilient to the effects of extreme weather events because it involves a passive system (PRBs) with minimal aboveground infrastructure. Alternative LNAPL/SW-4 would be the most effective in the long-term, as nearly all residual LNAPL would be removed by excavation.

The MPE and groundwater extraction and treatment systems under Alternatives LNAPL/SW-2, -3, and -4 would permanently remove and treat groundwater containing Site COCs that would otherwise enter the streams. However, in order to have long-term effectiveness, continuous efforts to operate the systems are required. Treatment residuals formed under the LNAPL/SW-2 and -3 alternatives can be properly managed and pose minimal risk. For Alternative LNAPL/SW-4, the PRBs would convert the COCs to less toxic contaminants. The PRBs would not require any day-to-day operation and maintenance; however, over time the reactive media within the barrier may become spent and require replacement.

Except for the No Action Alternative (LNAPL/SW-1), all of the alternatives include Institutional Controls to prevent exposure while the remedy is implemented.

Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment

The No Action Alternative (LNAPL/SW-1) does not include any treatment, and thus provides no reduction in toxicity, mobility, or volume through treatment. All of the remaining alternatives provide for treatment and/or removal of LNAPL and groundwater contamination that affects surface water quality.

Alternatives LNAPL/SW-2 and -3 provide for a permanent removal of Site COCs in groundwater through treatment. The groundwater treatment design (the same as for the groundwater hot spots, see above) would be refined during the RD phase, and would generally consist of a hypochlorite flash mixer for oxidation and removal of metals, breakpoint chlorination for ammonia treatment, sediment removal and consolidation, GAC, UV photo-oxidation, and dewatering of solids. Alternative LNAPL/SW-2, utilizing one MPE well, is estimated to capture eight gallons of mobile LNAPL (65% of the estimated 12 gallons of mobile LNAPL), which would be sent off-site for disposal. This alternative also includes collection and treatment of soil vapor and groundwater from the MPE well. Generally, groundwater treatment is well-proven and irreversible, however, there are waste materials from the treatment system(s) including solids from the filter press and used activated carbon. Treatment would achieve both water and air discharge standards. Alternative LNAPL/SW-3 provides for more reduction of toxicity, mobility, or volume, as it utilizes five MPE wells to capture and treat soil vapor and groundwater. This alternative is estimated to capture 11 gallons of mobile LNAPL (90% of the estimated 12 gallons of mobile LNAPL), including material under Plant B, which will be taken off-site for disposal. Metrics to govern the termination of MPE will be determined during the PDI phase. Again, groundwater treatment is irreversible and similar waste materials would be generated.

Alternative LNAPL/SW-4 includes the excavation of 390 tons of soil. This soil will not be treated and may require disposal as hazardous waste. However, there may be some reduction of pollutant mobility through the addition of bulking agents to facilitate off-site disposal of the excavated material. This alternative also utilizes PRBs and the three existing extraction wells along East Ditch Stream to treat groundwater, reducing its toxicity, prior to it flowing into streams. If Plant B were to be shut down prior to construction of the new groundwater treatment system(s), an evaluation of Site hydrogeology might result in the identification of a need for additional extraction wells and/or PRB segments along East Ditch Stream. After the PRBs have reached the end of their useful life, the material (activated carbon and zeolite) would need to be removed and replaced. Overall, Alterative LNAPL/SW-3 provides for the greatest reduction of contaminant toxicity, mobility, or volume through treatment.

Short-Term Effectiveness

While the No Action Alternative (LNAPL/SW-1) will not be effective in the short-term in protecting human health or the environment, because no remedial activities will occur, there will be no adverse impacts to the public or workers performing the cleanup, or the environment.

Alternatives LNAPL/SW-2 and -3 are expected to pose minimal risk to the community from well drilling and associated general construction activities, treatment of groundwater, O&M, and transport and disposal of collected LNAPL and residual wastes from groundwater treatment. These alternatives also pose very low risk to workers and risks from collected LNAPL and treatment residuals can be minimized by the use of best management practices. The risk of human exposure to contaminated groundwater is expected to be addressed upon implementation of Institutional Controls. An estimated one year is the timeframe for remediating LNAPL under Alternatives LNAPL/SW-2 through -4. Construction of the groundwater extraction and treatment system(s) is expected to have low impacts to the community and workers, as the work will be conducted on the Property and/or within the bounds of secured property nearby and best management practices will be used to mitigate any issues. Installation of new wells and infrastructure is expected to have minor, short-term impacts to the environment, and use of best management practices during the work would serve to minimize environmental impacts in sensitive areas. Groundwater extraction and treatment for Alternatives LNAPL/SW-2 through -4 will require resources and material handling for an extended length of time. A 30-year timeframe was used for O&M, monitoring, and cost estimation purposes for the surface water component.

Alternative LNAPL/SW-4 (soil excavation/stabilization and off-site disposal and PRBs and extraction wells to treat groundwater) poses potential risks to the community from releases of vapor as well as structural stability issues in excavating close to the MBTA railroad tracks. Best management practices and technical controls (such as sheet piling) would mitigate these issues. Excavated soil and backfill material would be transported through the community, posing a potential risk. Soil excavation also poses the highest risks to workers from direct contact and inhalation of fugitive soil dusts. These issues can be mitigated by the use of best management practices. Overall, this alternative has the greatest possible short-term impacts, though is estimated to be constructed in less than one year. Construction of the PRBs would require material to be transported off-site, but since this alternative is estimated to be for a short duration, the overall impacts to the community are low. Risks to workers during construction of the PRBs are also low and could be minimized using best management practices. However, construction of the PRBs would have significant short-term impacts to the environment as trenching (heavy construction) will occur in sensitive areas. Overall, Alterative LNAPL/SW-3 provides the best short-term effectiveness.

Implementability

The No Action Alternative (LNAPL/SW-1) is the easiest to implement because it does not involve the construction, operation, or maintenance of remedial systems or enforcement of Institutional Controls. The remaining alternatives all use standard construction equipment and there are no infrastructure issues; no issues are anticipated regarding the availability of TSDFs for waste solids and other treatment residuals.

Groundwater extraction and treatment under Alternatives LNAPL/SW-2 and -3 is a reliable technology and allows for optimization, increasing the reliability. Groundwater extraction, treatment, and discharge are relatively routine tasks and the equipment and services required for implementation are readily available. Well designs and placement would be explored during the PDI phase and incorporated into the RD to optimize the performance of groundwater extraction. Planned monitoring of the treatment system(s) and nature and extent of COCs in surface water will assess remedy effectiveness.

The PRBs under Alternative LNAPL/SW-4 would require a PDI and bench-scale testing. Once constructed, there is little post-construction flexibility and therefore less reliability compared to groundwater extraction. Large quantities of reactive material are needed for the PRBs, requiring extra lead time to ensure adequate supply during implementation.

Institutional Controls under all three action alternatives can be administratively challenging, however, they can be implemented and completed quickly with adequate planning. Overall, of the three action alternatives, Alternative LNAPL/SW-3 is the most reliable and easiest to implement.

Costs

The costs for all alternatives are presented in **Table K-1** in **Appendix B** of this ROD. The range in estimated cost for all four alternatives is from $0 for Alternative LNAPL/SW-1 to $9 million for Alternatives LNAPL/SW-2 and -4. Specifically, the overall costs for Alternatives LNAPL/SW-2, -3, and -4 are $9 million, $6.6 million, and $9 million, respectively.

Alternative LNAPL/SW-3 has the lowest capital costs ($2.3 million, as compared to $4.6 million for Alternative LNAPL/SW-2 and $5.3 million for Alternative LNAPL/SW-4) and the highest O&M costs ($7.4 million, as compared to $6.5 million for Alternative LNAPL/SW-2 and $6.7 million for Alternative LNAPL/SW-4). However, this alternative has the lowest overall costs.

Comparative Analysis of Alternatives for a Final Action for Soil and Sediments

Overall Protection of Human Health and the Environment

Under the No Action Alternative (SOIL/SED-1), no action would be taken to address exposure to soils and leaching of Site COCs from soil to groundwater in the Containment Area. No action would be taken to address contaminated upland soil; soil with concentrations of Site COCs above those allowed for unrestricted use/unrestricted exposure would not be addressed. No active remediation would occur for any type of soil, and RAOs would not be achieved. Additionally, no action would be taken to address exposure to wetland soil and sediments with concentrations of Site COCs above cleanup levels. No active remediation would occur, and RAOs would not be achieved. Finally, no action would be taken to address TMPs in soil. No controls would be put in place to prevent human exposure to TMPs. TMPs would remain in place, and no controls would be put in place to prevent migration of TMP vapors.

Alternative SOIL/SED-1 offers no protection of human health and the environment, and risks to current and future users from direct exposure to contaminated soil or soil vapors, as well as ecological receptors, including the American Robin, Marsh Wren, and other insect-eating birds, Short-Tailed Shrew, and benthic invertebrate community, would remain.

Alternatives SOIL/SED-2 through -4 are expected to provide protection of human health and the environment by eliminating risks to human health from direct exposure to and inhalation of Site COCs, and eliminating risks to ecological receptors from direct exposure and ingestion. Site Management Plans (SMPs) and Institutional Controls would be incorporated into each of these alternatives to address soil remaining with concentrations above those allowed for unrestricted use/unrestricted exposure, prevent disturbance of remedial measures, and restrict use to commercial/industrial.

Alternative SOIL/SED-2 includes a low-permeability cap that meets RCRA Subtitle D and Massachusetts solid waste landfill performance standards above the contaminated soil in and near the Containment Area to prevent exposure and minimize leaching of soil COCs to groundwater. Although the alternative does not involve removal of soil from the Containment Area, the low-permeability cover coupled with the slurry wall and closure of the equalization window would serve to minimize leaching.

Alternative SOIL/SED-2 also includes covering all upland soil areas containing elevated levels of Site COCs above cleanup levels with clean soil, eliminating the exposure pathway for ecological receptors. The soil covers would include long-term maintenance and repair and would be protected by Institutional Controls to prevent disturbance of these soil covers. Under this alternative, all wetland soil and sediments containing elevated levels of Site COCs above cleanup levels would be excavated and disposed of off-site, eliminating future exposures for ecological receptors. The restoration of the excavated wetland soil and sediment to existing grades would prevent the need for further wetland or flood storage mitigation (other than restoring the surface to native wetland/aquatic habitat and restoring any access ways to the excavation areas). Finally, the Alternative SOIL/SED-2 includes additional vapor intrusion evaluations to assess risks and/or the use of vapor barriers and/or sub-slab depressurization systems if buildings are constructed or altered in areas containing soil contaminated with TMPs at levels that may pose a vapor intrusion risk. Any engineered systems preemptively installed or otherwise determined to be necessary as a result of the vapor intrusion evaluations would prevent the migration of soil vapors into buildings, eliminating future exposures to indoor workers.

Alternative SOIL/SED-3 contains many of the same components as Alternative SOIL/SED-2, except it would handle the upland soil contaminated with Site COCs above cleanup levels differently. With the exception of TMPs, soil containing Site COCs above cleanup levels would be excavated down to 1 ft, backfilled, and then covered with either clean soil or asphalt, depending on the location. Soil containing TMPs would be treated with air sparging and SVE. These technologies would eliminate exposure pathways for ecological receptors and remove contaminants causing potential vapor intrusion issues.

Alternative SOIL/SED-4 applies excavation to all media. Containment Area and other upland soil containing COCs above cleanup levels would be excavated down to 10 ft, then covered with clean soil. This alternative would include treatment of water generated from excavations or dewatered soils, as necessary, and discharge of treated water to surface water. All wetland soil and sediments containing elevated levels of Site COCs above cleanup levels would be excavated and disposed of off-site, eliminating future exposures for ecological receptors. This alternative includes backfilling and restoration of the excavated areas, environmental monitoring, and implementation of Institutional Controls to prohibit excavation or disturbance of these soils and restrict use to commercial/industrial.

Alternatives SOIL/SED-2 through -4 will require Five Year Reviews since each will leave contaminated soil and/or sediments in place that exceeds unrestricted use risk standards. The time to achieve RAOs for each of the three action alternatives is approximately two years.

Compliance with ARARs

The remedial action alternatives for soil and sediments are final actions that will be evaluated against the RAOs specified in **Part 2**, **Section H** of this ROD, above. All of the alternatives, except for the No Action Alternative (SOIL/SED-1), have been developed to comply with ARARs. Alternative SOIL/SED-1 would not meet chemical-specific ARARs since it does not prevent exposure to contaminated soil, soil vapors, or sediment. No activities would be performed under Alternative SOIL/SED-1, thus action-specific and location-specific ARARs do not apply to this alternative. With proper implementation, it is anticipated that Alternatives SOIL/SED-2, -3 and -4 would meet action-specific, location-specific, and chemical-specific ARARs. Any impacts to wetlands from remedial work under the three action alternatives would be mitigated, thus meeting location-specific ARARs. Alternatives SOIL/SED-2, -3, and -4 would all meet ARAR requirements for minimization of impacts, mitigation of any alteration of floodplains and/or wetlands that is unavoidable to implement the remedial measures, and restoration of flood storage capacities, if necessary, following completion of remedial activities.

Alternative SOIL/SED-2 includes a low-permeability cap that meets RCRA Subtitle D and Massachusetts solid waste landfill performance standards above the Containment Area, covering contaminated upland soil areas with clean soil, excavating contaminated wetland soil and sediments, and conducting vapor intrusion evaluations and/or using vapor barriers and/or sub-slab depressurization systems in new construction in areas with soil containing TMPs at levels that may pose a vapor intrusion risk. The cap for the Containment Area would comply with RCRA Subtitle D regulations and Massachusetts Solid Waste Management Facility Regulations and meet impermeability requirements with an effective permeability that is equivalent to the permeability of the existing slurry wall (approximately $1x10^{-8}$ centimeters per second (cm/sec)) or a permeability of no greater than $1x10^{-7}$ cm/sec, whichever is less. Excavated contaminated wetland soil and sediments determined to contain hazardous waste would be managed in accordance with RCRA hazardous waste regulations.

Permanent or temporary wetlands loss and/or impacts to the 500-year floodplain due to construction of the Containment Area cap, installation of covers in upland soil areas, excavation of wetland soil and sediments, and construction of engineered vapor intrusion mitigation systems would comply with location-specific ARARs through appropriate avoidance and minimization of impacts, and mitigation and restoration activities. Impacted wetlands would be re-established following completion of remedial activities. Upon completion of excavation work in wetlands, erosion blankets would be installed, where applicable, and wetland grass varieties would be seeded. Temporary erosion control best management practices would be instituted until such time as natural systems recover. Plants and visible ground surfaces would be inspected and maintained until plantings are fully established.

Through its analysis of alternatives, EPA has determined that construction of the Containment Area cap, installation of covers in upland soil areas, excavation of wetland soil and sediments, and construction of engineered vapor intrusion mitigation systems may, but is not likely to, result in temporary occupancy of the 500-year floodplain, but after completion of work there will not be any net loss of flood storage capacity. Additionally, based on the available data, EPA has determined that implementation of these remedial alternatives will not result in the permanent occupancy and modification of the 500-year floodplain. A stormwater study would be undertaken as part of these alternatives to confirm that this is the case. If temporary impacts to the 500-year floodplain are found to be unavoidable while implementing the alternatives, additional mitigation measures would be incorporated to address temporary alteration of floodplains during remedial construction and any additional floodplain impairment within the 500-year floodplain. Excavated materials would be managed so as to not temporarily impair resources within the 500-year floodplain or adjacent wetlands, to the extent practicable. Upon completion of work in floodplains and wetlands, the impacted areas would be backfilled to original grade with clean soil (i.e., soil that meets appropriate screening levels) and restored with native vegetation.

Alternative SOIL/SED-3 differs from Alternative SOIL/SED-2 only in how the upland soil contaminated with BEHP, chromium, and TMPs is handled (excavation for soils containing BEHP and chromium; and air sparging and SVE to treat TMPs). Soil with concentrations of Site COCs above cleanup levels would be removed and managed on-site in compliance with ARARs until disposed of at a permitted, off-site facility. Chemical-specific ARARs were considered in the development of the cleanup levels for soils and sediments.

Alternative SOIL/SED-4, which applies excavation to all media, will also comply with all ARARs. Soil and sediments with concentrations of Site COCs above cleanup levels would be removed and managed on-site in compliance with ARARs until disposed of at a licensed off-site facility. Under this alternative, soil exceeding cleanup levels (i.e., chromium exceeding 1,000 mg/kg and BEHP exceeding 3 mg/kg) within the Containment Area (estimated to be approximately 44,608 cy) would be excavated and disposed of at an approved off-site facility after dewatering and stabilization, as necessary. Based on the available upland soil data, the majority of cleanup level exceedances for the Site COCs are generally limited to approximately 8 ft bgs. Excavated areas would then be backfilled with clean soils, which would serve as a cap over areas of remaining subsurface contamination. Due to the depth of the excavation and proximity of excavation areas to the slurry wall, a sheet pile wall would be installed to protect the structural integrity of the slurry wall and the equalization window when excavation occurs near the wall. Although not expected based on available data, any excavated soil that contains hazardous waste because it fails the toxicity characteristic leaching procedure (TCLP), and any excavated soil from below the water table would be treated and stabilized on-site in accordance with ARARs prior to transportation and off-site disposal. Water and any associated air discharges generated from dewatering activities during excavations and the management of excavated soil would meet applicable ARARs for discharge.

In summary, any wastes generated by remedial activities for Alternatives SOIL/SED-2 through -4 would be managed on-site in compliance with ARARs until disposed of at a permitted, off-site disposal facility. Any water generated during soil and sediment excavation and de-watering activities would be characterized and treated appropriately, then discharged to surface water. All work within wetlands and streams would meet action-specific ARARs for protecting water quality.

Long-Term Effectiveness and Permanence

The No Action Alternative (SOIL/SED-1) is the least effective alternative for long-term effectiveness and permanence because risks from Site COCs in soil and sediments are not addressed. COC concentrations exceeding cleanup levels would remain, human health and ecological risks would not be addressed, and the process whereby Site COCs above cleanup levels leach to groundwater would remain unchanged. This alternative will have the highest remaining risk due to the lack of Institutional Controls or removal or treatment of contamination in soil and sediments. Alternatives SOIL/SED-2 through -4 have some degree of residual risk due to contamination that will remain on-site and will require Five Year Reviews to assess the ongoing protectiveness of the remedy and Institutional Controls to prevent exposure to the remaining contamination. Except for the No Action Alternative (SOIL/SED-1), all of the alternatives include Institutional Controls to prevent exposure to any remaining contamination, prohibit future residential use of the Property, prevent disturbance of any engineered systems and any other new and existing remedy infrastructure components, prevent contact with soil beneath cover systems, and require either a vapor intrusion evaluation or vapor mitigation systems be installed if a new building is constructed or altered on the Property.

Alternatives SOIL/SED-2 and -3 are comparably effective in the long-term, while Alternative SOIL/SED-4 would be the most effective in the long-term, as this alternative provides for removal of the greatest quantities of contaminated soil and contamination that is furthest from the surface than either Alternatives SOIL/SED-2 or -3. Alternative SOIL/SED-4 would also have the highest degree of resiliency to extreme weather events because the smallest volume of impacted material would remain in the subsurface, followed by Alternative SOIL/SED-3 (shallow upland soil excavation and treatment of TMP-impacted soils), followed by Alternative SOIL/SED-2, which leaves the largest volume of impacted soil close to the surface, where it may be impacted by flooding and more extreme freeze/thaw cycling.

Alternatives SOIL/SED-2 through -4 include the same approach to remediating wetland soil and sediments: excavation to a depth of one ft, followed by backfilling with clean wetland soil and sediment, as appropriate and in accordance with a wetland restoration plan, and restoration to original grades, which will be protective of human and ecological receptors. Long-term effectiveness is dependent on the adequacy of the hydric soil (soil that is sufficiently wet to create anaerobic conditions, as is found in wetlands), the success of the wetland plantings, environmental monitoring, and Institutional Controls.

Alternatives SOIL/SED-2 and -3 include a permanent, low-permeability cap that meets RCRA Subtitle D and Massachusetts solid waste landfill performance standards over the Containment Area and closure of the equalization window. These actions would help to hydraulically isolate the impacted soils, reduce the potential for COCs to leach and migrate, and therefore control the exposure to COCs remaining in place. Some residual risk would remain for the soil remaining in place beneath the permanent cap, which would be addressed via Institutional Controls. Installation of the cap will help to minimize leaching from impacted soil remaining in place and reduce the potential for disturbance from extreme weather events. Institutional Controls would protect the cap, prevent exposure to Site COCs in soil and soil vapor, and prevent use other than commercial/industrial.

Under Alternative SOIL/SED-2, contaminated upland soil would be covered to eliminate the exposure pathway for ecological receptors, and engineering controls for TMPs would be required for new construction to address potential vapor intrusion risks. COCs would remain in place, causing potential future risk if they were to be exposed and a higher potential for disturbance from extreme weather events. Institutional Controls would mitigate these risks, provided that the controls are maintained. The long-term effectiveness of the soil cover and Institutional Controls to prevent disturbance and require engineering controls to address vapor intrusion would be contingent on maintenance and monitoring of the controls chosen during remedy design.

Treatment of TMPs under Alternative SOIL/SED-3 – via air sparging/SVE – would be less effective in the long-term than the approach taken under Alternative SOIL/SED-2. While vapor capture would effectively control TMPs during treatment and residual risk would be low and mitigated through Institutional Controls, some TMPs would likely remain sorbed to soil and not fully removed. Any remaining soil containing TMPs may be subject to disturbance from extreme weather effects.

Under Alternative SOIL/SED-4, which would be most effective in the long-term, excavation would be applied to all media. Excavation and replacement with clean soil would reliably reduce the potential for human health and ecological risk. Some residual risk would remain for the soil that remains (*e.g.*, any contaminated soil remaining in the Containment Area that is more than 10 feet deep), but Institutional Controls would prevent exposure to this soil and prevent use other than commercial/industrial. The depth of the remaining soil would minimize potential impacts from extreme weather events. While soil excavation in TMP-impacted areas would have the potential to release vapors and might require additional water handling, these risks would be mitigated via an SMP during implementation.

Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment

The No Action Alternative (SOIL/SED-1) does not include any treatment, and thus provides no reduction in toxicity, mobility, or volume through treatment. While Alternatives SOIL/SED-2 and -4 provide comparable reductions in contaminant toxicity, mobility, or volume through treatment, Alternative SOIL/SED-3 provides the highest degree of reduction in contaminant toxicity, mobility, or volume through treatment.

All of the alternatives, with the exception of the No Action Alternative, reduce the mobility of COCs throughout the Site by providing for their on-site containment, off-site disposal, and/or treatment. However, active treatment is a component of only one alternative – SOIL/SED-3 – via air sparging/SVE. With the exception of this active-treatment approach under Alternative SOIL/SED-3, the components of all of the other alternatives require either caps/covers or excavation and clean soil covers, as opposed to primary treatment, to reduce the toxicity, mobility, or volume of contaminated soil and sediment.

Alternatives SOIL/SED-2 and -4, in addition to the non-TMP components of Alternative SOIL/SED-3, include limited treatment as a component of the alternatives, in that excavated soil or sediment that exhibits a hazardous waste characteristic or soil/sediments that are excavated from below the water table would be treated (stabilized) by adding Portland cement, lime, or another suitable stabilizing agent to reduce contaminant mobility prior to off-site disposal. Additionally, water generated from excavation/dewatering soil prior to off-site disposal would be treated to reduce toxicity prior to discharge to surface waters.

Alternative SOIL/SED-2 includes vapor intrusion evaluations and/or engineering controls, including vapor mitigation features, to prevent human exposure to TMPs in soil. For engineered systems, regular inspections and maintenance would be required to ensure a completed vapor intrusion pathway does not develop. The removal and diversion of soil vapors through natural degradation processes would be considered irreversible, however, TMP mass would remain in place and would not be actively treated by a vapor barrier or sub-slab depressurization system, which are considered passive/semi-passive systems. To achieve protection of human health, this alternative relies on the implementation and enforcement of engineering controls and Institutional Controls.

Short-Term Effectiveness

While the No Action Alternative (SOIL/SED-1) will not be effective in the short-term in protecting human health or the environment, because no remedial activities will occur, there will be no adverse impacts to the public or workers performing the cleanup, or short-term impacts to natural habitats.

The remaining alternatives (SOIL/SED-2 through -4) all include excavation and consolidation of contaminated soil and sediments, to varying degrees, which will have some short-term impacts or risks that will be mitigated via use of best management practices requiring appropriate Personal Protective Equipment (PPE) during remedial activities, dust control, and proper handling and management of contaminated media and other waste materials. Of these three alternatives, Alternative SOIL/SED-2 would be the most effective in the short-term, Alternative SOIL/SED-3 would be somewhat less effective in the short-term, and Alternative SOIL/SED-4 would be the least effective in the short-term.

Alternative SOIL/SED-2 will require approximately 6,000 tons of contaminated soil and sediments to be transported off-site; Alternative SOIL/SED-3 will require approximately 10,000 tons of material to be transported off-site; and Alternative SOIL/SED-4 will require the transportation of approximately 130,000 tons of material off-site. In terms of risks for the community and on-site workers during implementation, Alternative SOIL/SED-2 incorporates the least amount of contaminated soil and sediment excavation, temporary stockpiling, on-site consolidation, loading, and transportation, while Alternative SOIL/SED-4 incorporates the most amount. These remedial action alternatives provide a means of potential exposure to the nearby community, on-site workers (via fugitive dust or the active work environment), and the nearby environment to contaminated media.

The least amount of soil and sediments is handled by Alternative SOIL/SED-2, which means it creates the least risk to the community, workers, and the environment, while the most amount of material is handled by Alternative SOIL/SED-4, which would create the most risk from these perspectives. Excavation of deeper upland soil under Alternative SOIL/SED-4 may also require excavation support to protect the railroad, which would entail greater risks to workers. Alternative SOIL/SED-4 also includes deep soil excavation, and soil and water management, which pose a high potential for direct contact and vapor exposure compared to the other alternatives. Risks to the community include those from increased transportation of hazardous materials and increased traffic to bring in backfill material, and some of the excavated soil may have contaminated soil vapor, however, best management practices would reduce these risks to the community. Excavation, stabilization, and restoration will require a larger temporary footprint than capping alone, as more space will be needed for staging materials. However, efforts will be made to avoid and, where unavoidable, minimize impacts to ecologically sensitive areas.

Short-term impacts to the environment include emissions from on-site equipment, trucks delivering clean soil cover and/or capping materials, and potential transport of excavated material to the on-site consolidation area(s). Every effort will be made to minimize the areas of upland and wetland habitat impacted to access contaminated surface and subsurface soil and sediment for excavation and consolidation, regardless of which alternative is selected, and mitigation measures will be taken to reduce impacts wherever possible. Following excavation, upland and wetland areas will be restored to match original conditions to the greatest degree possible. Short-term environmental impacts are considerable under Alternatives SOIL/SED-3 and -4, but less so under Alternative SOIL/SED-2. The engineering controls and Institutional Controls for TMPs under Alternative SOIL/SED-2 would not pose a risk to the community, construction personnel, or the environment during installation activities. Accomplishing vapor mitigation with an SSDS would require low levels of electrical power, and air/soil gas monitoring would require relatively minimal resources to complete. Installation and operation of air sparging/SVE equipment to treat TMPs under Alternative SOIL/SED-3 has some potential for vapors to escape and poses lower-level risks to workers, which would be addressed via best management practices.

Alternatives SOIL/SED-2 through -4 will all meet the established RAOs for soil and sediments in the same general timeframe, and all will require generally the same amount of time to construct (approximately two years).

Implementability

The No Action Alternative (SOIL/SED-1) would not require any actions to be taken at the Site and therefore does not present any implementability issues. This alternative is the easiest to implement because it does not involve the construction, operation, or maintenance of remedial systems or enforcement of Institutional Controls. All of the remaining alternatives are relatively comparable given that they involve routine construction work (conventional and available technology), available trained personnel and materials, and, in the case of air sparging/SVE for TMPs under Alternative SOIL/SED-3, a technology that was previously implemented at the Site without any issues related to construction or operation. Overall, of the three action alternatives, Alternative SOIL/SED-2 is the most reliable and easiest to implement.

Excavation and capping/covering are not considered highly complex and have been frequently and readily implemented at similar environmental restoration sites. Of the three action alternatives, Alternative SOIL/SED-2 is comparatively the easiest to implement because of the higher implementability of caps/covers over excavation, as well as the various attributes of the engineering controls which would be used to address risks from TMPs. These include the relative ease of conducting vapor intrusion evaluations and incorporating vapor barriers and SSDSs into new building construction, and the reliability and minimal maintenance associated with engineered systems. Permits are not required to implement the remedy for TMPs under Alternative SOIL/SED-2; however, the construction and operation of vapor mitigation systems is highly reliant on Institutional Controls to prevent human contact with hazardous wastes. Coordination with the Town of Wilmington and MassDEP will be necessary to ensure that new construction within zones of TMP impacts properly account for residual risks from TMP vapors.

No difficulties or uncertainties are anticipated with construction of the permanent cap and sealing the equalization window for the Containment Area under Alternatives SOIL/SED -2 and -3. The proposed cap will be reliable if regularly inspected and maintained. Migration of COCs via leaching is possible, as is also the case for the excavation remedy for the Containment Area under Alternative SOIL/SED-4, under which remaining contamination that is more than 10 ft deep may be a source for groundwater, surface water, and sediment contamination. This concern may be mitigated, however, via the use of monitoring wells both inside and outside the Containment Area to monitor groundwater contaminant concentrations.

Alternatives SOIL/SED-3 and -4 are comparatively more difficult to implement than Alternative SOIL/SED-2 because the former require managing and consolidating the greatest amount of waste and, in the case of Alternative SOIL/SED-4, a possible need for sheet piling for soil structural support in an area near the MBTA railroad tracks where the structural stability of soil may be a concern. All three of these alternatives will result in impacts to wetlands during excavation activities (and for some, placement of caps or covers); such impacts will be minimized to the extent possible and mitigation for unavoidable impacts will be required. Actions will be taken to ensure that current flood storage capacities are not diminished after completion of the proposed remedial activities. For Alternatives SOIL/SED-2 through -4, coordination with other agencies, as well as monitoring to determine the effectiveness of the remedy, is equally implementable. PDI sampling would be used to map the extents of soil and sediment contamination, ensure that caps/covers are adequately protective, and that excavations are complete.

Costs

The costs for all alternatives are presented in **Table K-1** in **Appendix B** of this ROD. The range in estimated cost for all four alternatives is from $0 for Alternative SOIL/SED-1 to $34.2 million for Alternative SOIL/SED-4. Specifically, the overall costs for Alternatives SOIL/SED-2, -3, and -4 are $6 million, $7.5 million, and $34.2 million, respectively.

Alternative SOIL/SED-2 has the lowest capital costs ($5.6 million, as compared to $6.7 million for Alternative SOIL/SED-3 and $34 million for Alternative SOIL/SED-4) and O&M costs comparable to those of Alternative SOIL/SED-3, but higher than the O&M costs associated with Alternative SOIL/SED-4 ($1.1 million, as compared to $1.5 million for Alternative SOIL/SED-3 and $330,000 for Alternative SOIL/SED-4). However, due to the high capital costs associated with Alternative SOIL/SED-4 (which raises the overall costs for this alternative significantly over the other alternatives), Alternative SOIL/SED-2 has the lowest overall costs.

Modifying Criteria with Respect to Alternatives DAPL/GWHS-3, LNAPL/SW-3, and SOIL/SED-2

State Acceptance

The Commonwealth of Massachusetts, through its lead agency, MassDEP, has expressed its support for EPA's preferred alternatives presented in the August 2020 Proposed Plan and concurs with the selected remedy outlined in this ROD (see **Appendix A** of this ROD for the State concurrence letter).

Community Acceptance

EPA's extensive community engagement efforts at the Site included the publication of a Proposed Plan in August 2020, and the occurrence of multiple public meetings which are described in further detail above in **Section C** of this ROD. An in-person public informational meeting was held at the Wilmington High School in Wilmington, MA on October 22, 2019 to provide information on the site history and RI findings and update the community on the progress towards a ROD, which was followed by a question-and-answer session. A virtual public informational meeting on the Proposed Plan was held on August 25, 2020, which included a question-and-answer session. A virtual formal public hearing on the Proposed Plan was held on September 22, 2020. A transcript was created for this hearing and has been made part of the Administrative Record for this ROD. In addition to the oral comments received at the hearing, 25 sets of written comments were also provided. A summary of the comments specific to the proposed alternatives for the Site and EPA's responses to the comments are included in the **Responsiveness Summary, Part 3** of this ROD.

In general, the comments received from the community were supportive of the remedial alternatives selected in the ROD. There were concerns related to making sure the interim action for groundwater remains a priority and that the final action for groundwater results in restoration of the aquifer as a drinking water aquifer. There were also concerns raised regarding future development of the Property, noting that cleanup should occur before redevelopment is allowed. Responses to these concerns are included in the Responsiveness Summary.

L. THE SELECTED REMEDY

1. Summary of the Rationale for the Selected Remedy

The selected remedy for the Site is a comprehensive final remedy for LNAPL, surface water, soil, and sediments and an interim remedy for DAPL and groundwater hot spots. The final and interim remedies both utilize source control and management of migration components to address unacceptable risk from exposure to Site COCs and/or exceedances of ARARs. The final remedy utilizes source control measures to address the following: COCs in soil and sediments that present unacceptable risks to human health and/or environmental receptors; and LNAPL that represents a source of COCs to groundwater and a source of TMPs to indoor air vapors. The interim remedy utilizes source control measures to address DAPL and COCs in groundwater hot spots that represent an ongoing source of COCs to groundwater, surface water, and sediments.

Additionally, the final remedy utilizes management of migration components to prevent the migration of LNAPL to East Ditch Stream and prevent groundwater containing COCs from flowing into surface water features. The interim remedy utilizes management of migration components to reduce the horizontal and vertical migration of DAPL and groundwater hot spots. Of all the alternatives, the selected interim remedy for DAPL and groundwater hot spots and final remedy for LNAPL, surface water, soil, and sediments best satisfy the statutory criteria for remedy selection.

The remedy is estimated to cost approximately $48 million. The cost analyses include an estimation of the capital costs and annual O&M costs. In addition, the cost estimate is based on a present worth analysis by discounting to a base year or current year using a 7 percent discount rate. The selected remedy is anticipated to take two to three years to construct. Groundwater restrictions are expected to be in place for over 100 years, until final cleanup levels are identified in a future remedy decision for groundwater and achieved.

2. Description of Remedial Components

The following is a detailed description of the components of the selected remedy. The final selected source control and management of migration remedy for the Site is consistent with EPA's preferred alternatives outlined in the August 2020 Proposed Plan.

<u>Components of the Remedy Specific to DAPL and Groundwater Hot Spots (Interim Action – Alternative DAPL/GWHS-3)</u>

The selected remedy for the interim action for DAPL and groundwater hot spots – Alternative DAPL/GWHS-3: DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting 5,000 ng/L NDMA contour (approx. 6 wells), and treatment at new treatment system(s) – includes the following components:

- Construction and operation of a DAPL extraction system, conceptualized with approximately four wells in the Off-Property Jewel Drive DAPL pool, approximately four wells in the Containment Area DAPL pool, and approximately 12 wells in the Main Street DAPL pool (see **Figures 34**, **35**, and **36** in **Appendix C** of this ROD, respectively), the final number, location, and configuration of which will be determined based on the PDIs;
- Construction and operation of a groundwater extraction and treatment system, conceptualized with approximately six wells targeting the 5,000 ng/L NDMA contour, the final number, location, and configuration of which will be determined based on the PDIs, to remove and treat the mass of contaminants in groundwater hot spots; and
- Treatment of extracted DAPL and hot spot groundwater in a new treatment system(s). Conceptually, it is assumed that such treatment will generally include the following methodologies:
    - Treatment for DAPL:
        - Lime precipitation to remove metals, with subsequent dewatering and off-site disposal of the liquids and sludge materials;
        - Air stripping to remove VOCs and ammonia;
        - UV photo-oxidation to remove NDMA; and
        - Evaporation of the remaining water and off-site disposal of the residual solids;
    - Treatment for hot spot groundwater:
        - Influent equalization tank;

- Hypochlorite flash mixer (a rapid mixer that uniformly distributes a treatment chemical) for oxidation and removal of metals (iron and manganese);
- Breakpoint chlorination to treat ammonia;
- Slow mix flocculation (a process by which fine particulates are caused to clump together) and lamella clarifier (a series of inclined plates on which particulates can settle) to remove solids;
- Filter press for solids dewatering;
- Off-site disposal of residual solids and sludge materials;
- GAC to ensure clarity and ultra-violet (UV) transmittance, as well as remove volatile organic compounds (VOCs);
- UV photo-oxidation for NDMA destruction; and
- Discharge of treated water.

Overview of the DAPL and Groundwater Hot Spots Remedy

Figure 31 in **Appendix C** of this ROD provides a conceptual layout of the DAPL and groundwater hot spot remedy, and **Figure 32** in **Appendix C** of this ROD provides a cross-section of the conceptual plan for this alternative. Alternative DAPL/GWHS-3 is expected to remove approximately 14.8 million gallons of DAPL and 68.4 million gallons of hot spot groundwater from the aquifer, and generate approximately 16,531 tons of sludge residuals for off-site disposal as a result of DAPL treatment. These sludge residuals are assumed to be non-hazardous waste, but will be further characterized prior to shipment off-site. If solids meet hazardous waste criteria, further dewatering will be conducted, where possible, as necessary to minimize moisture content/water weight before disposal off-site at an approved disposal facility licensed to accept the contaminated media. Studies will be conducted to evaluate and optimize the on-site treatment of DAPL. The goal will be to pre-treat the extracted DAPL to reduce its volume, thus reducing the volume of residuals requiring off-site disposal. If it is not feasible to treat DAPL on-site, extracted DAPL will be disposed of off-site at a permitted facility licensed to receive such wastes.

DAPL Remedy

This alternative includes the construction and operation of a DAPL extraction system, with approximately four wells in the Off-Property Jewel Drive DAPL pool, approximately four wells in the Containment Area DAPL pool, and approximately 12 wells in the Main Street DAPL pool (see **Figures 34**, **35**, and **36** in **Appendix C** of this ROD, respectively), the final number, location, and configuration of which will be determined based on the PDIs. Multiple extraction wells in each DAPL pool will serve to minimize drawdown, provide flexibility with pumping rates, and target bedrock low points identified during the PDI activities of the RD phase.

Groundwater Hot Spots Remedy

Alternative DAPL/GWHS-3 also includes construction and operation of a groundwater extraction system, with approximately six new, deep overburden extraction wells, the final number, location, and configuration of which will be based on the PDIs, to remove and treat the mass of contaminants within the area of groundwater that targets the 5,000 ng/L NDMA contour. **Figure 31** in **Appendix C** of this ROD shows proposed locations of extraction wells and conveyance lines, and a hypothetical location for the groundwater treatment plant. An estimated three new extraction wells will be sited in the general vicinity of existing wells GW-58D, GW-83D, and GW-84D; approximately one new extraction well will be located in the general vicinity of well GW-85D, and approximately two new extraction wells will be sited in the Main Street DAPL area, screened in the hot spot groundwater layer over the DAPL surface.

Other Components of the DAPL and Groundwater Hot Spots Remedy

Extracted DAPL and groundwater will be treated at a newly constructed treatment system or systems (potentially the same system(s) as for Alternative LNAPL/SW-3, see below) and discharged to surface water. The groundwater hot spot extraction wells are estimated to pump at 10 gpm each, for a constant combined extraction rate of 60 gpm. The Off-Property Jewel Drive and Containment Area wells will be pumped at an estimated 0.25 gpm. Based on the deeper bedrock and steeper sides of the Main Street DAPL pool, the Main Street wells will be pumped initially at 0.5 gpm, but it may become necessary to progressively reduce the rate of DAPL extraction with time as DAPL pool volumes diminish. The waste liquids and residual solids/sludges generated during DAPL treatment are assumed to be non-hazardous waste, but will be further characterized prior to off-site disposal. The goal will be to evaporate a sufficient volume of DAPL such that it is a solid suitable for off-site transportation/disposal. DAPL would be removed to the extent practicable based on measured concentrations meeting the definition of DAPL.

Alternative DAPL/GWHS-3 includes all appropriate plans and specifications relevant to this component of the remedy (*e.g.*, air monitoring plan, transportation/trucking plan, dust and odor control plan, site management plan, restoration plan, and health and safety plan) and all necessary preparation and mobilization activities to implement this remedy component (*e.g.*, removal of vegetation and debris, as appropriate, installation of temporary fencing, decontamination facilities, solids/sludges/waste liquids management areas, trailer, and sanitation facilities). Details regarding these plans and other measures will be developed during the RD phase.

O&M for Alternative DAPL/GWHS-3 will include monitoring to assure that the extraction pumps are operating properly, the treatment components are in proper operation, the activated carbon, pumps, tubing, and other consumable components are changed/replaced as needed, and compliance monitoring for air emissions and treated water are being performed. O&M will also include routine inspections of extraction system components, including pumps, pump enclosure vaults, system controls, communication equipment, piping, storage tank(s), and tanker truck loading station(s), and periodic evaluation and adjustment of pumping rates.

Existing wells (*e.g.,* potable, irrigation, and process wells) in the Site groundwater study area (see **Figure 11** in **Appendix C** of this ROD) will be identified and evaluated to determine whether their use will pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy. Monitoring of groundwater and surface water will be performed to assess remedy progress and effects on surface water features, evaluate the response of the DAPL and overlying groundwater during pumping, assess trends of monitored parameters in DAPL and groundwater, and assess the specific chemical characteristics of the extracted DAPL. Long-term monitoring and maintenance will be conducted for any new and existing remedy infrastructure components and to maintain any required wetland/floodplain mitigation and/or stormwater controls. Five Year Reviews will be required since contamination will be left in place.

Components of the Remedy Specific to LNAPL and Surface Water (Final Action – Alternative LNAPL/SW-3)

The selected remedy for the final action for LNAPL and Surface Water – Alternative LNAPL/Surface Water-3: Demolition of Plant B, MPE for LNAPL, Targeted Groundwater Extraction to Prevent Impacts to Surface Water, Treatment at New Treatment System(s) – conceptually includes the following components:

- An estimated three to five MPE wells installed within the LNAPL footprint, including beneath the Plant B building foundation (the exact number, location, and configuration of which will be based on the PDIs), to remediate LNAPL, the smear zone, and dissolved-phase COCs that would otherwise impact East Ditch Stream;
- Treatment of recovered LNAPL and soil vapor via a treatment system that conceptually includes an oil/water separator to remove the LNAPL and vapor-phase GAC to treat the soil vapor;
- Off-site disposal of recovered LNAPL at an appropriate off-site permitted facility;
- Construction and operation of a new groundwater extraction and treatment system or systems, with extraction wells sited based on PDIs to intercept and treat the overburden groundwater contaminant plume that impacts Site surface water;
- Re-routing of groundwater currently treated by Plant B to the new groundwater treatment system or systems (potentially the same system(s) as for the hot spot groundwater, see above); and
- Decommissioning and demolition of the Plant B groundwater treatment system.

Overview of the LNAPL and Surface Water Remedy

Figure 28 in **Appendix C** of this ROD provides a conceptual layout of the LNAPL and surface water remedy. Extraction wells will be installed to intercept and treat the overburden groundwater contaminant plume that impacts Site surface water. Extracted groundwater will be treated at a newly constructed groundwater treatment system (potentially the same system as for the groundwater hot spots, see above) and discharged to surface water, the design of which will be refined during the RD phase. Additionally, groundwater currently treated by Plant B will be re-routed to the new groundwater treatment system. Following this, the Plant B groundwater treatment system will be decommissioned and demolished. An estimated three to five MPE wells (the exact number, location, and configuration of which will be based on the PDIs) will then be installed within the LNAPL footprint, including beneath the Plant B building foundation following Plant B's demolition, to remediate LNAPL, the smear zone, and dissolved-phase COCs that would otherwise impact East Ditch Stream.

LNAPL Remedy

Plant B will continue to operate until the new groundwater hot spot treatment system (see above) is operational. Once the new treatment system becomes operational, the extracted groundwater currently being treated at Plant B will be re-routed to the new treatment system. After the reconfiguration, the Plant B building, tanks, and associated infrastructure will be decommissioned and demolished to grade, removing obstructions prior to investigation and treatment. Data collected during the PDIs will be used to confirm the limit of LNAPL in soil and groundwater that requires remediation (see **Figure 20** in **Appendix C** of this ROD).

Following the PDI phase, the MPE system will be constructed, which will likely employ a skid-mounted system to treat the extracted materials. Conceptually, the skid-mounted system will consist of an extraction blower, knockout tank to separate the streams, oil/water separator to remove LNAPL, and GAC to treat vapors. Extracted LNAPL will be stored on-site, with off-site disposal at an appropriate off-site facility licensed to receive the contaminated media. A post-remediation verification program will be conducted to confirm achievement of RAOs. The sampling will include collection of soil boring samples from the smear zone as well as groundwater samples with analysis for BEHP and VPH. The currently operating extraction wells at Plant B will continue to operate, at a minimum, through the first Five Year Review following the LNAPL remedial action. Groundwater monitoring, including product thickness measurements, will be performed as LNAPL is being removed and following the cessation of LNAPL removal, until a Five Year Review determines that further monitoring is no longer necessary.

Surface Water Remedy

Groundwater extraction wells will be installed, based on data collected during PDIs, to intercept and treat the overburden groundwater contaminant plume that impacts Site surface water (see conceptual layout in **Figure 37** in **Appendix C** of this ROD). Continued short-term operation of Plant B is assumed. Following the shut-down and demolition of Plant B, an evaluation of Site hydrogeology would be performed first and the necessity of additional extraction wells to prevent groundwater impacts to surface water would be evaluated, followed by their design and installation. Extracted groundwater will be conveyed to the new treatment plant for the DAPL and groundwater hot spot remediation (see above). The treated groundwater will be discharged to surface drainage, the precise location(s) of which will be determined during the PDI phase. Remedy optimization, such as modifying the number of extraction wells, adjusting the extraction pumping rates, and/or changes to the monitoring program, will be evaluated as part of the monitoring program and the Five Year Review process.

Other Components of the LNAPL and Surface Water Remedy

All appropriate plans and specifications relevant to this component of the remedy will be developed and implemented (*e.g.*, air monitoring plan, transportation/trucking plan, dust and odor control plan, site management plan, restoration plan, demolition plan for existing structures, erosion and sedimentation control plan, and health and safety plan), as well as all necessary preparation and mobilization activities to implement this remedy component (*e.g.*, removal of vegetation and debris, as appropriate, installation of temporary fencing, decontamination facilities, wastes/waste liquids management areas, trailer, and sanitation facilities). Details regarding these plans and other measures will be developed during the RD phase.

O&M for Alternative LNAPL/SW-3 will include monitoring to assure that the extraction pumps are operating properly, the treatment components are in proper operation, the activated carbon, pumps, tubing, and other consumable components are changed/replaced as needed, and compliance monitoring for air emissions and treated water are being performed. O&M will also include routine inspections of extraction system components, including pumps, pump enclosure vaults, system controls, communication equipment, piping, storage tank(s), and tanker truck loading station(s), and periodic evaluation and adjustment of pumping rates.

Performance monitoring schedules will be evaluated as part of the RD phase. Monitoring of groundwater and surface water will be performed to assess remedy progress and effects on surface water features. Long-term monitoring and maintenance will be conducted for any new and existing remedy infrastructure components and to maintain any required wetland/floodplain mitigation and/or stormwater controls. Five Year Reviews will be required since contamination will be left in place.

Components of the Remedy Specific to Soil and Sediments (Final Action – Alternative SOIL/SED-2)

The selected remedy for the final action for soil and sediments – Alternative SOIL/SED-2: Containment Area cap, upland soil covers, excavation with off-site disposal and restoration of wetland soil and sediments, limited action for TMPs (Institutional Controls, including vapor intrusion evaluations or vapor barriers/SSDSs) – includes the following components:

- Placement of a permanent, low-permeability cap that meets RCRA Subtitle D and Massachusetts solid waste landfill performance standards over the Containment Area, the design and footprint of which will be determined during the RD phase; [21]
- Closure of the existing slurry wall equalization window by grouting in place;
- Placement of a soil or asphalt cover system over areas of shallow (0-1 ft) upland soil with concentrations of COCs in excess of the cleanup levels;
- Excavation of approximately 4,000 cy of wetland soil and sediment with concentrations of COCs in excess of the cleanup levels;
- Post-excavation confirmatory sampling to document limits of impacts and confirm achievement of the RAOs and cleanup levels;

[21] While soil in the Containment Area has not been identified as RCRA hazardous waste, it is possible that hazardous waste may be present. Historical disposal practices in this area suggest that unsaturated soil within the Containment Area contains waste materials. Pre-RI soil samples were primarily collected from the Containment Area between the surface and 10 feet bgs. During the OU1/OU2 RI, characterization of Containment Area soil was limited to surface samples from beneath the temporary cap, which were collected by cutting slits in the cap and using a hand-held spatula. Deeper samples were not collected at that time to avoid potential damage to the temporary cap that may have resulted from the presence of the drill rig. In 2019, twelve soil samples were collected at a variety of depths from the Containment Area to determine if Containment Area soil meets the definition of characteristic hazardous waste (Wood, 2020a). Each boring was drilled through overburden soil and advanced 5 feet into the top of bedrock. Analytical results from the soil samples collected from these borings showed elevated concentrations of TMPs, BEHP, and total chromium; none of the samples exceeded the criteria for RCRA hazardous waste characteristics. However, the sampling data was limited, and additional sampling would be necessary to demonstrate the absence of non-hazardous wastes (*i.e.*, solid wastes) within the Containment Area. Accordingly, the solid wastes in the Containment Area will need to be contained, a remedial action that would include the prevention of leaching of chemicals or constituents from such wastes, in accordance with RCRA Subtitle D regulations and Massachusetts Solid Waste Management Facility Regulations.

- Minimization of potential harm and avoidance to the extent practicable of adverse impacts to wetlands and floodplains; restoration and/or replication nearby to address unavoidable impacts from remedial activities, including proper regrading, restoration with native vegetation and to address any diminishment of flood storage capacity, erosion control, monitoring, and maintenance;
- Off-site disposal of all excavated material at an appropriate off-site permitted facility;
- Prevention of future exposure to TMPs that may pose inhalation risks via vapor intrusion by requirements to conduct additional evaluations and/or implement mitigation measures such as vapor barriers or SSDSs for new building construction or building alterations on the Property; and
- Long-term monitoring and maintenance of any new and existing remedy infrastructure, including the cap for the CSL

Overview of the Soil and Sediments Remedy

Figure 24 in **Appendix C** of this ROD provides a conceptual layout of the soil and sediments remedy, including the areas expected to be excavated and the areas to be addressed via caps and cover systems. A permanent, low-permeability cap that meets RCRA Subtitle D and Massachusetts solid waste landfill performance standards will be placed over the Containment Area. The existing equalization window will be closed by grouting in place. Soil or asphalt cover systems will be placed over areas of shallow (0-1 ft) upland soil with concentrations of COCs in excess of the cleanup levels as verified with additional sampling during the PDI. Wetland soil and sediment with concentrations of COCs in excess of the cleanup levels will be excavated and disposed of off-site at an approved, permitted facility. A PDI will be conducted to further refine the extent of soil and sediments to be excavated. Excavated contaminated wetland soil and sediments determined to contain hazardous waste will be managed in accordance with RCRA hazardous waste regulations. The caps and cover systems will be designed to prevent direct contact with impacted soil, to prevent soil from being carried to nearby areas (including streams and wetlands) via erosion during rain events, and to prevent soil contaminants from leaching to groundwater. The caps and cover systems will be adequately designed with long-term integrity for seasonal conditions, severe storms (up to a 500-year storm event), and freeze/thaw conditions; to satisfy ARAR requirements; and to prevent contaminants leaching to groundwater (*i.e.*, meet impermeability requirements). As appropriate, alternative cap/cover system designs such as new building foundations, pavement, or landscaping may be evaluated and assessed during the RD phase for adequacy of satisfying the RAOs and ARARs low-permeability cap standards. Five Year Reviews will be required since contamination will be left in place.

Containment Area Remedy

A permanent cap meeting ARARs' low-permeability cap standards will be designed and constructed, the objective of which is to permanently minimize infiltration of rainwater. The cap will comply with RCRA Subtitle D regulations and Massachusetts Solid Waste Management Facility Regulations and meet low-permeability requirements with an effective permeability of the existing slurry wall (approximately $1x10^{-8}$ centimeters/second (cm/s)) or a permeability of no greater than $1x10^{-7}$ cm/s, whichever is less). The footprint of the cap will extend approximately 30-50 ft beyond the boundary of the Containment Area, except where the detention basin is adjacent to the southern end of the Containment Area. PDIs will include a program to obtain geotechnical information in support of the RD and will determine if the existing temporary cap should be removed or if the new permanent cap can be placed on top of the existing temporary cap. The geotechnical data, along with settlement and slope stability evaluations, will be used to design the cap. The approximate limits of the proposed cap as shown on **Figure 38** of **Appendix C** of this ROD are based on a maximum of 7.5 ft of subgrade soil (average depth of approximately 2.5 ft) to achieve a 3% minimum slope prior to construction of the approximately 2-ft thick composite cap. A general cross-section of the cap is shown on **Figure 39** of **Appendix C** of this ROD, and will be refined further during the RD phase. Conceptually, the components of the cap from depth to surface will generally be as follows:

- Compacted sub-grade fill;
- 12 in of soil;
- Geosynthetic clay liner;
- Linear low-density polyethylene geomembrane;
- Geocomposite drainage layer;
- 18 in of soil cover; and
- Vegetative layer with 6 in of topsoil.

As noted above, alternative cap/cover system designs such as new building foundations, pavement, or landscaping may also be evaluated and assessed during the RD. Prior to construction of the cap for the Containment Area, the existing equalization window will be closed by grouting in place. The equalization window is an approximately 10-ft by 40-ft opening in the west side of the Containment Area's 3-ft wide slurry wall, filled with crushed stone. The window will be sealed and grouted in place to eliminate the flow of groundwater through the slurry wall.

PDIs for the Containment Area will include a stormwater study to verify the current understanding that the Containment Area (85 ft above mean sea level [msl]) is above the 500-year flood elevation (82 ft above msl), which would mean that the remedy will not result in the occupancy and modification of the 500-year floodplain at the Property. If additional site preparation is needed to allow for adequate drainage and storage within the 500-year floodplain, this will be evaluated as part of the design activities and implemented during the remedial action phase. Institutional Controls will be implemented to limit and restrict future activities within the confines of the slurry wall/Containment Area that would negatively impact the integrity of the permanent cap.

Upland Soil Remedy

Figure 40 in **Appendix C** of this ROD shows the estimated remediation areas consisting of caps and cover systems for the upland soil remedy. The extents of remediation areas will be further refined during the PDIs. Contamination in upland soil exceeding the cleanup levels will be addressed by placement of cover systems to prevent unacceptable ecological exposures. The cover systems will consist of either 1-ft soil layers or 3-in layers of asphalt pavement over areas of shallow (0-1 ft) contamination. As appropriate, alternative cover system designs such as new building foundations or parking lots may be evaluated and assessed during the RD phase for adequacy of satisfying the RAOs and meeting ARARs. Areas that are already inaccessible because they are under buildings or are covered with competent concrete or asphalt will be maintained without additional cover, and included within the set of

Institutional Controls to ensure their long-term integrity. If existing buildings, foundations, or pavement are removed, the soil beneath these areas shall be evaluated to determine if cover systems are needed to prevent exposure.

PDIs for upland soil will be conducted to confirm the extent of COCs in the upper foot of soil and facilitate the design of adequately protective caps and cover systems. Institutional Controls will include a Soil Management Plan to ensure the integrity of the caps and cover systems over areas of remediated upland soil and provide requirements to minimize future excavation of soil in these areas. In the event that future excavation is necessary, the Soil Management Plan will provide requirements for notifying and obtaining agency approvals, and requirements to prohibit subsurface soil with COCs above cleanup levels from being placed at the ground surface and specify appropriate material handling and waste management practices. Periodic inspections of all caps/cover systems will be conducted to verify that the integrity has not been compromised. If soil erosion is identified in the areas with soil covers or if deterioration or damage is identified in the areas with asphalt pavement covers, the damages will be repaired and monitored to ensure long-term integrity.

Wetland Soil and Sediments Remedy

Figure 41 in **Appendix C** of this ROD shows the wetland soil and sediment areas to be addressed via excavation and off-site disposal under this remedy. Excavation will occur for sediments in the northern half of Off-Property West Ditch Stream, along the entire length of the on-Property portion of South Ditch Stream (both Upper and Lower South Ditch Streams), and in Central Pond. For wetland soil, remediation areas will include Lower South Ditch Stream (the off-Property portion) and E-EA-5, E-EA-4 and E-EA-6, and the eastern portion of E-EA-2 within the On-Property West Ditch Stream wetlands. Wetland soil and sediment analytical data indicates that the majority of cleanup level exceedances for COCs are limited to approximately 1-ft bgs; remediation areas estimated to total 106,500 square feet will generally be excavated to a depth of approximately 1-ft bgs, yielding approximately 5,000 loose cy of excavated soil and sediments. In total, approximately 4,000 in-place cy are estimated to be excavated and stabilized on-site (if needed) prior to shipping off-site for disposal, weighing 6,200 tons. The actual excavation depths and extents will be determined during the RD phase and will be based on additional wetlands delineation confirmed through site reconnaissance and evaluation by a qualified wetlands soil scientist and data collected during the PDI. PDIs will include sample analysis to confirm the limits in wetland soil that require remediation.

A detailed Stormwater Pollution Prevention Plan (SWPPP) will be included in the design package to protect areas surrounding the remediation areas during wetland soil/sediments excavation. Temporary stormwater controls may be required during remedy implementation to minimize the amount of soil that requires stabilization and to facilitate excavation. Depending on the season, temporary stormwater diversions may be needed to facilitate excavation in streams. In relatively dry conditions, stream water may be temporarily diverted to facilitate soil and sediment removal. Existing roads will be utilized wherever possible to access areas requiring remediation. In certain areas, new access routes may need to be constructed.

Central Pond will require dewatering before excavating the sediments from this area. An estimated 640,000 gallons of recovered water will be treated locally through the treatment system(s), the same as for the DAPL and groundwater hot spots remedy.

Sediment excavation areas will be backfilled with off-site borrow material that is verified to meet appropriate guidelines. Excavation areas will be backfilled to generally match pre-excavation conditions, using granular soil material within the stream channel and dressed with an organic top soil in adjacent forested wetland areas. Upon completion of excavation, erosion blankets will be installed on channel banks where applicable and wetland grass varieties will be seeded. Temporary erosion controls best management practices will be instituted until such time as natural systems recover.

Excavated wetland areas will be backfilled and re-vegetated in accordance with wetland restoration plans. Wetland soil excavation areas will be backfilled with off-site borrow material that is verified to meet appropriate guidelines. Wetland soil areas will be backfilled to match pre-excavation conditions generally, using granular soil material and dressed with an organic top soil. Best management practices to control erosion and sedimentation will be maintained until vegetation is re-established.

TMPs Remedy

Under this component of the remedy, Institutional Controls will address potential vapor intrusion concerns associated with future buildings or building alterations on the Property in areas where elevated concentrations of TMPs have been detected in soil. **Figure 42** in **Appendix C** of this ROD shows currently known areas of TMP-impacted soil. The Institutional Controls will require vapor intrusion evaluations and/or engineering controls, such as vapor barriers and/or SSDSs, for future building construction on the Property, or building alteration or modification. SSDS designs may be passive systems with an option to upgrade to an active system based on post-construction/post-renovation monitoring results.

As part of the Institutional Controls, engineering controls in the form of vapor barriers and/or SSDSs would be required to be incorporated into the design and construction of future building foundations in the vicinity of HH-EA-1, HH-EA-3, and HH-EA-7 where elevated levels of TMPs in soil have been detected. Final design requirements will depend on the size and type of the building to be constructed, but are expected to generally consist of collection piping or a collection geotextile laid into a layer of gravel, connected to header pipes that vent the vapors to outdoor air outside the building footprint.

Periodic monitoring will be required for buildings with mitigation systems in order to determine whether the systems are functioning properly and to document negative pressures beneath floor slabs for active systems. System fans, piping, and other components will be monitored for signs of wear. Periodic sampling and monitoring will be recommended for buildings with elevated measurements of TMPs in soil but where no active mitigation system was installed because indoor air sampling indicated that the passive system was adequate to prevent unacceptable indoor air risks. Periodic inspections will also be required for all buildings with mitigation systems to evaluate whether building conditions may have changed in a manner that could cause an increased potential for vapor intrusion and thus necessitate a modification/addition to the existing engineered mitigation system.

Calcium Sulfate Landfill Maintenance and Monitoring

Long-term maintenance and monitoring (post-construction monitoring) in accordance with Massachusetts Solid Waste Management Facility Regulations (310 CMR 19.000) will be implemented for the CSL cap and associated infrastructure, as well as Institutional Controls, to ensure the integrity, maintenance, and repair (as necessary) of the cap to ensure its protectiveness and prevent contact with the underlying soil. On January 7, 2009, MassDEP issued a determination that the CSL had been capped in conformance with the landfill design plans and was deemed closed, subject to conditions including monitoring in accordance with a December 2006 post closure monitoring plan (MassDEP, 2009). On March 3, 2011, MassDEP issued an approval of a modification of the post closure monitoring plan (MassDEP, 2011). The post closure monitoring plan approved by MassDEP may be modified by EPA as needed for the overall remedy at the Site.

Other Components of the Soil and Sediments Remedy

Potential harmful temporary or permanent impacts to wetlands and/or floodplain resources will be minimized to the extent practicable and mitigated as necessary. Mitigation measures will be required to address any unavoidable short- or long-term floodplain impairment within the 500-year floodplain on the Property and within the 100-year and 500-year floodplains off-Property in the MMB wetlands. Caps and cover systems within the 500-year floodplain on the Property will be designed, constructed, and maintained to prevent any releases in the event of flooding (up to a 500-year flood event). **Figure 5** in **Appendix C** of this ROD shows the Site FEMA flood zone designations.

A sequencing plan will be developed for implementing the soil and sediments remedy to coordinate work with the remedial actions for the DAPL and groundwater hot spots and LNAPL and surface water and ensure that remedial activities taken to address COCs in soil and sediments are not undermined by recontamination from LNAPL and contamination in groundwater and surface water. The soil and sediments remedy will be implemented after it is established that flow from contaminated groundwater is not serving as on ongoing source which could negatively impact the quality of wetland soil and sediments. Based on the available wetland soil and sediment data, cleanup level exceedances for the Site COCs are generally limited to approximately 1 ft bgs. A PDI will be conducted to further refine the extent of material to be excavated. Temporary roads may need to be installed to support excavation and other remedial activities. Prior to excavation, erosion control measures will be installed around the excavation areas. During the excavation, dust control and air monitoring will be performed, as well as monitoring of adjacent wetlands/waterways, as necessary, to ensure that no contaminant releases adversely impact human health and/or the environment during the cleanup activities. Wetland soil and sediments with concentrations of Site COCs in excess of the cleanup levels will be excavated (estimated to be approximately 6,000 tons) and disposed of off-site at an appropriate permitted facility. Excavated soil and sediments will be stockpiled at an approved location. Excavated soil and sediments will be dewatered and stabilized, as necessary, prior to shipment off-site to an approved, permitted facility. The dewatering water is expected to be treated to appropriate levels prior to either appropriate off-site disposal at a permitted facility or discharge at an appropriate approved surface water discharge location. Construction of a dewatering pad may be necessary to handle saturated soil and sediments. Prior to disposal, waste characterization samples will be collected from the stockpiled soil.

A land survey will be conducted of all cleanup infrastructure to be left in place (*e.g.*, impermeable caps, soil and pavement covers, monitoring wells, *etc.*). Excavated areas will be restored with clean, imported backfill to achieve pre-existing elevations and grades and re-vegetated with native vegetation to control erosion and conform with pre-remedial conditions, to the extent practicable. Restoration will include returning disturbed areas to pre-existing conditions, and applying seed (native species to the extent practicable), mulch and/or soil amendments to restore the disturbed areas. Any wetland/floodplain habitat altered by the remedial action will be restored such that current flood storage capacities and wetlands are not diminished after completion of remedial actions. All appropriate plans and specifications (*e.g.*, air monitoring plan, transportation/trucking plan, dust and odor control plan, soil management plan, restoration plan, demolition plan for existing structures, as appropriate, erosion and sedimentation control plan, and health and safety plan) will be prepared to implement this component of the remedy. Necessary preparation and mobilization activities to implement this remedy component (*e.g.*, removal of vegetation and debris, as appropriate, installation of temporary fencing, decontamination facilities, soil stockpile/management areas, trailer, and sanitation facilities) will be developed during the design phase and implemented during the remedial action.

Long-term monitoring and maintenance will be implemented for capped/covered areas, as well as Institutional Controls, to ensure the integrity, maintenance, and repair (as necessary) of caps and cover systems and prevent contact with the underlying soil, prohibit residential, school, and daycare use of the Property, and guard against the future vapor intrusion pathway. Long-term monitoring and maintenance will be conducted for any new and existing remedy infrastructure components and to maintain any required wetland/floodplain mitigation and/or stormwater controls. Long-term monitoring of other environmental media (*e.g.*, groundwater and surface water) will also be conducted to evaluate the effectiveness of the remedy for soil and sediments. Five Year Reviews will be required since contamination will be left in place.

<u>Common Components of the Remedy for All Media</u>

Pre-Design Investigations

PDIs will be conducted for all components of the remedy during the RD process to:

- Determine the final number, location, and configuration of extraction wells and other remedial components; and
- Facilitate the implementation of the chosen cleanup alternatives and map the precise extent of remediation limits, including the extent of excavation limits and the extent of caps and cover systems.

Well and piping locations under the DAPL and groundwater hot spots component of the selected remedy, as well as the location of the treatment system(s), will be designed so as to not interfere with the remedial infrastructure required for the soil, sediment, LNAPL, and surface water components of the selected remedy. Similarly, well and piping locations, as well as the location of the LNAPL and groundwater treatment systems under the LNAPL and surface water component of the selected remedy, will be designed so as not to interfere with the remedial infrastructure required for the soil and sediment components and DAPL and groundwater hot spot components of the selected remedy. The exact number, location, and configuration of DAPL and groundwater extraction wells, as well as groundwater extraction wells for the surface water component of the LNAPL/surface water remedy, may be modified based on the additional information obtained during implementation of the data gaps studies and during the PDI phase. PDI activities will also focus on extraction well design. The PDIs will evaluate hydraulic data to revise, update, and support calibration of the existing groundwater flow model. This model will be updated and used to evaluate optimal placement for the extraction wells and optimal pumping rates for groundwater and DAPL capture. Such modeling will also provide quantitative insight on methods to prevent the vertical capture of underlying bedrock groundwater through pumping of deep overburden groundwater.

Additionally, the precise location of the groundwater treatment systems will be determined as part of the PDI activities. A sequencing plan will be developed for implementing the soil and sediments remediation to coordinate work with the remedial actions for DAPL, groundwater hot spots, LNAPL, and surface water to ensure that remedial activities taken to address contamination in soil and sediments are not undermined by recontamination from LNAPL and contamination in groundwater and surface water. The remedial work to address contaminated soil and sediments will be conducted after it is established that flow from contaminated groundwater is not serving as on ongoing source which could negatively impact the quality of wetland soil and sediments.

Under both the DAPL/GWHS-3 and LNAPL/SW-3 alternatives, PDIs will be conducted to determine appropriate locations for discharge of treated groundwater to surface water and refine the DAPL/groundwater treatment system(s) design, including specific treatment technology unit operations and components. For the SOIL/SED-2 alternative and the LNAPL-component of the LNAPL/SW-3 alternative, sampling will be conducted to further refine the horizontal and vertical extents of soil and sediment contamination to be addressed by MPE, excavation, capping, and/or cover systems. Waste characterization sampling will be conducted, where necessary, to facilitate the proper handling of remediation wastes for off-site disposal.

Restoration

Restoration of wetlands and aquatic ecosystems affected by remedial activities will be conducted under all of the remedy components. Any wetlands affected by remedial work will be restored and/or replicated consistent with the requirements of federal and state wetlands protection laws with native wetland vegetation and any restoration efforts will be monitored. Mitigation measures will be used to protect wildlife and aquatic life during remediation, as necessary. Floodplain resources affected by implementation of the remedy will be addressed via the implementation of measures refined during the RD phase to ensure that flood storage capacities are not diminished following completion of remedial actions. Best management practices will be used during construction to minimize temporary impacts to floodplains and excavated areas will be returned to original grade to avoid diminishing flood storage capacity. Long-term monitoring of restored areas will be conducted as part of the response actions.

Institutional Controls

In order to protect human health by controlling potential exposures to contaminated soil, sediments, groundwater, and surface water, and LNAPL and DAPL, the selected remedy relies on the use of Institutional Controls, including limitations on land and groundwater uses and activities. Institutional

Controls are also necessary for the protection of the selected remedy, including limitations on uses and activities that interfere with or disturb components of the remedy. Institutional Controls will be required to prevent residential, school, and daycare uses of the Property. Institutional Controls will also be necessary to: 1) prohibit the use of groundwater in the OU3 groundwater study area unless it can be demonstrated to EPA, in consultation with the Commonwealth, that such use will not pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy; 2) prevent disturbance of any engineered systems such as caps and cover systems, and any other new and existing remedy infrastructure components; 3) prevent contact with soil beneath caps and cover systems; and 4) require a vapor intrusion evaluation and/or vapor mitigation systems such as vapor barriers or SSDSs be installed if a new building is constructed or altered on the Property (examples of Institutional Controls include NAULs, GEREs, town ordinance, advisories, building permit requirements, and other administrative controls). Should someone wish to demonstrate that there are no unacceptable risks from vapor intrusion and therefore mitigation systems are not required, an evaluation of vapor intrusion risks (following EPA-approved procedures and subject to EPA approval) must be performed prior to the building of structures or a change in building structure or usage on the Property to demonstrate that vapor intrusion risks are within or below EPA's target risk levels (risk range of 10^{-4} to 10^{-6} and/or a target organ HI of 1).

To facilitate future use and redevelopment of the Property consistent with the cleanup, Institutional Controls will be established to preserve the remedy, and appropriately manage impacted soil and groundwater encountered during future intrusive activities (*e.g.*, installing subsurface utilities, building foundations/slabs, *etc.*) to protect human health and the environment. A groundwater restriction zone or other mechanism will be established as part of the Institutional Controls for the OU3 groundwater study area to prevent contact with contaminated groundwater, prevent further migration of the groundwater contaminant plume, and prevent interference with the remedy until final groundwater cleanup levels are selected and achieved in the final remedy for the Site (see **Figure 11** in **Appendix C** of this ROD). Twenty-eight (28) residential drinking water wells have been sampled at least once, and 20 are monitored on a quarterly basis to confirm that levels of NDMA do not exceed the upper end of EPA's health-protective cancer risk range of 0.47 ng/L to 47 ng/L (see also **Section G**, **SUMMARY OF SITE RISKS**, Section 1 – Human Health Risk Assessment, *Risk Characterization*, Future Potable Use of Groundwater and DAPL in **Part 2** of this ROD, below), which would result in unacceptable risk to human health based on cancer health effects. As part of the selected remedy, all current potable and irrigation wells, including those not currently or previously sampled, will be evaluated to determine whether their use will pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy. The extent of groundwater Institutional Controls may be expanded or reduced, as appropriate, based on new data or information. The details of the Institutional Controls will be resolved during the pre-design and RD phase in coordination with the parties performing the remedial action, impacted landowners, local officials, and MassDEP.

Monitoring and Studies
The selected remedy includes long-term monitoring of groundwater and surface water to evaluate remedy effectiveness.

Five Year Reviews

At the conclusion of remedy construction, hazardous substances, pollutants, or contaminants will remain at the Site. Therefore, as required by law, EPA will review the Site remedy to ensure that the remedial action continues to protect human health and the environment at least once every five years. These Five Year Reviews will evaluate the components of the remedy for as long as hazardous substances remain on-site above levels that permit unlimited use and unrestricted exposure. The purpose of the Five Year Review is to evaluate the implementation and performance of the remedy in order to determine if the remedy is or will be protective of human health and the environment. The Five Year Review will document recommendations and follow-up actions as necessary to ensure the long-term protectiveness of the remedy or bring about protectiveness of a remedy that is not protective. These recommendations could include providing additional response actions, improving O&M activities, optimizing the remedy, enforcing access controls and Institutional Controls, and conducting additional studies and investigations.

Remedy Modifications

The selected remedy may change somewhat as a result of the RD and construction processes. Different numbers and configurations of extraction wells under the DAPL, groundwater, and surface water alternatives and MPE wells under the LNAPL alternative may be determined based on PDI results and/or observations during remedy implementation, and their locations and configurations may change. For the surface water remedy, Plant B will continue to be operated in the short-term until its replacement. Following the shut-down and demolition of Plant B, an evaluation of Site hydrogeology would be performed and the necessity of additional extraction wells to prevent groundwater impacts to surface water would be evaluated, followed by their design and installation. DAPL and groundwater treatment system components, design, and configuration will all be determined during RD and may differ from the specific components outlined above.

PDIs will include survey, sampling, and evaluation work to determine the final configuration of remedial components, further map the extent of remediation limits, and facilitate the implementation of the chosen remedies. Investigations at the Property will include additional sampling to refine the extent of soil and sediment contamination to implement the LNAPL and soil and sediments remedies and determine the volume of hazardous waste to be disposed of off-site at a permitted facility.

Changes to the remedy described in this ROD will be documented in a technical memorandum in the Administrative Record for the Site, an Explanation of Significant Differences (ESD), or a ROD Amendment, as appropriate.

3. Summary of the Estimated Remedy Costs

The total estimated total cost of the selected remedy is approximately $48 million. A summary table of the major capital and annual O&M cost elements for each component of the selected remedy are shown below and in **Table K-1** in **Appendix B** of this ROD. The discount rate used for calculating total present worth costs was 7%. The timeframe estimated in the FS Report over which cost expenditures are calculated is 30 years.

Component of Remedy	Capital Cost	O&M – Present Value (30 years)[22]	Total Cost – Present Value[23]
DAPL/GWHS-3	$15,625,318	$24,620,268	$35,497,565
LNAPL/SW-3	$2,278,032	$7,356,000	$6,644,452
SOIL/SED-2	$5,614,205	$1,127,600	$6,072,515
2021 ROD Totals	**$23,517,555**	**$33,103,868**	**$48,214,532**

The information in the cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternatives. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternatives. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, 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.

4. Expected Outcomes of the Selected Remedy

The primary expected outcome of the selected interim remedy for DAPL and groundwater hot spots is that uncontrolled DAPL sources – a major source of contamination to the aquifer and highly toxic – will be removed and treated. Groundwater hot spots will be removed and treated, thereby limiting the further spread of hot spot groundwater which acts as source of contamination to the aquifer. The volume of DAPL and mass of Site COCs in DAPL and groundwater hot spots that represent an ongoing source to groundwater, surface water, and sediments will be reduced. Institutional Controls will prevent unacceptable human exposure to DAPL and contaminated groundwater via ingestion, dermal contact, and inhalation by showering.

For the selected final remedy for LNAPL and surface water, following completion of the remedial action, groundwater will no longer serve as a source of continuing impacts to surface water resulting in levels of Site COCs in Off-Property West Ditch Stream that no longer pose unacceptable human health risks to current or future trespassers via ingestion and dermal contact. LNAPL that represents a source of Site COCs to groundwater and a source of TMPs to indoor air, via the subsurface-to-indoor air vapor intrusion pathway, and that poses unacceptable human health risks to future indoor workers or building occupants on the Property, will be removed. The migration of LNAPL to East Ditch Stream and the migration of groundwater containing Site COCs to surface waters including East, South, and Off-Property West Ditch Streams, which presents adverse ecological impacts, will be prevented.

The expected outcomes of the selected final remedy for soil and sediments include the prevention of unacceptable human health risks from exposure by a future resident of the Property via ingestion, dermal contact, or inhalation of airborne dusts. Unacceptable human health risks via the vapor intrusion pathway by a future indoor worker or building occupant on the Property will be prevented. The leaching of Site

[22] Annual O&M costs presented is total present value and includes annual O&M for 30 years.
[23] Total Cost – Present Value presented is the sum of capital cost, net present value of periodic cost (separate from O&M) for 30 years, and net present value of annual O&M for 30 years.

COCs associated with the Containment Area into groundwater, surface water, and sediments at levels that pose unacceptable risks to human health and the environment will be prevented. Adverse ecological impacts associated with exposures to contaminated upland soil and wetland soil and sediments will be prevented by covering and/or removing and disposing contaminated soil and sediments. Finally, the further migration of contaminated wetland soil and sediments to nearby wetlands, surface water, drainage features, and adjoining properties that would result in potential adverse impacts will be prevented.

Groundwater restrictions are expected to be in place until final cleanup levels are identified in a future remedy decision for groundwater and achieved. It is anticipated that the selected remedy will also provide socio-economic and community revitalization impacts such as increased property values, increased tax revenues due to redevelopment, and enhanced human uses of ecological resources.

The effectiveness of the components of the final remedy for LNAPL, surface water, soil, and sediments will be determined based upon attainment of the cleanup levels and performance standards outlined in **Tables L-1** and **L-2** in **Appendix B** of this ROD. A monitoring program will be implemented in order to evaluate remedy performance and progress towards attainment of RAOs and cleanup levels. The details of the monitoring program will be established during the RD phase and will include preparation of a long-term monitoring plan. Monitoring scope and frequency could change over time based on technical analysis of the remedy, optimization studies, revised CSM, or other information, as determined by EPA. To evaluate the interim measures for DAPL and groundwater, monitoring of DAPL, groundwater, and surface water will be conducted which will, together with the information and data gathered as a result of the data gaps studies, form the basis for the evaluation of long-term groundwater remedial alternatives, leading to the selection of a final remedy for groundwater.

Cleanup Levels and Performance Standards

Cleanup levels and performance standards for the final remedy addressing soil, surface water, and sediments were developed for the Site COCs identified in the human health and ecological risk assessments. The cleanup levels and performance standards were selected by considering the ARARs, risk-based PRGs, quantitation limits, and reference/background data. Cleanup levels and performance standards were identified for Site COCs that posed any of the following:

- An excess lifetime cancer risk (ELCR) in excess of 10^{-4};
- A HI greater than 1; or
- A significant ecological risk.

The human health and ecological risk-based cleanup levels and performance standards for soil, sediments, and surface water are identified in **Tables L-1** and **L-2** in **Appendix B** of this ROD (created from Table 2.1-12 of the *FS Report Volume 1* and the PRG summary table from *Upland Soil (including Containment Area Soil) and Surface Water at the Olin Chemical Superfund Site* (Wood, 2020c). The detailed documentation of the technical basis and the derivation of the PRGs are included in the *May 15, 2020 Ecological Risk Calculations* (Wood, 2020b) and the *July 1, 2020 Risk Calculations* (Wood, 2020c).

Interim Action – DAPL and Groundwater Hot Spot Cleanup Levels

Cleanup levels were not established for DAPL and groundwater hots spots because the interim remedial actions developed for the Site are focused on removing contaminant mass from the groundwater and minimizing further impacts to the aquifer rather than risk-based endpoints. DAPL will be addressed by the selected interim remedy and will target the DAPL pools through increased extraction, thereby reducing the mass of NDMA[24] – the primary COC that drives human health risks – in the DAPL and its further migration in groundwater. Remediation goals and cleanup levels for groundwater will be established by EPA in the final ROD for groundwater (OU3).

EPA evaluated several options for where to target initial mass removal actions. Because there is no MCL for NDMA, EPA established contours at orders of magnitude above the RSL for NDMA in groundwater, 11 ng/L, and calculated NDMA mass within such contours. NDMA concentration contours of 1,100 ng/L and 11,000 ng/L were used. Based on the broad NDMA mass difference between the 1,100 and 11,000 ng/L contours (more than 3,000 g),[25] a third mass estimate was calculated based on the 5,000 ng/L median contour.[26] Based on the available data, estimates of the mass of NDMA within the three concentration contours are as follows:[27]

- Within the 11,000 ng/L NDMA contour = **1,715 g NDMA**
- Within the 5,000 ng/L NDMA contour = **4,440 g NDMA**
- Within the 1,100 ng/L NDMA contour = **4,747 g NDMA**

These estimates show significant NDMA mass in groundwater that exceeds the combined NDMA mass of 2,573 g within the three DAPL pools. The calculations of NDMA mass show a significant increase in NDMA mass removal if remediation were targeted to the 5,000 ng/L contour as compared to the 11,000 ng/L contour, but only a modest increase in NDMA mass removal if remediation were targeted to the 1,100 ng/L contour. The 5,000 ng/L contour, which contains an estimated 4,440 g of NDMA, would require the treatment of approximately 68.4 million gallons of water to remove this mass. The 1,100 ng/L contour, which contains an estimated 4,747 g of NDMA, would require the treatment of approximately 110.0 million gallons of water, almost twice the volume of water for an additional 307 g of NDMA removal. Since the goal of the interim action for groundwater is mass removal, the selected interim remedy appropriately targets the 5,000 ng/L contour based on mass of NDMA removed and the volume of groundwater requiring treatment.

---

[24] Based on the available data, the range of NDMA mass estimates for DAPL developed by EPA and Olin range from 996 to 2,573 grams (g). See further discussion in *Updates to Draft 2019 OU3 RI Report Conclusions* (USEPA, 2020b).

[25] The figure of 3,000 g represents Olin's estimate of the NDMA mass difference between the 1,100 and 11,000 ng/L contours. EPA's estimate of the NDMA mass difference between these two contours is approximately 2,200 g. Differences between EPA's and Olin's NDMA mass calculations within the various NDMA concentration contours were not significant enough to change the general approach to conceptualizing alternatives in the *FS Report Volume II* to address DAPL and groundwater hot spots.

[26] See **Figure 3**, *N-nitrosodimethylamine (NDMA) Concentrations in Shallow Overburden Groundwater* and **Figure 4**, *N-nitrosodimethylamine (NDMA) Concentrations in Deep Overburden Groundwater* in **Appendix C** of this ROD.

[27] These figures represent Olin's estimates of the mass of NDMA within these three concentration contours. EPA's NDMA mass estimates are 1,361 g, 3,129 g, and 3,599 g for the 11,000 ng/L, 5,000 ng/L, and 1,100 ng/L NDMA contours, respectively. Differences between EPA's and Olin's NDMA mass calculations within the various NDMA concentration contours were not significant enough to change the general approach to conceptualizing alternatives in the *FS Report Volume II* to address DAPL and groundwater hot spots.

Included with the interim remedy are a set of Institutional Controls that will prohibit the use of groundwater in the OU3 groundwater study area unless it can be demonstrated to EPA, in consultation with the Commonwealth, that such use will not pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy. In parallel to the interim remedy, groundwater studies will continue as part of the OU3 RI/FS to close remaining data gaps and evaluate long-term groundwater remedial alternatives. At the conclusion of the data gaps investigation for groundwater, EPA will prepare an FS that will evaluate additional alternatives targeted at restoration of the aquifer. These alternatives will include options for addressing contamination beyond the 5,000 ng/L contour.

Final Action – LNAPL Cleanup Levels
The removal of LNAPL is not based on attainment of media-specific concentrations of specific contaminants or a chemical-specific ARAR. The selected final action alternative includes LNAPL recovery that will remove floating LNAPL and will address LNAPL in the smear zone to the extent that natural fluctuations in the water table reach the extent of the smear zone. Some residual risk will remain, as this alternative will not remove all LNAPL from soil pores and LNAPL sorbed to soil particles. Mobile LNAPL will be greatly reduced; removed LNAPL will no longer act as a source of contaminants to groundwater. Free-phase LNAPL that would otherwise migrate towards and impact surface water will be removed by the MPE wells, therefore terminating the pathway that poses an unacceptable risk.

Final Action – Surface Water Performance Standards
The OU1/OU2 BHHRA (AMEC, 2015d) concluded that the cancer risk for the trespasser exposed to COCs in sediments and surface water in Off-Property West Ditch Stream is above the CERCLA acceptable risk range. The main risk contributor for the receptor is from the combined ingestion and dermal exposure to surface water for benzo(a)pyrene. The combined ingestion and dermal cancer risk for benzo(a)pyrene in surface water for the trespasser is 2.51×10^{-4}. The benzo(a)pyrene EPC in Off-Property West Ditch Stream surface water is 2.3 µg/L. The cumulative surface water HIs for the adolescent trespasser and for the adult trespasser are both below 1. Therefore, a risk-based surface water performance standard has been established for benzo(a)pyrene based on a target cancer risk of 1×10^{-4} – 0.9 µg/L – which will be used to assess the progress of Alternative LNAPL/SW-3 in groundwater treatment and this alternative's effects on surface water quality. This target cancer risk level was selected because benzo(a)pyrene was the sole risk driver for exposure to surface water and sediment in Off-Property West Ditch Stream. In addition, there may be other sources of benzo(a)pyrene not related to the Site.

The *July 2015 Final OU1/OU2 RI Report* (AMEC, 2015a) and OU1/OU2 BHHRA (AMEC, 2015d) indicate potential off-Property sources of benzo(a)pyrene and other PAHs in Off-Property West Ditch Stream surface water, including stormwater runoff from parking lots, nearby creosote-treated railroad ties, and stormwater runoff from roadways. The *July 1, 2020 Risk Calculations* summarize health risks and document the basis for human health risk-based PRGs for surface water (Wood, 2020c).

The ecological risk-based COCs for surface water were identified as the Site-related contaminants in South Ditch Stream surface water with concentrations above screening benchmarks and site-specific chronic NRWQC. For each medium and exposure scenario, chemicals with HI values above 1 for RME scenarios were identified as COC candidates. Ecological risk-based surface water performance standards have been established for chromium (0.1 mg/L) and ammonia (9 mg/L), which will be used to assess the progress of Alternative LNAPL/SW-3 in groundwater treatment and this alternative's effects on surface water quality.

Final Action – Soil and Sediment Cleanup Levels and Performance Standards
Soil cleanup levels have been established to address human health and ecological risks, and sediment cleanup levels have been established to address ecological risks.

The OU1/OU2 BHHRA concluded that calculated RME cancer risk and non-cancer HI values were below 10^{-4} and 1, respectively, for soil exposure (incidental ingestion, dermal contact, and inhalation of soil-derived dust), and sediments (incidental ingestion and dermal contact) (AMEC, 2015d). However, the *2020 Residential Human Health Risk Evaluation Memo* calculated a RME cancer risk of 4.1×10^{-3} and non-cancer HI = 31 for a future resident based on metals and benzo(a)pyrene for upland soil exposure (ingestion, dermal contact, and inhalation of airborne dust) (Bluestone, 2020). Because these risks will be addressed by Institutional Controls, human health-based cleanup levels were not established for upland soil.

The OU1/OU2 BERA included evaluation of multiple assessment endpoints and measurement endpoints. Each of the assessment endpoint/measurement endpoint combinations were assigned an Inference Weight (Low, Medium, and High) used in interpreting the results for the various assessment endpoint/measurement endpoint combinations. The OU1/OU2 BERA evaluated risks to ecological receptors based on multiple assessment endpoints and measurement endpoints using a Four-Way Interpretive Risk Matrix and a Two-Way Interpretive Matrix that had previously been developed for EPA (pages 5-1 and 5-2 of the OU1/OU2 BERA).

Based on the OU1/OU2 BERA conclusions, ecological risk-based cleanup levels were derived for chromium and BEHP in soil (upland soil, wetland soil, and streambank soil), chromium and BEHP in sediments, and chromium and ammonia in surface water. The cleanup levels for upland soil, wetland soil, streambank soil, and sediments were derived using the risk calculations for food chain exposure modeling which were identified as having medium or high inference weight in the ecological risk characterization. For each medium (i.e. upland soil, wetland soil, streambank soil, sediments) and exposure scenario, chemicals with HI values above 1 for RME scenarios were identified as Site COC candidates. The cleanup levels for soil and sediments represent concentrations associated with target HI values of 1 or above.

Final Action – Indoor Air Performance Standard
Soil cleanup levels (source medium cleanup levels) that address VI were not established for TMPs due to the uncertainty with predicting indoor air impacts caused by soil contamination (Wood, 2020b). Based on information presented in the *July 2015 Final OU1/OU2 RI Report* (AMEC, 2015a) and the associated OU1/OU2 BHHRA (AMEC, 2015d), there are no occupied buildings in contact with the ground surface at the Property in locations where TMPs have been identified in soil,[28] and therefore, a complete VI pathway does not exist under current conditions.

[28] An office trailer is currently maintained on the Property, from which Olin staff operate and maintain the Plant B groundwater remediation system. However, there is open airspace between the trailer floor and the ground surface.

TMP concentrations in soil within HH-EA-1, HH-EA-3, and HH-EA-7 indicate a potential concern for subsurface-to-indoor air VI in future occupied buildings. In the OU1/OU2 BHHRA, it was not possible to estimate VI-related potential indoor air concentrations and associated industrial/commercial employee risks for future buildings without significant uncertainty; however, potential VI risks may be addressed by preventing VI into a building via engineering controls or by removing and/or treating soil with elevated TMP concentrations.

TMPs are not classified as carcinogens by EPA; therefore, an indoor air performance standard has been established based on toxicity information for non-cancer effects. The performance standard was set for a commercial/ industrial indoor worker being on the Property 8 hours per day for 250 days per year. The calculated indoor air performance standard for TMPs based on a target HQ of 1 is 0.175 mg/m^3. Details supporting the development of this performance standard are included in Section 2.1.3.1 of the *FS Report Volume I.*

M. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Site, which includes an interim action to address current and potential future risks caused by groundwater contamination and a final action to address all current and potential future risks caused by LNAPL, surface water, soil, and sediment contamination, is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, will comply will ARARs, and is cost-effective. In addition, the selected remedy utilizes permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practicable, and partially satisfies the statutory preference for treatment that permanently and significantly reduces the mobility, toxicity, or volume of hazardous substances as a principal element to the maximum extent practicable.

1. The Selected Remedy is Protective of Human Health and the Environment

The selected interim remedy for OU3 for DAPL and groundwater will protect human health and the environment in the short term, until a final ROD is implemented. The selected remedy will remove and treat uncontrolled DAPL sources, a major source of contamination to downgradient groundwater, and extract and treat hot spot groundwater that would otherwise migrate uncontrolled. By removing DAPL and extracting hot spot groundwater, the timeframe for groundwater restoration may also be decreased. The selected interim remedy for OU3 will use Institutional Controls to prevent future exposures to groundwater contaminants.

COCs in groundwater hot spots to be addressed by the selected remedy are currently above acceptable levels and pose future unacceptable risks. Available treatment technologies are technically feasible and have been proven to be effective at other sites to degrade or destroy the groundwater contaminants. Implementation of the selected interim remedy will not pose unacceptable short-term risks. While potential adverse cross-media impacts may occur due to the civil site work associated with interim remedy implementation, the design and implementation of the remedy, and associated treatment and monitoring efforts will be conducted to minimize impacts to nearby streams and wetlands, including surface water that receives discharges from the DAPL and groundwater treatment system(s).

The selected final remedy for OU1 and OU2 will adequately protect human health and the environment by eliminating, reducing, or controlling exposures to human and environmental receptors through caps and cover systems, excavation, treatment, engineering controls, long-term monitoring, and Institutional Controls.

The selected remedy will reduce potential human health risk levels such that they do not exceed EPA's target risk range of a total ELCR of 10^{-6} to 10^{-4} and/or a non-cancer HI greater than 1.0. It will reduce potential human health risk levels to protective ARARs levels (i.e., the remedy will comply with ARARs and risk-based standards derived using TBC criteria). In addition, unacceptable ecological risks associated with exposure to wetland sediment/soil will be eliminated by permanent removal of impacted wetland sediment/soil and wetland restoration.

More specifically, the selected remedy for OU1/OU2 includes the following components: a low-permeability cap that meets RCRA Subtitle D and Massachusetts solid waste landfill performance standards above the contaminated soil in and near the Containment Area along with closure of the equalization window, covering all upland soil areas containing elevated levels of Site COCs above cleanup levels with clean soil or pavement, excavation and off-site disposal of all wetland soil and sediments containing elevated levels of Site COCs above cleanup levels, and additional vapor intrusion evaluations to assess risks and/or the use of vapor barriers and/or sub-slab depressurization systems if buildings are constructed or altered in areas containing soil contaminated with TMPs at levels that may pose a vapor intrusion risk. The selected remedy for OU2 includes the following components: MPE wells to extract LNAPL and contaminated groundwater, and groundwater extraction wells to prevent the overburden groundwater plume from contaminating surface water.

The components of the OU1/OU2 remedy will be protective of human health and the environment by preventing exposure to and minimize leaching of soil COCs in the Containment Area to groundwater, eliminating the exposure pathways from upland and wetland soil for ecological receptors, and preventing the migration of soil vapor into buildings, eliminating future exposures to indoor workers. The components of the OU2 remedy will be protective of human health and the environment by preventing the release of LNAPL into East Ditch Stream, as well as using groundwater extraction wells to prevent the overburden groundwater plume from impacting Site surface water.

Long-term monitoring of groundwater, surface water, and the vapor intrusion pathway will ensure the remedy remains protective until cleanup levels and performance standards are met. The selected final remedy for OU1 and OU2 will use Institutional Controls to accomplish the following: prohibit future residential, school, and daycare use at the Property; maintain the integrity of caps, cover systems, and other remedial components and prevent the disturbance of any engineered systems and any other new and existing remedy infrastructure components; prevent contact with soil beneath caps and cover systems; and require either a vapor intrusion evaluation or vapor mitigation system be installed if a new building is constructed or modified on the Property. Implementation of the selected remedy will not pose any unacceptable short-term risks or cause cross-media impacts.

2. The Selected Remedy Complies with ARARs

Because the selected remedy for OU3 DAPL and groundwater hot spots is an interim action, compliance with chemical-specific ARARs is not expected to be achieved at this time. Chemical-specific ARARs have therefore not been identified. The selected interim remedy for DAPL and groundwater hot spots is a limited scope action and will comply with location-specific and action-specific ARARs and TBCs described in **Appendix D** of this ROD.

The selected final remedy for OU1 and OU2 will comply will all federal and any more stringent state ARARs identified for the Site. The selected remedy will also incorporate procedures and processes identified by a number of policies, advisories, criteria, and guidance documents (To Be Considered). A detailed list of ARARs/To Be Considered requirements for the selected final remedy for OU1 and OU2 is included in **Appendix D** of this ROD. A discussion of the more significant ARAR issues is include below.

Wetlands Impacts
Issuance of the ROD embodies specific ARARs determinations made by EPA, pursuant to federal regulatory standards. More specifically, as defined by Section 404(b) of the Clean Water Act and regulations promulgated under the Act at 40 CFR Parts 230, 231, and 33 CFR Parts 320-323, EPA has determined, with issuance of this ROD, that the selected remedial action is the Least Environmentally Damaging Practicable Alternative (LEDPA) for protecting federal jurisdictional wetlands and aquatic ecosystems at the Site under these standards. The selected remedy includes activities that will impact wetlands. Extraction wells, piping, and temporary (but possibly permanent) access roads will need to be installed in the MMB wetlands to address contaminated groundwater beneath the wetlands. In addition, the excavation of contaminated sediment will occur in portions of wetlands and surface water bodies. EPA has determined that because significant levels of contamination exist in sediment and wetland soil and within OU3 groundwater beneath the MMB wetlands, there is no practicable alternative to permanently removing the contaminants from these wetlands and from installing the necessary remedial infrastructure to implement the OU3 interim remedy. EPA has determined that the cleanup activities that impact wetlands are the LEDPA because they are necessary for the interim OU3 remedy and will permanently remove contaminants that are impairing sediments and wetland soil, and that any wetland resources altered by the cleanup will be restored to original grades and with native vegetation. The selected remedy provides the best balance of achieving the RAOs with minimizing both temporary and permanent alteration of wetlands. EPA will minimize potential harm and avoid adverse impacts to wetlands, to the extent practicable, by using best management practices during excavation and construction activities to minimize harmful impacts on the wetlands, wildlife, or habitat, and by restoring these areas consistent with federal and state wetlands protections laws. Any wetlands affected by remedial work will be restored to their original condition as a wetland area if practicable, or a new wetland area will be created within the same vicinity and any restoration or replacement efforts will be monitored until the wetland vegetation becomes re-established. Mitigation measures will be used to protect wildlife and aquatic life during remediation, as necessary.

In compliance with relevant and appropriate Wetland Protection and Floodplain Management regulations (44 CFR Part 9), EPA solicited public comment through the Proposed Plan on the proposed cleanup's impacts on wetland resources within the Proposed Plan. EPA's responses to general comments regarding wetland issues are located in **Part 3**, The Responsiveness Summary, of this ROD.

Floodplain Impacts
Further, EPA solicited public comment, under 44 CFR Part 9, through the Proposed Plan, on its determination that there is no practicable alternative to temporarily occupy and/or temporarily modify portions of the 100-year and 500-year floodplains within the Site in the MMB wetlands (see **Figure 5** in **Appendix C** of this ROD) in order to implement the proposed cleanup plan, but after completion of work there will not be any net loss of flood storage capacity. EPA also solicited public comment on its determination that the proposed cleanup plan will not result in occupancy and modification of the 500-year floodplain within the Property (see also **Figure 5** in **Appendix C** of this ROD), that a stormwater study will be undertaken as part of the PDI phase to confirm that this is the case, and that if impacts are found to be unavoidable while implementing the cleanup actions, appropriate measures will be incorporated into the cleanup design and subsequently implemented during the RA phase to ensure that current flood storage capacities and any adjacent wetlands are not diminished after completion of the proposed remedial actions. To address remedial measures that may affect floodplain resources, any excavation will be backfilled with clean fill and then restored to its original grade, to the extent practicable, so that the current flood storage capacity of these areas and any adjacent wetlands will not be diminished after completion of the proposed remedial actions. Moreover, EPA will avoid or minimize potential harmful temporary and permanent impacts on floodplain resources, to the extent practicable, within the Containment Area and MMB wetlands. Best management practices will be used during construction, which include erosion control measures, proper re-grading, and restoration and monitoring of impacted areas. EPA's responses to general comments regarding floodplain issues are located in **Part 3**, The Responsiveness Summary, of this ROD.

National Historic Preservation Act, Section 106
The National Historic Preservation Act, and the state equivalent law, require that prior to work taking place, a federal agency consider the effects of its undertaking on historic properties. EPA must consult with the state historic preservation officer (SHPO) as well as any interested tribal historic preservation officers (THPO) in making determinations and findings concerning the effects of its undertakings on historic property.

EPA initiated consultation with the Massachusetts Historical Commission (SHPO) and the Mashpee Wampanoag Tribe (THPO) in January 2021. At that time, EPA identified the Middlesex Canal (Middlesex Canal Historic and Archaeological District), located in the off-Property area of the Site and in close proximity to Maple Meadow Brook, as having historic significance. EPA does not anticipate any impacts to the Middlesex Canal from the construction or operation of the groundwater remedy. No remedial infrastructure is planned for the Middlesex Canal or its environs. The Town of Wilmington has designated an area within the Town – Wilmington Centre Village – from Middlesex Drive and Church Street, from Adams Street to Wildwood Cemetery, as a historic district. Other places and landmarks within the Town are also listed on the National Register of Historic Places, but such places and structures are not within the bounds of the Property, nor within off-Property areas where remedial equipment may be located for the purposes of implementing the remedy.

EPA will continue to consult with the SHPO and THPO during the RD to determine whether implementation of the remedy will adversely impact historic, archaeological, or cultural resources eligible for, or already listed on, the National Register of Historic Places. If any such adverse impacts cannot be avoided, EPA will work with the SHPO and THPO to develop a set of activities to mitigate those impacts, which will be memorialized in a Memorandum of Agreement between the parties.

3. The Selected Remedy is Cost-Effective

In EPA's judgment, the selected remedy is cost-effective because the remedy costs are proportional to its overall effectiveness (see 40 CFR § 300.430(f)(1)(ii)(D)). This determination was made by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (*i.e.*, that are protective of human health and the environment and comply with all federal and any more stringent state ARARs, or as appropriate, waive ARARs). Overall effectiveness was evaluated by assessing three of the five balancing criteria—long-term effectiveness and permanence; reduction in toxicity, mobility, or volume through treatment; and short-term effectiveness, in combination. The overall effectiveness of each alternative was then compared to the alternative's cost to determine cost-effectiveness. The relationship of the overall effectiveness of the remedial alternatives was determined to be proportional to their costs and hence represents a reasonable value for the money to be spent.

The combined DAPL and groundwater hot spots, LNAPL and surface water, and soil and sediment alternatives range in cost from $0 to $83.7 million. The range in estimated cost for the four DAPL/GWHS alternatives is $0 (DAPL/GWHS-1: No-Action) to $40.5 million (DAPL/GWHS-4). The range in estimated cost for the four LNAPL/SW alternatives is $0 (LNAPL/SW-1: No Action) to $9 million (LNAPL/SW-2 and 4). The range in estimated cost for the four SOIL/SED alternatives is $0 (SOIL/SED-1: No Action) to $34.2 million (SOIL/SED-4).

The selected interim remedy for DAPL and groundwater hot spots, Alternative DAPL/GWHS-3, is comparable to Alternative DAPL/GWHS-4 in terms of long-term effectiveness, reduction of toxicity, mobility, or volume through treatment, and short-term effectiveness. Both alternatives would achieve the removal and treatment of an estimated 14.8 million gallons of DAPL in an estimated 6 years, which is approximately 5% more DAPL than would be removed and treated under Alternative DAPL/GWHS-2 in an estimated 20 years. Alternative DAPL/GWHS-4 would remove and treat an estimated 110.3 million gallons of hot spot groundwater in an estimated 8 years, which is 41.9 million gallons more than would be removed and treated under Alternative DAPL/GWHS-3 in an estimated 6.5 years. However, Alternative DAPL/GWHS-4 would remove only an additional 307 g of NDMA (approximately 4%) from hot spot groundwater and DAPL compared to Alternative DAPL/GWHS-3 (7,320 g of NDMA for DAPL/GWHS-4 and 7,013 g of NDMA for DAPL/GWHS-3). In contrast, Alternative DAPL/GWHS-2 would only remove and treat 17.1 million gallons of hot spot groundwater in an estimated two to three years, resulting in removal and treatment of 4,159 g of NDMA.

As the number of extraction wells increases from Alternative DAPL/GWHS-2 to Alternative DAPL/GWHS-4, there are increasing short-term impacts to the community, workers, and the environment from well drilling and associated construction activities and piping installations (an estimated 7-8 wells, 26 wells, and 32 wells under Alternatives DAPL-GWHS-2, -3, and -4, respectively). The total net present value of the active alternatives is as follows: DAPL/GWHS-2 - $22.5 million; DAPL/GWHS-3 - $35.5 million; and DAPL/GWHS-4 - $40.5 million. Alternative DAPL/GWHS-3 would achieve approximately 4% less of a reduction of NDMA mass in overburden groundwater, but is nearly $5 million less expensive than Alternative DAPL/GW-4, and has slightly higher short-term effectiveness. Alternative DAPL/GWHS-3's costs are proportional to its overall effectiveness and it is therefore cost-effective.

The selected final remedy for LNAPL and surface water, Alternative LNAPL/SW-3, would remove an estimated 90% of the LNAPL for treatment, compared with an estimated 65% removal of LNAPL for Alternative LNAPL/SW-2. Although LNAPL/SW-4 would excavate all of the LNAPL, it would achieve less overall reduction in toxicity, mobility, or volume through treatment because the LNAPL-contaminated soil to be excavated will only be treated to a limited degree to facilitate off-site disposal of the material. Under all of the LNAPL/SW alternatives, groundwater containing COCs that would otherwise enter the streams would be permanently removed and treated, with the time to construct the PRBs in Alternative LNAPL/SW-4 being approximately two months and the time to construct the groundwater extraction and treatment system(s) under Alternatives LNAPL/SW-2 and -3 being two to three years. An estimated one year is the timeframe for remediating LNAPL under Alternatives LNAPL/SW-2 through -4.

Alternative LNAPL/SW-4 has the highest short-term impacts due to potential risks to the community from releases of vapor and transport of materials through the community, as well as structural stability issues in excavating close to the MBTA railroad tracks, and trenching for the PRBs occuring in sensitive environmental areas. Alternatives LNAPL/SW-2 and -3 are expected to pose minimal short-term risk to the community, workers, and the environment. The total net present value of the active alternatives is as follows: LNAPL/SW-2 - $9 million; LNAPL/SW-3 - $6.6 million; and LNAPL/SW-4 - $9 million. Alternative LNAPL/SW-3's costs are proportional to its overall effectiveness and it is therefore cost-effective.

The selected final remedy for soil and sediments, Alternative SOIL/SED-2, would be comparably effective in the long term to Alternative SOIL/SED-3. Both alternatives would leave some contaminants in place but would nonetheless be protective of human health and the environment. Under Alternative SOIL/SED-2, upland soil contaminants would be covered in place, which may pose potential future ecological risk if contaminants were to be exposed. Under Alternative SOIL/SED-3, upland soil contaminants would remain below one foot, which also could pose potential future ecological risk if contaminants were to be exposed. Both of these alternatives include long-term maintenance and would be protected by Institutional Controls to prevent disturbance of the soil covers. Additionally, under Alternative SOIL/SED-3, some TMPs would likely remain sorbed to soil and not be fully removed but vapor capture would effectively control TMPs during treatment and residual risk would be low. Alternative SOIL/SED-4 would be the most effective in the long-term, as this alternative provides for removal of greater quantities of contaminated soil and contamination that is furthest from the surface than either Alternative SOIL/SED-2 or -3.

All of the SOIL/SED alternatives would excavate and disposal off-site wetland soil and sediments with contaminants above cleanup levels. Alternatives SOIL/SED-2 and -4 provide comparably low reductions in contaminant toxicity, mobility, or volume through treatment because the components of these alternatives require either caps/covers or excavation and clean soil covers, as opposed to primary treatment. Alternative SOIL/SED-3 provides a slightly higher degree of reduction in contaminant toxicity, mobility, or volume through treatment because it contains the only active treatment component – air sparging/SVE for TMPs. Alternative SOIL/SED-2 would be the most effective in the short-term because it requires the smallest volume of contaminated soil and sediments (approximately 6,000 tons, compared with 10,000 tons for Alternative SOIL/SED-3 and 130,000 tons for SOIL/SED-4) to be transported off site, and all of the SOIL/SED alternatives would be constructed in approximately two years.

Additionally, the required deep soil excavation and soil and water management for Alternative SOIL-SED-4 would pose a high potential for direct contact and vapor exposure compared to the other alternatives, and this alternative may also require excavation support to protect the railroad, which would entail greater risks to workers. Short-term environmental impacts are considerable under Alternatives SOIL/SED-3 and -4, but less so under Alternative SOIL/SED-2 due to the smaller area of excavation. The total net present value of the active alternatives is as follows: SOIL/SED-2 - $6 million; SOIL/SED-3 - $7.5 million; and SOIL/SED-4 - $34.2 million. Alternative SOIL/SED-2's costs are proportional to its overall effectiveness and it is therefore cost-effective.

Table K-1 in **Appendix B** helps demonstrate the cost-effectiveness of the selected remedies.

4. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedy for DAPL and groundwater hot spots, as an interim remedial action, represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. EPA also determined that the selected remedy for DAPL and groundwater hot spots provides the best balance of tradeoffs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and considering state and community acceptance.

The selected remedy for DAPL and groundwater hot spots satisfies the long-term effectiveness criterion by removing DAPL and hot spot groundwater. The treatment of DAPL and hot spot groundwater is expected to effectively decrease contaminant mobility and volume and may also decrease the potential for exposure to Site-related contaminants. The selected remedy for DAPL and groundwater hot spots does not present any short-term risks that cannot be readily mitigated. The interim remedial action can be implemented using available technology and resources.

Once the Agency identified those final alternatives for LNAPL and surface water, and soil and sediments that attain or, as appropriate, waive ARARs and that are protective of human health and the environment, EPA identified which alternatives utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by deciding which one of the identified alternatives provides the best balance of trade-offs among alternatives in terms of: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility, or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost. The balancing test emphasized long-term effectiveness and permanence and the reduction of toxicity, mobility, or volume through treatment; and considered the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance. The selected final remedies for LNAPL and surface water, and soil and sediments provide the best balance of trade-offs among the alternatives.

The selected final remedy for LNAPL, surface water, soil, and sediments is protective of human health and the environment, uses proven cleanup technologies such as caps and cover systems, excavation, off-site disposal, treatment, engineering controls and Institutional Controls, and is cost-effective, while achieving the Site-specific cleanup objectives in a reasonable timeframe. This cleanup approach provides both short- and long-term protection of human health and the environment; attains all applicable or relevant and appropriate federal and state environmental laws and regulations; reduces the toxicity, mobility, or volume of contaminated soil, sediments, and groundwater impacting surface water through treatment, to the maximum extent practicable; utilizes permanent solutions and uses land use restrictions to prevent unacceptable exposures in the future to the contaminants that will remain at the Site.

5. The Selected Remedy Partially Satisfies the Preference for Treatment Which Permanently and Significantly Reduces the Toxicity, Mobility, or Volume of the Hazardous Substances as a Principal Element

As indicated in **Section E**, **STATUTORY DETERMINATIONS** of **Part 1** of this ROD, as an interim solution, the limited scope of the interim remedy for DAPL and groundwater hot spots is not intended to address the statutory mandate to utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Because the interim remedy does not constitute the final remedy for groundwater at the Site, the statutory preference in CERCLA Section 121(b)(1) for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element will be addressed by the final response action. Nonetheless, the interim remedy does employ active treatment components, including the methodologies described above in **Section L, THE SELECTED REMEDY** of **Part 2** of this ROD, to address the principal threat waste of NDMA-containing DAPL and groundwater hot spots, with off-site disposal of the residual solids resulting from DAPL treatment.

The principal elements of the selected final remedy for OU1 and OU2 addressing LNAPL, surface water, soil, and sediments are source control and management migration. The final remedy includes treatment of the recovered LNAPL via oil/water separation, the soil vapor via GAC, and the captured groundwater via the same treatment system(s) as for hot spot groundwater before discharge to surface water. Additionally, excavated soil or sediments that exhibit a hazardous waste characteristic or soil/sediments that are excavated from below the water table would be treated (stabilized) by adding Portland cement, lime, or another suitable stabilizing agent to reduce contaminant mobility prior to off-site disposal. Water generated from excavation/dewatering soil prior to off-site disposal would also be treated to reduce toxicity prior to discharge to surface waters. With the exception of these treatment elements, the selected final remedy for OU1 and OU2 soil and sediments includes either caps/covers or excavation and clean soil covers, as opposed to primary treatment, to reduce the toxicity, mobility, and volume of contaminated soil and sediments. By using treatment as a significant portion of the interim remedy for DAPL and groundwater hot spots and partially for the final remedy for LNAPL, surface water, soil, and sediments, the statutory preference for remedies that employ treatment as a principal element is partially satisfied.

6. Five Year Reviews of the Selected Remedy are Required

At the conclusion of the remedy construction, hazardous substances, pollutants, or contaminants will remain at the Site. Therefore, as required by law, EPA will review the Site remedy to ensure that the remedial action continues to protect human health and the environment at least once every five years as part of the Agency's Five Year Reviews for the entire Site. These Five Year Reviews will evaluate the components of the Site remedy for as long as contaminated media above CERCLA risk levels remain in place.

N. DOCUMENTATION OF NO SIGNIFICANT CHANGES

EPA presented the Olin Chemical Proposed Plan for remediation of the Site to the public for review and comment on August 10, 2020. The Proposed Plan described the alternatives considered and EPA's preferred alternatives for the selected remedy.

EPA reviewed all verbal comments submitted during the formal public hearing on September 22, 2020 and reviewed all written comments submitted during the public comment period, which began on August 26, 2020, and ended on October 26, 2020. Based upon a review of the comments, EPA determined that one change to the August 2020 Proposed Plan is necessary based on a comment that the PRG for ammonia in surface water is too high.

In response to this comment, EPA re-evaluated the surface water performance standards for ammonia (see Nobis, 2021). The surface water PRGs for ammonia were calculated using procedures described in the Aquatic Life Ambient Water Quality Criterion for Ammonia – Freshwater (USEPA, 2013a). The Criterion Continuous Concentration (CCC) is a value below which adverse effects would not be expected for the majority of aquatic receptors. For ammonia, the CCC is based in part on the temperature and pH of the water body or stream. EPA believes that the site-specific assumptions used for pH are appropriate, and pH has been, overall, less variable over time in both the South Ditch Stream and East Ditch Stream.

However, EPA believes that a slight adjustment in the PRG is needed based on the assumptions used for temperature. The PRG for ammonia presented in the Proposed Plan was based on an average spring instream temperature of 7.13 °C for East Ditch Stream and 6.92°C for South Ditch Stream**.** While EPA agrees that generally spring temperatures should be utilized as the basis, EPA believes that it is more appropriate to use an average of the in-stream temperatures in late spring (between May – June, not January – March as was utilized in the Proposed Plan). Late spring temperatures reflect a period when aquatic receptors will be more active, and epi-benthic organisms that are exposed to ambient water will be present in the water column. Also, the BERA assumes that the Marsh Wren and Green Heron may forage on-site. Adjusting to late spring temperatures would account for the time when both species would be present and breeding in New England. Therefore, EPA believes that the performance standard should be adjusted to **9 mg/L** from 15 mg/L in the Proposed Plan, based on an in-stream temperature of 18 °C and pH of 6.6 (see **Table L-2** in **Appendix B** of this ROD). The in-stream temperature is the 95% upper confidence level (UCL) of the temperature values from mid-May through June for the East Ditch Stream.

Additionally, EPA is clarifying that the proposed indoor air cleanup level for TMPs in upland soil included in Table 2 of the August 2020 Proposed Plan has been reclassified as a "performance standard." EPA has decided that the term "performance standard" is appropriate with regards to TMPs because the TMPs component of the selected remedy does not include active treatment of TMPs in soil. Rather, buildings constructed on the Property in the future will be required to meet the specified performance standard for indoor air.

O. STATE ROLE

The Commonwealth of Massachusetts, through MassDEP concurs with the selected remedy for the Site. A copy of the declaration of MassDEP's concurrence is attached as **Appendix A** of this ROD.

PART 3: THE RESPONSIVENESS SUMMARY

A. PUBLIC COMMENTS AND EPA RESPONSES

EPA published the notice of availability of the Proposed Plan and Administrative Record for the Olin Chemical Superfund Site (Site) in the Wilmington Town Crier on August 12, 2020 and released the Proposed Plan to the public by posting a publicly accessible link on EPA's website.

From August 26, 2020 through September 25, 2020, EPA held a thirty-day public comment period to accept public comments on the alternatives presented in the Feasibility Study (FS) and Proposed Plan, and on any other documents previously released to the public. In response to a request from a community member, EPA extended the public comment period an additional thirty days – through October 26, 2020 – for a total of sixty days. On August 25, 2020, EPA held a public informational meeting to provide an overview of the Site history and investigation findings, describe EPA's Proposed Plan, and answer questions. On September 22, 2020, EPA held a Public Hearing to accept oral comments.

In order to adhere to guidance from the Centers for Disease Control (CDC) and state and local restrictions on large gatherings due to the Covid-19 pandemic, both the August 25, 2020 and September 22, 2020 events were conducted virtually via the Adobe Connect platform with closed captioning, including an option to connect to the conference audio via telephone. Both events were simulcast on the local cable access television station – WCTV. Prior to the informational meeting, a copy of EPA's presentation, including the audio recording of EPA's remarks, was available on EPA's webpage for the Site.

During the Public Hearing, three comments were received from local elected officials, one comment was received from a state elected official, four comments were received from members of the local Community Advisory Group (CAG), and two comments were received from Wilmington residents. Additionally, 22 sets of written comments were received from Wilmington residents, the Town of Wilmington Board of Selectmen and the Town's consultant, the Wilmington Environmental Restoration Committee (WERC), Olin Corporation (Olin), Wilmington Woburn Intermodal LLC (WWI) and members of the Massachusetts Institute of Technology (MIT) community during the public comment period. Outlined below is a summary of comments received from the public and other interested parties during the public comment period and EPA's response to those comments. The full text of both the written and oral comments received during the comment period has been included in the Administrative Record for the Site.

B. SUMMARY OF COMMENTS RECEIVED AT THE SEPTEMBER 22, 2020 PUBLIC HEARING

Comment #1 (Jeffrey Hull, Town Manager; Jonathan Eaton, Chairman, Wilmington Board of Selectmen; and Stephanie Baima, WERC)

The goal of the groundwater remediation should be the restoration of the Town of Wilmington's drinking water.

EPA Response:

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the regulations governing the assessment and cleanup of sites under Superfund, describes EPA's expectations for groundwater restoration and states that EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site. When restoration of ground water to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated ground water, and evaluate further risk reduction. 40 C.F.R. § 300.430(a)(1)(iii)(F). Portions of the aquifer at the Site are classified as drinking water sources. Furthermore, the Massachusetts Department of Environmental Protection (MassDEP) has assigned a high use and value for the Site area aquifer in its Groundwater Use and Value Determination (MassDEP, 2010a). As such, the goal for the groundwater would be to restore this aquifer to its beneficial use, unless it is determined not to be practicable. There is insufficient data at this time to make this determination. Further work is underway to finish characterizing the nature and extent of contamination in the aquifer and to develop and evaluate a set of alternatives to address the groundwater contamination. Once this investigation is completed, EPA will issue a final Record of Decision (ROD) for groundwater identifying the final cleanup goals for groundwater at the Site.

Comment #2

(Jeffrey Hull, Town Manager) Site redevelopment must wait for the completion of remedial activities or work around any remedial activities.

(Suzanne Sullivan, WERC) Any remaining data gaps should be filled prior to redevelopment and closeout of Operable Unit 1 (OU1) and Operable Unit 2 (OU2). Operable Unit 3 (OU3) should not be separated from OU1 and OU2.

EPA Response:

While EPA does not dictate the terms of redevelopment, if redevelopment occurs, EPA will ensure that such redevelopment does not adversely impact the selected remedy for the Site and EPA's efforts to collect more data as needed to select and implement a final remedy for groundwater (OU3). EPA will also ensure that the developer refrains from using the Olin property (Property) in any manner that would interfere with or adversely affect the implementation, integrity, or protectiveness of any past or future response actions.

EPA has divided the cleanup of the Site into Operable Units (OUs) in order to expedite the remediation for those source areas considered to be sufficiently characterized to move forward with remedy selection. While the primary sources of impacts to groundwater (OU3) are addressed as interim actions in this selected remedy, significant data gaps remain regarding the extent of groundwater impacts, particularly in bedrock. The OU3 Remedial Investigation (RI) is ongoing and will incorporate the additional chemical, geological, and hydrogeological data collected. EPA is working closely with Olin to ensure that the OU3 RI, including the ongoing data gaps investigation, is comprehensive and will result in data of sufficient quality and quantity to support development of an FS and final remedy for Site groundwater.

Comment #3

(Jeffrey Hull, Town Manager) The remediation goal for the groundwater hot spot should be lowered below 5,000 nanograms per Liter (ng/L) as soon as practicable.

(Gary Mercer and Suzanne Sullivan, WERC) The groundwater hot spot should use 1,100 ng/L as the remedial goal.

EPA Response:

Remediation goals and cleanup levels for groundwater will be established by EPA in the final remedy for groundwater (OU3). The 5,000 ng/L and 1,100 ng/L n-nitrosodimethylamine (NDMA) concentration contours are not remediation goals. The 5,000 ng/L contour is the approximate area that EPA is targeting to begin mass removal of contaminants from the aquifer as an interim action. EPA evaluated several options for where to target the initial mass removal actions, including targeting the areas defined by the 1,100 ng/L, 5,000 ng/L, and 11,000 ng/L NDMA contours. According to Olin's calculations, the 5,000 ng/L contour contains an estimated 4,440 grams (g) of NDMA and would require the treatment of approximately 68.4 million gallons of water to remove this mass. The 1,100 ng/L contour contains an estimated 4,747 g of NDMA and would require the treatment of approximately 110.3 million gallons of water, almost twice the volume of water for an additional 307 g of NDMA removal. Since the goal of the interim action for groundwater is mass removal, the selected remedy appropriately targets the 5,000 ng/L contour based on mass of NDMA removed and the volume of groundwater requiring treatment. At the conclusion of the data gaps investigation for groundwater, EPA will prepare an FS that will evaluate additional alternatives targeted at restoration of the aquifer. These alternatives will include options for addressing the contamination beyond the 5,000 ng/L contour. The final ROD for OU3 will specify the final cleanup goals and the approach for achieving those goals.

Comment #4 (Jeffrey Hull, Town Manager)

Discharge of treated groundwater should minimize the transfer of groundwater from one watershed to the other.

EPA Response:

EPA agrees that in general, treated groundwater should be returned to the originating watershed to the extent feasible. However, years of data demonstrate that the water table across the impacted area is very flat with frequent mixing. Also, Dense Aqueous Phase Liquid (DAPL) and impacted groundwater within the bedrock fractures move independently from the watershed divide. Regardless, EPA considers the Site area aquifer (that is, groundwater from both watersheds) to be of high value, and the selected remedy includes extraction of groundwater, treatment at a newly constructed groundwater treatment system(s), and discharge to surface water. While the precise discharge location will be determined during the pre-design investigations (PDIs) of the Remedial Design (RD) phase, groundwater is not likely to be recharged under the selected remedy. However, long-term groundwater and surface water monitoring will be conducted, which will include evaluation of the impacts of extraction and discharge.

Comment #5 (Jeffrey Hull, Town Manager)

A permanent cap should be installed over the Containment Area.

EPA Response:

EPA agrees with the comment. The cap over the Containment Area will be a permanent feature. The remedial alternative including the cap also includes provisions for long-term monitoring and maintenance to ensure the cap's continued integrity and effectiveness. The cap will be subject to Five Year Reviews by EPA for as long as contamination remains in place above criteria allowing for unrestricted use (residential criteria).

Comment #6 (Jeffrey Hull, Town Manager and Jonathan Eaton, Chairman, Wilmington Board of Selectmen)

The Town of Wilmington is concerned about the imposition of restrictions of wells in the area and would like to receive examples of regulations or bylaws that EPA has developed for other communities.

EPA Response:

Comment noted. EPA will share examples of regulations developed by and for other communities. Institutional Controls on groundwater use are frequently implemented as part of remedies for Superfund sites. EPA's primary objective is the protection of public health; however, EPA understands the unintended consequences of overly restrictive controls. EPA will work closely and cooperatively with the Town of Wilmington to develop restrictions which provide for as much flexibility as possible with the goal of ensuring that members of the community are not exposed to contamination associated with the Site. EPA's general goals for the Institutional Controls include making sure that residents and other community members are not extracting water that is unsafe to use, and ensuring that groundwater extraction that may interfere with the implementation of EPA's remedy does not occur. One example of Institutional Controls is the Groundwater Management Zone created by the Town of Durham, Connecticut for the Durham Meadows Superfund Site (available at: https://ecode360.com/30752082).

Comment #7 (Jomarie O'Mahony)

The remedy selection should not consider cost.

EPA Response:

EPA is required by statute and regulation to consider cost in the Superfund remedy selection process. See *e.g.*, 42 U.S.C. § 9621(a)-(b); 40 C.F.R. §§ 300.430(e)(7)(iii) and 430(f)(1)(ii)(D). In addition, cost is included in EPA guidance (*Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. Interim Final.* October 1988. EPA/540/H-89/004) as a primary balancing criterion, along with long-term effectiveness and permanence, reduction of toxicity, mobility, and volume through treatment, short-term effectiveness, and implementability. The threshold criteria that must be met for remedy selection are overall protection of human health and the environment and compliance with Applicable and Relevant and Appropriate Requirements (ARARs). The preamble to the 1990 NCP (page 55 FR 8728 available at: https://semspub.epa.gov/work/HQ/174999.pdf and beginning on page 161 of the 376-page pdf) states in part (emphasis added):

> *...EPA notes that many alternatives will be protective but will achieve that protection through different methods or combinations of methods...alternatives may emerge from the detailed analysis as comparably "effective," in terms of the three effectiveness criteria of long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment and short-term effectiveness; in that event, the least costly of the comparably effective alternatives would be identified as cost-effective while the others would not. However, because the remedy selection process usually involves consideration of a range of distinct alternatives that generally vary in their effectiveness and cost, most often a comparative analysis of the relationship between the overall effectiveness of the alternatives and their costs will be required to determine which alternatives are cost-effective (i.e., provide overall effectiveness proportional to their costs)...*

The preamble to the 1985 NCP (see 55 FR 8727 available at https://semspub.epa.gov/work/HQ/174999.pdf and beginning on page 158 of the 376-page pdf, referencing 50 FR 47921) also explains the role of cost and states in part (emphasis added):

> *...The approach embodied in today's rule is to select a cost-effective alternative from a range of remedies that protects the public health and welfare and the environment. First, it is clear that if all the remedies examined are equally feasible, reliable, and provide the same level of protection, the lead agency will select the least expensive remedy. Second, where all factors are not equal, the lead agency must evaluate the cost, level of protection, and reliability of each alternative. In evaluating the cost of remedial alternatives, the lead agency must consider not only immediate capital costs, but also the costs of operating and maintaining the remedy for the period required to protect public health and welfare and the environment. For example, the lead agency might select a treatment or destruction technology with a higher capital cost than long-term containment because treatment or destruction might offer a permanent solution to the problem...*
>
> * * *

> *...Finally, the lead agency would not always select the most protective option, regardless of cost. The lead agency would instead consider costs, technology, reliability, administrative and other concerns, and their effects on public health and welfare and the environment. This allows selection of an alternative that is the most appropriate for the specific site in question...*

The preamble to the 1990 NCP states that it continues the approach outlined in the preamble to the 1985 NCP. The preamble (page 55 FR 8727) states in part:

> *...Today's rule continues the approach embodied in the 1985 NCP, although some of the terminology has changed. First, the approach promulgated today requires that alternatives are determined to be adequately protective and ARAR-compliant before cost-effectiveness is considered in remedy selection (see § 300.430(f)(1)(ii)(D)). Second, today's rule recognizes that a range of alternatives can be protective and ARAR-compliant, and that cost is a legitimate factor for choosing among such alternatives...*

Comment #8 (Gary Mercer, WERC)

An alternative should be developed for the removal of all impacted soils from within the Containment Area.

EPA Response:

EPA tasked Olin with developing an excavation and disposal alternative for Containment Area soil. This was developed in the *Interim Action Feasibility Study* (*FS Report Volume II;* Olin, 2020b) as "Alternative CA-3: Targeted Soil Removal." EPA's intent in developing this remedial option for the Containment Area was to establish an excavation alternative for all areas within the Containment Area where concentrations of Site contaminants exceed the Preliminary Remediation Goals (PRGs) for the Site. To conceptualize the alternative, excavation areas were assumed based on existing soil data where PRGs of 3 milligrams per kilogram (mg/kg) for bis-2-ethylhexylphthalate (BEHP) or 1,000 mg/kg for chromium were exceeded. The water table within the Containment Area is generally around 8 feet (ft) below ground surface (bgs). Assuming an excavation depth of 10 ft bgs yielded an in-situ volume of approximately 45,000 cubic yards of material to be excavated. However, given the limited sampling data from the Containment Area, EPA believes the actual volume would likely be significantly larger upon execution of the alternative. The limits of the excavation areas would be determined based on PDIs during the RD phase.

Significant implementability and worker safety concerns are associated with Alternative CA-3 with regard to shoring up 10-foot plus excavations across the Containment Area feature to address structural stability concerns, handling and transporting the large volume of waste materials off-site, and impacts to the community from increased transportation of hazardous materials, backfill, and other remedy-related equipment. The capping alternative selected for the Containment Area eliminates risks to human health and ecological receptors from direct exposure to Site contaminants, and prevents leaching of Site contaminants into groundwater, surface water, and sediments at levels that would pose unacceptable risks to human health and the environment, while creating the least risk and impacts to the community by handling the least amount of contaminated materials.

Comment #9 (Gary Mercer, WERC)

An alternative should be developed to consolidate impacted soils such as upland soils and trimethylpentene (TMP)-impacted soils within the Containment Area.

EPA Response:

EPA did consider an alternative that involved consolidation of impacted soil on the Property within the Containment Area. However, the alternative was screened out from consideration for two reasons. First, upland soil poses an ecological risk to birds that may feed in the area. These soils do not pose a significant risk of leaching to groundwater; therefore, an impermeable or low-permeability cap is not needed to eliminate the threat. Second, the volume of upland soil posing a threat to ecological receptors and TMP-containing soil posing a potential human health threat as presented in the FS was thought to significantly underestimate the actual volume. Although the FS depicts these areas to be finite based on the sampling conducted during the RI, the sampling data used to estimate these volumes of impacted soil are limited; the impacted areas requiring remediation are likely to be much larger, resulting in significantly larger volumes to manage. EPA anticipated that the contamination posing unacceptable ecological and human health threats was likely to be more widespread and would require extensive excavation of large volumes of soil which were not likely to fit within the footprint of the Containment Area.

According to the *FS Report Volume I* (Olin, 2020a), the total volume of soil that could be consolidated under the cap is 12,808 cubic yards (cy) or approximately 345,800 cubic feet (cf). This total was found by adding the volume of TMP-containing soil (5,648 cy), upland soil from 0 to 1 foot (ft) bgs (2,400 cy) minus an estimated 240 cy that would need to be transported off-site as hazardous waste for 2,160 cy total, and wetland soil and sediments from 0-1 ft bgs (roughly 5,000 cy). The area of the cap is approximately 200,000 square feet (sq. ft) or roughly 4.6 acres. Assuming that the slurry wall is fairly close to the edge of the cap, placing excavated soil within the Containment Area in a 1 ft-thick layer would use 1,613 cy per acre-ft. Taking the total volume of impacted soil of 12,808 cy and dividing by 1,613 cy per acre-ft yields 7.9 acre-ft. Assuming the entire cap area is used, 7.9 acre-ft divided by 4.6 acres yields a 1.72 ft elevation increase across the entire cap area. Assuming only half the cap is used would result in 7.9 acre-ft being divided by 2.3 acres, which yields a 3.4 ft elevation increase across half the cap area.

While these estimates may suggest that the volume of impacted upland and TMP-containing soil on the Property may be reasonably consolidated within the Containment Area, these volumes very likely underestimate the actual volume of impacted soil that would be determined during the PDI component of the RD phase. Since capping these soils in place with clean soil or pavement provided an effective alternative to address the risk, this capping alternative was carried through the detailed evaluation process in the FS.

Comment #10 (Gary Mercer, WERC)

The preliminary remediation goal for ammonia in surface water is too high.

EPA Response:

In response to this comment, EPA has re-evaluated the surface water performance standards for ammonia (see Nobis, 2021). The surface water performance standard for ammonia in the Proposed Plan was calculated using procedures described in the *Aquatic Life Ambient Water Quality Criterion for Ammonia – Freshwater* (USEPA, 2013a) to establish the Criterion Continuous Concentration (CCC). The CCC is a value below which adverse effects would not be expected for the majority of aquatic receptors. For ammonia, the CCC is dependent on the temperature and pH of the water body or stream. We believe that the site-specific assumptions used for pH are appropriate, and pH has been, overall, less variable over time in both the South Ditch Stream and East Ditch Stream.

EPA believes that a slight adjustment in the performance standard is needed based on the assumptions used for temperature. The proposed performance standard for ammonia was based on an average spring instream temperature of 7.13 °C for East Ditch Stream and 6.92°C for South Ditch Stream**.** While EPA agrees that generally spring temperatures should be utilized as the basis, EPA believes that it is more appropriate to use an average of the in-stream temperatures in late spring (between May – June, not January – March). Late spring temperatures reflect a period when aquatic receptors will be more active, and epi-benthic organisms that are exposed to ambient water will be present in the water column. Also, the Baseline Ecological Risk Assessment (BERA) assumes that the Marsh Wren and Green Heron may forage on-site. Adjusting to late spring temperatures would account for the time when both species would be present and breeding in New England. Therefore, EPA believes that the performance standard should be adjusted to 9 milligrams per Liter (mg/L), based on an in-stream temperature of 18 ˚C and pH of 6.6. The in-stream temperature is the 95% Upper Confidence Limit (UCL) of the temperature values from mid-May through June. The revised performance standard of 9 mg/L has been added to the ROD.

Comment #11 (Gary Mercer, WERC)

There is insufficient analysis to show that groundwater extraction wells would be adequate to intercept ammonia and chromium and sufficiently reduce their concentrations in surface water.

EPA Response:

A PDI is included in the selected remedy for surface water. As described in the *Volume 1, Operable Unit 1 & Operable Unit 2 Feasibility Study, Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts* (*FS Report Volume I*, Olin, 2020a), the PDI may include additional surface water sampling, evaluation of potential groundwater seepage locations, as well as a shallow groundwater hydrology evaluation to site the extraction wells to intercept ammonia and chromium. The surface water alternative also includes monitoring provisions to ensure that the surface water concentrations are reduced below applicable criteria. If monitoring indicates that the groundwater interception system is inadequate, EPA may require modifications to the system to address its deficiencies.

Comment #12 (Martha Stevenson and Suzanne Sullivan, WERC)

The virtual meeting format is not as effective as the in-person format for public meetings.

EPA Response:

Comment noted. EPA is balancing the need to continue progress towards selecting a cleanup remedy for the Site with the need to protect public health during the COVID-19 pandemic. For this public hearing, EPA followed the April 16, 2020 Memorandum regarding virtual public hearings and meetings (USEPA, 2020e), which states in part:

> *Virtual public hearings and meetings are a permissible tool under the federal environmental statutes that EPA administers to provide for public participation in permitting, rulemaking, and similar regulatory actions in lieu of in-person public hearings and meetings. Virtual public meetings are also permissible when conducting public engagement at Superfund sites.*

Comment #13 (Suzanne Sullivan, WERC)

The potential truck traffic impact of removing soil is not a significant impact and should not be weighted during alternative development and selection.

EPA Response:

Evaluation of potential impacts to the community from transport of waste materials off-site is included in EPA guidance (*Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. Interim Final.* October 1988. EPA/540/H-89/004). Section 6.2.3.5 – Short-Term Effectiveness – requires remedial alternatives to be evaluated with respect to their effects on human health and the environment during implementation of the remedial action and states in part (emphasis added):

> *The following factors should be addressed as appropriate for each alternative:*
>
> - *Protection of the community during remedial actions – This aspect of short-term effectiveness addresses any risk that results from implementation of the proposed remedial action, such as dust from excavation, <u>transportation of hazardous materials</u>, or air-quality impacts from a stripping tower operation that may affect human health.*

Table 6-3 – Short-Term Effectiveness – provides this list of questions to consider in analyzing the short-term effectiveness of the remedial alternative in protecting the community during remedial actions:

> - *What are the risks to the community during remedial actions that must be addressed?*
> - *How will the risks to the community be addressed and mitigated?*
> - *What risks remain to the community that cannot be readily controlled?*

The potential impacts of excavating and removing soil were considered in evaluating the short-term effectiveness of the soil cleanup alternatives, all of which, except for the No Action

Alternative, included removal of contaminated material to varying degrees. The potential short-term impacts considered by EPA included fugitive air emissions during excavation and from trucks transporting wastes, and the potential for accidents and spills. These impacts can be mitigated by best management practices, as noted in the Proposed Plan. It is EPA's experience that truck traffic and its associated impacts to a neighborhood, and in particular, the hazardous contents of trucks transporting wastes from a site, is frequently cited by community members as a concern for alternatives involving excavation and transport of material from Superfund sites. However, short-term effectiveness is one of the five balancing criteria that EPA is required by statute to consider in selecting a remedy and is secondary to the criteria of overall protection of human health and the environment and compliance with ARARs.

Comment #14 (Suzanne Sullivan, WERC)

The Zone 2 delineation performed by MassDEP pre-dates installation of the Containment Area and should be revisited.

EPA Response:

EPA presumes that the commenter believes the Zone 2 boundary should be expanded to include more of the Site. EPA also presumes that the commenter believes that expanding the Zone 2 will result in different cleanup goals for the Property. It is true that MassDEP developed the Zone 2 many years ago and some of the facts which form the basis for the Zone 2 designation may have changed. However, moving the Zone 2 or expanding it to include the Containment Area will not alter the remedial action objectives for the selected remedy.

The NCP – the regulations governing the assessment and cleanup of sites under Superfund – describes EPA's expectations for groundwater restoration and states that EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site. When restoration of ground water to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated ground water, and evaluate further risk reduction. 40 C.F.R. § 300.430(a)(1)(iii)(F). Since portions of the aquifer at the Site are classified as drinking water sources and since MassDEP has assigned a high use and value for the Site area aquifer in its Groundwater Use and Value Determination (MassDEP, 2010a), the goal for the groundwater would be to restore this aquifer to its beneficial use, unless it is determined not to be practicable. Since there is insufficient data at this time to determine whether full restoration is practicable, EPA's remedial action objectives for this portion of the remedy focused on removing the source, minimizing further migration of contaminants, and preventing exposure.

Further work is underway to finish characterizing the nature and extent of contamination in the aquifer and to develop and evaluate a set of alternatives to restore the groundwater to its beneficial use as a drinking water aquifer. Once this investigation is completed, EPA will issue a final ROD for groundwater identifying the final cleanup goals for groundwater at the Site. Expanding the Zone 2 to include the Containment Area will not result in a different outcome as the goals remains the same – restore the aquifer to its beneficial use (as a drinking water source), unless it is determined not to be practicable.

Comment #15 (Liz Harriman, WERC)

The interim action should not be approved before more design studies are performed to determine the rate of source removal.

EPA Response:

EPA's issuance of this selected remedy is not an "approval" of the conceptual design presented in the FS. EPA also agrees that the rate of source removal is a critical performance criterion that needs further evaluation during the design phase. However, EPA believes that sufficient data exists to issue a ROD that includes source removal actions for DAPL and groundwater hot spots as a key component of the initial remedy for OU3 (groundwater).

With regards to DAPL, a formal field scale pilot study – the Jewel Drive DAPL extraction pilot – was conducted between 2012 and 2015 to evaluate the feasibility of extracting DAPL. The pilot confirmed the feasibility of extracting DAPL from the aquifer. EPA has not yet determined the final extraction rates for each well or the final number of wells that will be needed to optimize the overall rate of removal of DAPL from the aquifer. The design phase for the DAPL and groundwater hot spot interim remedy will include an evaluation of other extraction methods (such as larger well screens) and different well configurations to expedite DAPL removal.

With regards to groundwater hot spots, the design will include an evaluation of how best to optimize source removal from groundwater while not interfering with DAPL removal. The final design of the extraction systems and identification of removal rates must be reviewed and approved by EPA before the remedy is fully implemented.

Comment #16 (Liz Harriman, WERC)

The design and installation of extraction wells should take place as soon as possible.

EPA Response:

EPA agrees that strong efforts should be made to hasten the pace of remedy design and implementation, while meeting EPA's obligations under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the NCP. EPA also agrees that source removal is a critical next step and will be a priority moving forward.

Comment #17 (Ethan Sawyer)

The speaker was concerned that the Olin property will be used for transmodal (truck to rail) storage and transportation of chemicals such as chlorine.

EPA Response:

Property use will be determined by local planning authorities and the property owner. EPA does not have the authority under CERCLA to dictate the future use of the Property. However, if redevelopment occurs, EPA will review any redevelopment plans to ensure that such redevelopment does not adversely impact the selected remedy for the Site and that the Site is safe for its intended use. A goal of the current interim remedy to address the major sources of contamination in groundwater and the final remedy for contaminated soil, sediments, and surface water is to remediate the Property to a level that is safe for a commercial/industrial use based on the current zoning. Please see also EPA's response to Comment #2 in **Section B**, above.

Comment #18 (Ethan Sawyer)

Wants to see stronger land use restrictions on the Olin property in addition to groundwater use restrictions.

EPA Response:

Land use restrictions for the Property, together with other Institutional Controls, will be developed in consultation with the Town of Wilmington and MassDEP, based on current zoning, known areas of contamination, and receptors at risk. EPA's general goals for land use restrictions include ensuring that members of the community are not exposed to contamination associated with the Site and that use of the Property does not interfere with the implementation of EPA's remedy. See also EPA's response to Comment #6 in **Section B**, above.

Comment #19 (Stephanie Baima, WERC)

Olin's preferences for remediation should not be taken into consideration for remedy selection.

EPA Response:

EPA's proposed cleanup remedy for the Site, as presented in the Proposed Plan, is based on EPA's review of the nine statutory criteria presented in the Superfund law and regulations for remedy selection. According to the Superfund law and regulations, EPA must also consider and respond to all comments received during the 60-day public comment period on the proposed remedy, including those provided by Olin.

Comment #20 (Multiple community members and representatives)

Multiple commenters expressed dissatisfaction with the pace of the cleanup.

EPA Response:

EPA acknowledges that the pace of the investigation has been slower than desired. The Site is among the more complex CERCLA sites in New England, which has posed challenges in determining the extent of contamination and how the contamination has migrated within the environment. The presence of DAPL at a Superfund site is rare and the chemical and physical properties of the DAPL present at the Site are largely unique to this Site. The hydraulic setting is complicated by the location of a major groundwater divide and the complex bedrock geology of the groundwater study area. EPA is also required by statute to rely on Potentially Responsible

Party (PRP) participation, where a viable PRP is present, to lead site investigations and cleanups under EPA oversight. The issuance of the ROD is a major milestone in the Superfund process, and EPA is hopeful that this accomplishment will help facilitate more expeditious cleanup work.

C. COMMENTS RECEIVED IN WRITING DURING THE PUBLIC COMMENT PERIOD

I. Written comments submitted by Olin on October 2, 2020

Comment #1

Specific design details for several remedial alternatives will depend on the planned pre-design investigations: location and number of groundwater and DAPL extraction wells, equipment for groundwater and DAPL treatment systems, and delineation of soil and sediment that exceeds PRGs and requires remediation.

EPA Response:

EPA agrees that PDIs are needed to refine the details of the selected remedy, including the location and number of groundwater and DAPL extraction wells, the configuration of the equipment for the groundwater and DAPL treatment systems, and the further delineation of contamination in soil and sediments. These studies will also include evaluating and optimizing the on-site treatment of DAPL prior to off-site disposal of the residuals, with the goal of pre-treating the extracted DAPL to reduce its volume as much as possible – thus reducing the volume of residuals requiring off-site disposal. If it is not feasible to treat DAPL on-site, extracted DAPL will be disposed of off-site at a permitted facility licensed to receive such wastes. However, it is important to note that EPA expects these investigations to be focused and implemented expeditiously such that active cleanup is initiated as soon as possible. The investigations at the Site have been ongoing for a very long time, with little progress in the actual cleanup. The dynamic of work at the Site must shift such that the PDIs do not become another long-term phase of the investigation. In order to facilitate the rapid implementation of DAPL extraction and treatment, the PDIs may need to incorporate treatability studies and additional field investigations (either pilot-scale or full-scale). For example, piloting extraction of DAPL in known bedrock low spots, even while the bedrock topography continues to be fully investigated, may be appropriate.

Comment #2

The currently operating groundwater and Light Non-Aqueous Phase Liquid (LNAPL) treatment and extraction system adjacent to East Ditch Stream (the Plant B treatment system) is operating as intended and LNAPL is not currently flowing into any surface water bodies. LNAPL (or other non-aqueous phase liquids) have not been observed in the vicinity of South Ditch, On-Property West Ditch, or Off-Property West Ditch Streams.

EPA Response:

Clarification noted.

Comment #3

The cap planned for the Containment Area should be a low-permeability cap, as specified in the OU1/OU2 FS, and not an impermeable cap as indicated in the Proposed Plan. The final details of the cap will be determined during the RD phase.

EPA Response:

The selected remedy includes the construction and maintenance of caps and cover systems on areas of soil contamination on the Property, including a multi-layer, *low-permeability cap* that meets Resource Conservation and Recovery Act (RCRA) Subtitle D and Massachusetts solid waste landfill performance standards over the Containment Area. The term *impermeable cap* in the Proposed Plan is fundamentally not different than a *low-permeability cap* required to meet ARARs. *Volume III – Comparative Analyses, Feasibility Study Report, Olin Chemical Superfund Site, Wilmington, Massachusetts* (*FS Report Volume III*, USEPA, 2020c) states:

> *Alternative SOIL/SED-2 includes an* impermeable cap *above the contaminated soil in and near the Containment Area…The cap for the Containment Area would comply with Resource Conservation and Recovery Act (RCRA) Subtitle D regulations and Massachusetts solid waste management regulations and meet impermeability requirements with an effective permeability that is equivalent to the permeability of the existing slurry wall (approximately* $1x10^{-8}$ *centimeters per second (cm/sec)) or a permeability of no greater than* $1x10^{-7}$ *cm/sec, whichever is less…*

Comment #4

Previous investigations have shown that there is no reasonable likelihood of contaminants leaching at unacceptable levels from the Containment Area, as demonstrated through analysis of samples collected for the 2019 Containment Area soil investigation and supported by historical data. In addition, human health evaluation has not identified unacceptable health risk for future land uses (which will be restricted or prohibited by Institutional Controls). While Olin does not disagree with the need for a cap, the leaching concerns are not supported by the available data.

EPA Response:

EPA disagrees with the comment, as insufficient data exists to conclude that there is no reasonable likelihood of contaminants leaching from soil to groundwater at unacceptable levels from the Containment Area. During the OU1/OU2 RI, characterization of Containment Area soil was limited to surface samples from beneath the temporary cap. Deeper samples were not collected at that time to avoid potential damage to the temporary cap that may have resulted from the presence of a drill rig.

The November 2019 Containment Area soil investigation referenced above was generally conducted in locations that targeted previously excavated areas, former disposal pits and lagoons, and other potential former disposal areas. The majority of samples collected during this event were from shallow sample intervals; a total of 103 discrete soil samples were collected, 76 of which (74%) were from depths shallower than 10 ft bgs. Additionally, the spatial resolution of the soil boring locations cannot be considered comprehensive, as a total 12 soil borings were used to assess a study area nearly five acres in size. The degree of interpolation required between sampling locations from the November 2019 soil investigation combined with the limitations of the surficial soil sample data set from the OU1/OU2 RI would, in the opinion of EPA, preclude a definitive conclusion regarding contaminant leaching from Containment Area soil.

Major findings from EPA's Memorandum entitled *Updates to OU1/OU2 RI Report Conclusions* (USEPA, 2020a) include the following:

- Significant volumes of acidic wastewaters and other wastes, including containerized and laboratory wastes from various facility production operations, were disposed of within the Containment Area from approximately 1965 until at least 1983;
- Specific areas within the Containment Area – primarily the drum and buried debris areas – have been remediated, but these areas represent a fraction of the total extent of the Containment Area. Therefore, unsaturated soil within the Containment Area likely contains waste materials; and
- The solid wastes in the Containment Area will need to be contained, a remedial action that would include the prevention of leaching of chemicals or constituents from such wastes, in accordance with RCRA Subtitle D regulations and Massachusetts Solid Waste Management Facility Regulations is appropriate.

The selected remedial actions for the Containment Area, which include closure of the equalization window, installation of a permanent, low-permeability cap, and DAPL extraction, will significantly reduce the potential for adverse groundwater impacts from the Containment Area.

Comment #5

The September 21, 2010 Use and Value Determination identified only portions of the groundwater impacted by the Site as current or potential future drinking water source areas that meet the criteria for Category GW-1 groundwater, and classified the remainder of the Site groundwater as GW-2/GW-3 (not current or potential future drinking water source areas).

EPA Response:

Comment noted, however, the September 21, 2010 Groundwater Use and Value Determination (MassDEP, 2010a) identified a high use and value for the Site area groundwater aquifer:

> *Because a portion of the Site falls within a GW-1 area, (the Zone II to the north) and the close proximity to private drinking water wells to the southeast and the GW-1 Potential Drinking Water Source Area to the south, and in light of the factors contained in EPA's Final Ground Water Use and Value Determination Guidance, the Department supports a high use and value for the Site area aquifer (See Attached Table: Groundwater Use and Value Factors)…*

Comment #6

The Proposed Plan indicates a potential need to extract "hot spot" groundwater from immediately above the DAPL pools. Current data is limited to a single well point but does not support the presence of a significant NDMA hot spot above the DAPL pool. The data gap investigation will verify current conditions. In addition, Olin believes that extraction of groundwater immediately above the DAPL pools will exacerbate conditions by causing convection and dilution of DAPL. The DAPL pilot test results suggest that the gravimetric DAPL recovery from the bottom of the DAPL pool will result in progressive drawdown of the DAPL/diffuse layer interface, stranding any extraction wells set above the DAPL pool.

EPA Response:

EPA agrees that additional evaluation is required to determine the thickness and extent of the groundwater hot spot above each of the DAPL pools, as well as the aquifer response to removal of DAPL. There may be advantages to phasing the work, with initial remediation focused on DAPL pool removal and subsequent groundwater extraction after the DAPL pool has been partially drawn down. These evaluations and exploration of phasing will be included in the PDIs and RD phase.

Comment #7

The Proposed Plan reflects the initial assumptions related to the operations required to successfully treat DAPL and impacted groundwater; these assumptions will require verification through treatability and potentially pilot-scale studies. The PDIs and RD will identify the location for the new treatment system and alignment of associated piping and appurtenances.

EPA Response:

EPA agrees with the comment. The selected remedy explains that the treatment system details for both DAPL and impacted groundwater will be determined based on PDIs and refined in the RD.

Comment #8

The available information indicates that the LNAPL in the subsurface is the result of a release of rubber process oil #425 from storage tank #6 (a raw material for chemical manufacturing) and not a fuel oil spill. The LNAPL has been contaminated by historical, co-located releases of bis-2-ethylhexylphthalate (BEHP), n-nitrosodiphenylamine (NDPhA), and TMPs. The process oil itself did not contain these constituents. This information is included in Figure 1.3-2, Table 1.4-1, and text of Section 1.4.2.2 of the 2015 OU1/OU2 RI Report.

EPA Response:

Part 2, **Section B**, **SITE HISTORY AND ENFORCEMENT ACTIVITIES**, History of Site, above, of this ROD explains that #415 process oil was a raw material utilized during the operating history of the Property. This section further explains that the LNAPL was released to soil and the subsurface in the area of the Plant B tank farm in the form of a processing oil. According to the *Comprehensive Site Assessment Phase II Field Investigation Report* (CRA, 1993), interviews with former workers at Plant B indicate that multiple spills occurred in the

Plant B area. Materials allegedly spilled included diisobutylene, diphenylamine, dioctylphthalate, dioctyldiphenylamine, and fuel oil. According to the *Supplemental Phase II Report* (Smith, 1997), as early as 1973, MassDEP contacted the Facility about a seep of oily material in East Ditch Stream, adjacent to the Plant B tank farm. A 1973 analysis of the oil (from well IW-11) indicated that the oil contained a high percentage of BEHP and lesser amounts of NDPhA, dioctylphthalate, and TMPs. **Part 2**, **Section E**, **SITE CHARACTERISTICS**, **Conceptual Site Model** explains that the LNAPL is a mixture of process oil and other raw materials historically stored and used at the former manufacturing facility (Facility) that contains various contaminants, including TMPs and BEHP.

Comment #9

The Proposed Plan noted that benzo(a)pyrene in surface water in Off-Property West Ditch Stream could result in unacceptable risk to trespassers. The available benzo(a)pyrene analytical data for shallow groundwater in the vicinity of this stream do not contain substantial concentrations of benzo(a)pyrene or other high molecular weight polycyclic aromatic hydrocarbon (PAH) compounds that were detected in the stream; likewise, low molecular weight PAHs (more soluble in water) were also not detected in the stream or nearby groundwater. The detection of only less-soluble PAH compounds in the stream suggest that the PAHs are associated with suspended particulate matter. The topography of the Olin property and area to the west do not support runoff toward the stream: on-property flow is toward On-Property West Ditch Stream, and immediately west of the property boundary, the ground surface elevation increases with the elevated PanAm Railway tracks. Finally, the risk calculated in the OU1/OU2 Baseline Human Health Risk Assessment (BHHRA) was based on a single sample result. Other potential PAH sources may include the railroad ties from the rail line and local stormwater runoff from the west. Additional sampling and analysis of surface water for benzo(a)pyrene and other PAHs would be beneficial in determining with more confidence what the representative concentrations are in surface water of Off-Property West Ditch Stream.

EPA Response:

EPA acknowledges that other sources may contribute to the benzo(a)pyrene concentrations in surface water; however, Olin's role as a potential contributor to the contamination has not been ruled out at this time, given the limited surface water and nearby groundwater sampling conducted. Benzo(a)pyrene and other PAHs were detected in surface and subsurface soil on the Property, with the highest concentrations occurring in the vicinity of the former Plant C Boiler and the former Laboratory Building Boiler near the Guard Shack (USEPA, 2020a). EPA's goal is to reduce, to the extent practicable, any sources of PAHs, including benzo(a)pyrene. In the absence of additional data that conclusively rules out the contributions of potential source areas on the Property to surface water in Off-Property West Ditch Stream, surface water impacts in Off-Property West Ditch Stream from Site contaminants are addressed by the selected remedy. Additional sampling is planned to clarify the current contaminant concentrations and trends in Off-Property West Ditch Stream. This sampling will help to determine if source areas on the Property are contributing to benzo(a)pyrene concentrations in Off-Property West Ditch Stream and will be taken into consideration during the RD phase and subsequent remedy implementation phases.

Comment #10

Olin provided suggested wording regarding the discussion of the residential well NDMA results, noting that samples from two wells have consistently had higher concentrations of NDMA than the other wells and that Olin is working with the Town of Wilmington to voluntarily extend a waterline to these two residences. Olin also provided suggested wording regarding the NDMA results from 2017 that were above the risk criterion of 47 ng/L.

EPA Response:

EPA acknowledges that the section in the Proposed Plan that summarizes the private well sampling results could have been clearer. **Part 2**, **Section F**, **CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES, Groundwater/Surface Water Uses** of this ROD explains the following (excerpt in part):

> *…There are 81 private wells (potable and irrigation) on file with the Town of Wilmington within the Site…Of these, 26 residential drinking water wells have been sampled at least once, and 18 are monitored on a quarterly basis to confirm that levels of NDMA do not exceed the upper end of EPA's health-protective cancer risk range of 47 ng/L…NDMA detections in 16 of these wells fall within EPA's health-protective range, with 72% of samples (438 out of 608 samples) showing non-detectable levels of NDMA…Two of the 18 wells have shown consistently higher levels of NDMA over time, with detections in one well ranging from 9.4 to 24 ng/L and detections in the second well ranging from non-detectable to 56 ng/L.[15] Olin has provided bottled water to these two residences since 2010, and is in the process of working with the Town of Wilmington to voluntarily extend a waterline to these two households. A third well had an NDMA detection of 57 ng/L in 2017, but previous and subsequent sampling results for this well were all within EPA's health-protective range.[16]*

Footnote 15 adds:

> *Prior to the 2017 sampling event which yielded an NDMA sampling result of 56 ng/L for one of the two residences on bottled water, sampling data for this well between 2008 and 2016 ranged from non-detectable to 33 ng/L (20 sampling events). Subsequent to the 2017 NDMA result of 56 ng/L, six sampling events were conducted between 2017 and June 2020. These sampling events yielded NDMA results ranging from 0.34 to 2.9 ng/L.*

Footnote 16 adds:

> *Prior to the 2017 sampling event for this well which yielded an NDMA sampling result of 57 ng/L, sampling data for this well between 2015 and 2015 ranged from 1.2 to 8.1 ng/L (five sampling events). Subsequent to the 2017 NDMA result of 57 ng/L, three sampling events were conducted between 2018 and June 2020. These sampling events yielded NDMA results ranging from 0.6 to 7.9 ng/L.*

II. <u>Written general and technical comments submitted by WERC on October 26, 2020</u>

Comment #1

It has been challenging to fully evaluate the more than 1,100 pages of technical documentation released by EPA and Olin in August 2020.

EPA Response:

EPA acknowledges that there has been a significant volume of information to digest. EPA has shared many documents during the course of the investigation with WERC, as well as the Town of Wilmington and their consultant. These documents included correspondence to and from Olin, sampling data, draft reports, and technical memoranda. EPA solicited written comments from WERC and the Town and incorporated such comments where appropriate. EPA met with WERC members on a regular basis to explain results, apprise the group of progress towards remedy selection, and discuss concerns. EPA is open to suggestions for how communications and the sharing of technical information can be improved. Nonetheless, EPA has strived to involve WERC and local officials as active stakeholders in the site investigation and will continue to do so in the next phase of the CERCLA remedial lifecycle for the Site. Please see also EPA's response to Comment #1 in **Section C, III**, below.

Comment #2

The use of a virtual hearing severely limited the participation of residents in both Wilmington and Woburn; in addition, concerns over Covid-19 limited WERC's internal interactions and ability to meet.

EPA Response:

Comment noted. EPA acknowledges these concerns. Please see EPA's response to Comment #12 in **Section B**, above.

Comment #3

WERC continues to be frustrated over the lack of progress at the Site over the preceding decades. EPA should require maximum effort to begin cleanup.

EPA Response:

EPA acknowledges that the pace of the investigation has been slower than desired. EPA agrees that strong efforts should be made to hasten the pace of remedy design and implementation, while meeting EPA's obligations under CERCLA and the NCP. Please see EPA's response to Comments #16 and #20 in **Section B**, above.

Comment #4

The commenter stated that groundwater contamination (OU3) is the sole reason the Olin Site was elevated to the National Priorities List in 2006 and questioned why groundwater has consistently been left to last in being addressed behind soil and sediment on Olin's parcel of property. EPA's focus always should have been and must now be determining the full extent and severity of the groundwater contamination throughout the entire Site. The proposed Interim Action to remove the worst of the worst groundwater is a good first step, but it is only a half-measure.

EPA Response:

EPA agrees that the groundwater contamination at the Site poses a significant threat to the environment. The issues posed by the unique material present – namely DAPL – have been a challenge to fully understand through the studies completed to date. Over the last few years, EPA has gained a much better understanding of the Conceptual Site Model (CSM) for the Site but there is still insufficient data to select a comprehensive remedy for groundwater. However, given the threats, EPA determined that an interim remedial action is appropriate at the Site to initiate source control while additional information is collected to better assess the practicability of aquifer restoration prior to the determination of final cleanup levels and selection of a final remedial action for groundwater. Accordingly, the cleanup objectives for the interim action were developed to prioritize reduction of exposure risk and reduction of contaminant mass through treatment. The selected interim remedy for groundwater includes the critical outcome of reducing the mass of NDMA in the aquifer by extracting and treating DAPL and groundwater hot spots.

Additionally, **Part 2**, **Section L**, **THE SELECTED REMEDY**, **Description of Remedial Components**, Common Components of the Remedy for All Media, *Pre-Design Investigations* of this ROD explains that a sequencing plan will be developed for implementing the soil and sediments remediation to coordinate work with the remedial actions for DAPL, groundwater hot spots, LNAPL, and surface water to ensure that remedial activities taken to address contamination in soil and sediments are not undermined by recontamination from LNAPL and contamination in groundwater and surface water. The remedial work to address contaminated soil and sediments will be conducted after it is established that discharge from impacted groundwater is not serving as on ongoing source which could negatively impact the quality of wetland soil and sediments. Please see also EPA's responses to Comment #1 in **Section B** and Comment #1 in **Section C, I**, above.

Comment #5

WERC continues its steadfast opposition to any redevelopment at the Olin property before all OU3 investigations are completed and the OU3 Feasibility Study has been approved.

EPA Response:

EPA is not taking a position on whether the Property should be redeveloped and when such redevelopment should occur. However, a redeveloper must cooperate fully with EPA's environmental investigation and response actions at the Site; protect and maintain remedial systems and containment infrastructure; and refrain from using the Property in any manner that would interfere with or adversely affect the implementation, integrity, or protectiveness of any past or future action. Please see also EPA's responses to Comment #2 and #17 in **Section B**, above.

Comment #6

EPA has fallen short in failing to require that Olin identify the source of NDMA once and for all. Recent studies have identified additional nitrosamines that pose a danger to human health. Aside from one sampling event done several years ago, WERC is not aware of any other investigations to identify other nitrogen compounds related to the manufacturing processes through the decades, or which may have resulted from Olin's various attempts to reduce hydrazine and ammonia levels, which are both present in the Plant B area, as well as widespread across the Site.

EPA Response:

EPA included information about the source of NDMA in the Hazard Ranking System (HRS) documentation record for the Site's listing on the National Priorities List (NPL; see page 19 of the 55-page pdf, available at: https://semspub.epa.gov/work/01/75001014.pdf), which states the following:

> *Although evidence indicates that NDMA was not directly used, produced, purchased, or disposed of at the Olin Chemical facility, there is evidence that the historical disposal of chemical wastes in the unlined pits may have resulted in conditions favorable for NDMA formation in the waste stream, waste disposal structures (unlined pits), DAPL ground water, or diffuse layer ground water (Ref. 8, pp. 24, 25). In particular, the processes for the manufacture of Opex, Kempore, Hydrazine, OBSC/OBSH, Wiltrol-N, Nitropore 5PT, and Nitropore OT produced wastes that when combined may have had the potential to result in NDMA formation (Ref. 8, p. 30). Details of these and other possible NDMA formation mechanisms are discussed in Section 3.1.1 of this HRS documentation record.*

Extensive time has been spent seeking to identify precisely how NDMA formed, without yielding a conclusive finding. At this point, the lack of a full understanding of how NDMA formed does not prevent EPA from making remedial decisions concerning groundwater at the Site. Regardless of how NDMA formed, the interim remedy focuses on removal of NMDA, thus preventing further contamination of the aquifer.

EPA acknowledges a number of data gaps with respect to the distribution of NDMA in the subsurface; however, EPA believes sufficient data exists to issue a ROD that includes source removal actions for DAPL and groundwater hot spots as a key component of the initial remedy for OU3 (groundwater). Continued studies to close remaining data gaps, including additional nitrosamine-precursor and nitrosamine-related compound sampling, will be further evaluated in the RD phase of the selected interim remedy, and in the OU3 Remedial Investigation/Feasibility Study (RI/FS).

Comment #7

The Zone II contribution area to Wilmington's municipal wells should be revised. The Zone II delineation was from a 1990 aquifer study, and the area's hydrological and hydraulic conditions have changed since then, including cessation of pumping of the Town of Wilmington municipal wells and Altron/Sanmina wells, Containment Area construction, and installation of the weir in the South Ditch Stream. Each of these developments affects the groundwater flows, and a new delineation is important in understanding future impacts of remedial activities and siting of any redevelopment.

We also have concerns regarding the outfall of the NPDES discharges and placement of proposed remedial structures. Over the years Olin has presented various scenarios showing how the groundwater and surface water divides between the Ipswich and Aberjona watersheds vary seasonally and under various pumping demands. Regardless of Olin's attempts to show that very little of their property lies within Wilmington's 1990 Zone II, contamination from Olin reached our town's wells, and has migrated off-property in all directions. If the Zone II delineation is not modified, EPA should remediate all water related to the Site to drinking water standards.

EPA Response:

Comment noted. Please see EPA's response to Comment #14 in **Section B**, above.

Comment #8

Over the years, many interim attempts to remediate various areas on the property were reviewed by local, state, and federal regulators prior to the Site's listing on the NPL, who in turn granted approvals with restrictions and conditions. These limitations on the property must be borne in mind when designing and siting future remedial and/or redevelopment structures. For example, Wilmington Conservation Commission's Order of Conditions and the United States Army Corps of Engineers' (USACE's) Water Quality Certification, which was incorporated into Massachusetts Environmental Policy Act (MEPA) approval of permitting work performed in 2000, prohibits any further alteration or removal of wetlands on the property. While temporary alteration is allowed for essential remedial activities and facilities, no net loss of wetlands is allowed. EPA must require that these restrictions on future activities be enforced.

The protective covenant on the southern portion of the Olin property was negotiated between Olin and the Town to prevent further disturbance to that area. EPA should not allow the siting of any remedial activity in the Conservation Restriction area to facilitate redevelopment. Only actions essential to the cleanup that cannot be located anywhere else should be permitted, and those should be temporary.

EPA Response:

EPA is aware of the conservation restriction, which has preserved the southern portion of the Property (the "Conservation Area") in a predominantly natural, undeveloped condition (Environmental and Open Space Restriction, recorded with the Middlesex North Registry of Deeds on November 7, 2006, Book 20680, Page 234). Currently, EPA is not planning any work within this area other than any remediation that is necessary to address areas with contamination exceeding cleanup levels, which is expressly permitted under the restriction. Wetland areas on the Property requiring remediation are generally located in the immediate environs of South Ditch Stream and areas to the north, though do appear to extend to a limited degree into the Conservation Area.

The selected remedies for LNAPL, surface water, soil, and sediments will comply with all wetland and floodplain ARARs and minimize impacts to wetlands and floodplains. **Part 1**, **Section F**, **SPECIAL FINDINGS**, above, of this ROD explains that pursuant to Section 404 of the Clean Water Act (CWA), 44 CFR Part 9, and Executive Order 11990 (Protection of Wetlands), EPA has determined that there is no practicable alternative to conducting work that will impact wetlands of the United States because significant levels of contamination exist within or under wetlands of the United States and these areas are included within the Site's cleanup areas.

For those areas impacted by cleanup activities, EPA has also determined that the selected remedy is the Least Environmentally Damaging Practicable Alternative (LEDPA), as required by the CWA, for protecting federal jurisdictional wetlands and aquatic ecosystems at the Site under these standards, because the remedy will permanently remove contaminants that are impairing the wetlands and any wetland resources altered by the cleanup will be restored to the original grade and with native vegetation.

EPA will minimize potential harm and avoid adverse impacts to wetlands, including in the Conservation Area, to the extent practicable, by using best management practices to minimize harmful impacts on wetlands, wildlife, or habitat. Any wetlands affected by remedial work will be restored and/or replicated consistent with the requirements of federal and state wetlands protection laws with native wetland vegetation, and any restoration efforts will be monitored. Mitigation measures will be used to protect wildlife and aquatic life during remediation, as necessary.

The conceptual plans for the selected interim and final remedies do not include remedial infrastructure such as staging areas, extraction wells, conveyance piping, and treatment buildings/systems in the southern portion of the Property, including the Conservation Area. The final location of these and other components of the remedy will be designed to minimize impacts to the Conservation Area. Regarding future development, it will be up to the local conservation commission, which is the grantee under the conservation restriction, to enforce the restriction in this area.

Comment #9

EPA is aware that WERC continues to have serious concerns about the Containment Area. What does it contain? We are not convinced that the soils, sediments, and waste products Olin placed in the Containment Area have been adequately characterized. We suggest that if EPA finds that the Containment Area is not functioning as designed, serious consideration should be given to 'daylighting' the On-Property West Stream, which was culverted at the time the Containment Area was constructed in 2000.

EPA Response:

Significant volumes of acidic wastewaters and other wastes, including containerized and laboratory wastes from various facility production operations, were disposed of within the Containment Area from approximately 1965 until at least 1983 (AMEC, 2015, Section 1.4.2.3). Specific areas within the Containment Area – primarily the drum and buried debris areas – have been remediated, but these areas represent a fraction of the total extent of the Containment Area. Therefore, unsaturated soil within the Containment

Area likely contains waste materials. EPA agrees with the commenter that insufficient data exists to fully characterize the Containment Area. However, the selected remedial actions for the Containment Area, which include closure of the equalization window, installation of a permanent, low-permeability cap, and DAPL extraction, will address the human health risks posed by the Containment Area, and significantly reduce the potential for adverse groundwater impacts from the Containment Area and associated impacts to surface water and sediments. Please see also EPA's response to Comment #4 in **Section C, I**, above.

Regarding the comment concerning the culverted portion of On-Property West Ditch Stream, the culvert is constructed of 30-inch (in) diameter reinforced concrete and was installed between September and October 2000 (GEI, 2004b). The culverted portion of On-Property West Ditch Stream discharges to South Ditch Stream, which is monitored by surface water location PZ-18R at the discharge point and surface water locations SD-17 and PZ-17RRR approximately 150 ft downgradient of the discharge point (see **Figure 27** in **Appendix C** of this ROD). These locations are sampled quarterly (if surface water is available to sample) and the selected remedy for surface water includes long-term monitoring of these and other locations. Based on most recent data available and previous surface water trends, the Site contaminant concentrations at surface water location PZ-18R are comparable to the closest upgradient surface water sample location (ISCO1) and generally lower than downgradient locations SD-17 and PZ-17RRR, suggesting that the culvert is not the source of these surface water impacts. A review of the available monitoring data does not suggest that surface water in the culvert has been impacted by surrounding soil.

Comment #10

Will the working documents during the design phase of remedial work be available for comment? WERC will have additional comments for the design phase. We hope to continue our working relationship as you move forward towards implementing the Action Alternatives adopted in your forthcoming Record of Decision.

EPA Response:

The RD plans and other documents submitted by Olin will be made available for WERC, Town officials, and other stakeholders to comment, similar to previous practice. Please see also EPA's responses to Comment #6 in **Section B** and Comment #1 in **Section C**, **II**, above, Comment #15 in **Section C**, **II**, below, and Comment #1 in **Section C, III,** below.

Comment #11

WERC requests an opportunity to discuss technical points with EPA in more detail prior to the issuance of the ROD.

EPA Response:

The NCP establishes the process that EPA must follow for the release of the Proposed Plan, the public comment period, and issuance of the ROD. Responses to oral and written comments received during the comment period are provided in the Responsiveness Summary of the ROD. These comments and responses become a part of the Administrative Record for the ROD in the event that the selected remedy is challenged. Once the ROD is issued, EPA will continue to discuss the technical points of its decision with interested parties during the design phase.

Comment #12

The premise and promise of the Superfund Program is the "Polluter Pays" principle. Olin has had 40 years to clean up the property at 51 Eames Street, and they have failed. Their only motivation now to implement additional clean-up activities is the anticipated sale of the property; their newfound cooperation to expedite certain aspects of additional groundwater investigations is driven by their desire to claim exemption from decontaminating our aquifer because they waited so long that the cost to do so will likely be astronomical. EPA should make the responsible parties pay all costs that were squandered by their failure to remediate OU3 (groundwater) upon confirming the presence of NDMA in 1990.

EPA Response:

EPA has a longstanding policy to pursue "enforcement first" throughout the Superfund cleanup process. This policy promotes the "polluter pays" principle and helps to conserve resources for the cleanup of sites where viable responsible parties do not exist. EPA guidance emphasizes that a major component of the "enforcement first" policy is that PRPs should conduct remedial actions whenever possible. See EPA's Memorandum, *Enforcement First for Remedial Action at Superfund Sites*, dated September 20, 2002 (available at: https://www.epa.gov/sites/production/files/documents/enffirst-mem.pdf). Following the issuance of the ROD, EPA will negotiate with the PRPs to enter into an agreement for the PRPs to perform the required response actions in accordance with Section 122 of CERCLA, 42 U.S.C. § 9622. If the parties are unable to reach agreement, EPA will consider other enforcement options. Please see also EPA's response to Comment #7 in **Section B**, above and Comment #2 in **Section C, IV**, below.

Comment #13

It's time for EPA to do everything possible *now* to require that all contamination be eliminated wherever possible, and that the concentrations are lowered to the largest degree possible where complete clean-up is not achievable. No half-measures – clean-up, not cover-up.

EPA Response:

EPA agrees that cleanup works needs to be initiated as soon as possible. The investigations at the Site have been ongoing for a very long time, with little progress in the actual cleanup. Strong efforts need to be made to hasten the pace of remedy design and implementation. Please see also EPA's responses to Comments #1, #3, and #16 in **Section B** and EPA's response to Comment #1 in **Section C, I**, above.

Comment #14

EPA should remove all contamination remaining at the Property and either consolidate within the Containment Area if the Containment Area is actually viable or treat it to safe standards. Contaminants of concern should not be left in place to "naturally attenuate" another 40-50 years. We don't want decades of additional monitoring, rather, a clean environment.

EPA Response:

During the FS, EPA considered several alternatives for remediation of the Site. For the soil contamination, EPA did consider removal and off-site disposal or consolidation within the Containment Area. These alternatives were not carried through the detailed analysis as they posed serious implementation issues. Please see EPA's responses to Comments #8 and #9 in **Section B**, above.

Comment #15

WERC is concerned that the group has not been included enough during development of the FS, Proposed Plan, and supporting documents.

EPA Response:

EPA has tried to keep WERC and other interested members of the public informed on the development of the FS, Proposed Plan, and supporting documents. Leading up to the issuance of the Proposed Plan, EPA met several times with representatives from WERC and discussed openly the status of work, the range of alternatives under development, the technical challenges posed by the Site, and many other issues. EPA provided the public an extended opportunity (10 days) for review of the Proposed Plan before the start of the comment period and conducted an extended formal comment period (60 days) for all parties to review the record. EPA remains committed to facilitating additional public input into the implementation of the remedy and will continue to discuss WERC's concerns as we move forward. Please see also EPA's response to Comment #1 in **Section C**, **II**, above and Comment #1 in **Section C, III,** below.

Comment #16

The Remedial Action Objectives (RAOs) for DAPL and groundwater hot spots are interim and fail to recognize the value of the aquifer as a public and private water supply. A long-term RAO must be included for the aquifer.

EPA Response:

The interim RAOs for DAPL and groundwater hot spots are intended to support the initiation of cleanup of the aquifer, designated as having a high use and value by MassDEP. EPA agrees that long-term RAOs are needed; EPA plans to develop and issue such RAOs as part of the final ROD, following completion of the data gaps work and final FS for groundwater (OU3). Please see also EPA's responses to Comment #1 and #14 in **Section B,** above.

Comment #17

The second RAO for surface water should be revised to remove the phrase "by a current or future trespasser."

EPA Response:

The second RAO for surface water states, "*Prevent migration of groundwater containing Site contaminants to Off-Property West Ditch Stream to prevent potential human exposure by a current or future trespasser to surface water containing Site contaminants at levels that pose an unacceptable risk.*" EPA Guidance for drafting RAOs suggests that the RAO identify the risk posed and the receptor at risk. In the case of Off-Property West Ditch Stream, the risk is to current and future trespassers. It is unclear why the commenter requests that the wording, "*by a current or future trespasser,*" be deleted, as removal of this language will make the RAO vague and incomplete. As such, the language remains in the ROD.

Comment #18

Compliance with the surface water RAOs will be achieved by monitoring the water quality in surface water, not groundwater. Therefore, the RAO should include surface water objectives and not groundwater objectives. The following RAO should be added: "Restore surface water to ambient water quality criteria for the contaminants of concern."

EPA Response:

The first RAO for surface water states, *"Prevent migration of groundwater containing Site contaminants to East Ditch Stream, South Ditch Stream, and Off-Property West Ditch Stream to prevent exposure by current and future ecological receptors to surface water containing Site contaminants that would result in potential adverse impacts."* EPA notes that this ROD establishes National Recommended Water Quality Criteria (NRWQC) as the performance standards for surface water as these levels are protective of ecological receptors. EPA also notes that the selected remedy includes monitoring of the water quality in surface water to demonstrate that these standards have been achieved. However, EPA does not agree that an additional RAO – "Restore surface water to ambient water quality criteria for the contaminants of concern" is needed. The selected remedy achieves the objective of preventing the migration of contaminated groundwater to East, South, and Off-Property West Ditch Streams that would result in potential adverse impacts by preventing contaminated groundwater from impacting surface water, not by actively restoring the surface water. Therefore, EPA believes the RAOs in the Proposed Plan and ROD are sufficient.

Comment #19

The following RAO should be added for sediments: "Restore sediments to pre-release/background conditions to the extent feasible, at a minimum to levels that will result in self-sustaining benthic communities with diversity and structure."

EPA Response:

EPA acknowledges the commenter's intention and notes that the selected remedy will restore sediments to levels that are protective of the benthic community by removal and off-site disposal. The RAOs in this ROD for wetland soil and sediments are as follows:

- *Prevent exposure by current and future ecological receptors to wetland soil and sediments containing Site contaminants that would result in potential adverse impacts.*
- *Prevent the further migration of wetland soil and sediments containing Site contaminants to nearby wetlands, surface water, drainage features, and adjoining properties that would result in potential adverse impacts.*

This ROD also establishes cleanup levels for sediments that will result in the re-establishment of the benthic community. Therefore, EPA does not agree that revisions to the RAOs for sediments are needed.

Comment #20

WERC has little trust in the future owner/operator adhering to Institutional Control requirements, so contamination should be cleaned up rather than covered or left in place with monitoring.

EPA Response:

Part 2, **Section E.3**, **SITE CHARACTERISTICS,** Principal Threat Waste, above, of this ROD explains that the soil impacted with chromium and BEHP on the Property is considered to be low-level threat waste that will be addressed under the selected remedy by installing a permanent, low-permeability cap over the Containment Area and installing soil and/or asphalt cover systems over contaminated upland soil. The Containment Area cap and upland soil cover systems will prevent unacceptable exposure by ecological receptors and unacceptable leaching of Site contaminants in the Containment Area. Institutional Controls and long-term maintenance of covers and caps will be used to address these materials over the long-term. Further, under the selected final remedy for soil and sediments, additional evaluations and/or implementation of engineering controls such as vapor barriers or sub-slab depressurization systems (SSDSs) will be required for new building construction or building alterations on the Property to address potential vapor intrusion risks to indoor workers from TMPs.

Institutional Controls are non-engineered instruments such as administrative and legal controls in the form of land use restrictions that help minimize the potential for human or ecological exposure to contamination and/or protect the integrity of the remedy. The details of the Institutional Controls required by this ROD will be resolved during the pre-design and RD phase in coordination with the parties performing the remedial action, impacted landowners, local officials, and MassDEP. Institutional Controls may be implemented through measures that may include, but are not limited to, Notice of Activity and Use Limitation (NAUL), Grant of Environmental Restriction and Easement (GERE), town ordinance, advisories, building permit requirements, and other administrative controls.

Institutional Controls for, and long-term maintenance of, upland soil covers, the Containment Area cap, and any implemented vapor barriers or SSDSs will ensure the protectiveness of these remedial activities over the long term. In addition, EPA will continue to evaluate Site conditions and the effectiveness of implemented Institutional Controls through its Five Year Reviews to ensure the remedy remains protective of human health and the environment. To facilitate future use and redevelopment of the Property consistent with the cleanup, Institutional Controls will also be established to appropriately manage impacted soil, soil vapor, and groundwater encountered during future intrusive activities (*e.g.*, installing subsurface utilities, building foundations/slabs, etc.) to protect human health and the environment. In the event that a future land owner or developer fails to comply with the Institutional Controls, EPA and the state can take enforcement actions requiring compliance.

Comment #21

Consolidation of the cleanup components does not promote public understanding of the interrelationships between the various cleanup components and does not allow for optimization. The alternatives should be decoupled for ease in evaluation.

EPA Response:

EPA considered several methods to develop remedial alternatives, but ultimately selected bundling alternatives because some of the alternatives are interrelated and needed to be combined to be appropriately protective. Additionally, due to the large number (34) and complexity of the remedial alternatives considered in Volumes I and II of the FS report for the eight cleanup components – DAPL, groundwater hot spots, LNAPL, surface water, Containment Area soil, upland soil, wetland soil and sediments, and TMPs in soil – EPA sought to simplify and consolidate the cleanup components to promote public understanding of the interrelationship between the various cleanup components and to reduce the number and extent of comparative analyses required. See *FS Report Volume III* (USEPA, 2020c) for further discussion on the rationale for consolidating the cleanup components.

The eight original cleanup components were grouped by media, which resulted in the linking of DAPL with groundwater hot spots for the development of a set of alternatives for an interim action to address the major sources of contamination in OU3. For the final action for OU1 and OU2, LNAPL was coupled with surface water, because of the inherent potential impacts to East Ditch Stream surface water from LNAPL contamination and the prudence of developing a consistent approach to addressing all surface water contamination at the Site. Further, all of the soil and sediment alternatives (Containment Area soil, upland soil, wetland soil and sediments, and TMPs in soil) were bundled together in consideration of their interrelated nature and to facilitate the development of a set of alternatives to address contamination on and in the immediate environs of the Property.

Comment #22

WERC prefers Alternative GWHS-4 – DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting **1,100 ng/L** NDMA (approx. 12 wells), on-site treatment at new treatment system – rather than Alternative GWHS-3 – DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting **5,000 ng/L** NDMA (approx. 6 wells), on-site treatment at new treatment system – which was listed as the preferred alternative component in the Proposed Plan, for the following reasons: it includes more mass removal; does more to prevent further NDMA migration into the aquifer and bedrock, making final cleanup more feasible; similar implementation to the selected alternative (Alternative GWHS-3); target concentration is still two orders of magnitude above the target cleanup level for NDMA; marginal cost increase of 14% present worth; construction time and time to achieve RAOs is the same as Alternative GWHS-3; and better achieves RAOs.

EPA Response:

Understood. Please see EPA's response to Comment #3 in **Section B**, above.

Comment #23

The groundwater hot spot alternatives GWHS-2 through GWHS-4 include new prohibitions on the use of groundwater in the OU3 study area unless demonstrated that it will not pose an unacceptable risk, cause further plume migration, or interfere with the remedy. Given these prohibitions, will residents and property owners be provided with water to replace their well water?

EPA Response:

Residential well water within the OU3 study area is tested quarterly to evaluate the potential risk posed. If residents and property owners within the study area are not already in the quarterly sampling program, they are welcome to reach out to EPA to discuss their potential risk and whether sampling of their well is warranted. If sampling indicates a potential unacceptable risk, residents and other users may be connected to existing or planned water lines. At this time, Olin is providing bottled water and water coolers to two residences and working cooperatively with the Town of Wilmington to extend a water line to these residences. Other properties in the area already have a water line nearby for connection. If a new well is planned, EPA will work with the Town of Wilmington to ensure that the well does not have the potential to cause adverse impacts to health or to the groundwater remedy.

Comment #24

WERC considers Alternative DAPL/GWHS-4 – DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting **1,100 ng/L** NDMA (approx. 12 wells), on-site treatment at new treatment system – to be more effective than the selected alternative (Alternative DAPL/GWHS-3 – targeting **5,000 ng/L** NDMA) because it will remove more source material sooner. Each delay in removal of source material results in more contamination migrating to bedrock, where it is much more difficult to remove or treat.

EPA Response:

Understood. Please see EPA's response to Comment #3 in **Section B**, above.

Comment #25

WERC disagrees with EPA's rating of Alternative DAPL/GWHS-4 – DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting **1,100 ng/L** NDMA (approx. 12 wells), on-site treatment at new treatment system – as "fair" and Alternative DAPL/GWHS-3 – DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting **5,000 ng/L** NDMA (approx. 6 wells), on-site treatment at new treatment system – as "good" for short-term effectiveness given that risks to the community are modest and can be minimized with best management practices. The groundwater extraction well placements for Alternatives DAPL/GWHS-4 and -3 are similar.

EPA Response:

While the location of the groundwater extraction wells are generally similar for the two alternatives, Alternative DAPL/GWHS-4 incorporates one extraction well approximately 400 ft further into the MMB wetlands. This may have significant temporary impacts on the wetland during construction of the extraction well and associated pipeline. Furthermore, two additional extraction wells are located on commercial properties and have some additional administrative and potentially operational impacts. Finally, while best management practices will be used to minimize impacts, the potential for impacts is larger in general for alternatives with more infrastructure. Therefore, EPA still supports the original ratings for short-term effectiveness of "good" for Alternative DAPL/GWHS-3 and "fair" for Alternative DAPL/GWHS-4.

Comment #26

WERC disagrees with EPA's rating of Alternative DAPL/GWHS-4 – DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting **1,100 ng/L** NDMA (approx. 12 wells), on-site treatment at new treatment system – as "fair" and Alternative DAPL/GWHS-3 – DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting **5,000 ng/L** NDMA (approx. 6 wells), on-site treatment at new treatment system – as "good" for implementability, and considers the alternatives to be the same, with the exception that the ease of implementing future remedial actions is considered to be better for Alternative DAPL/GWHS-4.

EPA Response:

The installation of an additional extraction well and associated infrastructure much further into the MMB wetlands as part of Alternative DAPL/GWHS-4 poses significant logistical challenges: all construction and maintenance would need to be tailored to minimize environmental impacts to a significant wetland resource, but at the same time, physical access to this area is challenging because of the soft ground and shallow water (that prevents use of water craft such as a barge). The additional wells outside of the MMB wetlands under Alternative DAPL/GWHS-4 also add some complexity to the design and operation of the extraction system. EPA acknowledges that a more aggressive approach earlier in the process may assist with later groundwater remediation, but considers that overall, Alternative DAPL/GWHS-4 is somewhat less implementable than Alternative DAPL/GWHS-3.

Comment #27

For LNAPL and surface water, WERC agrees with the selection of Individual Cleanup Component LNAPL-5 – continued operation of Plant B to capture and treat LNAPL, followed by Plant B demolition and expanded Multi-Phase Extraction (MPE) – but would prefer to pair this with surface water Individual Cleanup Component SW-3 – groundwater extraction and treatment – which has more extensive groundwater extraction because this combination of alternatives for LNAPL and surface water would better achieve RAOs. The cost of this alternative is unknown.

EPA Response:

Individual Cleanup Component SW-4 – targeted groundwater extraction and treatment – was included in the selected remedy because it included groundwater extraction and treatment at the identified source areas for potential groundwater impacts to surface water: the Plant B area, groundwater that may have been impacted by the Jewel Drive and Containment Area DAPL pools, and areas of elevated groundwater contamination that may be migrating from the industrial area in the northern portion of the Property. At the same time, this Individual Cleanup Component minimized the potential impacts on wetland areas to the south and southeast of the Containment Area. As provided in Section 4.5.2.7 (Individual Cleanup Component SW-3) and Section 4.5.3.7 (Individual Cleanup Component SW-4) of the *FS Report Volume I* (Olin, 2020a), the net present worth (NPW) of Individual Cleanup Component SW-3 was estimated to be approximately \$8.8 million compared to approximately \$5.0 million for Individual Cleanup Component SW-4. Given the other factors listed above and the cost difference, EPA retained Individual Cleanup Component SW-4. Note that the final configuration of groundwater extraction wells will be determined based on PDI results, subject to EPA's review and approval.

Comment #28

A new alternative for the Containment Area should be developed that includes excavation of all soil above PRGs.

EPA Response:

Please see EPA's response to Comment #8 in **Section B**, above.

Comment #29

WERC disagrees with EPA's selection of Individual Cleanup Component SOIL-2 – soil covers – for upland soil and does not consider Institutional Controls to be sufficient to address soil, given that compliance would be left to future property owners/operators. Following the National Institute for Occupational Safety and Health (NIOSH) and EPA's waste management hierarchy, Institutional Controls should be a solution of last resort.

EPA Response:

EPA has considered the reasonably anticipated future land use of the Property—in light of its industrial history and its location in a commercial/industrial area—in selecting Institutional Controls as a component of the remedy to ensure the prohibition of residential use. Soil covers will restrict access for ecological receptors. Please see also EPA's responses to Comment #6 in **Section B** and Comment #20 in **Section C, II**, above.

Comment #30

WERC disagrees with EPA's selection of Individual Component TMP-2 – limited action (Institutional Controls, including vapor intrusion evaluations or vapor barriers and/or SSDSs – for TMPs in Soil and prefers to see treatment or excavation of TMP-impacted soil.

EPA Response:

TMPs pose potential human health risks on the Property via the subsurface-to-indoor vapor intrusion pathway in future occupied buildings. Vapor intrusion risks are commonly and reliably mitigated in new construction by including vapor barriers and sub-slab ventilation systems, which can be readily incorporated into new building designs.

Comment #31

Soil data for the Containment Area have not been presented in a timely fashion to make an informed decision about this area, and the monitoring results were not compared to the upland soil PRGs.

EPA Response:

EPA does not consider the assessment of Containment Area soil to date to be comprehensive (please see EPA's response to Comment #4 in **Section C**, **I**, above) and acknowledges the time constraints for analyzing the data produced by the November 2019 Containment Area soil investigation prior to drafting RAOs for Site media. Results from the November 2019 Containment Area soil investigation were transmitted from Olin to EPA on March 20, 2020 and shared with WERC on March 23, 2020. The principal purpose of the 2019 investigation was to better define the requirements of the remedial action selected by EPA, specifically the requirements under RCRA by which the wastes within the Containment Area would need to be remediated, contained, and monitored for the foreseeable future. The 2019 investigation did not indicate that soil within the Containment Area exhibited toxicity characteristics as defined by RCRA (40 C.F.R. § 261.24(a)).

The PRGs established in the feasibility study for TMPs, BEHP, and chromium for upland soil and Containment Area soil assume that a complete risk pathway is present, meaning birds were feeding in the area and thus in direct contact with the contaminated soil. At the time of the issuance of this ROD, Containment Area soil is overlain by a temporary cover that theoretically prevents water infiltration and also disrupts the primary risk pathway for ecological receptors. Considering the results of the 2019 investigation, historical disposal practices, and analytical data produced by the RIs for the Site, EPA determined that a multi-layer, low-permeability cap compliant with RCRA Subtitle D and Massachusetts solid waste landfill performance standards would be necessary to address the risks posed by Containment Area soil. Specifically, the low-permeability cap preferred by EPA would further prevent leaching of Site contaminants associated with the Containment Area into groundwater, surface water, and sediments at levels that pose unacceptable risks to human health and the environment. Although soil results from the Containment Area were not compared to the upland soil PRGs – which were established based on ecological exposures and risks – the low-permeability cap in the Containment Area would also address these risks, should they exist, by eliminating the exposure pathway.

Comment #32

The Containment Area does not adequately control groundwater. While the proposed cap would prevent contact with soil, it would not prevent the continued migration of groundwater into the Containment Area from the north and the migration of groundwater out of the Containment Area to the south. Because the OU3 (groundwater) FS will be completed in the future, any decision regarding the Containment Area is premature at this time.

EPA Response:

EPA agrees that the current temporary cap is inadequate, that shallow groundwater migrates out of the Containment Area via the equalization window, and that there appears to be some degree of groundwater leakage elsewhere from the Containment Area at the interface between the slurry wall and bedrock surface. As discussed in EPA's response to Comment #4 in **Section C**, **I**, above, it is important to note that the Containment Area contains both solid waste material that poses a threat of leaching contaminants into groundwater, and DAPL, a liquid that can flow and similarly leaches contaminants into groundwater. The selected remedy includes the installation of a low-permeability cap over the Containment Area and closure of the equalization window to reduce the infiltration of water into this area and minimize leaching of contaminants from the solid waste and soil into groundwater. The selected remedy also includes the extraction of DAPL within the Containment Area to remove this material as a source of contaminants to groundwater.

Collectively, these activities are intended to control the sources of groundwater contamination in this area; they are not intended to result in restoration of the aquifer. Further investigations and an FS are needed to understand the full nature and extent of groundwater contamination and to evaluate alternatives for restoration of the aquifer. It is common practice in the Superfund cleanup process to start cleanup of a site by first selecting remedies that control the sources of contamination, followed by selecting remedies that achieve all the cleanup goals for the site. Therefore, EPA does not agree that selection of the source control activities for the Containment Area is premature. Once again, further alternatives will be evaluated as part of OU3 (groundwater) to further address groundwater contamination migrating from this area.

Comment #33

EPA needs to decide if the Containment Area truly restricts groundwater flow. If it does, then contaminated soils and sediments from elsewhere at the Site should be added before installing a cap. If not, then the contaminated soils above PRGs should be removed and clean fill added, without adding a cap.

EPA Response:

As noted previously in EPA's responses to Comment #5 in **Section B**, Comment #4 in **Section C**, **I**, and Comment #31 in **Section C, II**, above, EPA does not believe that the Containment Area, with its current temporary cap and slurry wall, is protective enough for the issues posed by this area of the Site. The Containment Area contains solid wastes that can leach contaminants and act as on ongoing source of contaminants to the aquifer. The area also contains DAPL that can migrate into bedrock fractures and act as on ongoing source of contamination to the aquifer. EPA's remedy involves closing the equalization window, capping the solid waste with a low-permeability cover to minimize infiltration, and extracting DAPL. These actions serve as source control measures to minimize ongoing impacts to groundwater.

The upland soil located outside of the Containment Area poses a different kind of risk. These upland soils pose ecological risks to birds feeding in the area. As such, these risks can be managed with different types of cover systems, such as clean soil or pavement. The upland soil does not pose a threat of leaching contaminants to the aquifer and as such does not require management via a low-permeability cover. Consolidation of contaminated upland soil within the Containment Area and under the low-permeability cap was considered by EPA (please see EPA's response to Comment #9 in **Section B**, above); however, the volume of soil requiring excavation and consolidation would likely cause capacity issues within the Containment Area.

III. Written comments submitted by the Town of Wilmington (Board of Selectmen and GeoInsight, Inc.) on October 22, 2020

Comment #1

Wilmington residents and their Town government did not cause or contribute to the contamination of the Property, private residential and commercial properties, a major aquifer and five of the Town's nine drinking water wells. Nor were they in a position to manage or mitigate that contamination, other than commenting on technical reports and work plans. Therefore, the Town of Wilmington should be afforded ample opportunity to contribute to decision-making concerning the selection and scope of plans to remediate that contamination.

EPA Response:

Part 2, **Section C**, **COMMUNITY PARTICIPATION**, above, of this ROD explains that EPA made significant efforts to keep Town of Wilmington officials, WERC, and other interested members of the public informed with regards to the development of the FS, Proposed Plan, and supporting documents leading up to the issuance of the Proposed Plan. EPA provided the public an extended opportunity (10 days) for review of the Proposed Plan before the start of the formal comment period, and also conducted an extended formal comment period (60 days) for all parties to review the record and provide comments. Please see also EPA's response to Comments #1, #10, and #15 in **Section C**, **II**, above.

EPA is required by statute to hold a formal public comment period to receive comment on its identified range of proposed cleanup approaches and its preferred alternative published in the Proposed Plan. EPA considers and uses these comments to improve the cleanup approach ultimately selected. In the Superfund process, the formal comment period on cleanup alternatives is concluded and a cleanup plan is selected and documented in the ROD before the engineering design phase can start. Although a formal public comment period is not held during any portion of the engineering design phase, EPA incorporates opportunities for public involvement as it proceeds with the implementation of the cleanup plan. EPA will seek the input of Town officials and WERC in design planning such as addressing soil and sediment erosion controls; flood, wetland, and stormwater management; traffic and construction management; and health and safety. As design progresses, EPA will issue several design documents (such as a 30% design, 60% design, and 100% design), outlining construction and monitoring plans in detail. These design documents will be shared with Town officials, WERC, the public, and other interested parties. Likely mechanisms for sharing engineering design information include posting design documents on the Site webpage and the EPA contractor's fileshare webpage, making them available at the information repositories, distributing e-mail updates, a Site fact sheet, and community mailers highlighting the design information, and holding public informational meetings. In addition, EPA will coordinate closely with residents who reside on potentially impacted properties. EPA remains committed to facilitating additional public input into the implementation of the remedy and will continue to discuss the Town's and public's concerns as we move forward.

Comment #2

Remediation should make good on the original goal of restoring the Ipswich Watershed and Aberjona Watershed and the Town of Wilmington's drinking water resources.

EPA Response:

Please see EPA's responses to Comments #1 and #3 in **Section B,** above.

Comment #3

Remedial measures should be sufficient to withstand any potential redevelopment and not be compromised by cost concerns.

EPA Response:

EPA will continue to provide oversight to ensure that redevelopment does not adversely impact the construction and operation of the selected remedy for the Site and EPA's efforts to collect more data as needed to select and implement a final remedy for groundwater (OU3). If redevelopment occurs, EPA will review any redevelopment plans to ensure that the portion of the Site under consideration for redevelopment is safe for the intended use. Please see also EPA's response to Comments #2 and #17 in **Section B,** above.

EPA is required by statute and regulation to consider cost in the Superfund remedy selection process. Please see EPA's response to Comment #7 in **Section B** and Comment #12 in **Section C, II**, above.

Comment #4

The Town is concerned that the Containment Area slurry wall may not have been installed properly, that the slurry wall's integrity is suspect, and that it has allowed the migration of DAPL contaminants to surrounding media and off-site. While the Town's preference would be complete cleanup and full remediation, the Town recognizes that a substantial and secure cap could be a valid method. The Town urges EPA to rigorously re-evaluate the cap and extraction measures at the Containment Area at each Five Year Review, or more frequently, once installed.

EPA Response:

The original intent of the slurry wall was to cut off the migration of contamination and contain the DAPL within the boundaries of the Olin Property (Property). However, this effort was not successful. The DAPL pooled beneath the Property (the On-Property DAPL Pool) migrated via gravity flow over time into a lower depression to the west and formed the Jewel Drive DAPL Pool. When the second depression filled, DAPL migrated into a third depression creating the Main Street DAPL Pool. The extent of DAPL beyond these pools is currently unknown and will be investigated further during the OU3 RI.

EPA agrees with the commenter that the current temporary cap is inadequate for the purposes of reducing or eliminating the movement of Site contaminants. EPA's selected remedy for the Containment Area addresses the issue of the open equalization window within the slurry wall, which may contribute to the inability of the current Containment Area design to adequately contain Site contaminants. EPA is also of the opinion that there appears to be some degree of groundwater leakage elsewhere from the Containment Area at the interface between the slurry wall and bedrock surface (see EPA's response to Comment #32 in **Section C, II**, above). Irrespective of the root cause of the observed leakage through the slurry wall, EPA's selected remedy of a permanent cap for the Containment Area addresses the threat of leaching of Site contaminants associated with the Containment Area into groundwater, surface water, and sediments at levels that pose unacceptable risks to human health and the environment. More importantly, EPA's selected interim remedy for DAPL and hot spot groundwater includes extraction wells both inside and outside of the Containment Area slurry wall. The extraction network is the primary mechanism to address the liquid waste (e.g. DAPL and contaminated groundwater) in this area which is acting as a continuous source. The use of this extraction network minimizes the issues associated with the possible leakage occuring through the slurry wall.

At the conclusion of the remedy construction, hazardous substances, pollutants, or contaminants will remain at the Site. Therefore, as required by law, EPA will review the Site remedy to ensure that the remedial action continues to protect human health and the environment at least once every five years as part of the Agency's Five Year Reviews for the entire Site. These Five Year Reviews will evaluate all of the components of the Site remedy for as long as contaminated media above CERCLA risk levels remain in place.

Comment #5

The Town recognizes that the proposed 5,000 ng/L NDMA target for groundwater hot spot extraction is associated with an interim action and that a lower concentration target is expected to be adopted in the future. EPA should re-evaluate the need for a far lower target level as it develops final remedial plans.

EPA Response:

Please see EPA's response to Comment #3 in **Section B**, above.

Comment #6

The proposed cleanup plan may result in a net loss of water from the Ipswich Watershed and depletion of groundwater in the MMB aquifer, which is mostly located in the Ipswich Watershed. The treatment system design should therefore include mechanisms to mitigate or minimize potential groundwater depletion in the MMB aquifer. EPA should require that the extraction, treatment, and discharge of treated groundwater should be designed and implemented, as much as practicable, in order to minimize the transfer of groundwater between the Ipswich and Aberjona watersheds.

EPA Response:

Generally, treated groundwater should be returned to the watershed from which it was withdrawn to the extent feasible. Years of data collected from the Site demonstrate that the water table across the impacted area is typically flat, with frequent groundwater mixing between the Ipswich and Aberjona River watersheds. This Site-specific hydrologic information indicated that the impacts of groundwater withdrawal will likely not have a significant effect on the MMB aquifer. However, the impacts of extraction and discharge of groundwater will be evaluated further during design and the design will be based on an approach that minimizes adverse impacts. In addition, once the remedy is operational, continued monitoring will occur to demonstrate that the system is not resulting in adverse impacts to either watershed. Please see also EPA's response to Comment #4 in **Section B**, above.

Comment #7

Wilmington is prepared to cooperate with EPA to develop and implement appropriate restrictions on use of private wells in areas specifically impacted by Site contamination. However, EPA should more specifically identify the nature, scope, and geographic areas for bylaws or other locally-imposed restrictions or conditions on residential or industrial water usage and/or construction of wells. Details regarding these restrictions should be included in the ROD.

EPA Response:

EPA will work closely with the Town of Wilmington on the development of Institutional Controls for limiting the use of groundwater either through the passage of an ordinance, an amendment to local bylaws, or the establishment of procedures. This ROD contains information on the nature, scope, and geographic area where the restrictions should apply (see **Figure 11** in **Appendix C** of this ROD). EPA will periodically review the Institutional Controls for the groundwater, at a minimum every five years, to make sure that they are effective and cover the appropriate area as more information about the extent of contamination is developed. Please see also EPA's response to Comment #6 in **Section B**, above.

Comment #8

The interim target groundwater concentration that was developed (5,000 ng/L) is several orders of magnitude above concentrations that are protective of human health and the environment. The final cleanup plan for groundwater should include a target cleanup goal for NDMA that is significantly lower than the interim action goal of 5,000 ng/L; expansion of the groundwater extraction system to remediate areas where NDMA concentrations are below 5,000 ng/L; remediation of groundwater to concentrations that do not present a risk to human health or the environment for unrestricted uses; and restoration of the MMB aquifer to meet drinking water standards.

EPA Response:

Please see EPA's responses to Comments #1 and #3 in **Section B**, above.

Comment #9

The interim groundwater extraction and treatment system should be designed so that it can be readily expanded to receive additional DAPL and/or contaminated groundwater. The system design should include: oversized liquid conveyance piping diameter to accommodate potential increases in liquid flow; installation of spare piping in trenches for potential future use; adding valves or appurtenances to the piping so that additional extraction wells can be installed in the future; and designing a treatment system with sufficient excess capacity to accommodate potential increases in flow rate.

EPA Response:

EPA agrees with the comment. The potential for capacity expansion will be considered during review of the PDI and RD documents.

Comment #10

EPA's preferred alternative for LNAPL and surface water in the Proposed Plan is LNAPL/SW-3 – Demolition of Plant B, MPE for LNAPL, Targeted Groundwater Extraction to Prevent Impacts to Surface Water, Treatment at New Treatment System(s). This approach is not expected to be effective in achieving cleanup goals and a different remedial alternative should be considered for LNAPL. The LNAPL has been described as "#415 Process Oil" and process oil that contains BEHP, NDPhA, and TMPs. This LNAPL is considered to be a highly viscous oil that is relatively immobile. LNAPL mobility tests have not been conducted, but the LNAPL appears to have remained in the same approximate area where it was originally identified and does not appear to be migrating. LNAPL recovery rates have been very low and LNAPL remains despite nearly 40 years of active remediation. This indicates that the LNAPL is not sufficiently mobile to be recovered by MPE. EPA should consider an alternative approach that combines Individual Cleanup Component LNAPL-6 (excavation and off-site disposal) with Individual Cleanup Component SW-3 (groundwater extraction and treatment). This approach would remove the LNAPL directly and allow groundwater extraction wells to be installed directly in the excavation prior to backfill.

EPA Response:

EPA's preferred alternative for LNAPL and surface water – Alternative LNAPL/SW-3 – includes MPE for the treatment of LNAPL. MPE and excavation were among a set of alternatives evaluated to address LNAPL contamination near Plant B in the *Interim Action Feasibility Study* (*FS Report Volume II;* Olin, 2020b) and *Volume III – Comparative Analyses, Feasibility Study*

Report, Olin Chemical Superfund Site, Wilmington, Massachusetts (FS Report Volume III, USEPA, 2020c). Please see also EPA's response to Comment #8 in **Section C, I**, above.

EPA disagrees with the commenter's position that MPE will not be effective in achieving the cleanup goals, and that LNAPL is not sufficiently mobile to be recovered by MPE. LNAPL remediation over the history of the Site has been passive – limited to removal by hand via skimmers or absorbent bailers – and while current recovery volumes are low, they demonstrate some degree of mobility. LNAPL was first detected as oily seepage into East Ditch Stream, and has remained in the same general area since its release because of the lack of a significant hydraulic gradient due to groundwater extraction by Plant B. LNAPL that is inherently mobile is not expected to migrate when a negligible groundwater gradient is present. Additionally, remediation efforts were limited in the past by the presence of the Plant B building, which will be demolished under the selected remedy to facilitate access to the entire LNAPL-contamination area. MPE is a more robust remedy than passive removal of LNAPL, and its implementation will include PDIs and testing. Under the selected remedy, the geographical extent of LNAPL will be further delineated via additional sampling and the LNAPL will be further characterized, including evaluations of LNAPL mobility. PDI data will be used to develop operating parameters and to calibrate the MPE system.

As the MPE remedy becomes operational, EPA will closely monitor its progress to ensure that the system is functioning as intended and working to meet the RAOs of preventing migration of LNAPL to East Ditch Stream and removing LNAPL that represents a source of Site contaminants to groundwater and a source of TMPs to indoor air in future building construction. EPA's selected remedy also includes groundwater extraction and treatment to prevent impacts to surface water.

For the reasons described above, excavation of LNAPL-impacted soil would only be slightly more effective in the long term than MPE. However, MPE provides for more reduction of contaminant toxicity, mobility, or volume than excavation, as EPA's Selected Alternative LNAPL/SW-3 will utilize an estimated three to five MPE wells to capture and treat soil vapor and groundwater, and only limited reduction of pollutant mobility would occur during excavation through the addition of bulking agents to facilitate off-site disposal. Both alternatives would be protective of human health and the environment and would meet ARARs. Both alternatives would remediate LNAPL in approximately one year, but excavation has greater short-term impacts in terms of worker and community health and safety issues due to risks associated LNAPL volatilization during excavation and trucking LNAPL-contaminated soil through the community for off-site disposal. Moreover, MPE is easier to implement than excavation because excavation would interfere with existing extraction and/or monitoring wells on the Property, and if additional LNAPL-impacted soil is encountered during excavation activities, removing those impacts would be difficult due to potential encroachment on the active Massachusetts Bay Transportation Authority (MBTA) railroad line and sheet piling along the bank of East Ditch Stream may also be necessary. The costs of MPE are proportional to its overall effectiveness, and it is therefore cost effective.

Additionally, as required by law, EPA will review the Site remedy, including the MPE remedy for LNAPL, to ensure that the remedial action continues to protect human health and the environment at least once every five years as part of the Agency's Five Year Reviews for the entire Site as long as hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unrestricted use. These Five Year Reviews will evaluate all of the components of the Site remedy for as long as contaminated media above CERCLA risk levels remain in place.

Comment #11

EPA's proposed alternative to install a permanent cap over the Containment Area is expected to adequately address residual impacts and achieve RAOs. However, Olin's investigations in the Containment Area were limited and may be insufficient to adequately assess remaining impacts.

EPA Response:

EPA agrees that the investigations within the Containment Area were limited and may not completely characterize all Containment Area soil. This area has been reworked several times during the history of the Site and during previous response actions. As such, the area would need a more robust sampling program to demonstrate that the soils in this area do not pose a leaching threat to groundwater. Please see also EPA's response to Comment #4 in **Section C, I**, above.

Comment #12

A significant amount of information will be collected regarding DAPL and groundwater impacts from the ongoing data gaps investigation. The Town and its contractor expect a final cleanup plan for OU3 after the data gaps work is completed and expect to review and comment on that document.

EPA Response:

Comment noted. Please see also EPA's response to Comment #10 in **Section C, II**, above.

IV. <u>Written comments submitted by residents on October 26 & 27, 2020</u>

Comment #1 (C. Baima, J. Baima)

The plan for the remedial action should involve cleaning rather than covering contamination.

EPA Response:

Portions of the selected remedy do consist of removal of contamination (the interim remedies for DAPL and groundwater hot spots; and the final remedy for wetland soil and sediments) based on a full evaluation that includes feasibility, cost, as well as effectiveness. Removal of all other impacted soil has a high degree of permanency relative to the other alternatives evaluated, however, EPA considered other factors as outlined in Superfund guidance. Excavation of all impacted soil requires significant effort to manage, consolidate, dewater, and transport material, and also results in more potential short-term impacts to workers and neighboring areas from this work. In addition, excavation near the eastern boundary of the Olin property (Property) may require additional structural support close to the MBTA railroad tracks, which poses significant structural, logistical, and safety challenges given that this is an active commuter rail line.

The engineering controls for the soils remaining in place under the selected remedy – capping and cover systems, installation of soil vapor barriers and other vapor mitigation systems for potential future buildings – are reliable and widely-accepted technologies. Given that the Property is zoned for industrial use and that soil impacts are generally limited to the Property or immediately adjacent to the Property boundary, EPA considers engineering controls and Institutional Controls to be adequately reliable for the soil contamination remaining in place under the selected remedy. As part of the selected remedy, Five Year Reviews will be required for as long as contamination remains in place at concentrations above residential criteria, and these reviews will evaluate the engineering controls and Institutional Controls in place to ensure their adequacy. Please see also EPA's responses to Comment #8 in **Section B** and Comments #14 and #20 in **Section C, II**, above.

Comment #2 (C. Baima, J. Baima)

What is the possible impact on the planned interim or final activities in the case of bankruptcy or change in ownership for Olin or other prior or future owners? The various owners of the Olin Site should not be excused from their environmental, social and fiscal responsibilities.

EPA Response:

Under CERCLA, the classes of liable parties include current owners and operators of a facility and past owners and operators of a facility at the time of disposal of hazardous substances. **Part 2**, **Section B.3**, **SITE HISTORY AND ENFORCEMENT ACTIVITIES**, History of CERCLA Enforcement Activities, above, of this ROD explains that as a result of Site PRP search activities, EPA issued notices of potential liability to several PRPs, including American Biltrite, Inc., Biltrite Corp., Olin, Stepan Company, Fisons Limited, and NOR-AM Agro LLC. These parties either owned or operated the Facility at a time when hazardous substances were disposed or are a successor to an entity that was the owner or operator of the Facility at a time of disposal of hazardous substances. Olin is the current owner and operator of the Facility. Pursuant to an Administrative Settlement Agreement and Order on Consent (AOC), Olin, American Biltrite, Inc., and Stepan Company have been performing the RI/FS with EPA oversight, which is still on-going for Site-wide groundwater. Therefore, EPA has identified a number of parties that it believes are responsible for the contamination at the Site and expects that these parties will pay for/perform the cleanup.

CERCLA liability is joint and several, which means that any one PRP may be held liable for the entire cleanup of a site. Therefore, if Olin or any of the other PRPs are unable to fulfill their cleanup obligations at the Site, the other PRPs would be required to satisfy the obligations. Additionally, EPA negotiates financial assurance requirements in its Superfund settlements and imposes financial requirements on PRPs through orders. In general, financial assurance provisions in settlements and orders require PRPs to demonstrate that adequate financial resources are available to complete required cleanup work.

CERCLA was amended in 2002 to allow certain parties who purchase contaminated properties to buy such properties and avoid potential CERCLA liability if they qualify as a "bona fide prospective purchaser" ("BFPP"). The BFPP provision provides that a person meeting the criteria of CERCLA Sections 101(40) and 107(r)(1) and who purchases after January 11, 2002 is protected from CERCLA liability and will not be liable as an owner or operator under CERCLA. To meet the statutory criteria for a BFPP, a landowner must satisfy certain threshold criteria and continuing obligations. Among other continuing obligations, a BFPP must do the following: (i) provide full cooperation, assistance, and access to persons that are authorized to conduct response actions at the site; (ii) take reasonable steps to stop any continuing release; prevent any threatened future release; and prevent or limit human, environmental, or natural resource exposure to any previously released hazardous substance; and (iii) establish that it is in compliance with any land use restrictions established or relied on in connection with the cleanup, and it does not impede the effectiveness or integrity of any Institutional Control employed in connection with the cleanup. Landowners must comply with land use restrictions and implement Institutional Controls even if the restrictions or Institutional Controls were not in place at the time the person purchased the property. Therefore, any future owners of the Olin property will be required to meet these requirements in order to maintain BFPP status. Please see also EPA's response to Comment #20 in **Section C, II**, above.

Comment #3 (C. Baima)

If the Containment Area is working as intended, contaminated material should be consolidated within it prior to capping. If not, it should be fixed prior to capping or the soils should be removed. If the status of the cap is unknown, a remedy should not be selected at this time.

EPA Response:

Please see EPA's responses to Comments #8 and #9 in **Section B**, above, Comment #4 in **Section C, I**, above, and Comments #14 and #32 in **Section C, II**, above.

Comment #4 (C. Baima)

Cost should not be a criterion for the selection of alternatives.

EPA Response:

Please see EPA's response to Comment #7 in **Section B**, above.

Comment #5 (C. Baima)

Remedial alternatives should be selected based on the expectation of restoration of soil and water to pre-contamination conditions and in the shortest possible timeframe. The goal for groundwater is to restore the aquifer to drinking water conditions.

EPA Response:

EPA's May 25, 1995 directive entitled, *Land Use in the CERCLA Remedy Selection Process* (available at: https://www.epa.gov/sites/production/files/documents/landuse.pdf) provides information for considering land use in remedy selection decisions. Major points of this directive include the following:

- *Discussions with local land use planning authorities, appropriate officials, and the public, as appropriate, should be conducted as early as possible in the scoping phase of the Remedial Investigation/Feasibility Study (RI/FS). This will assist EPA in understanding the reasonably anticipated future uses of the land on which the Superfund site is located;*
- *Remedial action objectives developed during the RI/FS should reflect the reasonably anticipated future land use or uses; and*
- *Future land use assumptions allow the baseline risk assessment and the feasibility study to be focused on developing practicable and cost effective remedial alternatives. These alternatives should lead to site activities which are consistent with the reasonably anticipated future land use.*

The Olin property (Property) is zoned for commercial/industrial use; EPA's understanding from discussions with Town of Wilmington officials is that the reasonably anticipated future uses of the Property continues to be commercial/industrial. Therefore, EPA developed the set of cleanup objectives for the Property during the remedy selection process with this anticipated future land use in mind. The RAOs developed to address soil contamination resulted in a set of remedial alternatives to address the ecological and human health risks posed by the Site, including the human health risks posed by the contamination on the Property that would need to be addressed to make the Property ready for commercial/industrial re-use.

Section 121(b)(1) of CERCLA presents the factors that, at a minimum, EPA is required to consider in its assessment of remedial alternatives. The selected remedies for soil (cap or cover systems for soil across the Property to prevent exposure and potential leaching; removal of contaminated soil and sediments from wetland areas and wetland restoration; treatment of LNAPL-contaminated soil via MPE; and vapor intrusion evaluations and/or mitigation systems for TMP-contaminated soil) meet the five principal requirements for the selection of remedies in CERCLA Section 121 and the nine criteria (see further discussion in **PART 2, Section K, SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES** of this ROD, above).

Low-level threat wastes are source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The NCP, which governs EPA cleanups, at 40 CFR § 300.430(a)(1)(iii), states that EPA expects to use "treatment to address the principal threats posed by a site, wherever practicable" and "engineering controls, such as containment, for waste that poses a relatively low long-term threat" to achieve protection of human health and the environment. Wastes that are generally considered to be low-level threat wastes include non-mobile contaminated source material of low to moderate toxicity, surface soil containing Site contaminants that are relatively immobile in air or groundwater, low-leachability contaminants, or low toxicity source material. Low-level threat wastes on the Olin property include soil impacted with chromium and BEHP. These materials will be addressed by installing a permanent, low-permeability cover over the Containment Area and installing soil and/or asphalt cover systems for contaminated upland soil. Institutional Controls and long-term maintenance of covers and caps will be used to address these materials over the long term.

The NCP describes EPA's expectations for groundwater restoration and states that EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site. When restoration of ground water to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated ground water, and evaluate further risk reduction. Since portions of the aquifer at the Site are classified as drinking water sources and since MassDEP has assigned a high use and value for the Site area aquifer, the goal for the groundwater would be to restore this aquifer to its beneficial use, unless it is determined not to be practicable. Since there is insufficient data at this time to determine whether full restoration is practicable, EPA's objectives for this interim remedy are focused on removing the source, minimizing further migration of contaminants, and preventing exposure.

Further work is underway to finish characterizing the nature and extent of contamination in the aquifer and to develop and evaluate a set of alternatives to restore the groundwater to its beneficial use as a drinking water aquifer. Once this investigation is completed, EPA will issue a final ROD for groundwater identifying the final cleanup goals for groundwater at the Site.

EPA agrees that strong efforts should be made to hasten the pace of remedy design and implementation, while meeting EPA's obligations under CERCLA and the NCP. The investigations at the Site have been ongoing for a very long time, with little progress in the actual cleanup. While PDIs are needed to refine the details of the selected remedy, EPA expects these investigations to be focused and implemented expeditiously such that active cleanup is initiated as soon as possible. The dynamic of work at the Site must shift such that the PDIs do not become another long-term phase of the investigation.

Please see also EPA's responses to Comments #1, #14, and #16 in **Section B**, above, and Comment #1 in **Section C, I**, above.

Comment #6 (C. Baima, S. Baima)

Institutional Controls should not be relied upon (such as for TMPs) when remediation is an option.

EPA Response:

Please see EPA's responses to Comments #20 and #30 in **Section C, II**, above.

Comment #7 (C. Baima, J. Baima, S. Baima)

The goal for groundwater should be to restore the aquifer to drinking water conditions.

EPA Response:

Please see EPA's responses to Comments #1 and #14 in **Section B**, above.

Comment #8 (L. Brooks)

Will Transrail be allowed on Olin's property to begin construction for operation? If land is disrupted before cleanup is complete, contamination may spread further.

EPA Response:

Please see EPA's responses to Comments #2 and #17 in **Section B**, above and Comment #2 in **Section C, IV**, above.

Comment #9 (S. Baima)

The PRPs should have no influence over the selection of a final remedy.

EPA Response:

Please see EPA's response to Comment #19 in **Section B**, above.

Comment #10 (S. Baima)

Alternative DAPL/GWHS-4 is preferable to DAPL/GWHS-3 because it removes more surface material. The temporary environmental impact of the installation of more wells is an acceptable price to pay for additional wells.

EPA Response:

Please see EPA's responses to Comment #3 in **Section B**, above and Comments #22, #24, #25, and #26 in **Section C, II**, above.

Comment #11 (S. Baima)

The PRGs for LNAPL and surface water appear to be using a mix of averages and "not to exceed" limits for ammonia and chromium. How is it appropriate to compare an average value to a "not to exceed" limit when you could fail the limit with high individual readings?

EPA Response:

The Proposed Plan contained performance standards for chromium and ammonia in surface water developed in accordance with EPA Guidance for *Aquatic Life Ambient Water Quality Criterion – Freshwater* (USEPA, 2013) to establish the Criterion Continuous Concentration (CCC). The CCC is a value below which adverse effects would not be expected for the majority of aquatic receptors. The site-specific chromium CCC of 0.10 mg/L was documented in Table 3.12-3 of the BERA. This concentration, for dissolved chromium, was calculated using EPA equations for deriving hardness-dependent criteria using the arithmetic mean of surface water hardness for the South Ditch Stream (177 mg/L Calcium Carbonate [$CaCO^3$]). Using an arithmetic mean for determining hardness is an appropriate approach for addressing the variability in this parameter and consistent with guidance.

The site-specific ammonia CCC was calculated based on site-specific surface water temperature and pH data consistent with Table N-1 in Appendix N of *Aquatic Life Ambient Water Quality*

Criteria for Ammonia –Freshwater (USEPA, 2013). The Proposed Plan contained a performance standard for ammonia in surface water of 15 mg/L based on an average temperature of 9.2°C and a pH of 7.13. As noted in EPA's response to Comment #10 in **Section B**, above, EPA has re-evaluated the performance standard for ammonia in surface water and believes that the performance standard should be based on the 95% Upper Confidence Limit (UCL) of temperature data from mid-May through June (18°C) and has revised the performance standard in the ROD to 9 mg/L. Using the 95% UCL for temperature is an appropriate approach for addressing the variability in this parameter and consistent with guidance.

It is important to note that the surface water performance standards are instream levels, protective of organisms over the long term (*e.g*., chronic conditions). To evaluate whether the remedy is functioning as designed, surface water samples will be taken at different locations within the stream and compared to these performance standards to evaluate the effectiveness of the remedy. Exceedances of the performance standards at a particular location may result in modifications to the remedy or may result in further evaluations including toxicity testing. In summary, the use of statistical methods such as UCLs, averages, and arithmetic means for characterizing the conditions of the stream *(i.e*., hardness, temperature, and pH) is an appropriate means to determine the performance standards. Long term monitoring results will be compared to these performance standards to determine if the remedy is functioning as designed and sufficiently protective.

Comment #12 (S. Baima)

The USACE water quality certification allows for wetland intrusion only if that intrusion is temporary and for remediation activities. While remediation activities will impact wetland areas, some impacts may be necessary to remove contaminants. The wetlands should be restored to the greatest extent possible.

EPA Response:

EPA agrees with the substance of this comment. Restoration of wetlands impacted by remedial activities is included in the selected remedy. EPA will minimize potential harm and avoid adverse impacts to wetlands, to the extent practicable, by using best management practices to minimize harmful impacts on wetlands, wildlife, or habitat. Any wetlands affected by remedial work will be restored and/or replicated consistent with the requirements of federal and state wetlands protection laws with native wetland vegetation, and any restoration efforts will be monitored. Mitigation measures will be used to protect wildlife and aquatic life during remediation, as necessary. Please see also EPA's response to Comment #8 in **Section C, II**, above.

V. <u>Written comments submitted by WWI LLC on October 26, 2020</u>

Comment #1

How does the fact that additional sampling is anticipated affect the proposed cap for the Containment Area? Does EPA anticipate that additional investigation and remediation will affect the design and installation of the permanent cap? Will the cap be installed after the data gap investigation is complete?

EPA Response:

Additional investigation and remediation are not expected to significantly change the plan for the cap. The data gap investigation in the area of the Containment Area is anticipated to be completed prior to final cap design and installation.

Comment #2

The removal of DAPL and highly contaminated groundwater is expected to take 8 years. Does EPA anticipate that the permanent cap would be installed after DAPL removal, or can DAPL removal proceed with the permanent cap in place?

EPA Response:

The implementation sequence for the remedy will be defined during the design. However, EPA anticipates that DAPL and hot spot groundwater extraction wells within the area of the Containment Area cap will be installed before the permanent cap is constructed.

Comment #3

The cap over the Containment Area has not yet been designed. Would EPA consider a building, designed to address potential vapor intrusion, as a component of that cap? If the building is not designed as part of the cap, could the cap be designed and constructed to allow for a building to be installed in the future? Note that this has occurred at other NPL sites. We can work with Olin on the specifics of integrating a building into cap design but request clarification that such an approach would be acceptable.

EPA Response:

The cap over the Containment Area must be designed and constructed to meet ARARs, specifically the performance requirements of RCRA Subtitle D criteria for solid waste landfills and Massachusetts solid waste landfill regulations to minimize infiltration. It is possible that a building could be designed and constructed to meet these requirements. It is also possible that the permanent cap could be designed and constructed to allow the installation of a building above the cap. If a building is constructed in this area, it must be constructed to ensure that vapor intrusion issues are mitigated and that the structure does not interfere with all other aspects of the remedy, including the extraction and monitoring of DAPL and groundwater.

Comment #4

The remedial plan for on-Site soil also includes some soil excavation and capping with either asphalt or soil cover. It appears to that the selection of asphalt or soil is consistent with existing conditions, e.g. replacing soil with soil, and asphalt with asphalt. The proposed redevelopment involves the construction of a large warehouse building. Is EPA amenable to a "cap" consisting of a building, rather than asphalt or soil?

EPA Response:

The upland soil on the Olin property (Property) pose an ecological risk to various species. To mitigate these risks, EPA's remedy includes covering these soils with either clean soil or pavement to eliminate the exposure pathway for these species. Construction of a building over those soils that pose a risk can also achieve the RAOs. However, the building would then become a component of the remedy and as such, the design, construction, and long-term maintenance would necessarily be conducted under the oversight and approval of EPA.

Comment #5

The Proposed Plan includes the collection and treatment of highly contaminated groundwater and product and the construction of a new treatment building, shown as being located near Plant B. WWI suggests that EPA consider locating the treatment building off-Property for the following reasons: the location depicted in the Proposed Plan would require installation of piping through much of the developable area of the Site and complicate future redevelopment, would require an increase distance to pipe contaminants (increasing potential for release) and would cross at least one wetland. Instead, WWI suggests that the treatment plant be located on 1 Jewel Drive.

EPA Response:

The location of the treatment plant in the Proposed Plan is conceptual and may be revised during the design phase. EPA is amenable to an alternate treatment plant location as long as it meets location-specific ARARs.

VI. Written comments submitted by MIT community/MIT Superfund Research Program (J. Kay, K. Vandiver, J. Beard, B. Engelward, T. Swager) October 22-26, 2020

Comment #1 (MIT SRP)

We agree that continued quarterly monitoring of the 18 currently tested residential wells for nitrosamine contamination is appropriate, but should be expanded to include other nitrosamines and contaminants beyond NDMA only.

EPA Response:

It has been concluded over many years of collecting groundwater samples at the Site that NDMA is both the most toxic and most mobile of all the target analytes and this chemical has been used to define the extent of groundwater impacts at the Site. The available data shows NDMA to be more widespread than any other nitrosamines that have been analyzed for at the Site; addressing the major sources of NDMA to the aquifer – DAPL and groundwater hot spots – will result in addressing other nitrosamines that are present in environmental media. NDMA concentrations in the currently tested private residential wells are orders of magnitude lower than concentrations in DAPL and groundwater hot spots, and EPA expect these levels in residential wells to decline even further upon implementation of the interim remedy for OU3.

The sampling effort for private wells under the Superfund program was initiated in October 2009 and has evolved over time. Initial samples were analyzed quarterly for the target analytical list as required by the *Final RI/FS Work Plan* (MACTEC, 2009).[29] The initial analyte list included 74 semi-volatile organic compounds (SVOCs), inorganics (ammonia, sulfate, chloride, nitrate, and nitrite), metals (sodium, chromium, and hexavalent chromium), NDMA, and n-nitrosodipropylamine (NDPrA). NDPrA detections were reported with NDMA as per EPA drinking water Method 521. Over time, the list of target analytes was narrowed based on ongoing results. SVOC analyses were discontinued for multiple wells due to a lack of detections.

Other nitrosamine compounds besides NDMA were sampled in known impacted wells GW-10S and GW-10D and there were no detections above EPA Regional Screening Levels (RSLs), which are conservative risk-based values. These wells are located on the Olin property (Property) in close proximity to the Jewel Drive DAPL pool. Given their location near an area of elevated NDMA concentrations in groundwater, these wells would be likely to exhibit concentrations of other nitrosamines, if present. Samples from these wells were analyzed for n-nitrosodi-n-butylamine (NDBA), NDPrA, n-nitrosodiethylamine (NDEA), NDMA, n-nitrosomethyleythylamine (NMEA), n-nitrosopiperidine (NPIP), and n-nitrosopyrrolidine (NPYR). For GW-10S, based on reporting limits ranging from 1.9 ng/L to 4.8 ng/L, the laboratory did not report any positive detections of these compounds. For GW-10D, the laboratory reported low, estimated (J-flagged) detections of NDBA (4.9 ng/L (J)) and NMEA (0.5 ng/L (J)), along with an NDMA concentration of 220 ng/L (J). A comparison of the estimated detections of NDBA and NMEA to the EPA RSLs did not indicate unacceptable human health risks.

In summary, the results support the conclusion that NDMA is the predominant compound of concern among the Method 521 analyte list as it was detected at the highest concentration and has the lowest tapwater RSL. Based on the results, EPA did not require Olin to conduct further groundwater sampling and analysis in the residential monitoring program for NDPrA, NDEA, NMEA, NPYR, NPIP, or NDBA. In addition, during design of the remedy and implementation of the data gaps work, EPA will continue to evaluate the nature and extent of all nitrosamines at the Site. For example, it will be important to evaluate and confirm that treatment systems are adequately addressing the full list of nitrosamines. Confirmation sampling from certain select wells and the influent and effluent from the treatment systems will be implemented to confirm our conclusions thus far.

Comment #2 (MIT SRP)

It is extremely important to characterize the full chemical composition of DAPL in order to understand health risks to the community.

EPA Response:

EPA believes that sufficient characterization of DAPL has occurred to understand the health risks to the community. While conductivity is often used as a primary indicator or screening tool, DAPL has been analyzed for a broad spectrum of contaminants and characteristics as listed in Table 3.1-1 of the *Final RI/FS Work Plan* (MACTEC, 2009), including VOCs, SVOCs including

[29] See MACTEC, 2009. Field Sampling Plan, Volume III-A, Table 3.1-1.

the nitrosamines NDMA, NDPrA, and NDPhA, total and dissolved metals, alkalinity, anions, ammonia, phthalic acid/phthalic anhydride, specific conductance, specific gravity, total organic carbon, and specialty compounds including 1,1-dimethylhydrazine, acetaldehyde, formaldehyde, Kempore, methylhydrazine, Opex, and perchlorate. The most recent RI report summarizing these results is the *June 2019 Draft OU3 RI Report* (Wood, 2019). Please see also EPA's response to Comment #1 in **Section C, VI,** above.

In addition, DAPL chemistry has been evaluated in technical bulletins and articles, including the following:

- Eary, L. E. and Davis, A., 2007. Geochemistry of an acidic chromium sulfate plume. Applied Geochemistry 22, 357-369.
- Geomega, 1999. Technical Series 3: Results of August 1998 multilevel piezometer samping event and DAPL/diffuse layer discrimination analysis. January 8.
- Geomega, 2004. Technical Series 37: Conclusion of the laboratory column test simulating aquifer pumping for DAPL removal. December 28.

Table 1.1 of the *Focused RI Report – DAPL* (AMEC, 2017) identifies the 33 monitoring wells and multi-port piezometers screened in DAPL; Table 4.1 summarizes all the chemical analyses that were conducted for each of those groundwater monitoring wells and multi-level piezometer ports. Tables 4.2-1, 4.2-2, and 4.2-3 include all of the analytical data for organics (including NDMA and NDPhA), inorganics, and non-standard analytes (including hydrazine, unsymmetrical dimethylhydrazine (UDMH), monomethylhydrazine (MMH), formaldehyde, dimethylformamide, acetaldehyde, Opex, and Kempore). Table 2.3-8 of the Draft Baseline Human Health Risk Assessment for OU3 (Draft 2019 OU3 BHHRA) – Attachment K of the *June 2019 Draft OU3 RI Report* (Wood, 2019) – summarizes analytical data for compounds detected at least once among samples collected from DAPL monitoring wells sampled between May 2010 and June 2016; the table includes full-suite analyses of DAPL samples including organics (VOCs and SVOCs, including NDMA, NDPrA, and NDPhA), volatile petroleum hydrocarbons (VPH), metals, inorganics, and specialty compounds (including hydrazine, UDMH, MMH, formaldehyde, dimethylformamide, acetaldehyde, Opex, and Kempore). The current data set indicates that NDMA is the predominant nitrosamine compound in DAPL. In addition, as noted in the previous response, during design of the remedy and implementation of the data gaps work, EPA will continue to evaluate the nature and extent of all nitrosamines at the Site.

Comment #3 (MIT SRP)

MIT is concerned regarding the proposed method of "pump and treat" for DAPL. Historically, pump-and-treat is ineffective because the entire mass cannot be treated simultaneously and turnover rates are extremely slow relative to the size and dynamics of the plume. Even if treated effectively, upon reinjection it returns to the plume and facilitates plume migration, and may still contain precursors that may re-form hazardous materials. For example, pump and treat of trichloroethene (TCE) on Cape Cod has not reduced contamination.

EPA Response:

The extraction and treatment method planned for DAPL has several major differences with traditional groundwater pump-and-treat, as described below.

- The DAPL targeted by the selected remedy has collected in bedrock depressions over time and is isolated from most groundwater advective flow. While EPA remains concerned that some of the DAPL has migrated over time via bedrock fractures, the targeted DAPL mass is not migrating measurably.
- There are no plans to reinject treated DAPL directly to the source area. If reinjection is contemplated in the future, further studies will be conducted to evaluate the feasibility of this action. Studies will be conducted to evaluate and optimize the on-site treatment of DAPL prior to off-site disposal of the residuals. The goal will be to pre-treat the extracted DAPL to reduce its volume as much as possible, thus reducing the volume of residuals requiring off-site disposal. There will be two waste streams from the treatment, a solid waste stream which will be containerized and then disposed of off-site and a liquid waste stream which will be evaporated. If it is not feasible to treat DAPL on-site, extracted DAPL will be disposed of off-site at a permitted facility licensed to receive such wastes.
- The planned extraction is designed to minimize mixing of DAPL and overlying groundwater. The proposed DAPL extraction rates are very low to match the rate of gravity flow, and the extraction screens will be placed at the top of bedrock to capture as much DAPL as possible and minimize entrainment of overlying groundwater. EPA has also selected a remedy for DAPL that includes a larger number of extraction wells in order to reduce the pumping rate at any given extraction point but still allow for extraction to proceed at a reasonable pace.

It is also important to note that Olin conducted a pilot test to evaluate extraction rates for DAPL that allow for removal of DAPL while minimizing the mixing of the overlying groundwater. Approximately one million gallons of DAPL have been successfully removed from the Jewel Drive DAPL pool to date.

With respect to the use of pump-and-treat technologies utilized to address TCE contamination on Cape Cod, EPA disagrees with the commenter's conclusion. Significant plume reduction and aquifer restoration has been achieved on Cape Cod using pump-and-treat technologies. Reinjection of the treated groundwater also helped contain the plumes as the reinjection was designed to create hydrologic highs that served to funnel the contaminated groundwater towards the extraction wells. A review of the historical extent of contamination compared to current extent showed dramatic decreases in the nature and extent.

Comment #4 (MIT SRP)

The proposed final actions for LNAPL and soil/sediment are not satisfactory. MIT is concerned about the efficacy of pumping and treatment for LNAPL. Considering the history of chemical disposal, NDMA precursors and other chemicals are likely present in the LNAPL and soil/sediment, and more aggressive assessment and response is needed. Olin manufactured nitrosamine products, such as NDPhA (Wiltrol N) and Opex, which may be less mobile in the environment than NDMA due to soil sorption, necessitating more aggressive soil remediation. The acidity of the Site's waste, combined with these nitrosamines, may create conditions favoring ongoing formation of more mobile nitrosamines such as NDMA that could continue to leach to groundwater. In addition, numerous nitrosamine precursors or materials known to create nitrosamine-forming conditions are known or highly likely to be present in LNAPL and soil/sediment, including hydrazines, raw material for Nitropore 5PT, and aqueous ammonia and chlorine.

EPA Response:

EPA believes that adequate site characterization has occurred to develop sets of alternatives to address LNAPL contamination and contamination in soil and sediments, and believes that the selected remedies for LNAPL and soil and sediment contamination are appropriate. EPA acknowledges that the LNAPL process oil was known to contain NDPhA as well as other constituents, however, NDPhA was not detected in surface soil or shallow subsurface soil at Plant A/C-1 or the Plant D Tank Farm where most of the hydrazine detections in soil were located; the hydrazine and NDPhA detections in soil are not co-located and therefore would not have the opportunity to react together. In addition, EPA is not of the opinion that there are currently acidic conditions in soil (a requisite for nitrosation) where the hydrazine has been detected (see below for further discussion of acidic conditions). Given the relatively small volume of LNAPL and its limited aerial extent, EPA does not believe the LNAPL is a significant source of groundwater contamination as compared to DAPL.

EPA notes that more than 400 soil samples were collected for nitrosamines (NDMA, NDPrA, and NDPhA), ammonia, chloride, and sulfate analysis. In addition, approximately 200 soil samples were collected and analyzed for 1,1-dimethylhydrazine, acetaldehyde, dimethylformamide, formaldehyde, hydrazine, and methylhydrazine. The LNAPL, soil, and sediment data indicate that NDMA precursors are not present at most sample locations, and where present, are at low concentrations and without the acidic conditions that would be needed to sustain reactions and create additional nitrosamines.

The acidic waste on the Olin property (Property) was in the liquid waste streams that were discharged to unlined lagoons and pits (including the one referred to as "Lake Poly") from 1953 to around 1970. These disposal areas are distinct from the LNAPL/Plant B area and range from more than 300 feet to more than 1,000 feet to the southwest. That waste stream ultimately resulted in the formation of DAPL. Lake Poly soil was excavated to bedrock and disposed of off-site. There is no corollary acidic waste distributed within soils on the Property where NDPhA is found. EPA does not believe that the conditions that previously existed in the chemical manufacturing processes and the discharges of associated liquid wastes currently exist in soil, sediments, or the LNAPL area at the Property.

Please see also EPA's response to Comment #10 in **Section C, III** above for a discussion of LNAPL excavation and EPA's responses to Comment #8 in **Section B**, Comment #14 in **Section C, II**, and Comment #1 in **Section C, IV**, above, for a discussion of removal of impacted soils.

Comment #5 (MIT SRP/recommendation letter)

Because the slurry wall was not installed to bedrock and leaves opportunity for fluid transport, ongoing NDMA production will continue to contaminate the groundwater of Wilmington unless chemical sources (hydrazines, aqueous ammonia and chlorine) are removed and an effective barrier constructed.

Containment walls should be installed that extend to bedrock and a permanent, secure, impermeable cap should be installed.

EPA Response:

The slurry wall of the Containment Area feature was constructed to bedrock; however, EPA believes there may be some degree of groundwater leakage at the interface between the slurry wall and bedrock surface because the slurry wall was not keyed or grouted into the bedrock during construction. The open equalization window may also contribute to the inability of the current Containment Area design to adequately contain Site contaminants. EPA's selected interim remedy for DAPL and hot spot groundwater includes extraction wells both inside and outside of the slurry wall to remove these liquid sources of contamination and reduce the potential for ongoing NDMA production instead of trying to contain them with physical barriers. The addition of a permanent, low-permeability cap and closure of the equalization window will also address the threat of future leaching of Site contaminants associated with the soils and solid waste within the Containment Area. EPA has concluded that these two components of the remedy in this area (extraction for liquid waste and capping for solid waste) will provide adequate source control for the Containment Area. Please see also EPA's responses to Comment #5 in **Section B,** Comment #32 in **Section C, II**, and Comment #4 in **Section C, III**, above.

Comment #6 (MIT SRP/J.Beard/N. Owiti/S. Kaushal)

N-nitrosamines, a class comprising hundreds of chemicals, are among the most potent carcinogens known. Over 70 n-nitrosamines have been documented to cause cancer in animals, and most are not currently tested for at the Olin Site. For example, n-nitrosodiethylamine (NDEA) is even more toxic and carcinogenic than NDMA, and given its structural similarity, it is almost certainly present, but does not appear to have been routinely measured.

Given the known contamination of the Site with additional nitrosamines and potential for even more toxic nitrosamines, it is important to take measures to identify, monitor and remediate other nitrosamines and potential carcinogens in DAPL, LNAPL, and groundwater.

EPA Response:

It has been concluded over many years of collecting groundwater samples at the Site that NDMA is both the most toxic and most mobile of all the target analytes and this chemical has been used to define the extent of groundwater impacts at the Site. As noted previously, prior investigations carefully evaluated whether other nitrosamines were present at levels that posed a risk. Specifically, two key monitoring wells known to be representative of known source areas were sampled in 2012 and analyzed for the nitrosamines NDBA, NDPrA, NDEA, NDMA, NMEA, NPIP, and NPYR (see discussion in Comment #1 in **Section C, VI**, above). NDEA was not detected in either of the wells at a reporting limit of 1.9 ng/L while NDMA concentrations ranged up to 4,600 ng/L in these two wells from 2011 to 2019. Based on these evaluations, EPA has concluded that NDEA is not a contaminant of concern at the Site. However, EPA will continue to evaluate this issue as part of the remedial design for the remedy to ensure that the groundwater treatment is sufficient to address all nitrosamines. For example, during pre-design activities key monitoring wells can be sampled for verification of key contaminants. In addition, the treatment system influent and effluent will be analyzed for a full suite of contaminants including all nitrosamines to confirm sufficient treatment prior to discharge to surface water. Please see also EPA's response to Comment #3 in **Section C, VI,** above.

Comment #7 (MIT SRP)

N-nitrosodiphenylamine (NDPhA), which was manufactured at the Site and has been found in Olin LNAPL and groundwater, is a substantial concern. NDPhA is an EPA class B2 probable carcinogen and is a precursor for NDMA. Given the relative thermal instability and low volatility of NDPhA, gas chromatography/mass spectrometry (GC/MS) analysis of this chemical is problematic and thus results of analysis likely underestimates the true level of contamination. Even so, NDPhA has been detected at unacceptably high levels.

EPA Response:

EPA believes that the range of possible nitrosamines has been adequately characterized. NDMA has been identified as the predominant nitrosamine compound in environmental media at the Site, and the data from the Site investigation and monitoring efforts demonstrates that NDMA is the most significant human health risk contributor. Please see also EPA's responses to Comments #1 and #6 in **Section C, VI,** above. NDPhA has exceeded the tapwater RSL of 12 ug/L on the Olin Property in shallow overburden groundwater near Plant B and in deep overburden groundwater north of the on-property DAPL pool, with a maximum concentration of 400 ug/L (GW-16R, November 2009). These exceedances are limited to small areas on the Olin Property.

Although EPA believes that adequate characterization for nitrosamines has occurred, EPA will evaluate the use of other analytical methods such as liquid chromatography with tandem mass spectrometry (LC/MS) for analysis of groundwater samples collected as part of the planned remedial design and data gap investigation to eliminate potential degradation concerns from GC/MS. Limited sampling is planned during design to ensure that the treatment components adequately address all possible contaminants.

Comment #8 (MIT recommendation letter)

Ongoing nitrosamine formation and nitrosamine levels over time should be monitored. The MIT SRP team is developing a rapid NDMA sensor and offers to test NDMA concentrations in and around the Olin Site, and also request access to water samples. Likewise, the MIT SRP team is developing analytical approaches to detect and identify multiple nitrosamines and requests surface water and groundwater samples for analysis.

EPA Response:

The Site is routinely monitored for NDMA concentrations using EPA-approved methods. The data collected does not show evidence of ongoing nitrosamine formation. EPA is aware that MIT is developing an NDMA rapid sensor and has suggested that MIT work with Olin on a proposal to test this sensor using samples collected at the Site and validated by other approved methods.

Comment #9 (MIT recommendation letter)

EPA should communicate the intended fate of treated, excavated or otherwise removed contamination. Note that contaminants should not be transferred to another site that risks human exposure.

EPA Response:

The selected remedy involves extracting and treating the groundwater. Currently, the plan is to discharge the treated groundwater to surface water. Prior to discharge, the water must meet performance standards that are safe for human health and the environment. In the event it is determined that it is beneficial to reinject the groundwater, EPA will establish injection standards protective of this discharge option. The selected remedy also includes extracting and treating DAPL. The proposed treatment process for DAPL will result in a solid waste that must be disposed of off-site. The treatment also involves evaporation of any wastewater. Any solid or sludge generated from the treatment of DAPL and groundwater and any contaminated sediments excavated from the wetlands will be taken off-site to a disposal facility that has been approved to accept CERCLA waste. EPA will review and approve all disposal facilities used for wastes from the Site to ensure that they are in compliance with the regulations governing their continued operation.

Comment #10 (MIT recommendation letter)

A critical evaluation should be performed for pump and treat of LNAPL to ensure that evidence of efficacy is established and treated waste is tested for remaining contaminants and nitrosamine precursors before re-release to the environment. Treated water should also be treated for nitrosamines other than NDMA and NDPhA prior to discharge.

EPA Response:

MPE is a proven technology for the extraction and treatment of LNAPL. The selected remedy also requires monitoring of the discharge from the treatment system to demonstrate it achieves levels protective of surface water and sediments prior to discharge. Please see also EPA's response to Comment #3 in **Section C, VI,** above.

Comment #11 (MIT recommendation letter)

If nitrosamine concentrations do not decrease significantly, alternative remediation methods should be identified and applied.

EPA Response:

The selected remedy includes long-term monitoring of contaminants in the aquifer to demonstrate that the remedy is functioning as it was designed. As part of this monitoring, contaminant trends will be evaluated and if progress is not demonstrated, other actions will be evaluated and implemented as part of the final remedy selected for groundwater (OU3). Furthermore, as part of the selected remedy, Five Year Reviews will be required for as long as contamination remains in place at concentrations above unrestricted use, and these reviews will evaluate how well the remedy is performing.

Comment #12 (A. Moise)

Longitudinal studies should be conducted to track changes in concentration of NDMA, NDMA precursors, and other chemicals in LNAPL, DAPL, and soil as remediation progresses.

EPA Response:

The selected remedy includes monitoring of all aspects of the remedy, including groundwater, surface water, soil, and sediments to demonstrate remediation progress and whether the cleanup levels and performance standards have been achieved. Pre-design studies will evaluate the presence and impact of NDMA precursors on the remedy and if further monitoring is needed over time. Please see also EPA's response to Comment #11 in **Section C, VI,** above.

Comment #13 (H. Feng)

Further investigations should be conducted to understand the impact of contaminant migration via bedrock fractures, especially since prior activities have not involved removal of contamination from fractures.

EPA Response:

EPA agrees. Contaminant migration in bedrock has been identified as a data gap for the Site, and additional characterization activities to identify bedrock fractures and the potential impact of contaminated groundwater and DAPL in bedrock fractures and within the bedrock matrix are planned as part of the ongoing data gap work, which will lead to the final ROD for groundwater (OU3).

Comment #14 (H. Feng)

Did the DAPL pilot program include studies on how the act of extraction may impact contaminant migration in the surrounding areas? When the municipal wells were in operation, they resulted in upward migration of contaminants.

EPA Response:

The DAPL pilot program was intended to determine the feasibility of DAPL extraction and a sustainable extraction rate for DAPL, and associated monitoring evaluated the potential for entrainment of groundwater into the DAPL pool. The pilot test demonstrated that extraction rates around 0.25 gallons per minute (gpm) were sustainable in the Jewel Drive DAPL pool and would not result in excessive mixing of groundwater and DAPL and fouling in the extraction wells. The total combined extraction rate from all 20 DAPL extraction wells is estimated at 8 gpm or 11,520 gallons per day. Given the low extraction rates determined to be sustainable to prevent mixing, minimal impact is expected on groundwater flow above the DAPL pools. In contrast, the municipal wells were located on the far side of the MMB wetlands and pumped a significant volume of groundwater (combined flow rate of more than 5 million gallons per day when all six Town wells were in operation). The CSM for the Site suggests that Town wells had a strong influence on the migration of contamination from the Site, pulling the contamination plume in from both below the wells and from across the aquifer.

Comment #15 (J. Beard)

The Proposed Plan states that NDMA will be destroyed with "ultra-violet (UV) photo-oxidation" and it is unclear if this is UV irradiation or if the intent is to pair UV light with the addition of an oxidant. If the latter is correct, it has been shown that UV/O_3 can reduce the formation of the secondary amine during photolysis, somewhat mitigating re-formation of nitrosamines.

EPA Response:

The selected remedy includes the use of UV photo-oxidation to treat NDMA in groundwater and DAPL. The details of the technology will be developed further during design to ensure that the performance goals can be achieved, and the suggestion in the comment will be taken into consideration.

Comment #16 (J. Kelly)

The transport of contaminants through different media is highly uncertain and difficult to predict, therefore, contaminants have the potential to migrate into the air both outside and in peoples' homes. Both indoor and outdoor air should be monitored for contaminants as well as their degradation products.

EPA Response:

Most of the contaminants found at the Site do not have the potential to migrate into air under ambient conditions at levels that pose an unacceptable risk. TMPs were detected on the Olin property-portion of the Site and the selected remedy for this area includes further evaluation of vapor intrusion impacts or the use of vapor mitigation systems if buildings were to be constructed in this area. Beyond this area, no other air impacts are anticipated. In addition, routine air sampling is conducted as part of the normal health and safety procedures during implementation of the remedy when there is a risk (usually due to the nature of the contaminants) that a release to the ambient air is possible. Such routine monitoring will be implemented when work proceeds at the Site.

Comment #17 (J. Kelly)

Environmental monitoring of contaminants should be expanded to also include degradation products.

EPA Response:

The investigations at the Site have included monitoring and analysis of numerous contaminants, and where appropriate, degradation products have been included in the analysis. The commenter did not provide further information on which contaminants and degradation products they believe have been omitted from our analysis and why further analysis of these contaminants are needed.

Therefore, further response cannot be provided. Please see also EPA's responses to Comments #1 and #6 in **Section C, VI**, above.

Comment #18 (S. Kaushal)

Genetic variability profoundly impacts the biological consequences of NDMA exposure. The *in vivo* studies that form the basis for federal NDMA health hazard assessment were performed in wild type animals, but humans are known to vary widely in their capacity for repairing NDMA-induced DNA damage, so existing risk assessments do not account for highly susceptible populations.

EPA Response:

The EPA human health risk assessment process does account for sensitive subpopulations in both the development of toxicity values and through exposure assessment, which characterizes the magnitude of exposure to a receptor. The toxicity values for NDMA have undergone an extensive review process and are suitable for risk assessment purposes. Additionally, the methodologies for developing the toxicity values do take into account uncertainty from extrapolating from animal models to humans. Another way the risk assessment process accounts for sensitive populations is in the exposure assessment phase. Sensitive receptors including children were evaluated as part of the risk assessment. Exposure parameters were selected to represent what is considered the reasonable maximum exposure, or the maximum exposure that is reasonably expected to occur at a site. This approach follows the EPA Risk Assessment Guidance for Superfund[30] and ensures that potential impacts to sensitive populations are captured by the human health risk assessment.

[30] EPA Risk Assessment Guidance for Superfund, Part A.

Appendices

Appendix A

Massachusetts Department of Environmental Protection

Letter of Concurrence

MassDEP
Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

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

March 25, 2021

Mr. Robert Cianciarulo
Office of Site Remediation and Restoration
U.S. Environmental Protection Agency, Region 1
5 Post Office Square
Boston, MA 02109

Re: State Concurrence Determination
Record of Decision OU1, OU2, Interim OU3– Olin Chemical Superfund Site
Wilmington, Massachusetts

Dear Mr. Cianciarulo:

The Department of Environmental Protection ("the Department") has reviewed the Operable Unit ("OU")1, OU2, and Interim OU3 Record of Decision ("ROD") for Olin Chemical Superfund Site ("Site") in Wilmington, Massachusetts dated March 2021. OU1 consists of soil, sediments, and surface water on the Olin Property ("Property"); OU2 consists of soil, surface water, and sediment areas on and off Property. OU3 consists of all groundwater, both on- and off-Property, and soil located below the water table. See attached figures for details. For the reasons described below, MassDEP concurs with the remedy selected in the ROD ("Selected Remedy").

The Selected Remedy includes;

- an interim action to begin restoration of groundwater and to prevent unacceptable risks from exposure to Site groundwater while gathering additional information to select a final cleanup plan for groundwater (OU3); and
- a final action to address all current and potential future risks caused by contaminated soil, sediments, and surface water, Light Non-Aqueous Phase Liquid (LNAPL), and the subsurface-to-indoor air vapor intrusion (VI) pathway (OU1 and OU2).

The major components of the Selected Remedy include;

- groundwater extraction and treatment;
- multi-phase extraction (MPE) to remove LNAPL;

- oil/water separation;
- treatment of soil vapor using granular activated carbon (GAC);
- installation of caps and cover systems;
- soil excavation and off-site disposal;
- continued groundwater studies to close remaining data gaps and evaluate long-term groundwater cleanup options;
- long-term operation and maintenance of new and existing remedy infrastructure components;
- long-term groundwater and surface water monitoring;
- removal of Dense Aqueous Phase Liquid ("DAPL") from the aquifer;
- removal of contaminated soil and sediments from on- and off-Property wetlands and restoration of the wetland areas;
- removal of LNAPL and associated contaminated soil vapor from the Property;
- prevention of indoor air exposures via the VI pathway; and
- restoration of the Property to allow for beneficial re-use.

The Selected Remedy includes Institutional Controls ("ICs"). ICs will require VI evaluations and/or mitigation measures such as vapor barriers or sub-slab depressurization systems (SSDSs), which are intended to preserve the remedy and ensure that any impacted soil and groundwater encountered during future intrusive activities (*e.g.*, installing subsurface utilities and/or building foundations/slabs) are appropriately managed to protect human health. ICs have been selected to maintain caps and cover systems, prevent residential, school, and daycare use of the Property, and prohibit use of groundwater in the OU3 groundwater study area unless it can be demonstrated to EPA, in consultation with the Department, that such use will not pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy. Periodic Five-Year Reviews by EPA are also required to assess protectiveness.

The specific remedial measures selected in this ROD are described in detail in Attachment A to this letter.

If you have any questions regarding this letter, please contact Mr. Garry Waldeck, Project Manager at (617) 348-4017.

Very truly yours,

Paul W. Locke.
Assistant Commissioner
Bureau of Waste Site Cleanup
Department of Environmental Protection

Copies to:
Lynne Jennings, USEPA

ATTACHMENT A

Remedial Measures selected in March 2021 Olin Chemical ROD

Interim Action OU3 – DAPL and Groundwater Hot Spots (GWHS)

EPA's selected remedy for the interim action for DAPL and Groundwater Hot Spots is DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting the 5,000 nanograms/Liter (ng/L) n-nitrosodimethylamine (NDMA) contour (approx. 6 wells), and treatment at a new treatment system or systems, which include the following components:

- Construction and operation of a DAPL extraction system (conceptualized with approximately four wells in the Off-Property Jewel Drive DAPL pool, approximately four wells in the Containment Area DAPL pool, and approximately 12 wells in the Main Street DAPL pool), with the final number and location of wells based on pre-design investigations (PDIs);

- Construction and operation of a groundwater extraction and treatment system (conceptualized with approximately six wells targeting the 5,000 ng/L NDMA contour), the final number and location of which will be based on PDIs, to remove and treat the mass of contaminants in groundwater hot spots; and

- Treatment of extracted DAPL and hot spot groundwater in a new treatment system or systems generally consisting of the following methodologies:

    - Treatment for DAPL:
        - Lime precipitation to remove metals, with subsequent dewatering and off-site disposal of the liquids and sludge materials;
        - Evaporation of the remaining water and off-site disposal of the residual solids; and
        - Additional treatment as described for hot spot groundwater, below;

    - Treatment for hot spot groundwater:
        - Influent equalization tank;
        - Hypochlorite flash mixer (a rapid mixer that uniformly distributes a treatment chemical) for oxidation and removal of metals (iron and manganese);
        - Breakpoint chlorination to treat ammonia;
        - Slow mix flocculation (a process by which fine particulates are caused to clump together) and lamella clarifier (a series of inclined plates on which particulates can settle) to remove solids;

- Filter press for solids dewatering;
- Off-site disposal of residual solids and sludge materials;
- GAC to ensure clarity and ultra-violet (UV) transmittance, as well as remove volatile organic compounds (VOCs);
- UV photo-oxidation for NDMA destruction; and
- Discharge of treated water.

Final Action OU1 and OU2– LNAPL and Surface Water:

EPA's selected remedy for LNAPL and Surface Water is Demolition of Plant B, MPE for LNAPL, targeted groundwater extraction to prevent impacts to surface water, and treatment at new treatment system or systems, which include the following components:

- An estimated three to five MPE wells installed within the LNAPL footprint, including beneath the Plant B building foundation, to remediate LNAPL, the smear zone, and dissolved-phase Site contaminants that would otherwise impact East Ditch Stream;
- PDIs to determine the final number and location of MPE wells;
- Treatment of recovered LNAPL and soil vapor via a skid-mounted treatment system that includes an oil/water separator to remove the LNAPL and vapor-phase GAC to treat the soil vapor;
- Off-site disposal of recovered LNAPL at an appropriate off-site permitted facility;
- Construction and operation of a new groundwater extraction and treatment system(s), with extraction wells sited based on PDIs to intercept and treat the overburden groundwater contaminant plume that impacts Site surface water;
- Re-routing of groundwater currently treated by Plant B to the new groundwater treatment system(s) (the same system(s) as for the hot spot groundwater); and
- Decommissioning and demolition of the Plant B groundwater treatment system.

Final Action OU1 and OU2 – Soil and Sediments:

EPA's selected remedy for Soil and Sediments is Containment Area cap, upland soil covers, excavation with off-site disposal and restoration of wetland soil and sediments, and limited action for trimethylpentenes (TMPs) – Institutional Controls, including vapor intrusion evaluations or vapor barriers/SSDSs, which include the following components:

- Placement of a permanent, low-permeability cap that meets Resource Conservation and Recovery Act (RCRA) Subtitle D and Massachusetts solid waste management performance standards over the Containment Area, the design and footprint of which will be determined during the Remedial Design (RD) phase;
- Closure of the existing slurry wall equalization window by grouting in place;
- Placement of a soil or asphalt cover system over areas of shallow (0-1 foot [ft]) upland soil with concentrations of Site contaminants in excess of the cleanup levels;

- Excavation of wetland soil and sediments with concentrations of Site contaminants in excess of the cleanup levels;
- Post-excavation confirmatory sampling to document limits of impacts and confirm achievement of the Remedial Action Objectives (RAOs) and cleanup levels; and
- Off-site disposal of all excavated material at an appropriate off-site permitted facility.

Included with the three cleanup actions above are the following:

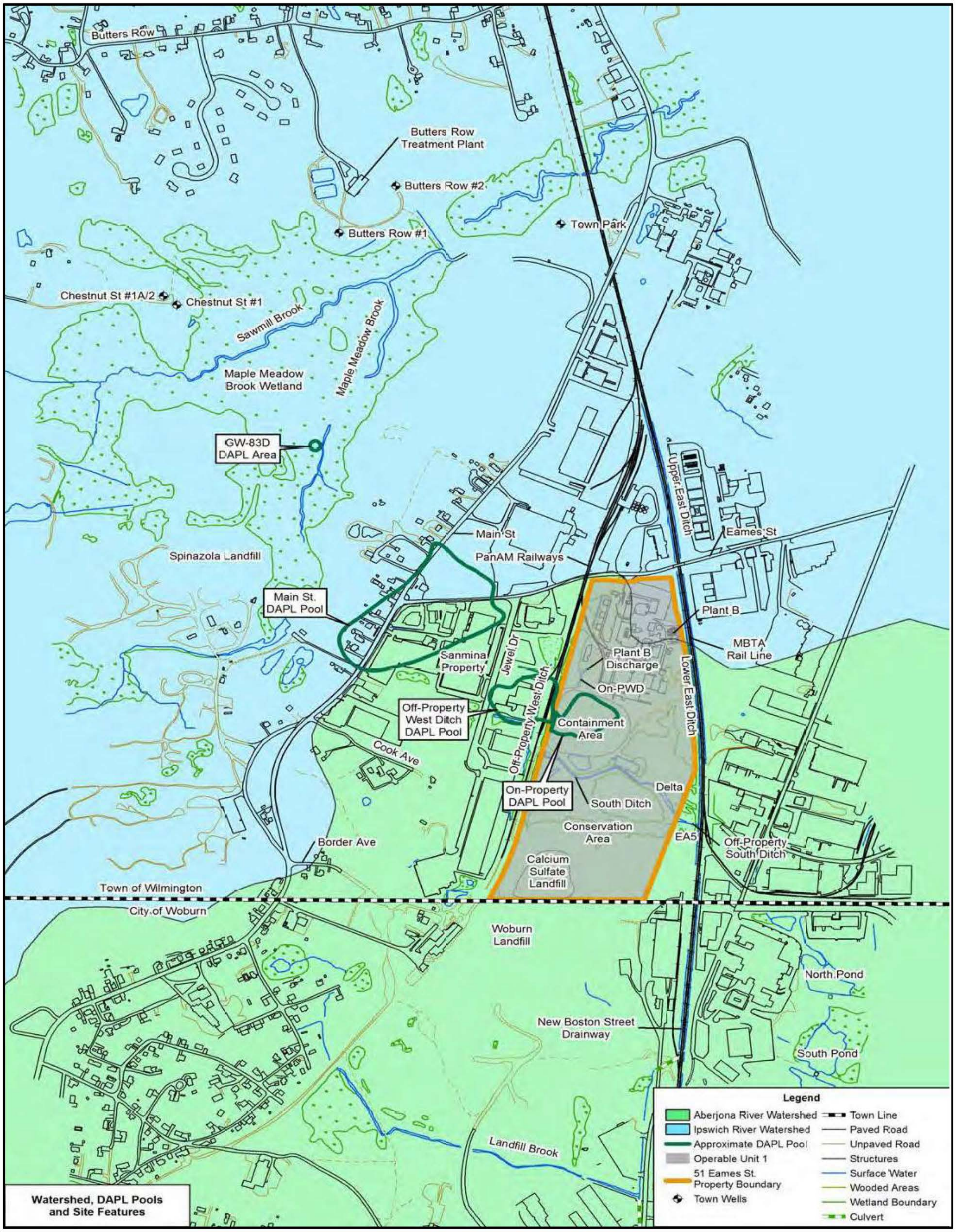
- PDIs and/or treatability studies during the RD process to:
    - determine the final number, location, and configuration of extraction wells and other remedial components;
    - determine appropriate locations for discharge of treated groundwater to surface water; and
    - facilitate the implementation of the chosen cleanup alternatives and map the precise extent of both excavation limits and the extent of caps and cover systems;
- Restoration with hydric (wetland-type) soil and native vegetation, as needed, of any wetland habitat or floodplains altered by the remedial action, as well as restoration of any excavated or otherwise altered areas with clean, imported backfill to grade and revegetation with native vegetation to control erosion;
- Long-term maintenance and monitoring of any new and existing remedy infrastructure components, including the Calcium Sulfate Landfill (CSL);
- Long-term monitoring of the groundwater plume and surface water, to evaluate remedy effectiveness;
- Institutional Controls to 1) prohibit future residential use at the Property; 2) prohibit the use of groundwater in the OU3 groundwater study area (for example, for potable, irrigation, or industrial purposes) unless it can be demonstrated to EPA, in consultation with the Commonwealth, that such use will not pose an unacceptable risk to human health and the environment, cause further migration of the groundwater contaminant plume, or interfere with the remedy; 3) prevent disturbance of any engineered systems and any other new and existing remedy infrastructure components; 4) prevent contact with soil beneath cover systems; and 5) require either a VI evaluation or vapor mitigation system be installed if a new building is constructed or altered on the Property (examples of Institutional Controls include Notice of Activity and Use Limitation (NAUL), Grant of Environmental Restriction and Easement (GERE),[1] town ordinance, advisories, building permit requirements, and other administrative controls); and
- Periodic Five Year Reviews to ensure the remedy remains protective.

---

1 NAULs and GEREs are approved forms of Massachusetts land use restrictions established under the Massachusetts Contingency Plan (MCP).

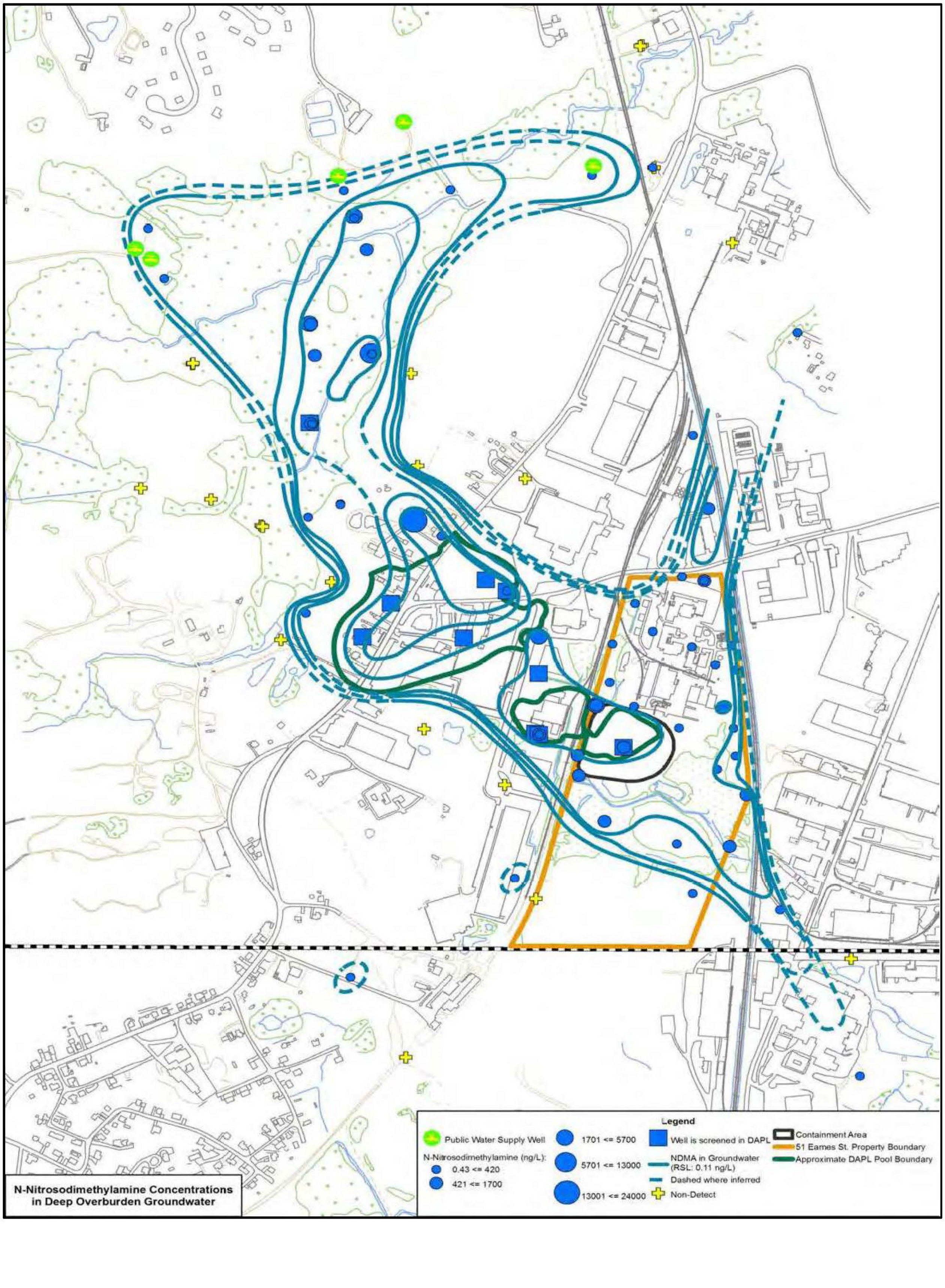
In parallel to the selected remedy, the following activities will continue as part of the OU3 RI/FS:

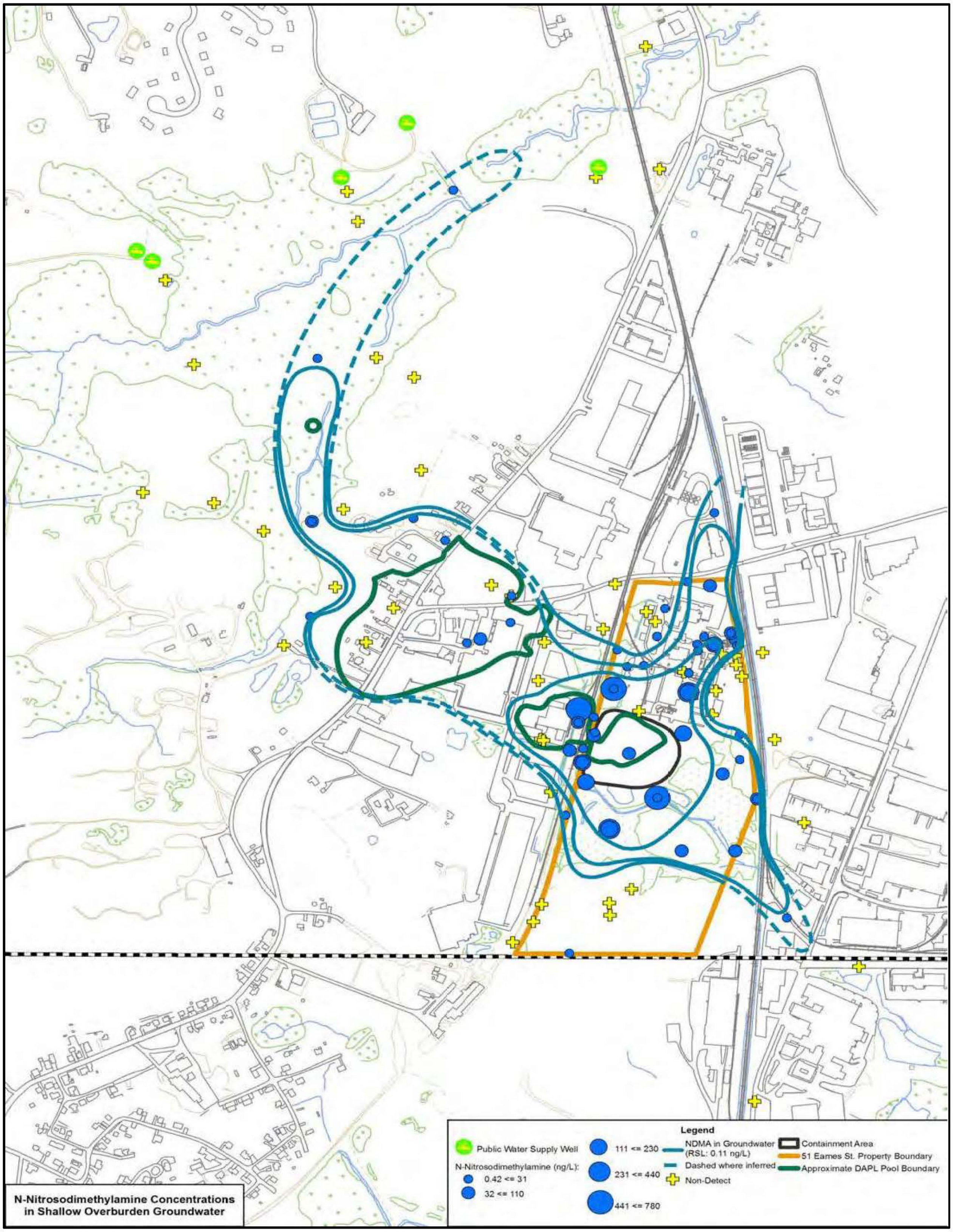
- Continued studies to close remaining data gaps, including an improved characterization of bedrock topography and fractures and further delineation of the horizontal and vertical extent of groundwater contamination; and
- Evaluation of long term groundwater cleanup options, leading to a selection of a final cleanup plan for OU3



Area map. Shown are the major features of the Olin Site, watersheds, nearby surface waters, and the pools of Dense Aqueous-Phase Liquid (DAPL). Site straddles two watersheds – the Ipswich River Watershed to the north (in blue) and the Aberjona River Watershed to the south (in green).
Visible are the subsurface pools of DAPL (shown in green outline), located in depressions on the top of bedrock.


Former Office Building
Guard Shack
Former Lab
Butler Building
Former Plant B Tank Farm
Pilot Lab
Plant B Production Area
EPH/VPH Area
PanAM Railroad
Finished Product Storage
Plant A
Plant B Treatment Bldg
Maintenance Shop
Plant C-1
Plant C-2
Plant C-3
Boiler House
Stockroom
Dual Wall Storage Tank
MBTA Rail Line
Plant D Tank Farm
Plant D
Lake Poly
West Pit
East Pit
Drum Storage Area
West Ditch Wetland
East Warehouse
East Ditch
West Warehouse
Jewel Drive
Leak Detection Manhole
Former Wastewater Treatment Plant
Inspection Cleanout Vault
Plant B Discharge
Buried Debris Area
Acid Pits
Drum Area A
Lined Lagoon I
Drum Area B
Equalization Window
On-Property West Ditch
Central Wetland
Lined Lagoon II
Containment Area
DAPL Extraction Well/ Enclosure Vault
Off-Property West Ditch
Central Pond
Delta
Central Pond Drainage Areas
Detention Basin
Lower South Ditch
EA5
Upper South Ditch
Off-Property South Ditch
Weir
Conservation Easement
Ephemeral Drainage
Biocell
Calcium Sulfate Landfill
Town of Wilmington
City of Woburn
Site Features (Current and Historic)


Legend
Public Water Supply Well
N-Nitrosodimethylamine (ng/L):
0.43 <= 420
421 <= 1700
1701 <= 5700
5701 <= 13000
13001 <= 24000
Well is screened in DAPL
NDMA in Groundwater (RSL: 0.11 ng/L)
Dashed where inferred
Non-Detect
Containment Area
51 Eames St. Property Boundary
Approximate DAPL Pool Boundary
N-Nitrosodimethylamine Concentrations in Deep Overburden Groundwater


N-Nitrosodimethylamine Concentrations in Shallow Overburden Groundwater
Legend
Public Water Supply Well
N-Nitrosodimethylamine (ng/L):
0.42 <= 31
32 <= 110
111 <= 230
231 <= 440
441 <= 780
NDMA in Groundwater (RSL: 0.11 ng/L)
Dashed where inferred
Non-Detect
Containment Area
51 Eames St. Property Boundary
Approximate DAPL Pool Boundary

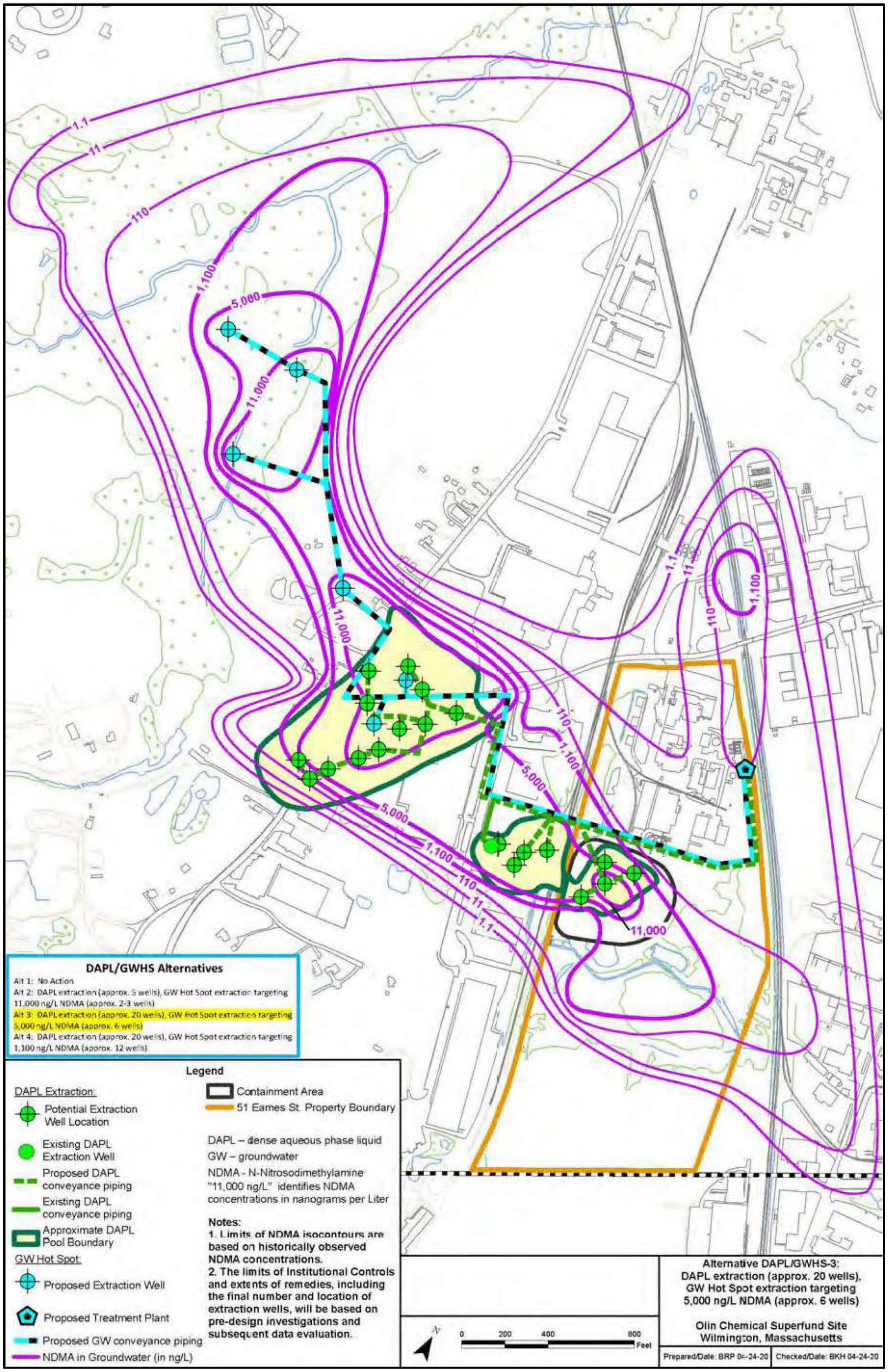

1.1
11
110
1,100
5,000
11,000
DAPL/GWHS Alternatives
Alt 1: No Action
Alt 2: DAPL extraction (approx. 5 wells), GW Hot Spot extraction targeting 11,000 ng/L NDMA (approx. 2-3 wells)
Alt 3: DAPL extraction (approx. 20 wells), GW Hot Spot extraction targeting 5,000 ng/L NDMA (approx. 6 wells)
Alt 4: DAPL extraction (approx. 20 wells), GW Hot Spot extraction targeting 1,100 ng/L NDMA (approx. 12 wells)
Legend
DAPL Extraction:
Potential Extraction Well Location
Existing DAPL Extraction Well
Proposed DAPL conveyance piping
Existing DAPL conveyance piping
Approximate DAPL Pool Boundary
GW Hot Spot:
Proposed Extraction Well
Proposed Treatment Plant
Proposed GW conveyance piping
NDMA in Groundwater (in ng/L)
Containment Area
51 Eames St. Property Boundary
DAPL – dense aqueous phase liquid
GW – groundwater
NDMA - N-Nitrosodimethylamine
"11,000 ng/L" identifies NDMA concentrations in nanograms per Liter
Notes:
1. Limits of NDMA isocontours are based on historically observed NDMA concentrations.
2. The limits of Institutional Controls and extents of remedies, including the final number and location of extraction wells, will be based on pre-design investigations and subsequent data evaluation.
N
0 200 400 800 Feet
Alternative DAPL/GWHS-3:
DAPL extraction (approx. 20 wells), GW Hot Spot extraction targeting 5,000 ng/L NDMA (approx. 6 wells)
Olin Chemical Superfund Site
Wilmington, Massachusetts
Prepared/Date: BRP 04-24-20
Checked/Date: BKH 04-24-20

Figure - 5

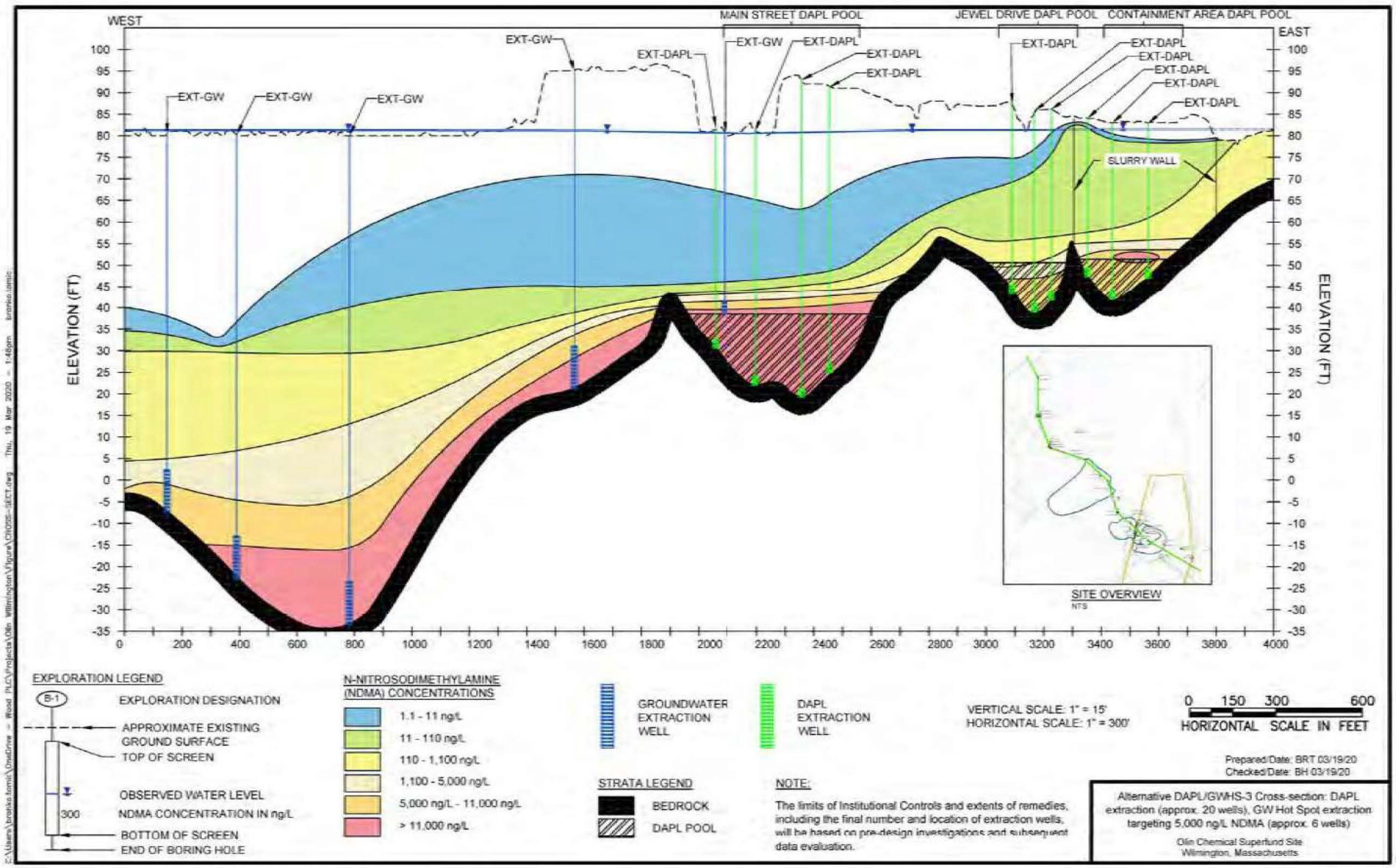

WEST
EAST
MAIN STREET DAPL POOL
JEWEL DRIVE DAPL POOL
CONTAINMENT AREA DAPL POOL
EXT-GW
EXT-DAPL
SLURRY WALL
ELEVATION (FT)
SITE OVERVIEW
NTS
EXPLORATION LEGEND
B-1
EXPLORATION DESIGNATION
APPROXIMATE EXISTING GROUND SURFACE
TOP OF SCREEN
OBSERVED WATER LEVEL
300
NDMA CONCENTRATION IN ng/L
BOTTOM OF SCREEN
END OF BORING HOLE
N-NITROSODIMETHYLAMINE (NDMA) CONCENTRATIONS
1.1 - 11 ng/L
11 - 110 ng/L
110 - 1,100 ng/L
1,100 - 5,000 ng/L
5,000 ng/L - 11,000 ng/L
> 11,000 ng/L
GROUNDWATER EXTRACTION WELL
DAPL EXTRACTION WELL
STRATA LEGEND
BEDROCK
DAPL POOL
NOTE:
The limits of Institutional Controls and extents of remedies, including the final number and location of extraction wells, will be based on pre-design investigations and subsequent data evaluation.
VERTICAL SCALE: 1" = 15'
HORIZONTAL SCALE: 1" = 300'
0 150 300 600
HORIZONTAL SCALE IN FEET
Prepared/Date: BRT 03/19/20
Checked/Date: BH 03/19/20
Alternative DAPL/GWHS-3 Cross-section: DAPL extraction (approx. 20 wells), GW Hot Spot extraction targeting 5,000 ng/L NDMA (approx. 6 wells)
Olin Chemical Superfund Site
Wilmington, Massachusetts

Figure - 6

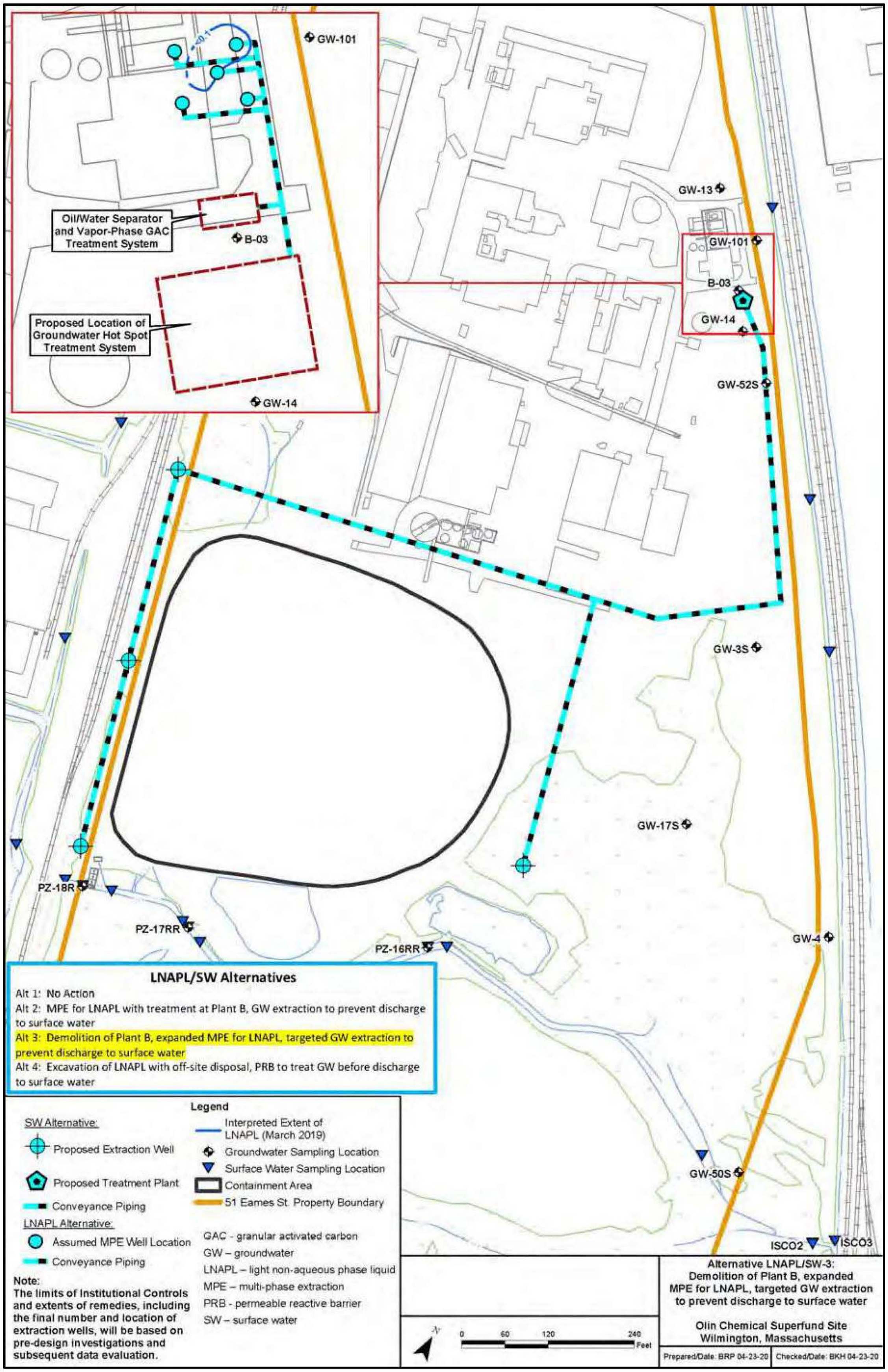

GW-101
Oil/Water Separator and Vapor-Phase GAC Treatment System
B-03
Proposed Location of Groundwater Hot Spot Treatment System
GW-14
GW-13
GW-101
B-03
GW-14
GW-52S
GW-3S
GW-17S
PZ-18R
PZ-17RR
PZ-16RR
GW-4
GW-50S
ISCO2
ISCO3
LNAPL/SW Alternatives
Alt 1: No Action
Alt 2: MPE for LNAPL with treatment at Plant B, GW extraction to prevent discharge to surface water
Alt 3: Demolition of Plant B, expanded MPE for LNAPL, targeted GW extraction to prevent discharge to surface water
Alt 4: Excavation of LNAPL with off-site disposal, PRB to treat GW before discharge to surface water
Legend
SW Alternative:
Proposed Extraction Well
Proposed Treatment Plant
Conveyance Piping
LNAPL Alternative:
Assumed MPE Well Location
Conveyance Piping
Interpreted Extent of LNAPL (March 2019)
Groundwater Sampling Location
Surface Water Sampling Location
Containment Area
51 Eames St. Property Boundary
GAC - granular activated carbon
GW – groundwater
LNAPL – light non-aqueous phase liquid
MPE – multi-phase extraction
PRB - permeable reactive barrier
SW – surface water
Note:
The limits of Institutional Controls and extents of remedies, including the final number and location of extraction wells, will be based on pre-design investigations and subsequent data evaluation.
0 60 120 240 Feet
Alternative LNAPL/SW-3: Demolition of Plant B, expanded MPE for LNAPL, targeted GW extraction to prevent discharge to surface water
Olin Chemical Superfund Site Wilmington, Massachusetts
Prepared/Date: BRP 04-23-20
Checked/Date: BKH 04-23-20

Figure - 7

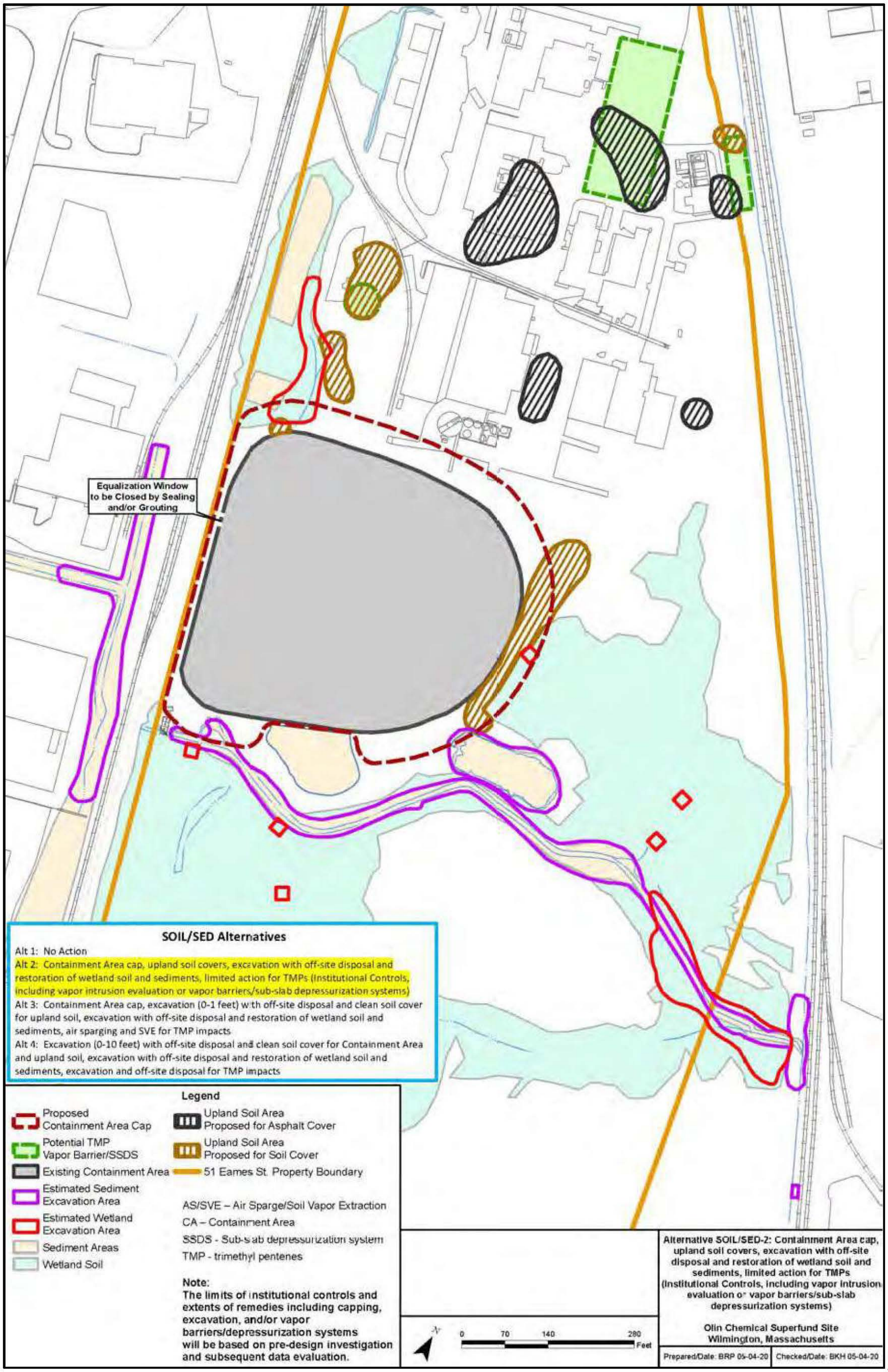
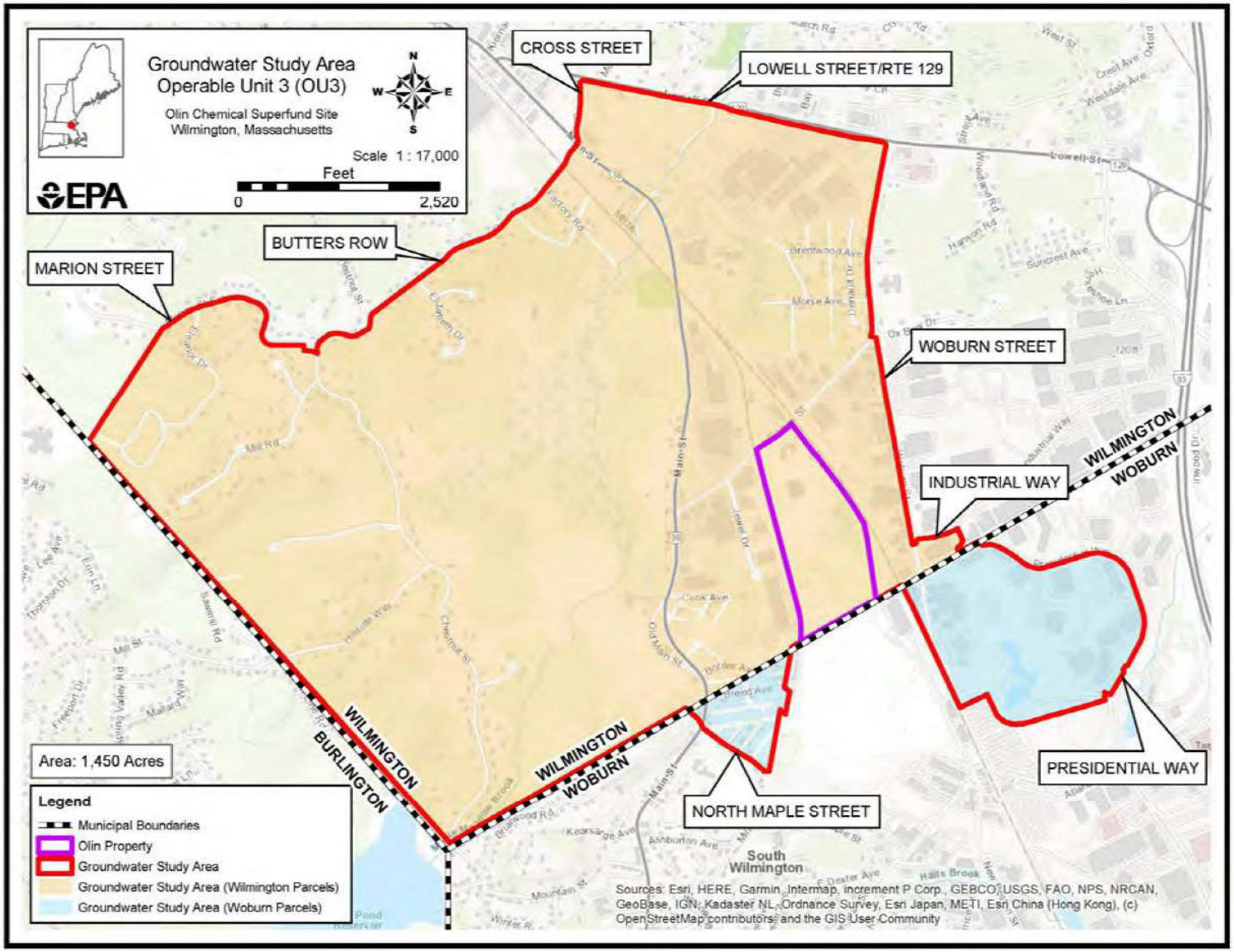

Equalization Window to be Closed by Sealing and/or Grouting
SOIL/SED Alternatives
Alt 1: No Action
Alt 2: Containment Area cap, upland soil covers, excavation with off-site disposal and restoration of wetland soil and sediments, limited action for TMPs (Institutional Controls, including vapor intrusion evaluation or vapor barriers/sub-slab depressurization systems)
Alt 3: Containment Area cap, excavation (0-1 feet) with off-site disposal and clean soil cover for upland soil, excavation with off-site disposal and restoration of wetland soil and sediments, air sparging and SVE for TMP impacts
Alt 4: Excavation (0-10 feet) with off-site disposal and clean soil cover for Containment Area and upland soil, excavation with off-site disposal and restoration of wetland soil and sediments, excavation and off-site disposal for TMP impacts
Legend
Proposed Containment Area Cap
Potential TMP Vapor Barrier/SSDS
Existing Containment Area
Estimated Sediment Excavation Area
Estimated Wetland Excavation Area
Sediment Areas
Wetland Soil
Upland Soil Area Proposed for Asphalt Cover
Upland Soil Area Proposed for Soil Cover
51 Eames St. Property Boundary
AS/SVE – Air Sparge/Soil Vapor Extraction
CA – Containment Area
SSDS - Sub-slab depressurization system
TMP - trimethyl pentenes
Note:
The limits of institutional controls and extents of remedies including capping, excavation, and/or vapor barriers/depressurization systems will be based on pre-design investigation and subsequent data evaluation.
N
0
70
140
280
Feet
Alternative SOIL/SED-2: Containment Area cap, upland soil covers, excavation with off-site disposal and restoration of wetland soil and sediments, limited action for TMPs (Institutional Controls, including vapor intrusion evaluation or vapor barriers/sub-slab depressurization systems)
Olin Chemical Superfund Site
Wilmington, Massachusetts
Prepared/Date: BRP 05-04-20
Checked/Date: BKH 05-04-20

Figure - 8



Groundwater Study Area
Operable Unit 3 (OU3)
Olin Chemical Superfund Site
Wilmington, Massachusetts
N
W
E
S
Scale 1 : 17,000
Feet
0
2,520
EPA
CROSS STREET
LOWELL STREET/RTE 129
BUTTERS ROW
MARION STREET
WOBURN STREET
INDUSTRIAL WAY
WILMINGTON
WOBURN
BURLINGTON
NORTH MAPLE STREET
PRESIDENTIAL WAY
South Wilmington
Area: 1,450 Acres
Legend
Municipal Boundaries
Olin Property
Groundwater Study Area
Groundwater Study Area (Wilmington Parcels)
Groundwater Study Area (Woburn Parcels)
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Figure - 9

Appendix B

Tables

Table B-1

Contaminants of Concern

Contaminant of Concern	OU1-OU2				OU3 (Interim)		
	Surface Soil	Subsurface Soil	Surface Water	Sediment	Overburden Groundwater	Bedrock Groundwater	DAPL
Volatile Organic Compounds							
1,2,4-Trichlorobenzene					X	X	
1,2-Dichloroethane					X	X	X
1,3-Dichlorobenzene			X				
1,4-Dichlorobenzene					X		X
2,4,4-Trimethyl-1-Pentene		X			X	X	
2,4,4-Trimethyl-2-Pentene		X			X	X	
4-Isopropyltoluene		X		X			
Benzene					X	X	X
Bromodichloromethane			X		X	X	X
Bromoform					X	X	X
Carbon tetrachloride					X		
Chlorodibromomethane			X				
Chloroform			X		X	X	X
Cis-1,2-Dichloroethene			X		X	X	
Dibromochloromethane					X	X	X
Dibromomethane			X		X	X	X
Ethylbenzene							X
Methyl tert-butyl ether					X		
Methylene chloride							X
Naphthalene					X		X
Trichloroethene			X		X	X	X
Vinyl Chloride			X		X	X	X

Table B-1

Contaminants of Concern

Contaminant of Concern	OU1-OU2				OU3 (Interim)		
	Surface Soil	Subsurface Soil	Surface Water	Sediment	Overburden Groundwater	Bedrock Groundwater	DAPL
Semivolatile Organic Compounds							
1,1-Biphenyl					X		X
2-Nitrophenol			X				
3 & 4 Methylphenol			X				
4-Bromophenyl-phenylether					X		
4-Chloroaniline							X
4-Chlorophenyl-phenylether		X		X	X		
4-Nitrophenol							
Azobenzene			X			X	
Benzo(a)anthracene	X	X	X	X			
Benzo(a)pyrene	X	X	X	X	X	X	X
Benzo(b)fluoranthene	X	X	X	X			X
Benzo(k)fluoranthene		X	X				
Bis(2-ethylhexyl)phthalate	X	X	X	X		X	
Carbazole	X	X		X			
Chrysene			X				
Dibenz(a,h)anthracene	X		X	X	X	X	X
Dimethylphthalate	X						
Diphenyl Ether	X	X	X	X	X	X	X
Diphenylmethanone			X				
N-Nitrosodimethylamine (NDMA)			X		X	X	X
N-Nitrosodiphenylamine (NDPhA)		X			X		
N-Nitroso-di-n-propylamine (NDPrA)	X		X				
Pentachlorophenol						X	
Phenanthrene	X		X				
Pyrene			X				

Table B-1

Contaminants of Concern

Contaminant of Concern	OU1-OU2				OU3 (Interim)		
	Surface Soil	Subsurface Soil	Surface Water	Sediment	Overburden Groundwater	Bedrock Groundwater	DAPL
Pesticides/PCBs							
Aroclor-1260	X	X					
Delta-BHC	X						
Metals							
Aluminum			X		X	X	X
Antimony	X	X	X		X	X	
Arsenic	X	X	X	X	X	X	X
Beryllium						X	X
Cadmium					X		X
Chromium			X			X	X
Chromium, Hexavalent	X	X	X	X	X		X
Cobalt	X		X	X	X	X	X
Copper					X	X	X
Iron					X	X	X
Lead			X				
Manganese			X	X	X	X	X
Mercury			X				
Nickel			X		X	X	X
Silver	X				X	X	X
Thallium	X		X		X	X	X
Tin					X		X
Vanadium			X		X	X	X
Zinc						X	

Table B-1

Contaminants of Concern

Contaminant of Concern	OU1-OU2				OU3 (Interim)		
	Surface Soil	Subsurface Soil	Surface Water	Sediment	Overburden Groundwater	Bedrock Groundwater	DAPL
Inorganics							
Bromide			X				
Chloride	X	X	X	X	X		
Nitrate as N			X				
Nitrogen, as Ammonia	X	X	X	X			
Sulfate	X	X	X	X			
Urea		X					
Petroleum Hydrocarbons							
C5-C8 Aliphatics					X		
C9-C10 Aromatics					X		
C9-C12 Aliphatics					X		
C11-C22 Aromatics	X	X		X	X		
C19-C22 Aliphatics				X			
Specialty Compounds							
1,1-Dimethylhydrazine (UDMH)					X		X
4-Nonylphenol			X				
Acetaldehyde							X
Formaldehyde							X
Hydrazine		X	X		X	X	X
Kempore (Azodicarbonamide)			X				
Monomethylhydrazine (MMH)					X		
Perchlorate					X	X	

Key

X = Contaminant of Concern or potential Contaminant of Concern

Site = Olin Chemical Superfund Site

Property = Olin Property at 51 Eames Street, Wilmington, MA

OU = Operable Unit

DAPL = Dense Aqeous Phase Liquid

BHHRA = Baseline Human Health Risk Assessment

PCBs = Polychlorinated Biphenyls

Note:

1.Surface soil, subsurface soil, surface water, and sediment contaminants of concern based on OU1/OU2 Remedial Investigation Report Table 6.2-1. Groundwater contaminants of concern based on Draft OU3 BHHRA Tables 5.3-1 through 5.3-4. DAPL contaminants of concern based on Draft OU3 BHHRA Table E-28; all analytes with cancer risk above 1x10-6 or Hazard Index above 1 assumed to be contaminants of concern.

2. The list of overburden groundwater Contaminants of Concern includes both on-Property (Plant B) and off-Property impacts.

ROD RISK WORKSHEET

Table G-1

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
EA1 - OU1	**Semivolatile Organics**								
	Benzo(a)anthracene	0.91	28	4.2	NP [a]	mg/Kg	4.2	mg/Kg	UCL - NP [a]
	Benzo(a)pyrene	0.70	21	3.0	NP [a]	mg/Kg	3.0	mg/Kg	UCL - NP [a]
	Benzo(b)fluoranthene	0.86	29	4.0	NP [a]	mg/Kg	4.0	mg/Kg	UCL - NP [a]
	Bis(2-Ethylhexyl)phthalate	6.3	375	39	NP [a]	mg/Kg	39	mg/Kg	UCL - NP [a]
	C11-C22 Aromatics	171	1900	437	NP [b]	mg/Kg	437	mg/Kg	UCL - NP [b]
	Carbazole	0.19	5.4	0.34	NP [c]	mg/Kg	0.34	mg/Kg	UCL - NP [c]
	Dibenz(a,h)anthracene	0.24	4.8	0.23	G [h]	mg/Kg	0.23	mg/Kg	UCL - G [h]
	Dimethylphthalate	0.34	0.11	0.040	NP [c]	mg/Kg	0.040	mg/Kg	UCL - NP [c]
	Diphenyl ether	0.10	1.7	0.086	G [h]	mg/Kg	0.086	mg/Kg	UCL - G [h]
	Indeno(1,2,3-cd)pyrene	0.45	14	1.9	NP [a]	mg/Kg	1.9	mg/Kg	UCL - NP [a]
	PCBs								
	Aroclor-1260	0.89	13	1.8	NP [c]	mg/Kg	1.8	mg/Kg	UCL - NP [c]
	Metals								
	Antimony	0.66	0.92	0.48	NP [c]	mg/Kg	0.48	mg/Kg	UCL - NP [c]
	Arsenic	7.0	56	10.9	NP [d]	mg/Kg	10.9	mg/Kg	UCL - NP [d]
	Chromium, Hexavalent	2.8	11	7.4	NP [a]	mg/Kg	7.4	mg/Kg	UCL - NP [a]
	Cobalt	3.5	12	4.8	NP [e]	mg/Kg	4.8	mg/Kg	UCL - NP [e]
	Silver	0.73	15	1.2	NP [b]	mg/Kg	1.2	mg/Kg	UCL - NP [b]
	Thallium	0.63	2.2	0.50	NP [c]	mg/Kg	0.50	mg/Kg	UCL - NP [c]
	Inorganics								
	Chloride	16	95	26	NP [c]	mg/Kg	26	mg/Kg	UCL - NP [c]
	Nitrogen, as Ammonia	34	170	53	NP [d]	mg/Kg	53	mg/Kg	UCL - NP [d]
	Sulfate	432	19400	1821	NP [d]	mg/Kg	1821	mg/Kg	UCL - NP [d]

Table G-1

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
EA2 - OU1	**Semivolatile Organics**								
	Benzo(a)anthracene	1.0	0.36	0.19	NP [c]	mg/Kg	0.19	mg/Kg	UCL - NP [c]
	Benzo(a)pyrene	0.25	0.24	0.15	NP [f]	mg/Kg	0.15	mg/Kg	UCL - NP [f]
	Benzo(b)fluoranthene	1.1	0.56	0.20	G [i]	mg/Kg	0.20	mg/Kg	UCL - G [i]
	Bis(2-Ethylhexyl)phthalate	22	340	91	G [i]	mg/Kg	91	mg/Kg	UCL - G [i]
	Dibenz(a,h)anthracene	0.28	0.31	0.21	NP [c]	mg/Kg	0.21	mg/Kg	UCL - NP [c]
	Diphenyl ether	2.1	0.12		NC	mg/Kg	0.12	mg/Kg	Maximum
	Indeno(1,2,3-cd)pyrene	1.0	0.2	0.13	NP [f]	mg/Kg	0.13	mg/Kg	UCL - NP [f]
	Metals								
	Arsenic	6.7	15	8.5	NP [f]	mg/Kg	8.5	mg/Kg	UCL - NP [f]
	Cobalt	3.0	5.9	3.7	N [l]	mg/Kg	3.7	mg/Kg	UCL - N [l]
	Silver	0.73	1.3	0.70	NP [c]	mg/Kg	0.70	mg/Kg	UCL - NP [c]
	Inorganics								
	Chloride	79	550	173	NP [c]	mg/Kg	173	mg/Kg	UCL - NP [c]
	Nitrogen, as Ammonia	439	1200	625	N [l]	mg/Kg	625	mg/Kg	UCL - N [l]
	Sulfate	41	37	35	NP [c]	mg/Kg	35	mg/Kg	UCL - NP [c]
EA3 - OU1	**Semivolatile Organics**								
	Benzo(a)anthracene	0.09	0.12	0.083	NP [c]	mg/Kg	0.083	mg/Kg	UCL - NP [c]
	Benzo(a)pyrene	0.08	0.17	0.093	NP [c]	mg/Kg	0.093	mg/Kg	UCL - NP [c]
	Benzo(b)fluoranthene	0.10	0.24	0.13	NP [f]	mg/Kg	0.13	mg/Kg	UCL - NP [f]
	Bis(2-Ethylhexyl)phthalate	3.0	13	4.6	NP [b]	mg/Kg	4.6	mg/Kg	UCL - NP [b]
	C11-C22 Aromatics	27	100	75	NP [e]	mg/Kg	75	mg/Kg	UCL - NP [e]
	Dibenz(a,h)anthracene	0.087	0.21		NC	mg/Kg	0.21	mg/Kg	Maximum
	Diphenyl ether	0.091	0.19	0.10	NP [c]	mg/Kg	0.10	mg/Kg	UCL - NP [c]
	Indeno(1,2,3-cd)pyrene	0.087	0.14	0.097	NP [c]	mg/Kg	0.097	mg/Kg	UCL - NP [c]
	PCBs								
	Aroclor-1260	0.095	0.14		NC	mg/Kg	0.14	mg/Kg	Maximum
	Metals								
	Arsenic	5.8	8.2	7.1	N [l]	mg/Kg	7.1	mg/Kg	UCL - N [l]
	Cobalt	4.6	7.9	5.9	N [l]	mg/Kg	5.9	mg/Kg	UCL - N [l]
	Chromium, Hexavalent	1.2	1.7	1.8	N [l]	mg/Kg	1.7	mg/Kg	Maximum
	Silver	0.32	0.11		NC	mg/Kg	0.11	mg/Kg	Maximum
	Inorganics								
	Nitrogen, as Ammonia	285	2100	2892	NP [g]	mg/Kg	2100	mg/Kg	Maximum

Table G-1

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
EA4 - OU1	**Semivolatile Organics**								
	Benzo(a)anthracene	0.51	0.4	0.23	NP [f]	mg/Kg	0.23	mg/Kg	UCL - NP [f]
	Benzo(a)pyrene	0.24	0.62	0.24	NP [c]	mg/Kg	0.24	mg/Kg	UCL - NP [c]
	Benzo(b)fluoranthene	0.54	1.065	0.23	G [i]	mg/Kg	0.23	mg/Kg	UCL - G [i]
	Bis(2-Ethylhexyl)phthalate	14	200	33	NP [b]	mg/Kg	33	mg/Kg	UCL - NP [b]
	Dibenz(a,h)anthracene	0.20	0.25	0.43	NP [a]	mg/Kg	0.25	mg/Kg	Maximum
	Indeno(1,2,3-cd)pyrene	0.53	0.725	0.28	NP [c]	mg/Kg	0.28	mg/Kg	UCL - NP [c]
	Metals								
	Antimony	5.9	79		NC	mg/Kg	79	mg/Kg	Maximum
	Arsenic	9.8	32	13.1	NP [f]	mg/Kg	13.1	mg/Kg	UCL - NP [f]
	Chromium, Hexavalent	21	95		NC	mg/Kg	95	mg/Kg	Maximum
	Cobalt	7.9	45.5	31	NP [a]	mg/Kg	31	mg/Kg	UCL - NP [a]
	Silver	0.61	0.99		NC	mg/Kg	0.99	mg/Kg	Maximum
	Inorganics								
	Chloride	81	560	185	NP [c]	mg/Kg	185	mg/Kg	UCL - NP [c]
	Nitrogen, as Ammonia	193	460	254	N [l]	mg/Kg	254	mg/Kg	UCL - N [l]
	Sulfate	273	2400	638	NP [c]	mg/Kg	638	mg/Kg	UCL - NP [c]

Table G-1

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
EA5 - OU2	**Semivolatile Organics**								
	Benzo(a)anthracene	0.42	2.3	2.999	NP [g]	mg/Kg	2.3	mg/Kg	Maximum
	Benzo(a)pyrene	0.072	0.44	0.15	NP [c]	mg/Kg	0.15	mg/Kg	UCL - NP [c]
	Benzo(b)fluoranthene	0.27	0.6	0.21	NP [c]	mg/Kg	0.21	mg/Kg	UCL - NP [c]
	Bis(2-Ethylhexyl)phthalate	31	216	103	NP [d]	mg/Kg	103	mg/Kg	UCL - NP [d]
	C11-C22 Aromatics	4,450	7500		NC	mg/Kg	7500	mg/Kg	Maximum
	Carbazole	0.036	0.086	0.055	NP [c]	mg/Kg	0.055	mg/Kg	UCL - NP [c]
	Diphenyl ether	0.37	1.9	0.95	NP [c]	mg/Kg	0.95	mg/Kg	UCL - NP [c]
	Indeno(1,2,3-cd)pyrene	1.3	13	17.0	NP [g]	mg/Kg	13.0	mg/Kg	Maximum
	N-Nitrosodi-n-propylamine	2.5	0.26		NC	mg/Kg	0.26	mg/Kg	Maximum
	Metals								
	Antimony	0.88	0.34	0.36	NP [c]	mg/Kg	0.34	mg/Kg	Maximum
	Arsenic	19	42	23	NP [f]	mg/Kg	23	mg/Kg	UCL - NP [f]
	Chromium, Hexavalent	79	1100	240	NP [c]	mg/Kg	240	mg/Kg	UCL - NP [c]
	Cobalt	3.2	10	4.988	N [l]	mg/Kg	4.988	mg/Kg	UCL - N [l]
	Silver	103	1100	1441	NP [g]	mg/Kg	1100	mg/Kg	Maximum
	Thallium	1.9	7.4		NC	mg/Kg	7.4	mg/Kg	Maximum
	Inorganics								
	Nitrogen, as Ammonia	406	1100	749	LN [m]	mg/Kg	749	mg/Kg	UCL - LN [m]
	Sulfate	74	230	143	NP [c]	mg/Kg	143	mg/Kg	UCL - NP [c]

Table G-1

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
EA6 - OU1	**Semivolatile organics**								
	Benzo(a)anthracene	0.47	1.1	0.19	NP [c]	mg/Kg	0.19	mg/Kg	UCL - NP [c]
	Benzo(a)pyrene	0.36	3.4	0.36	G [h]	mg/Kg	0.36	mg/Kg	UCL - G [h]
	Benzo(b)fluoranthene	0.48	0.71	0.17	NP [f]	mg/Kg	0.17	mg/Kg	UCL - NP [f]
	Bis(2-Ethylhexyl)phthalate	7.4	110	36	NP [g]	mg/Kg	36	mg/Kg	UCL - NP [g]
	C11-C22 Aromatics	32	130	54	NP [f]	mg/Kg	54	mg/Kg	UCL - NP [f]
	Carbazole	0.091	0.02		NC	mg/Kg	0.020	mg/Kg	Maximum
	Dibenz(a,h)anthracene	0.23	0.14	0.080	NP [c]	mg/Kg	0.080	mg/Kg	UCL - NP [c]
	Indeno(1,2,3-cd)pyrene	0.46	0.43	0.19	NP [c]	mg/Kg	0.19	mg/Kg	UCL - NP [c]
	PCBs								
	Delta-BHC	0.016	0.031	0.027	NP [g]	mg/Kg	0.027	mg/Kg	UCL - NP [g]
	Metals								
	Arsenic	6.7	31	8.0	NP [f]	mg/Kg	8.0	mg/Kg	UCL - NP [f]
	Chromium, Hexavalent	7.9	8.9		NC	mg/Kg	8.9	mg/Kg	Maximum
	Cobalt	2.4	7.3	3.9	G [j]	mg/Kg	3.9	mg/Kg	UCL - G [j]
	Silver	1.9	0.98		NC	mg/Kg	0.98	mg/Kg	Maximum
	Thallium	1.1	0.8		NC	mg/Kg	0.80	mg/Kg	Maximum
	Inorganics								
	Chloride	16	56		NC	mg/Kg	56	mg/Kg	Maximum
	Nitrogen, as Ammonia	309	1800	748	NP [e]	mg/Kg	748	mg/Kg	UCL - NP [e]
	Sulfate	1752	23900	17890	NP [g]	mg/Kg	17890	mg/Kg	UCL - NP [g]

Table G-1

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
EA7 - OU1	**Semivolatile Organics**								
	Benzo(a)anthracene	0.056	0.22	0.062	NP [c]	mg/Kg	0.062	mg/Kg	UCL - NP [c]
	Benzo(a)pyrene	0.058	0.22	0.071	NP [c]	mg/Kg	0.071	mg/Kg	UCL - NP [c]
	Benzo(b)fluoranthene	0.061	0.31	0.082	NP [c]	mg/Kg	0.082	mg/Kg	UCL - NP [c]
	Bis(2-Ethylhexyl)phthalate	1.8	21	3.9	NP [b]	mg/Kg	3.9	mg/Kg	UCL - NP [b]
	C11-C22 Aromatics	43	390	113	NP [b]	mg/Kg	113	mg/Kg	UCL - NP [b]
	Diphenyl ether	0.16	1.7	0.34	NP [c]	mg/Kg	0.34	mg/Kg	UCL - NP [c]
	Indeno(1,2,3-cd)pyrene	0.05	0.13		NC	mg/Kg	0.13	mg/Kg	Maximum
	Metals								
	Arsenic	6.9	15	13.6	NP [e]	mg/Kg	13.6	mg/Kg	UCL - NP [e]
	Chromium, Hexavalent	0.86	2.0	1.2	N [l]	mg/Kg	1.2	mg/Kg	UCL - N [l]
	Cobalt	3.2	7.4	4.5	G [k]	mg/Kg	4.5	mg/Kg	UCL - G [k]
	Silver	0.28	0.42	0.32	NP [c]	mg/Kg	0.32	mg/Kg	UCL - NP [c]
	Thallium	0.49	0.11		NC	mg/Kg	0.11	mg/Kg	Maximum
	Inorganics								
	Chloride	13	25		NC	mg/Kg	25	mg/Kg	Maximum
	Nitrogen, as Ammonia	21	45	29	NP [f]	mg/Kg	29	mg/Kg	UCL - NP [f]
	Sulfate	40	140	65	NP [c]	mg/Kg	65	mg/Kg	UCL - NP [c]

Table G-1

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
Containment Area - OU1	**Semivolatile Organics**								
	Benzo(a)anthracene	0.019	0.019	0.020	NP [c]	mg/Kg	0.019	mg/Kg	Maximum
	Benzo(a)pyrene	0.018	0.017	0.017	NP [c]	mg/Kg	0.017	mg/Kg	Maximum
	Benzo(b)fluoranthene	0.020	0.027	0.028	NP [c]	mg/Kg	0.027	mg/Kg	Maximum
	Bis(2-Ethylhexyl)phthalate	0.69	1.6	1.1	G [k]	mg/Kg	1.1	mg/Kg	UCL - G [k]
	Diphenyl ether	0.019	0.015 J		NC	mg/Kg	0.015	mg/Kg	Maximum
	Metals								
	Arsenic	9.5	23	13.6	G [k]	mg/Kg	13.6	mg/Kg	UCL - G [k]
	Cobalt	4.2	5.6	4.7	N [l]	mg/Kg	4.7	mg/Kg	UCL - N [l]
	Chromium, Hexavalent	3.3	5.1	3.9	N [l]	mg/Kg	3.9	mg/Kg	UCL - N [l]
	Silver	0.65	1.2	0.83	N [l]	mg/Kg	0.83	mg/Kg	UCL - N [l]
	Inorganics								
	Chloride	13.4	44		NC	mg/Kg	44	mg/Kg	Maximum
	Nitrogen, as Ammonia	12.4	39	21	NP [c]	mg/Kg	21	mg/Kg	UCL - NP [c]
	Sulfate	3460	13000	9225	G [k]	mg/Kg	9225	mg/Kg	UCL - G [k]

Key

(1) Statistics: Maximum Detected Value (maximum); 95% UCL; Arithmetic Mean (Mean)

NC - Not Calculated

UCL - Upper Confidence Limit

J - estimated value

PCB - polychlorinated biphenyls

mg/kg - milligrams per kilogram

NP - Nonparametric distribution
- [a] 97.5% KM (Chebyshev) UCL
- [b] 95% KM (BCA) UCL
- [c] 95% KM (t) UCL
- [d] 95% KM (Chebyshev) UCL
- [e] 95% Chebyshev (Mean, Sd) UCL
- [f] 95% KM (Percentile Bootstrap) UCL
- [g] 99% KM (Chebyshev) UCL

G - Gamma Distribution
- [h] 95% GROS Approximate Gamma
- [i] 95% GROS Adjusted Gamma
- [j] 95% Adjusted Gamma KM-UCL
- [k] 95% Adjusted Gamma UCL

N - Normal distribution
- [l] 95% Student's-t

LN - Lognormal distribution
- [m] 95% H- UCL

The table represents the current/future chemical of concern (COC) and exposure point concentration (EPC) for the COCs in surface soil (i.e., the concentration that will be used to estimate the exposure and risk for the COC in surface soil). The table includes the range of concentrations detected for the COCs, the EPC, and how the EPC was derived. Frequency of Detection was not used for evaluation given the size of the areas, number of samples, and potential for varied chemical impacts. The 95% UCL on the arithmetic mean was used as the EPC for all COCs except for the following: diphenyl ether (EA2); dibenz(a,h)anthracene, Aroclor-1260, hexavalent chromium, silver, and ammonia (EA3); dibenz(a)anthracene, antimony, hexavalent chromium, and silver (EA4); benzo(a)anthracene, C11-C22 aromatics, indeno(1,2,3-cd)pyrene, n-nitrosodi-n-propylamine, antimony, silver, and thallium (EA5); carbazole, hexavalent chromium, silver, thallium, and chloride (EA6); indeno(1,2,3-cd)pyrene, thallium, and chloride (EA7); and benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, diphenyl ether, and chloride (Containment Area). For these COCs, the maximum concentration was used because it is lower than the calculated 95% UCL, or no 95% UCL could be calculated.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-2

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
EA1 - OU1	**Volatile Organics**								
	2,4,4-Trimethyl-1-pentene	2.2	103	9.5	NP [h]	mg/Kg	9.5	mg/Kg	UCL - NP [h]
	2,4,4-Trimethyl-2-pentene	1.0	45	1.4	G [i]	mg/Kg	1.4	mg/Kg	UCL - G [i]
	4-iso-Propyltoluene	0.14	5.2	0.26	NP [c]	mg/Kg	0.26	mg/Kg	UCL - NP [c]
	4-Chlorophenyl phenyl ether	3.4	0.17		NC	mg/Kg	0.17	mg/Kg	Maximum
	Semivolatile Organics								
	Benzo(a)anthracene	0.28	0.088	0.029	NP [c]	mg/Kg	0.029	mg/Kg	UCL - NP [c]
	Benzo(a)pyrene	0.17	0.34	0.038	NP [c]	mg/Kg	0.038	mg/Kg	UCL - NP [c]
	Benzo(b)fluoranthene	0.28	0.49	0.048	NP [c]	mg/Kg	0.048	mg/Kg	UCL - NP [c]
	Benzo(k)fluoranthene	0.46	0.22	0.027	NP [c]	mg/Kg	0.027	mg/Kg	UCL - NP [c]
	Bis(2-Ethylhexyl)phthalate	51	1218	159	NP [h]	mg/Kg	159	mg/Kg	UCL - NP [h]
	Carbazole	4.3	0.017		NC	mg/Kg	0.017	mg/Kg	Maximum
	Diphenyl ether	0.12	3.8	0.24	NP [c]	mg/Kg	0.24	mg/Kg	UCL - NP [c]
	Indeno(1,2,3-cd)pyrene	0.36	10	0.12	G [i]	mg/Kg	0.12	mg/Kg	UCL - G [i]
	N-Nitrosodiphenylamine	57	3400	266	NP [h]	mg/Kg	266	mg/Kg	UCL - NP [h]
	PCBs								
	Aroclor-1260	0.55	10	1.0	NP [c]	mg/Kg	1.0	mg/Kg	UCL - NP [c]
	Metals								
	Antimony	2.5	41	2.7	NP [b]	mg/Kg	2.7	mg/Kg	UCL - NP [b]
	Arsenic	3.7	16	4.1	NP [e]	mg/Kg	4.1	mg/Kg	UCL - NP [e]
	Chromium, Hexavalent	3.2	19.9	4.7	NP [e]	mg/Kg	4.7	mg/Kg	UCL - NP [e]
	Inorganics								
	Chloride	23	170	26	NP [c]	mg/Kg	26	mg/Kg	UCL - NP [c]
	Nitrogen, as Ammonia	181	4700	449	NP [b]	mg/Kg	449	mg/Kg	UCL - NP [b]
	Sulfate	5469	285000	27406	NP [h]	mg/Kg	27406	mg/Kg	UCL - NP [h]
	Petroleum Hydrocarbons								
	C11-C22 Aromatics	372	4700	693	NP [e]	mg/Kg	693	mg/Kg	UCL - NP [e]
	Specialty Compounds								
	Hydrazine	0.11	1.9	0.41	NP [d]	mg/Kg	0.41	mg/Kg	UCL - NP [d]

Table G-2

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
EA3 - OU1	**Volatile Organics**								
	2,4,4-Trimethyl-1-pentene	32	230	66	NP [a]	mg/Kg	66	mg/Kg	UCL - NP [a]
	2,4,4-Trimethyl-2-pentene	3.7	27	7.3	NP [a]	mg/Kg	7.3	mg/Kg	UCL - NP [a]
	Semivolatile Organics								
	Bis(2-Ethylhexyl)phthalate	901	8600	3522	NP [b]	mg/Kg	3522	mg/Kg	UCL - NP [b]
	N-Nitrosodiphenylamine	2.0	0.41	0.24	NP [c]	mg/Kg	0.24	mg/Kg	UCL - NP [c]
	Metals								
	Antimony	4.2	0.67	0.61	NP [c]	mg/Kg	0.61	mg/Kg	UCL - NP [c]
	Arsenic	3.6	5.2	4.1	N [f]	mg/Kg	4.1	mg/Kg	UCL - N [f]
	Chromium, Hexavalent	0.44	1.1	0.59	N [f]	mg/Kg	0.59	mg/Kg	UCL - N [f]
	Inorganics								
	Chloride	22	56	37	NP [c]	mg/Kg	37	mg/Kg	UCL - NP [c]
	Nitrogen, as Ammonia	5.9	11.3	8.7	NP [c]	mg/Kg	8.7	mg/Kg	UCL - NP [c]
	Sulfate	31	120	54	NP [c]	mg/Kg	54	mg/Kg	UCL - NP [c]
	Petroleum Hydrocarbons								
	C11-C22 Aromatics	1,006	4500	1904	N [f]	mg/Kg	1904	mg/Kg	UCL - N [f]
	Specialty Compounds								
	Hydrazine	0.0025	0.0039		NC	mg/Kg	0.0039	mg/Kg	Maximum

Table G-2

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
EA7 - OU1	**Volatile Organics**								
	2,4,4-Trimethyl-1-pentene	72	1200	133	NP [c]	mg/Kg	133	mg/Kg	UCL - NP [c]
	2,4,4-Trimethyl-2-pentene	22	310	40	NP [c]	mg/Kg	40	mg/Kg	UCL - NP [c]
	Semivolatile Organics								
	Benzo(a)anthracene	0.78	18	1.5	NP [c]	mg/Kg	1.5	mg/Kg	UCL - NP [c]
	Benzo(a)pyrene	0.70	23	1.7	NP [c]	mg/Kg	1.7	mg/Kg	UCL - NP [c]
	Benzo(b)fluoranthene	0.53	17		NC	mg/Kg	17	mg/Kg	Maximum
	Bis(2-Ethylhexyl)phthalate	36	580	225	NP [d]	mg/Kg	225	mg/Kg	UCL - NP [d]
	Diphenyl ether	0.22	3.1	0.52	NP [c]	mg/Kg	0.52	mg/Kg	UCL - NP [c]
	Indeno(1,2,3-cd)pyrene	0.40	10	0.78	NP [c]	mg/Kg	0.78	mg/Kg	UCL - NP [c]
	N-Nitrosodiphenylamine	1.4	38	2.9	G [g]	mg/Kg	2.9	mg/Kg	UCL - G [g]
	Metals								
	Antimony	3.0	0.35	0.38	NP [c]	mg/Kg	0.35	mg/Kg	Maximum
	Arsenic	4.4	7.5	5.3	N [f]	mg/Kg	5.3	mg/Kg	UCL - N [f]
	Chromium, Hexavalent	0.77	1.9	0.95	N [f]	mg/Kg	0.95	mg/Kg	UCL - N [f]
	Inorganics								
	Nitrogen, as Ammonia	5.6	11	8.0	NP [c]	mg/Kg	8.0	mg/Kg	UCL - NP [c]
	Sulfate	32	80	46	NP [c]	mg/Kg	46	mg/Kg	UCL - NP [c]
	Urea	120	350	310	NP [c]	mg/Kg	310	mg/Kg	UCL - NP [c]
	Petroleum Hydrocarbons								
	C11-C22 Aromatics	237	1700	374	NP [e]	mg/Kg	374	mg/Kg	UCL - NP [e]
	Specialty Compounds								
	Hydrazine	0.00085	0.0007	0.00078	NP [c]	mg/Kg	0.0007	mg/Kg	Maximum

Key

(1) Statistics: Maximum Detected Value (maximum); 95% UCL; Arithmetic Mean (Mean)

NC - Not Calculated

UCL - Upper Confidence Limit

J - estimated value

PCB - polychlorinated biphenyls

mg/kg - milligrams per kilogram

NP - Nonparametric distribution
- [a] 95% KM (Percentile Bootstrap) UCL
- [b] 95% KM (Chebyshev) UCL
- [c] 95% KM (t) UCL
- [d] 99% KM (Chebyshev) UCL
- [e] 95% KM (BCA) UCL
- [h] 97.5% KM (Chebyshev) UCL

N - Normal distribution
- [f] 95% Student's-t

G - Gamma Distribution
- [g] 95% GROS Adjusted Gamma
- [i] 95% GROS Approximate Gamma UCL

The table represents the current/future chemical of concern (COC) and exposure point concentration (EPC) for the COCs in subsurface soil (i.e., the concentration that will be used to estimate the exposure and risk for the COC in subsurface soil). The table includes the range of concentrations detected for the COCs, the EPC, and how the EPC was derived. Frequency of Detection was not used for evaluation given the size of the areas, number of samples, and potential for varied chemical impacts. The 95% UCL on the arithmetic mean was used as the EPC for all COCs except for the following: 4-chlorophenyl phenyl ether and carbazole (EA1); hydrazine (EA3); and benzo(b)fluoranthene, antimony, and hydrazine (EA7). For these COCs, the maximum concentration was used because it is lower than the calculated 95% UCL, or no 95% UCL could be calculated.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-3

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
Upper South Ditch	**Volatile Organics**								
Stream	1,3-Dichlorobenzene	0.00049	0.00057	0.00068	NP [a]	mg/L	0.00057	mg/L	Maximum
	Bromodichloromethane	0.00036	0.00051	0.00044	NP [a]	mg/L	0.00044	mg/L	UCL - NP [a]
	Chlorodibromomethane	0.0014	0.0038	0.0022	NP [c]	mg/L	0.0022	mg/L	UCL - NP [c]
	Chloroform	0.00060	0.0012	0.00086	NP [c]	mg/L	0.00086	mg/L	UCL - NP [c]
	Dibromomethane	0.00061	0.0011	0.00076	NP [c]	mg/L	0.00076	mg/L	UCL - NP [c]
	Semivolatile Organics								
	2-Nitrophenol	0.0013	0.0018	0.0013	NP [c]	mg/L	0.0013	mg/L	UCL - NP [c]
	4-Nitrophenol	0.0020	0.0021	0.0021	NP [a]	mg/L	0.0021	mg/L	Maximum
	Azobenzene	0.0016	0.00053	0.00056	NP [a]	mg/L	0.00053	mg/L	Maximum
	Bis(2-Ethylhexyl)phthalate	0.0019	0.0018		NC	mg/L	0.0018	mg/L	Maximum
	Diphenyl ether	0.0013	0.0011	0.00089	NP [a]	mg/L	0.00089	mg/L	UCL - NP [a]
	Diphenylmethanone	0.0015	0.0012	0.0010	NP [a]	mg/L	0.0010	mg/L	UCL - NP [a]
	N-Nitrosodimethylamine	0.00013	0.0003	0.00019	N [g]	mg/L	0.00019	mg/L	UCL - N [g]
	N-Nitrosodi-n-propylamine	0.0000040	0.0000093	0.0000060	NP [a]	mg/L	0.0000060	mg/L	UCL - NP [a]
	Metals, Total								
	Aluminum	5.5	280	2.6	NP [f]	mg/L	2.6	mg/L	UCL - NP [f]
	Antimony	0.0031	0.0037		NC	mg/L	0.0037	mg/L	Maximum
	Arsenic	0.0049	0.0035		NC	mg/L	0.0035	mg/L	Maximum
	Chromium	1.2	64	0.61	NP [e]	mg/L	0.61	mg/L	UCL - NP [e]
	Chromium, Hexavalent	0.074	3.8	0.23	N [e]	mg/L	0.23	mg/L	UCL - N [e]
	Cobalt	0.028	0.05	0.038	N [g]	mg/L	0.038	mg/L	UCL - N [g]
	Lead	0.00049	0.0012	0.00066	NP [c]	mg/L	0.00066	mg/L	UCL - NP [c]
	Manganese	1.5	2.2	1.8	N [g]	mg/L	1.8	mg/L	UCL - N [g]
	Mercury	0.00012	0.00029		NC	mg/L	0.00029	mg/L	Maximum
	Nickel	0.031	0.057	0.042	N [g]	mg/L	0.042	mg/L	UCL - N [g]
	Thallium	0.0048	0.0031		NC	mg/L	0.0031	mg/L	Maximum
	Vanadium	0.0047	0.0022		NC	mg/L	0.0022	mg/L	Maximum
	Inorganics								
	Bromide	0.30	0.48	0.39	NP [c]	mg/L	0.39	mg/L	UCL - NP [c]
	Chloride	165	320	175	G [l]	mg/L	175	mg/L	UCL - G [l]
	Nitrate as N	1.2	6	1.8	NP [f]	mg/L	1.8	mg/L	UCL - NP [f]
	Nitrogen, as Ammonia	52	180	70	NP [e]	mg/L	70	mg/L	UCL - NP [e]
	Sulfate	320	1300	439	NP [e]	mg/L	439	mg/L	UCL - NP [e]
	Specialty Compounds								
	Hydrazine	0.000053	0.000076		NC	mg/L	0.000076	mg/L	Maximum
	4-Nonylphenol (Tech.)	0.011	0.018	0.015	NP [c]	mg/L	0.015	mg/L	UCL - NP [c]
	Kempore (Azodicarbonamide)	0.69	1.4	1.19	NP [a]	mg/L	1.2	mg/L	UCL - NP [a]

Table G-3

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
Detention Basin	**Semivolatile Organics**								
	N-Nitrosodimethylamine	0.0000032	0.0000032 J		NC	mg/L	0.0000032	mg/L	Maximum
	N-Nitrosodi-n-propylamine	0.0000074	0.0000032		NC	mg/L	0.0000074	mg/L	Maximum
	Metals, Total								
	Aluminum	0.90	0.9		NC	mg/L	0.90	mg/L	Maximum
	Chromium	0.0068	0.0068		NC	mg/L	0.0068	mg/L	Maximum
	Chromium, Hexavalent	0.010	0.01		NC	mg/L	0.010	mg/L	Maximum
	Lead	0.0030	0.003		NC	mg/L	0.0030	mg/L	Maximum
	Manganese	0.12	0.12		NC	mg/L	0.12	mg/L	Maximum
	Nickel	0.0014	0.0014		NC	mg/L	0.0014	mg/L	Maximum
	Vanadium	0.0020	0.002		NC	mg/L	0.0020	mg/L	Maximum
	Inorganics								
	Chloride	9.0	9		NC	mg/L	9.0	mg/L	Maximum
	Nitrate as N	0.084	0.084		NC	mg/L	0.084	mg/L	Maximum
	Nitrogen, as Ammonia	7.5	7.5		NC	mg/L	7.5	mg/L	Maximum
	Sulfate	96	96		NC	mg/L	96	mg/L	Maximum
Central Pond	**Metals, Total**								
	Aluminum	0.21	0.21		NC	mg/L	0.21	mg/L	Maximum
	Chromium	0.0085	0.0085		NC	mg/L	0.0085	mg/L	Maximum
	Cobalt	0.0012	0.0012		NC	mg/L	0.0012	mg/L	Maximum
	Lead	0.00090	0.0009		NC	mg/L	0.00090	mg/L	Maximum
	Manganese	0.70	0.70		NC	mg/L	0.70	mg/L	Maximum
	Nickel	0.0053	0.0053		NC	mg/L	0.0053	mg/L	Maximum
	Inorganics								
	Bromide	0.13	0.13		NC	mg/L	0.13	mg/L	Maximum
	Chloride	52	52		NC	mg/L	52	mg/L	Maximum
	Nitrate as N	3.6	3.6		NC	mg/L	3.6	mg/L	Maximum
	Nitrogen, as Ammonia	28	28		NC	mg/L	28	mg/L	Maximum
	Sulfate	460	460		NC	mg/L	460	mg/L	Maximum

Table G-3

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
Lower South Ditch Stream	**Volatile Organics**								
	Chlorodibromomethane	0.0018	0.0034		NC	mg/L	0.0034	mg/L	Maximum
	Chloroform	0.00039	0.00027		NC	mg/L	0.00027	mg/L	Maximum
	Dibromomethane	0.00041	0.00032		NC	mg/L	0.00032	mg/L	Maximum
	Semivolatile Organics								
	2-Nitrophenol	0.00074	0.00091		NC	mg/L	0.00091	mg/L	Maximum
	Benzo(a)pyrene	0.00012	0.00015		NC	mg/L	0.00015	mg/L	Maximum
	Bis(2-Ethylhexyl)phthalate	0.0047	0.0061		NC	mg/L	0.0061	mg/L	Maximum
	Diphenylmethanone	0.0015	0.00067		NC	mg/L	0.00067	mg/L	Maximum
	N-Nitrosodimethylamine	0.000099	0.00012		NC	mg/L	0.00012	mg/L	Maximum
	Metals, Total								
	Aluminum	1.7	9.6	1.6	G [i]	mg/L	1.6	mg/L	UCL - G [i]
	Arsenic	0.0041	0.0031		NC	mg/L	0.0031	mg/L	Maximum
	Chromium	0.35	2.2	0.32	G [k]	mg/L	0.32	mg/L	UCL - G [k]
	Chromium, Hexavalent	0.016	0.12	0.027	G [k]	mg/L	0.027	mg/L	UCL - G [k]
	Cobalt	0.029	0.032		NC	mg/L	0.032	mg/L	Maximum
	Lead	0.0013	0.0021		NC	mg/L	0.0021	mg/L	Maximum
	Manganese	1.6	1.7		NC	mg/L	1.7	mg/L	Maximum
	Nickel	0.030	0.034		NC	mg/L	0.034	mg/L	Maximum
	Inorganics								
	Bromide	0.38	0.43		NC	mg/L	0.43	mg/L	Maximum
	Chloride	155	220	171	N [g]	mg/L	171	mg/L	UCL - N [g]
	Nitrate as N	1.4	3.9	1.8	G [k]	mg/L	1.8	mg/L	UCL - G [k]
	Nitrogen, as Ammonia	74	250	93	N [g]	mg/L	93	mg/L	UCL - N [g]
	Sulfate	447	1200	546	N [g]	mg/L	546	mg/L	UCL - N [g]
	Specialty Compounds								
	Hydrazine	0.000065	0.00008		NC	mg/L	0.000080	mg/L	Maximum
	4-Nonylphenol (Tech.)	0.0059	0.0062		NC	mg/L	0.0062	mg/L	Maximum
	Kempore (Azodicarbonamide)	0.85	1.2		NC	mg/L	1.2	mg/L	Maximum

Table G-3

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration		95% UCL		Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure (1)
		Mean	Maximum						
Off-Property West Ditch Stream	**Semivolatile Organics**								
	3 & 4 Methylphenol	0.0018	0.00076	0.00078	NP [a]	mg/L	0.00076	mg/L	Maximum
	4-Nitrophenol	0.0020	0.00075		NC	mg/L	0.00075	mg/L	Maximum
	Benzo(a)anthracene	0.00047	0.002		NC	mg/L	0.0020	mg/L	Maximum
	Benzo(a)pyrene	0.00089	0.0042	0.0023	NP [a]	mg/L	0.0023	mg/L	UCL - NP [a]
	Benzo(b)fluoranthene	0.0016	0.0077	0.0042	NP [a]	mg/L	0.0042	mg/L	UCL - NP [a]
	Benzo(k)fluoranthene	0.00061	0.0026		NC	mg/L	0.0026	mg/L	Maximum
	Chrysene	0.0012	0.0053	0.0029	NP [a]	mg/L	0.0029	mg/L	UCL - NP [a]
	Dibenz(a,h)anthracene	0.00039	0.0012		NC	mg/L	0.0012	mg/L	Maximum
	Indeno(1,2,3-cd)pyrene	0.00088	0.004	0.0023	NP [a]	mg/L	0.0023	mg/L	UCL - NP [a]
	N-Nitrosodimethylamine	0.000049	0.00011	0.000076	NP [c]	mg/L	0.000076	mg/L	UCL - NP [c]
	Pyrene	0.0031	0.012	0.0065	NP [a]	mg/L	0.0065	mg/L	UCL - NP [a]
	Metals, Total								
	Aluminum	0.82	1.6	1.3	N [g]	mg/L	1.3	mg/L	UCL - N [g]
	Arsenic	0.0060	0.012	0.0087	NP [a]	mg/L	0.0087	mg/L	UCL - NP [a]
	Chromium	0.050	0.13	0.093	N [g]	mg/L	0.093	mg/L	UCL - N [g]
	Chromium, Hexavalent	0.0024	0.0071	0.0078	N [e]	mg/L	0.0071	mg/L	Maximum
	Cobalt	0.0097	0.018	0.015	N [g]	mg/L	0.015	mg/L	UCL - N [g]
	Lead	0.0027	0.0058	0.0043	N [g]	mg/L	0.0043	mg/L	UCL - N [g]
	Manganese	0.85	1.5	1.3	N [g]	mg/L	1.3	mg/L	UCL - N [g]
	Nickel	0.0090	0.018	0.013	N [g]	mg/L	0.013	mg/L	UCL - N [g]
	Vanadium	0.0057	0.012	0.0087	NP [a]	mg/L	0.0087	mg/L	UCL - NP [a]
	Inorganics								
	Bromide	0.15	0.21	0.19	NP [c]	mg/L	0.19	mg/L	UCL - NP [c]
	Chloride	139	180	176	N [g]	mg/L	176	mg/L	UCL - N [g]
	Nitrate as N	0.032	0.069		NC	mg/L	0.069	mg/L	Maximum
	Nitrogen, as Ammonia	45	66	60	N [g]	mg/L	60	mg/L	UCL - N [g]
	Sulfate	211	360	318	N [g]	mg/L	318	mg/L	UCL - N [g]

Table G-3

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
East Ditch Stream	**Volatile Organics**								
	Cis-1,2-Dichloroethene	0.0015	0.0061	0.0029	NP [a]	mg/L	0.0029	mg/L	UCL - NP [a]
	Trichloroethene	0.0011	0.0034	0.0017	NP [a]	mg/L	0.0017	mg/L	UCL - NP [a]
	Vinyl chloride	0.00028	0.00052		NC	mg/L	0.00052	mg/L	Maximum
	Xylenes (m&p)	0.0010	0.00052		NC	mg/L	0.00052	mg/L	Maximum
	Semivolatile Organics								
	Bis(2-Ethylhexyl)phthalate	0.0010	0.0015	0.0016	NP [a]	mg/L	0.0015	mg/L	Maximum
	Dibenz(a,h)anthracene	0.00020	0.00018	0.00017	NP [a]	mg/L	0.00017	mg/L	UCL - NP [a]
	Indeno(1,2,3-cd)pyrene	0.00020	0.00017	0.00017	NP [a]	mg/L	0.00017	mg/L	Maximum
	N-Nitrosodimethylamine	0.0000045	0.000012	0.0000069	NP [a]	mg/L	0.0000069	mg/L	UCL - NP [a]
	N-Nitrosodi-n-propylamine	0.0000021	0.0000033		NC	mg/L	0.0000033	mg/L	Maximum
	Metals, Total								
	Aluminum	0.16	0.77	0.19	G [i]	mg/L	0.19	mg/L	UCL - G [i]
	Arsenic	0.0053	0.0078	0.0090	NP [a]	mg/L	0.0078	mg/L	Maximum
	Chromium	0.0055	0.065	0.011	NP [b]	mg/L	0.011	mg/L	UCL - NP [b]
	Chromium, Hexavalent	0.00028	0.00086	0.00047	NP [e]	mg/L	0.00047	mg/L	UCL - NP [e]
	Cobalt	0.0036	0.0024	0.0024	NP [a]	mg/L	0.0024	mg/L	UCL - NP [a]
	Lead	0.00051	0.0015	0.00075	NP [c]	mg/L	0.00075	mg/L	UCL - NP [c]
	Manganese	0.41	0.91	0.59	N [g]	mg/L	0.59	mg/L	UCL - N [g]
	Nickel	0.0040	0.0039	0.0036	NP [c]	mg/L	0.0036	mg/L	UCL - NP [c]
	Thallium	0.0050	0.0052		NC	mg/L	0.0052	mg/L	Maximum
	Vanadium	0.0048	0.0025		NC	mg/L	0.0025	mg/L	Maximum
	Inorganics								
	Bromide	0.069	0.18	0.13	NP [a]	mg/L	0.13	mg/L	UCL - NP [a]
	Chloride	170	360	192	N [g]	mg/L	192	mg/L	UCL - N [g]
	Nitrate as N	1.0	2.6	1.2	N [g]	mg/L	1.2	mg/L	UCL - N [g]
	Nitrogen, as Ammonia	2.7	10	4.5	G [j]	mg/L	4.5	mg/L	UCL - G [j]
	Sulfate	36	99	46	LN [h]	mg/L	46	mg/L	UCL - LN [h]
	Specialty Compounds								
	Kempore (Azodicarbonamide)	1.0	4.1	2.1	NP [a]	mg/L	2.1	mg/L	UCL - NP [a]

Table G-3									
OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration									
Scenario Timeframe: Current/Future **Medium: Surface Water** **Exposure Medium: Surface Water**									
Exposure Point	**Chemical of Concern**	**Concentration**				**Units**	**Exposure Point Concentration**	**Exposure Point Concentration Units**	**Statistical Measure**
		Mean	**Maximum**	**95% UCL**					**(1)**
Maple Meadow Brook	**Volatile Organics**								
	Cis-1,2-Dichloroethene	0.00049	0.00062	0.00077	NP [a]	mg/L	0.00062	mg/L	Maximum
	Trichloroethene	0.00050	0.0004		NC	mg/L	0.00040	mg/L	Maximum
	Semivolatile Organics								
	3 & 4 Methylphenol	0.0022	0.00074		NC	mg/L	0.00074	mg/L	Maximum
	Benzo(a)pyrene	0.000094	0.00013	0.00014	NP [a]	mg/L	0.00013	mg/L	Maximum
	Benzo(b)fluoranthene	0.00014	0.00013		NC	mg/L	0.00013	mg/L	Maximum
	Indeno(1,2,3-cd)pyrene	0.00023	0.0002		NC	mg/L	0.00020	mg/L	Maximum
	N-Nitrosodimethylamine	0.0000041	0.00000047		NC	mg/L	0.00000047	mg/L	Maximum
	N-Nitrosodi-n-propylamine	0.0000041	0.00000078	0.00000080	NP [a]	mg/L	0.00000078	mg/L	Maximum
	Metals, Total								
	Aluminum	0.17	1.8	0.68	NP [d]	mg/L	0.68	mg/L	UCL - NP [d]
	Arsenic	0.0050	0.0048	0.0049	NP [a]	mg/L	0.0048	mg/L	Maximum
	Chromium	0.0024	0.00098		NC	mg/L	0.00098	mg/L	Maximum
	Chromium, Hexavalent	0.00026	0.000275	0.00028	N [g]	mg/L	0.00028	mg/L	Maximum
	Cobalt	0.0046	0.0077	0.0051	NP [a]	mg/L	0.0051	mg/L	UCL - NP [a]
	Lead	0.0065	0.11	0.038	NP [d]	mg/L	0.038	mg/L	UCL - NP [d]
	Manganese	0.91	9.3	2.7	NP [e]	mg/L	2.7	mg/L	UCL - NP [e]
	Nickel	0.0046	0.0072	0.0052	NP [c]	mg/L	0.0052	mg/L	UCL - NP [c]
	Thallium	0.0051	0.0066		NC	mg/L	0.0066	mg/L	Maximum
	Vanadium	0.0048	0.0037	0.0045	NP [a]	mg/L	0.0037	mg/L	Maximum
	Inorganics								
	Bromide	0.055	0.12	0.10	NP [a]	mg/L	0.10	mg/L	UCL - NP [a]
	Chloride	121	220	138	N [g]	mg/L	138	mg/L	UCL - N [g]
	Nitrate as N	0.19	0.6	0.26	NP [c]	mg/L	0.26	mg/L	UCL - NP [c]
	Nitrogen, as Ammonia	0.30	2.5	0.56	NP [b]	mg/L	0.56	mg/L	UCL - NP [b]
	Sulfate	15.1	39	18.3	N [g]	mg/L	18.3	mg/L	UCL - N [g]
	Specialty Compounds								
	Hydrazine	0.000050	0.00006		NC	mg/L	0.000060	mg/L	Maximum
	Kempore (Azodicarbonamide)	0.55	0.71		NC	mg/L	0.71	mg/L	Maximum

Table G-3

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

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

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
North Pond	**Semivolatile Organics**								
	Benzo(a)anthracene	0.00012	0.00012	0.00015	NP [a]	mg/L	0.00012	mg/L	Maximum
	Benzo(a)pyrene	0.00012	0.00017	0.00020	NP [a]	mg/L	0.00017	mg/L	Maximum
	Benzo(b)fluoranthene	0.00019	0.00027	0.00031	NP [a]	mg/L	0.00027	mg/L	Maximum
	Benzo(k)fluoranthene	0.00013	0.00015	0.00020	NP [a]	mg/L	0.00015	mg/L	Maximum
	Bis(2-Ethylhexyl)phthalate	0.0010	0.0026	0.0023	N [g]	mg/L	0.0023	mg/L	UCL - N [g]
	Chrysene	0.00036	0.00029	0.00035	NP [a]	mg/L	0.00029	mg/L	Maximum
	Pyrene	0.00080	0.00039	0.00051	NP [a]	mg/L	0.00039	mg/L	Maximum
	Metals, Total								
	Aluminum	0.15	0.22	0.24	NP [a]	mg/L	0.22	mg/L	Maximum
	Chromium	0.0025	0.0043	0.0041	N [g]	mg/L	0.0041	mg/L	UCL - N [g]
	Lead	0.00093	0.0013	0.0015	N [g]	mg/L	0.0013	mg/L	Maximum
	Manganese	0.39	0.49	0.48	N [g]	mg/L	0.48	mg/L	UCL - N [g]
	Nickel	0.0026	0.0025	0.0026	NP [a]	mg/L	0.0025	mg/L	Maximum
	Inorganics								
	Bromide	0.28	0.65	0.64	NP [a]	mg/L	0.64	mg/L	UCL - NP [a]
	Chloride	190	320	301	N [g]	mg/L	301	mg/L	UCL - N [g]
	Nitrate as N	0.11	0.24	0.22	NP [a]	mg/L	0.22	mg/L	UCL - NP [a]
	Nitrogen, as Ammonia	0.077	0.10	0.13	NP [a]	mg/L	0.10	mg/L	Maximum
	Sulfate	8.4	15	14.5	N [g]	mg/L	14.5	mg/L	UCL - N [g]

Key

(1) Statistics: Maximum Detected Value (maximum); 95% UCL; Arithmetic Mean (Mean)

NC - Not Calculated

UCL - Upper Confidence Limit

J - estimated value

mg/L - milligrams per liter

NP - Nonparametric distribution
- [a] 95% KM (t) UCL
- [b] 95% KM (BCA) UCL
- [c] 95% KM (Percentile Bootstrap) UCL
- [d] 97.5% KM (Chebyshev) UCL
- [e] 95% Chebyshev (Mean, Sd) UCL
- [f] 95% KM (Chebyshev) UCL

N - Normal distribution
- [g] 95% Student's-t UCL

LN - Lognormal distribution
- [h] 95% H-UCL

G - Gamma Distribution
- [i] 95% GROS Adjusted Gamma UCL
- [j] 95% Adjusted Gamma KM-UCL
- [k] 95% Adjusted Gamma UCL
- [l] 95% Approximate Gamma UCL

The table represents the current/future chemical of concern (COC) and exposure point concentration (EPC) for the COCs in surface water (i.e., the concentration that will be used to estimate the exposure and risk for the COC in surface water). The table includes the range of concentrations detected for the COCs, the EPC, and how the EPC was derived. Frequency of Detection was not used for evaluation given the size of the areas, number of samples, and potential for varied chemical impacts. The 95% UCL on the arithmetic mean was used as the EPC for all COCs except for the following: 1,3-dichlorobenzene, 4-nitrophenol, azobenzene, bis(2-ethylhexyl)phthalate, antimony, arsenic, mercury, thallium, vanadium, and hydrazine (Upper South Ditch Stream); 3 & 4 methylphenol, nitrophenol, benzo(a)anthracene, benzo(k)fluoranthene, dibenz(a,h)anthracene, hexavalent chromium, and nitrate (Off-Property West Ditch Stream); vinyl chloride, m&p xylenes, bis(2-ethylhexyl)phthalate, indeno(1,2,3-cd)pyrene, n-nitrosodi-n-propylamine, arsenic, thallium, and vanadium (East Ditch Stream); cis-1,2-dichloroethene, trichloroethene, 3&4 methylphenol, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, n-nitrosodimethylamine, n-nitrosodi-n-propylamine, arsenic, chromium, hexavalent chromium, thallium, vanadium, hydrazine, and kempore (Maple Meadow Brook); benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, pyrene, aluminum, lead, nickel, and ammonia (North Pond) and all COCs at the Detention Basin, Central Pond, and Lower South Ditch Stream. For these COCs, the maximum concentration was used because it is lower than the calculated 95% UCL, or no 95% UCL could be calculated.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-4									
OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration									
Scenario Timeframe: Current/Future **Medium: Sediment** **Exposure Medium: Sediment**									
Exposure Point	**Chemical of Concern**	**Concentration**				**Units**	**Exposure Point Concentration**	**Exposure Point Concentration Units**	**Statistical Measure**
		Mean	**Maximum**	**95% UCL**					**(1)**
On Property West Ditch Stream	**Semivolatile Organics**								
	Benzo(b)fluoranthene	2.1	3		NC	mg/Kg	3	mg/Kg	Maximum
	Bis(2-Ethylhexyl)phthalate	4.2	14	5.7	NP [a]	mg/Kg	5.7	mg/Kg	UCL - NP [a]
	Metals								
	Arsenic	3.3	7.77		NC	mg/Kg	7.8	mg/Kg	Maximum
	Chromium, Hexavalent	4.1	11.0	4.7	G [f]	mg/Kg	4.7	mg/Kg	UCL - G [f]
	Manganese	13.0	22		NC	mg/Kg	22	mg/Kg	Maximum
Upper South Ditch Stream	**Volatile Organics**								
	4-iso-Propyltoluene	0.0018	0.0026 J		NC	mg/Kg	0.0026	mg/Kg	Maximum
	Semivolatile Organics								
	Benzo(a)anthracene	0.21	0.51	0.35	NP [a]	mg/Kg	0.35	mg/Kg	UCL - NP [a]
	Benzo(a)pyrene	0.095	0.13	0.11	NP [b]	mg/Kg	0.11	mg/Kg	UCL - NP [b]
	Benzo(b)fluoranthene	0.099	0.16	0.12	NP [b]	mg/Kg	0.12	mg/Kg	UCL - NP [b]
	Bis(2-Ethylhexyl)phthalate	42	210	707	G [f]	mg/Kg	210	mg/Kg	Maximum
	Dibenz(a,h)anthracene	0.078	0.048	0.048	NP [a]	mg/Kg	0.048	mg/Kg	Maximum
	Diphenyl ether	0.15	0.22	0.22	NP [a]	mg/Kg	0.22	mg/Kg	UCL - NP [a]
	Diphenylmethanone	0.098	0.0305		NC	mg/Kg	0.031	mg/Kg	Maximum
	Metals								
	Arsenic	5.3	13	8.6	N [e]	mg/Kg	8.6	mg/Kg	UCL - N [e]
	Chromium, Hexavalent	7.0	25	15.5	NP [a]	mg/Kg	15.5	mg/Kg	UCL - NP [a]
	Cobalt	4.5	5.5	5.2	N [e]	mg/Kg	5.2	mg/Kg	UCL - N [e]
	Manganese	121	270	211	N [e]	mg/Kg	211	mg/Kg	UCL - N [e]
	Inorganics								
	Chloride	74	140	127	N [e]	mg/Kg	127	mg/Kg	UCL - N [e]
	Nitrogen, as Ammonia	148	240	215	N [e]	mg/Kg	215	mg/Kg	UCL - N [e]
	Sulfate	454	640	695	N [e]	mg/Kg	640	mg/Kg	Maximum
	Petroleum Hydrocarbons								
	C11-C22 Aromatics	288	1100	925	N [e]	mg/Kg	925	mg/Kg	UCL - N [e]
	C19-C36 Aliphatics	194	690	583	N [e]	mg/Kg	583	mg/Kg	UCL - N [e]

Table G-4

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
Detention Basin	**Semivolatile Organics**								
	Benzo(a)pyrene	0.24	0.22		NC	mg/Kg	0.22	mg/Kg	Maximum
	Bis(2-Ethylhexyl)phthalate	2.3	3.1		NC	mg/Kg	3.1	mg/Kg	Maximum
	Metals								
	Arsenic	10.7	12		NC	mg/Kg	12.0	mg/Kg	Maximum
	Cobalt	4.7	4.8		NC	mg/Kg	4.8	mg/Kg	Maximum
	Manganese	420	440		NC	mg/Kg	440	mg/Kg	Maximum
	Inorganics								
	Chloride	9.7	13		NC	mg/Kg	13.0	mg/Kg	Maximum
	Nitrogen, as Ammonia	18.0	22		NC	mg/Kg	22	mg/Kg	Maximum
	Sulfate	1400	1900		NC	mg/Kg	1900	mg/Kg	Maximum
Central Pond	**Semivolatile Organics**								
	Benzo(b)fluoranthene	0.19	0.14		NC	mg/Kg	0.14	mg/Kg	Maximum
	Metals								
	Arsenic	7.2	8.1		NC	mg/Kg	8.1	mg/Kg	Maximum
	Chromium, Hexavalent	5.1	22.4	12.6	G [f]	mg/Kg	12.6	mg/Kg	UCL - G [f]
	Cobalt	4.0	4		NC	mg/Kg	4.0	mg/Kg	Maximum
	Manganese	515	590		NC	mg/Kg	590	mg/Kg	Maximum
	Inorganics								
	Chloride	21	24		NC	mg/Kg	24	mg/Kg	Maximum
	Nitrogen, as Ammonia	26	35		NC	mg/Kg	35	mg/Kg	Maximum
	Sulfate	855	1200		NC	mg/Kg	1200	mg/Kg	Maximum

Table G-4

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
Lower South Ditch Stream	**Semivolatile Organics**								
	Benzo(a)anthracene	2.0	3.1		NC	mg/Kg	3.1	mg/Kg	Maximum
	Benzo(a)pyrene	0.98	0.099		NC	mg/Kg	0.099	mg/Kg	Maximum
	Bis(2-Ethylhexyl)phthalate	560	920	1112	N [e]	mg/Kg	920	mg/Kg	Maximum
	Dibenz(a,h)anthracene	1.0	0.26 J		NC	mg/Kg	0.26	mg/Kg	Maximum
	Diphenyl ether	2.7	2.6		NC	mg/Kg	2.6	mg/Kg	Maximum
	Metals								
	Arsenic	6.4	6.7	6.8	N [e]	mg/Kg	6.7	mg/Kg	Maximum
	Chromium, Hexavalent	172	480	622	N [e]	mg/Kg	480	mg/Kg	Maximum
	Cobalt	15.6	21	26	N [e]	mg/Kg	21	mg/Kg	Maximum
	Manganese	68	87	100	N [e]	mg/Kg	87	mg/Kg	Maximum
	Inorganics								
	Chloride	130	130		NC	mg/Kg	130	mg/Kg	Maximum
	Nitrogen, as Ammonia	227	290 J	328	N [e]	mg/Kg	290	mg/Kg	Maximum
	Sulfate	715	830		NC	mg/Kg	830	mg/Kg	Maximum
	Petroleum Hydrocarbons								
	C11-C22 Aromatics	9,400	9400		NC	mg/Kg	9400	mg/Kg	Maximum
	C19-C36 Aliphatics	6,400	6400		NC	mg/Kg	6400	mg/Kg	Maximum
Off-Property West Ditch Stream	**Semivolatile Organics**								
	4-Chlorophenyl phenyl ether	0.044	0.061 J		NC	mg/Kg	0.061	mg/Kg	Maximum
	Benzo(a)anthracene	0.14	0.17	0.20	N [e]	mg/Kg	0.17	mg/Kg	Maximum
	Benzo(a)pyrene	0.17	0.2	0.23	N [e]	mg/Kg	0.20	mg/Kg	Maximum
	Benzo(b)fluoranthene	0.31	0.31		NC	mg/Kg	0.31	mg/Kg	Maximum
	Bis(2-Ethylhexyl)phthalate	0.092	0.12 J	0.16	N [e]	mg/Kg	0.12	mg/Kg	Maximum
	Carbazole	0.045	0.051 J	0.055	N [e]	mg/Kg	0.051	mg/Kg	Maximum
	Dibenz(a,h)anthracene	0.048	0.061 J		NC	mg/Kg	0.061	mg/Kg	Maximum
	Diphenyl ether	0.33	0.86 J	3.3	NP [c]	mg/Kg	0.86	mg/Kg	Maximum
	Diphenylmethanone	0.091	0.2 J	0.50	NP[d]	mg/Kg	0.20	mg/Kg	Maximum
	Metals								
	Arsenic	10.0	14	16.2	N [e]	mg/Kg	14	mg/Kg	Maximum
	Chromium, Hexavalent	89	224	288	N [e]	mg/Kg	224	mg/Kg	Maximum
	Cobalt	7.5	15 J	18.5	N [e]	mg/Kg	15	mg/Kg	Maximum
	Manganese	85	160 J	195	N [e]	mg/Kg	160	mg/Kg	Maximum
	Inorganics								
	Chloride	147	240	284	N [e]	mg/Kg	240	mg/Kg	Maximum
	Nitrogen, as Ammonia	254	540 J	673	N [e]	mg/Kg	540	mg/Kg	Maximum
	Sulfate	697	1500	1870	N [e]	mg/Kg	1500	mg/Kg	Maximum

Table G-4

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
East Ditch Stream	**Semivolatile Organics**								
	Benzo(a)anthracene	0.55	0.77 J	1.0	N [e]	mg/Kg	0.77	mg/Kg	Maximum
	Benzo(a)pyrene	0.62	0.94 J	1.2	N [e]	mg/Kg	0.94	mg/Kg	Maximum
	Benzo(b)fluoranthene	1.0	1.6 J	2.0	N [e]	mg/Kg	1.60	mg/Kg	Maximum
	Bis(2-Ethylhexyl)phthalate	4.2	10 J	12.7	N [e]	mg/Kg	10	mg/Kg	Maximum
	Carbazole	0.20	0.24 J		NC	mg/Kg	0.24	mg/Kg	Maximum
	Dibenz(a,h)anthracene	0.15	0.037 J		NC	mg/Kg	0.037	mg/Kg	Maximum
	Diphenyl ether	0.20	0.28 J		NC	mg/Kg	0.28	mg/Kg	Maximum
	Metals								
	Arsenic	178	450 J	576	N [e]	mg/Kg	450	mg/Kg	Maximum
	Chromium, Hexavalent	7.9	12.5	14.7	N [e]	mg/Kg	12.5	mg/Kg	Maximum
	Cobalt	16.7	30 J	37	N [e]	mg/Kg	30	mg/Kg	Maximum
	Manganese	1,343	3200 J	4072	N [e]	mg/Kg	3200	mg/Kg	Maximum
	Inorganics								
	Chloride	257	690	890	N [e]	mg/Kg	690	mg/Kg	Maximum
	Nitrogen, as Ammonia	50	130	167	N [e]	mg/Kg	130	mg/Kg	Maximum
	Sulfate	58	71		NC	mg/Kg	71	mg/Kg	Maximum
Maple Meadow Brook	**Semivolatile Organics**								
	4-Nitrophenol	0.43	0.091 J		NC	mg/Kg	0.091	mg/Kg	Maximum
	Benzo(a)anthracene	0.13	0.4 J	0.17	NP [a]	mg/Kg	0.17	mg/Kg	UCL - NP [a]
	Benzo(a)pyrene	0.13	0.4 J	0.17	NP [b]	mg/Kg	0.17	mg/Kg	UCL - NP [b]
	Benzo(b)fluoranthene	0.16	0.56 J	0.23	NP [b]	mg/Kg	0.23	mg/Kg	UCL - NP [b]
	Bis(2-Ethylhexyl)phthalate	0.15	0.35 J	0.20	NP [b]	mg/Kg	0.20	mg/Kg	UCL - NP [b]
	Carbazole	0.093	0.097 J	0.082	NP [a]	mg/Kg	0.082	mg/Kg	UCL - NP [a]
	Dibenz(a,h)anthracene	0.094	0.15 J	0.10	NP [a]	mg/Kg	0.10	mg/Kg	UCL - NP [a]
	Metals								
	Arsenic	17.2	52 J	23.8	N [e]	mg/Kg	24	mg/Kg	UCL - N [e]
	Chromium, Hexavalent	3.5	6.4	4.5	N [e]	mg/Kg	4.5	mg/Kg	UCL - N [e]
	Cobalt	12.7	34 J	18.1	N [e]	mg/Kg	18.1	mg/Kg	UCL - N [e]
	Manganese	788.46	2100 J	1358	G [f]	mg/Kg	1358	mg/Kg	UCL - G [f]
	Thallium	2.6	1.4 J		NC	mg/Kg	1.4	mg/Kg	Maximum
	Inorganics								
	Chloride	485	1000	658	N [e]	mg/Kg	658	mg/Kg	UCL - N [e]
	Nitrogen, as Ammonia	567	1500 J	771	N [e]	mg/Kg	771	mg/Kg	UCL - N [e]
	Sulfate	600	1400 J	800	NP [b]	mg/Kg	800	mg/Kg	UCL - NP [b]

Table G-4

OU1/2 Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Concern	Concentration				Units	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Mean	Maximum	95% UCL					(1)
North Pond	**Semivolatile Organics**								
	Benzo(a)anthracene	0.46	0.66	0.79	NP [a]	mg/Kg	0.66	mg/Kg	Maximum
	Benzo(a)pyrene	0.44	0.7	0.75	NP [a]	mg/Kg	0.70	mg/Kg	Maximum
	Benzo(b)fluoranthene	0.70	1.1	1.2	NP [a]	mg/Kg	1.1	mg/Kg	Maximum
	Bis(2-Ethylhexyl)phthalate	1.8	3.7 J		NC	mg/Kg	3.7	mg/Kg	Maximum
	Carbazole	0.34	0.16 J		NC	mg/Kg	0.16	mg/Kg	Maximum
	Metals								
	Arsenic	8.3	13	13.6	NP [a]	mg/Kg	13.0	mg/Kg	Maximum
	Chromium, Hexavalent	0.59	0.9	0.99	N [e]	mg/Kg	0.90	mg/Kg	Maximum
	Cobalt	6.7	9	9.1	N [e]	mg/Kg	9.0	mg/Kg	Maximum
	Manganese	420	1250	1071	N [e]	mg/Kg	1071	mg/Kg	UCL - N [e]
	Thallium	0.76	0.82 J		NC	mg/Kg	0.82	mg/Kg	Maximum
	Inorganics								
	Chloride	184	320	333	N [e]	mg/Kg	320	mg/Kg	Maximum
	Nitrogen, as Ammonia	12.2	23	24	N [e]	mg/Kg	23	mg/Kg	Maximum
	Sulfate	183	270	327	NP [a]	mg/Kg	270	mg/Kg	Maximum

Key

(1) Statistics: Maximum Detected Value (maximum); 95% UCL; Arithmetic Mean (Mean)
NC - Not Calculated
J - estimated value
UCL - Upper Confidence Limit
mg/kg - milligrams per kilogram
NP - Nonparametric distribution
[a] 95% KM (t) UCL
[b] 95% KM (Percentile Bootstrap) UCL
[c] 99% KM (Chebyshev) UCL
[d] 97.5% KM (Chebyshev) UCL
N - Normal distribution
[e] 95% Student's-t UCL
G - Gamma Distribution
[f] 95% Adjusted Gamma UCL

The table represents the current/future chemical of concern (COC) and exposure point concentration (EPC) for the COCs in sediment (i.e., the concentration that will be used to estimate the exposure and risk for the COC in sediment). The table includes the range of concentrations detected for the COCs, the EPC, and how the EPC was derived. Frequency of Detection was not used for evaluation given the size of the areas, number of samples, and potential for varied chemical impacts. The 95% UCL on the arithmetic mean was used as the EPC for all COCs except for the following: benzo(b)fluoranthene, arsenic, and manganese (On-Property West Ditch Stream); 4-iso-propyltoluene, bis(2-ethylhexyl)phthalate, dibenz(a,h)anthracene, diphenylmethanone, and sulfate (Upper South Ditch Stream); benzo(b)fluoranthene, arsenic, cobalt, manganese, chloride, ammonia, and sulfate (Central Pond); 4-nitrophenol and thallium (Maple Meadow Brook); benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, carbazole, arsenic, hexavalent chromium, cobalt, thallium, chloride, ammonia, and sulfate (North Pond) and all COCs at the Detention Basin, Lower South Ditch Stream, Off-Property West Ditch Stram, and East Ditch Stream. For these COCs, the maximum concentration was used because it is lower than the calculated 95% UCL, or no 95% UCL could be calculated.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-5

OU1/2 Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/Cancer Guideline Description	Source	Date [1]
VOLATILES						
1,2-Dichloroethene (cis)	ND	ND		Inadequate evidence	IRIS	July-13
2,4,4-Trimethyl-1-pentene	NA	NA		ND		July-13
2,4,4-Trimethyl-2-pentene	NA	NA		ND		July-13
4-iso-Propyltoluene	NA	ND		ND		July-13
Bromodichloromethane	6.2E-02	6.2E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13
Chlorodibromomethane	8.4E-02	8.4E-02	$(mg/kg\text{-}day)^{-1}$	C	IRIS	July-13
Chloroform	3.1E-02	3.1E-02	$(mg/kg\text{-}day)^{-1}$	B2 [a]	CALEPA	July-13
Dibromomethane	ND	ND		Inadequate evidence	PPRTV	July-13
Trichloroethene	4.6E-02	4.6E-02	$(mg/kg\text{-}day)^{-1}$	Carcinogenic to humans	IRIS	July-13
Vinyl Chloride (child and adult)	1.4E+00	1.4E+00	$(mg/kg\text{-}day)^{-1}$	Known carcinogen	IRIS	July-13
Xylenes (total)	NA	NA		Inadequate evidence	IRIS	NP
SEMIVOLATILES						
1,3-Dichlorobenzene	ND	ND		D	IRIS	September-11
2-Nitrophenol	ND	ND		Inadequate evidence	PPRTV	July-13
4-Bromophenyl-phenylether	NA	NA		D	IRIS	NP
4-Methylphenol (p-Cresol)	NA	NA		C	IRIS	NP
4-Nitrophenol	ND	ND				July-13
Azobenzene	1.1E-01	1.1E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13
Benzo(a)anthracene	7.3E-01	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	July-13
Benzo(a)pyrene	7.3E+00	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13
Benzo(b)fluoranthene	7.3E-01	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	July-13
Benzo(k)fluoranthene	7.3E-02	7.3E-02	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	July-13
Bis(2-ethylhexyl)phthalate (BEHP)	1.4E-02	1.4E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13
Carbazole	2.0E-02	2.0E-02	$(mg/kg\text{-}day)^{-1}$	B2	HEAST	July-13
Chrysene	7.3E-03	7.3E-03	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	July-13
Dibenzo(a,h)anthracene	7.3E+00	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	July-13
Dimethylphthalate	NA	ND		D	IRIS	July-13
Diphenyl ether	NA	NA				July-13
Diphenylmethanone	NA	NA				July-13
Hydrazine	3.0E+00	3.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13
Indeno(1,2,3-cd)pyrene	7.3E-01	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	July-13
n-Nitrosodimethylamine	5.1E+01	5.1E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13
n-Nitrosodi-n-propylamine	7.0E+00	7.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13
n-Nitrosodiphenylamine	4.9E-03	4.9E-03	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13
Phenanthrene	NA	NA		D	IRIS	July-13
Pyrene	ND	NA		D	IRIS	July-13

Table G-5						
OU1/2 Cancer Toxicity Data Summary						
Pathway: Ingestion, Dermal						
Chemical of Concern	**Oral Cancer Slope Factor**	**Dermal Cancer Slope Factor**	**Slope Factor Units**	**Weight of Evidence/Cancer Guideline Description**	**Source**	**Date [1]**
PESTICIDES/PCBs						
delta-BHC	NA	ND		D	IRIS	July-13
Aroclor 1260	2.0E+00	2.0E+00	$(mg/kg\text{-}day)^{-1}$	See PCBs	IRIS	July-13
INORGANICS/METALS						
Aluminum	ND	ND		Inadequate evidence	PPRTV	July-13
Antimony	ND	ND		ND	IRIS	July-13
Arsenic	1.5E+00	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	July-13
Bromide	NA	NA				July-13
Cadmium	ND	ND		ND	IRIS	NP
Cadmium	ND	ND		Inadequate evidence	IRIS	NP
Calcium	ND	ND		ND		
Chloride	NA	NA				July-13
Chromium III	ND	ND		D	IRIS	July-13
Chromium VI	ND	ND		D	IRIS	July-13
Cobalt	ND	ND				July-13
Lead	ND	ND		B2	IRIS	July-13
Manganese	ND	ND		D	IRIS	July-13
Mercury (as mercuric chloride)	ND	NA		C	IRIS	July-13
Nickel	ND	ND		ND	IRIS	July-13
Nitrate	ND	ND		ND	IRIS	July-13
Nitrogen, Ammonia	ND	ND				July-13
Silver	ND	ND		D	IRIS	July-13
Sulfates as SO4	NA	NA				July-13
Thallium	ND	ND		Inadequate evidence	IRIS	July-13
Urea	ND	ND		Inadequate evidence		July-13
Vanadium	ND	ND		ND		July-13
PETROLEUM HYDROCARBONS						
C19-C36 Aliphatics	NA	NA				July-13
C11-C22 Aromatics	NA	NA				July-13
SPECIALTY COMPOUNDS						July-13
4-Nonylphenol	NA	NA				July-13
Kempore	NA	NA				July-13

Table G-5

OU1/2 Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/Cancer Guideline Description	Source	Date (1)

Pathway: Inhalation

Chemical of Concern	Unit Risk	Units	Inhalation Cancer Slope Factor	Units	Weight of Evidence/Cancer Guideline Description	Source	Date (1)
VOLATILES							
1,2-Dichloroethene (cis)	ND		ND		Inadequate data	IRIS	July-13
2,4,4-Trimethyl-1-pentene	ND		ND		ND		July-13
2,4,4-Trimethyl-2-pentene	ND		ND		ND		July-13
4-iso-Propyltoluene	ND		ND		Inadequate data	PPRTV	July-13
Bromodichloromethane	3.7E-05	$(ug/m^3)^{-1}$	1.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	CALEPA	July-13
Chlorodibromomethane	2.7E-05	$(ug/m^3)^{-1}$	9.4E-02	$(mg/kg\text{-}day)^{-1}$	C	CALEPA	July-13
Chloroform	2.3E-05	$(ug/m^3)^{-1}$	8.1E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13
Dibromomethane	ND		ND		Inadequate data	PPRTV	July-13
Trichloroethene	4.10E-06	$(ug/m^3)^{-1}$	7.00E-03	$(mg/kg\text{-}day)^{-1}$	Carcinogenic to humans	IRIS	July-13
Vinyl Chloride (adult and child)	8.80E-06	$(ug/m^3)^{-1}$	3.10E-02	$(mg/kg\text{-}day)^{-1}$	Known human carcinogen	IRIS	July-13
Xylenes (total)	NA		NA		Inadequate data	IRIS	July-13
SEMIVOLATILES							
1,3-Dichlorobenzene	ND		ND		D	IRIS	September-11
2-Nitrophenol	ND		ND		Inadequate data	PPRTV	July-13
4-Chlorophenyl-phenylether	NA		NA				July-13
4-Methylphenol (p-Cresol)	NA		NA		C	IRIS	July-13
4-Nitrophenol	NA		NA			IRIS	July-13
Azobenzene	3.1E-05	$(ug/m^3)^{-1}$	1.1E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13
Benzo(a)anthracene	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg\text{-}day)^{-1}$	B2	CALEPA	July-13
Benzo(a)pyrene	1.1E-03	$(ug/m^3)^{-1}$	3.9E+00	$(mg/kg\text{-}day)^{-1}$	B2	CALEPA	July-13
Benzo(b)fluoranthene	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg\text{-}day)^{-1}$	B2	CALEPA	July-13
Benzo(k)fluoranthene	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg\text{-}day)^{-1}$	B2	CALEPA	July-13
bis(2-ethylhexyl)phthalate (BEHP)	2.4E-06	$(ug/m^3)^{-1}$	8.4E-03	$(mg/kg\text{-}day)^{-1}$	B2	CALEPA	July-13
Carbazole	ND		ND		Inadequate data	PPRTV	July-13
Chrysene	1.10E-05	$(ug/m^3)^{-1}$	3.9E-02	$(mg/kg\text{-}day)^{-1}$	B2	CALEPA	July-13
Dibenzo(a,h)anthracene	1.2E-03	$(ug/m^3)^{-1}$	4.1E+00	$(mg/kg\text{-}day)^{-1}$	B2	CALEPA	July-13
Dimethylphthalate	NA		ND		D	IRIS	July-13
Diphenyl ether	NA		NA				July-13
Diphenylmethanone	NA		NA				July-13
Hydrazine	4.90E-03	$(ug/m^3)^{-1}$	1.7E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13
Indeno(1,2,3-cd)pyrene	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg\text{-}day)^{-1}$	B2	CALEPA	July-13
N-Nitrosodimethylamine	1.4E-02	$(ug/m^3)^{-1}$	5.0E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13
n-Nitrosodi-n-propylamine	2.0E-03	$(ug/m^3)^{-1}$	7.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	CALEPA	July-13
n-Nitrosodiphenylamine	2.6E-06	$(ug/m^3)^{-1}$	9.0E-03	$(mg/kg\text{-}day)^{-1}$	B2	CALEPA	July-13
Phenanthrene	NA		NA		D	IRIS	July-13
Pyrene	NA		NA		D	IRIS	July-13
PESTICIDES/PCBs							
delta-BHC	NA		NA		D	IRIS	July-13
Aroclor 1260	5.7E-04	$(ug/m^3)^{-1}$	2.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	July-13

Table G-5

OU1/2 Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units		Weight of Evidence/Cancer Guideline Description	Source	Date (1)
INORGANICS/METALS							
Aluminum	ND		ND				July-13
Antimony	ND		ND				July-13
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	1.5E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	July-13
Bromide	NA		NA				July-13
Chloride	NA		NA				July-13
Chromium III	ND		ND		D	IRIS	July-13
Chromium VI	1.2E-02	$(ug/m^3)^{-1}$	4.3E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	July-13
Cobalt	9.0E-03	$(ug/m^3)^{-1}$	3.2E+01	$(mg/kg\text{-}day)^{-1}$	Likely carcinogenic in humans	PPRTV	July-13
Lead	ND		ND		B2	IRIS	July-13
Manganese	ND		ND		D	IRIS	July-13
Mercury (as mercuric chloride)	ND		ND		C	IRIS	July-13
Nickel	2.6E-04	$(ug/m^3)^{-1}$	9.1E-01	$(mg/kg\text{-}day)^{-1}$	A	CALEPA	July-13
Nitrate	ND		ND		ND	IRIS	July-13
Nitrogen, Ammonia	ND		ND			IRIS	July-13
Silver	ND		ND		D	IRIS	July-13
Sulfates as SO4	NA		NA				July-13
Thallium	ND		ND				July-13
Urea	ND		ND		Inadequate evidence	IRIS	July-13
Vanadium	ND		ND		ND		July-13
TPH							
C19-C36 Aliphatics	NA		NA				July-13
C11-C22 Aromatics	NA		NA				July-13
SPECIALTY COMPOUNDS							
4-Nonylphenol	NA		NA				July-13
Kempore	NA		NA				July-13

Key

mg = milligram
ug = microgram
kg = kilogram
m^3 = cubic meter

NA - not listed in heirarchy sources
ND - no data available
NP - not provided in Baseline Human Health Risk Assessment
PCBs - polychlorinated biphenyls

(1) Date indicates when source was last reviewed.
In accordance with OSWER 9285.7-53, slope factors based on the following heirarchy of sources:
Tier 1: IRIS = Integrated Risk Information System, EPA
Tier 2: PPRTV = Provisional Peer Reviewed Toxicity Value developed by Superfund Technical Support Center (STSC)
Tier 3:
HEAST = Health Effects Assessment Summary Tables
MRL = Minimum Risk Level (Agency for Toxic Substances and Disease Registry: chronic MRLs)
CalEPA = California Environmental Protection Agency, Office of Environmental Health Hazard Assessment
In addition, provisional Reference Doses are presented for informational purposes to be used on a case-by-case basis:
NCEA = National Center for Environmental Assessment (RSL Table May 2013)
PPRTV SL = Preliminary Peer-Reviewed Toxicity Value Screening Level

Weight of Evidence
A - Human carcinogen
B1 - Probable human carcinogen - Indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen

This table provides the carcinogenic risk information which is relevant to the chemicals of concern in soil, sediment, and surface water. The RfD for chloroform is protective of cancer risk. Per risk assessment guidance for Superfund (RAGS) Part E, adjustments to the dermal slope factor are only performed for chemicals with an oral absorption efficiency of less than 50%. Inhalation cancer dose-response values are typically published as unit risk values. The slope factor for benzo(a)yyrene was used for other carcinogenic polycyclic aromatic hydrocarbons (PAHs), adjusted by Relative Potency Factors of 1.0 (benzo(a)pyrene and dibenz(a,h)anthracene); 0.1 (benzo(a)anthracene, benzo(b)flouoranthene, and indeno(1,2,3-c,d)pyrene); 0.01 (benzo(k)fluoranthene); and 0.001 (chrysene).

Cancer toxicity values shown are those developed for the OU1/OU2 BHHRA (Amec, 2015). There have been toxicity updates for PAHs since the BHHRA was completed. These updates would not change the risk conclusions. However, the Preliminary Remediation Goals (PRGs) for PAHs were developed using updated toxicity values in Wood, 2000.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-6

OU1/2 Non-Cancer Toxicity Data Summary

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Dermal RfD	Dermal RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ(1)
Pathway: Ingestion, Dermal									
VOLATILES									
1,2-Dichloroethene (cis)	chronic	2.0E-03	mg/kg/day	2.0E-03	mg/kg/day	Hematological	3,000	IRIS	July-13
	subchronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day	Hematological	100/1	MRL	July-13
2,4,4-Trimethyl-1-pentene	chronic	2.1E-02	mg/kg/day	2.1E-02	mg/kg/day	Liver/LOAEL	10,000	AMEC	July-13
	subchronic	2.1E-01	mg/kg/day	2.1E-01	mg/kg/day	Liver/LOAEL	1,000	AMEC	July-13
2,4,4-Trimethyl-2-pentene	chronic	2.1E-02	mg/kg/day	2.1E-02	mg/kg/day	Liver/LOAEL	10,000	AMEC	July-13
	subchronic	2.1E-01	mg/kg/day	2.1E-01	mg/kg/day	Liver/LOAEL	1,000	AMEC	July-13
4-iso-Propyltoluene	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Bromodichloromethane	chronic	2.0E-02	mg/kg/day	2.0E-02	mg/kg/day	Kidney; renal cytomegaly	1,000/1	IRIS	July-13
	subchronic	8.0E-03	mg/kg/day	8.0E-03	mg/kg/day	Reproductive	100	PPRTV	July-13
Chlorodibromomethane	chronic	2.0E-02	mg/kg/day	2.0E-02	mg/kg/day	Hepatic lesions	1,000/1	IRIS	July-13
	subchronic	7.0E-02	mg/kg/day	7.0E-02	mg/kg/day	NOAEL / Liver lesions	300	PPRTV	July-13
Chloroform	chronic	1.0E-02	mg/kg/day	1.0E-02	mg/kg/day	Liver; fatty cyst formation in liver	100/1	IRIS	July-13
	subchronic	1.0E-01	mg/kg/day	1.0E-01	mg/kg/day	Hepatic	100	MRL	July-13
Chloromethane (Methyl chloride)	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Dibromomethane	chronic	1.0E-02	mg/kg/day	1.0E-02	mg/kg/day	increased carboxyhemoglobin	1,000	HEAST	July-13
	subchronic	9.0E-03	mg/kg/day	9.0E-03	mg/kg/day	Kidney, liver, thyroid	1,000	PPRTV	July-13
Trichloroethene	chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Immune System, heart malformations	1,000	IRIS	July-13
	subchronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Immune System, heart malformations	1,000	Chronic	July-13
Vinyl Chloride	chronic	3.0E-03	mg/kg/day	3.0E-03	mg/kg/day	Liver; liver cell polymorphism	30/1	IRIS	July-13
	subchronic	3.0E-03	mg/kg/day	3.0E-03	mg/kg/day	Liver; liver cell polymorphism	30/1	Chronic	July-13
Xylenes (total)	chronic	2.0E-01	mg/kg/day	2.0E-01	mg/kg/day	General toxicity; increased mortality	1,000/1	IRIS	December-10
	subchronic	4.0E-01	mg/kg/day	4.0E-01	mg/kg/day	decreased body weight	1,000	PPRTV	February-11
SEMIVOLATILES									
1,3-Dichlorobenzene	chronic	3.0E-03	mg/kg/day	3.0E-03	mg/kg/day	Liver		NCEA	December-10
	subchronic	2.0E-02	mg/kg/day	2.0E-02	mg/kg/day	Endocrine	100	MRL	September-11
2-Nitrophenol	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
4-Chlorophenyl-phenylether	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
4-Methylphenol (p-Cresol)	chronic	5.0E-03	mg/kg/day	5.0E-03	mg/kg/day	Reproductive; maternal death	1,000/1	HEAST	
	subchronic	1.0E-01	mg/kg/day	1.0E-01	mg/kg/day	Respiratory system	100/1	MRL	
4-Nitrophenol	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Azobenzene	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Benzo(a)anthracene	chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	July-13
	subchronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day	Kidney; renal tubular pathology	300/1	Surrogate (1)	July-13
Benzo(a)pyrene	chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	July-13
	subchronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day	Kidney; renal tubular pathology	300/1	Surrogate (1)	July-13
Benzo(b)fluoranthene	chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	July-13
	subchronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day	Kidney; renal tubular pathology	300/1	Surrogate (1)	July-13
Benzo(k)fluoranthene	chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	July-13
	subchronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day	Kidney; renal tubular pathology	300/1	Surrogate (1)	July-13
Bis(2-ethylhexyl)phthalate (BEHP)	chronic	2.0E-02	mg/kg/day	2.0E-02	mg/kg/day	Liver; increased liver weight	1,000/1	IRIS	July-13
	subchronic	1.0E-01	mg/kg/day	1.0E-01	mg/kg/day	Reproductive	100	MRL	July-13
Carbazole	chronic	ND		ND				PPRTV	July-13
	subchronic	ND		ND				PPRTV	July-13
Chrysene	chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	July-13
	subchronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day	Kidney; renal tubular pathology	300/1	Surrogate (1)	July-13
Dibenzo(a,h)anthracene	chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	July-13
	subchronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day	Kidney; renal tubular pathology	300/1	Surrogate (1)	July-13
Dimethylphthalate	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Diphenyl ether (diphenyl oxide)	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Diphenylmethanone	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Hydrazine	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Indeno(1,2,3-cd)pyrene	chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	July-13
	subchronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day	Kidney; renal tubular pathology	300/1	Surrogate (1)	July-13
n-Nitrosodimethylamine	chronic	8.0E-06	mg/kg/day	8.0E-06	mg/kg/day	Developmental effects	3,000	PPRTV	July-13
	subchronic	8.0E-06	mg/kg/day	8.0E-06	mg/kg/day	Developmental effects	3,000	PPRTV	July-13
n-Nitrosodi-n-propylamine	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
n-Nitrosodiphenylamine	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Phenanthrene	chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	Surrogate (1)	July-13
	subchronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day	Kidney; renal tubular pathology	300/1	Surrogate (1)	July-13
Pyrene	chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Kidney; renal tubular pathology	3,000/1	IRIS	July-13
	subchronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day	Kidney; renal tubular pathology	300	PPRTV	July-13

Table G-6									
OU1/2 Non-Cancer Toxicity Data Summary									
Chemical of Concern	**Chronic/ Subchronic**	**Oral RfD Value**	**Oral RfD Units**	**Dermal RfD**	**Dermal RfD Units**	**Primary Target Organ**	**Combined Uncertainty/ Modifying Factors**	**Sources of RfD: Target Organ**	**Dates of RfD: Target Organ[1]**
PESTICIDES/PCBs									
delta-BHC	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Aroclor 1260	chronic	2.0E-05	mg/kg/day	2.0E-05	mg/kg/day	Immune system; immunotoxicity; Eye	300/1	Surrogate (2)	July-13
	subchronic	3.0E-05	mg/kg/day	3.0E-05	mg/kg/day	Immune system; immunotoxicity; Eye	1,000	Surrogate (2)	July-13
INORGANICS/METALS									
Aluminum	chronic	1.0E+00	mg/kg/day	1.0E+00	mg/kg/day	LOAEL / CNS	100	PPRTV	July-13
	subchronic	1.0E+00	mg/kg/day	1.0E+00	mg/kg/day	CNS	30	MRL	July-13
Antimony	chronic	4.0E-04	mg/kg/day	6.0E-05	mg/kg/day	Reduced lifespan; hematological; blood glucose and cholesterol	1,000/1	IRIS	July-13
	subchronic	4.0E-04	mg/kg/day	6.0E-05	mg/kg/day	Reduced lifespan; hematological; blood glucose and cholesterol		PPRTV	July-13
Arsenic	chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Skin; keratosis, hyperpigmentation and vascular complications	3/1	IRIS	July-13
	subchronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Skin; keratosis and hyperpigmentation	3/1	HEAST	July-13
Bromide	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Chloride	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Chromium III	chronic	1.5E+00	mg/kg/day	2.0E-02	mg/kg/day	No effects observed	100/10	IRIS	July-13
	subchronic	1.5E+00	mg/kg/day	2.0E-02	mg/kg/day	No effects observed	1,000/1	HEAST	July-13
Chromium VI	chronic	3.0E-03	mg/kg/day	7.5E-05	mg/kg/day	No effects reported	300/3	IRIS	July-13
	subchronic	2.0E-02	mg/kg/day	5.0E-04	mg/kg/day	No effects reported	100/1	HEAST	July-13
Cobalt	chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	LOAEL / Thyroid	3,000	PPRTV	July-13
	subchronic	3.0E-03	mg/kg/day	3.0E-03	mg/kg/day	LOAEL / Thyroid	300	PPRTV	July-13
Lead	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Manganese (soil)	chronic	2.4E-02	mg/kg/day	9.6E-04	mg/kg/day	CNS; Impairment of neurobehavioral function	3/1	IRIS	July-13
	subchronic	2.4E-02	mg/kg/day	9.6E-04	mg/kg/day	CNS; Impairment of neurobehavioral function	3/1	chronic	July-13
Mercury (as mercuric chloride)	chronic	3.0E-04	mg/kg/day	2.1E-05	mg/kg/day	Immune system; autoimmune effects	1,000/1	IRIS	July-13
	subchronic	2.0E-03	mg/kg/day	1.4E-04	mg/kg/day	Renal	100	MRL	July-13
Nickel	chronic	2.0E-02	mg/kg/day	8.0E-04	mg/kg/day	Decreased body and organ weights	300/1	IRIS	July-13
	subchronic	2.0E-02	mg/kg/day	8.0E-04	mg/kg/day	Decreased body and organ weights	300/1	Chronic	July-13
Nitrate	chronic	1.6E+00	mg/kg/day	1.6E+00	mg/kg/day	Hematological; early clinical signs of methemoglobinemia	1/1	IRIS	July-13
	subchronic	1.6E+00	mg/kg/day	1.6E+00	mg/kg/day	Hematological; early clinical signs of methemoglobinemia	1/1	chronic	July-13
Nitrogen, Ammonia	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Silver	chronic	5.0E-03	mg/kg/day	2.0E-04	mg/kg/day	Skin, eye, and respiratory tract; argyria	3/1	IRIS	July-13
	subchronic	5.0E-03	mg/kg/day	2.0E-04	mg/kg/day	Skin; argyria	3/1	HEAST	July-13
Sulfates as SO4	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Thallium	chronic	1.0E-05	mg/kg/day	1.0E-05	mg/kg/day	No effects observed	3,000	PPRTV SL	July-13
	subchronic	8.0E-04	mg/kg/day	8.0E-04	mg/kg/day	No effects observed	300/1	HEAST	July-13
Urea	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Vanadium - Region 1	chronic	4.9E-03	mg/kg/day	1.3E-04	mg/kg/day	Kidney	100/1	IRIS	July-13
	subchronic	1.0E-02	mg/kg/day	2.6E-04	mg/kg/day	Hematological	10/1	MRL	July-13
EPH									
C19-C36 Aliphatics	chronic	2.0E+00	mg/kg/day	2.0E+00	mg/kg/day			MassDEP	July-13
	subchronic	6.0E+00	mg/kg/day	6.0E+00	mg/kg/day			MassDEP	July-13
C11-C22 Aromatics	chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day			MassDEP	July-13
	subchronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day			MassDEP	July-13
SPECIALTY COMPOUNDS									
4-Nonylphenol	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Kempore	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13

Table G-6									
OU1/2 Non-Cancer Toxicity Data Summary									
Chemical of Concern	**Chronic/ Subchronic**	**Oral RfD Value**	**Oral RfD Units**	**Dermal RfD**	**Dermal RfD Units**	**Primary Target Organ**	**Combined Uncertainty/ Modifying Factors**	**Sources of RfD: Target Organ**	**Dates of RfD: Target Organ[(1)]**
Pathway: Inhalation									
VOLATILES									
1,2-Dichloroethene (cis)	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
2,4,4-Trimethyl-1-pentene	chronic	7.2E-02	mg/m3	2.1E-02	mg/kg/day	Liver / NOAEL	10,000	AMEC	July-13
	subchronic	7.2E-01	mg/m3	2.1E-01	mg/kg/day	Liver / NOAEL	1,000	AMEC	July-13
2,4,4-Trimethyl-2-pentene	chronic	7.2E-02	mg/m3	2.1E-02	mg/kg/day	Liver / NOAEL	10,000	AMEC	July-13
	subchronic	7.2E-01	mg/m3	2.1E-01	mg/kg/day	Liver / NOAEL	1,000	AMEC	July-13
4-iso-Propyltoluene	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Bromodichloromethane	chronic	ND		ND					July-13
	subchronic	2.0E-02	mg/m3	5.7E-03	mg/kg/day	NOAEL / kidney degeneration	300	PPRTV	July-13
Chlorodibromomethane	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Chloroform	chronic	9.8E-02	mg/m3	2.8E-02	mg/kg/day	Hepatic	100	MRL	July-13
	subchronic	2.4E-01	mg/m3	6.9E-02	mg/kg/day	Hepatic	300	MRL	July-13
Dibromomethane	chronic	4.0E-03	mg/m3	1.1E-03	mg/kg/day		3,000	PPRTV	July-13
	subchronic	4.0E-02	mg/m3	1.1E-02	mg/kg/day		300	PPRTV	July-13
Trichloroethene	chronic	2.0E-03	mg/m3	5.7E-04	mg/kg/day	Immune system; heart malformations	100	IRIS	July-13
	subchronic	2.0E-03	mg/m3	5.7E-04	mg/kg/day	Immune system; heart malformations	100	Chronic	July-13
Vinyl Chloride	chronic	1.0E-01	mg/m3	2.9E-02	mg/kg/day	Liver; liver cell polymorphism	30/1	IRIS	July-13
	subchronic	1.0E-01	mg/m3	2.9E-02	mg/kg/day	Liver; liver cell polymorphism	30/1	Chronic	July-13
Xylenes (total)	chronic	1.0E-01	mg/m3	2.9E-02	mg/kg/day	CNS; impaired motor coordination	300/1	IRIS	January-00
	subchronic	4.0E-01	mg/m3	1.1E-01	mg/kg/day	CNS; impaired motor coordination	100	PPRTV	January-00
SEMIVOLATILES									
1,3-Dichlorobenzene	chronic	ND		ND				IRIS	
	subchronic	ND		ND					
2-Nitrophenol	chronic	ND		ND					July-13
	subchronic	5.00E-04	mg/m3	1.4E-04	mg/kg/day	Squamous metaplasia of nasal epithelium	300	PPRTV	July-13
4-Chlorophenyl-phenylether	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
4-Methylphenol (p-Cresol)	chronic	6.0E-01	mg/m3	1.7E-01	mg/kg/day	CNS		REL	January-00
	subchronic	6.0E-01	mg/m3	1.7E-01	mg/kg/day	CNS		Chronic	
4-Nitrophenol	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Azobenzene	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Benzo(a)anthracene	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Benzo(a)pyrene	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Benzo(b)fluoranthene	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Benzo(k)fluoranthene	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Bis(2-ethylhexyl)phthalate (BEHP)	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Carbazole	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Chrysene	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Dibenzo(a,h)anthracene	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Dimethylphthalate	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Diphenyl ether	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Diphenylmethanone	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Hydrazine	chronic	3.0E-05	mg/m3	8.6E-06	mg/kg/day	Liver	1,000	PPRTV	July-13
	subchronic	9.0E-05	mg/m3	2.6E-05	mg/kg/day	Liver	300	PPRTV	July-13
Indeno(1,2,3-cd)pyrene	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13

Table G-6

OU1/2 Non-Cancer Toxicity Data Summary

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Dermal RfD	Dermal RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ[1]
SEMIVOLATILES (cont.)									
n-Nitrosodimethylamine	chronic	4.0E-05	mg/m3	1.1E-05	mg/kg/day	LOAEL / Reduced body weight	3,000	PPRTV SL	July-13
	subchronic	4.0E-05	mg/m3	1.1E-05	mg/kg/day	LOAEL / Reduced body weight	3,000	chronic	July-13
n-Nitrosodi-n-propylamine	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
n-Nitrosodiphenylamine	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Phenanthrene	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Pyrene	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
PESTICIDES/PCBs									
delta-BHC	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Aroclor 1260	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
INORGANICS/METALS									
Aluminum	chronic	5.0E-03	mg/m3	1.4E-03	mg/kg/day	LOAEL / CNS	300	PPRTV	July-13
	subchronic	5.0E-03	mg/m3	1.4E-03	mg/kg/day	LOAEL / CNS	300	chronic	July-13
Antimony	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Arsenic	chronic	1.5E-05	mg/m3	4.3E-06	mg/kg/day	Developmental; cardiovascular; CNS		CalEPA	July-13
	subchronic	1.5E-05	mg/m3	4.3E-06	mg/kg/day	Developmental; cardiovascular; CNS		chronic	July-13
Bromide	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Chloride	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Chromium III	chronic	ND		ND					July-13
	subchronic	5.0E-03	mg/m3	1.4E-03	mg/kg/day	Respiratory system	90	MRL	July-13
Chromium VI	chronic	1.0E-04	mg/m3	2.9E-05	mg/kg/day	Lung; enzyme alterations	300/1	IRIS	July-13
	subchronic	3.0E-04	mg/m3	8.6E-05	mg/kg/day	Respiratory system	100	MRL	July-13
Cobalt	chronic	6.0E-06	mg/m3	1.7E-06	mg/kg/day	Respiratory tract / Lung / NOAEL	300	PPRTV	July-13
	subchronic	2.0E-05	mg/m3	5.7E-06	mg/kg/day	Respiratory tract / Lung / NOAEL	100	PPRTV	July-13
Lead	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Manganese	chronic	5.0E-05	mg/m3	1.4E-05	mg/kg/day	CNS; impairment of neurobehavioral function	1,000/1	IRIS	July-13
	subchronic	5.0E-05	mg/m3	1.4E-05	mg/kg/day	CNS; impairment of neurobehavioral function	1,000/1	Chronic	July-13
Mercury (as mercuric chloride)	chronic	3.0E-05	mg/m3	8.6E-06	mg/kg/day			REL	July-13
	subchronic	3.0E-05	mg/m3	8.6E-06	mg/kg/day			Chronic	July-13
Mercury (as elemental mercury)	chronic	3.0E-04	mg/m3	8.6E-05	mg/kg/day	CNS; tremors, memory; autonomic dysfunction	30/1	IRIS	July-13
	subchronic	3.0E-04	mg/m3	8.6E-05	mg/kg/day	CNS; neurotoxicity	30/1	HEAST97	July-13
Mercury (as methyl mercury)	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Nickel	chronic	9.0E-05	mg/m3	2.6E-05	mg/kg/day	Respiratory system	30	MRL	July-13
	subchronic	2.0E-04	mg/m3	5.7E-05	mg/kg/day	Respiratory system	30	MRL	July-13
Nitrate	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Nitrogen, Ammonia	chronic	1.0E-01	mg/m3	2.9E-02	mg/kg/day	Respiratory system; chemical pneumonia	30/1	IRIS	July-13
	subchronic	1.0E-01	mg/m3	2.9E-02	mg/kg/day	NOAEL / Pulmonary	30	PPRTV	July-13
Silver	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Sulfates as SO4	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Thallium	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Urea	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
Vanadium	chronic	1.0E-04	mg/m3	2.9E-05	mg/kg/day	Respiratory	30	MRL	July-13
	subchronic	1.0E-04	mg/m3	2.9E-05	mg/kg/day	Respiratory	30	Chronic	July-13
EPH									
C19-C36 Aliphatics	chronic	ND		ND					July-13
	subchronic	ND		ND					July-13
C11-C22 Aromatics	chronic	5.0E-02	mg/m3	1.4E-02	mg/kg/day			MassDEP	July-13
	subchronic	5.0E-01	mg/m3	1.4E-01	mg/kg/day			MassDEP	July-13

Table G-6

OU1/2 Non-Cancer Toxicity Data Summary

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Dermal RfD	Dermal RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ(1)
SPECIALTY COMPOUNDS									
4-Nonylphenol	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13
Kempore	chronic	NA		NA					July-13
	subchronic	NA		NA					July-13

Key

mg = milligram

kg = kilogram

m^3 = cubic meter

NA - not listed in heirarchy sources

ND - no data available

CNS - central nervous system

LOAEL - lowest observed adverse effect level

NOAEL - no observed adverse effect level

PCBs - polychlorinated biphenyls

RfD - reference dose

(1) Date indicates when source was last reviewed.

NA - No information available

IRIS: Integrated Risk Information System, EPA

PPRTV = Provisional Peer Reviewed Toxicity Value developed by Superfund Technical Support Center (STSC)

HEAST = Health Effects Assessment Summary Tables

MRL = Minimum Risk Level (Agency for Toxic Substances and Disease Registry)

CalEPA = California Environmental Protection Agency, Office of Environmental Health Hazard Assessment

MassDEP = Massachusetts Department of Environmental Protection

PPRTV SL = Preliminary Peer-Reviewed Toxicity Value Screening Level

(1) Date indicates when source was last reviewed.

This table provides non-carcinogenic risk information which is relevant to the chemicals of concern (COCs) in soil, sediment, and surface water. Thirty nine COCs have oral toxicity data (or surrogate toxicity data) indicating their potential for adverse non-carcinogenic health effects in humans. Chronic toxicity data available for the COCs for oral exposures have been used to develop chronic oral reference doses (RfDs), provided in this table. The available chronic toxicity data indicate that trichloroethene, Aroclor 1260 and mercury affect the immune system, 2,4,4-trimethyl-1-pentene, 2,4,4-trimethyl-2-pentene, chlorodibromomethane, chloroform, dibromomethane, vinyl chloride, 1,3-dichlorobenzene, bis(2-ethylhexyl)phthalate, and hydrazine affect the liver, bromodichloromethane, dibromomethane, benzo(a)anthracene, benzo(b)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, mercury, and vanadium affect the kidney; 4-methylphenol, aluminum, arsenic, and manganese affect the central nervous system; n-nitrosodimethylamine and arsenic are developmental toxicants; xylenes, n-nitrosodimethylamine, xylenes, antimony, and nickel affect the whole body; 4-methylphenol, chromium, nickel, silver, vanadium, and ammonia affect the respiratory system; trichloroethene, antimony, and arsenic affect the cardiovascular system, 1,2-dichloroethene, dibromomethane, antimony, vanadium and nitrate affect the blood; bromodichloromethane, 4-methylphenol, and bis(2-ethylhexyl)phthalate affect the reproductive system; dibromomethane, 1,3-dichlorobenzene and cobalt affect the endocrine system; Aroclor 1260 and silver affect the eyes; and arsenic and silver affect the skin. As was the case for the carcinogenic data, dermal RfDs can be extrapolated from oral RfDs by applying an adjustment factor as appropriate. Oral RfDs were adjusted for COCs with less than 50% absorption via the ingestion route to derive dermal RfDs for these COCs. Inhalation reference concentrations (RfCs) are available for twenty three COCs evaluated for the inhalation pathway.

Toxicity values shown are those developed for the OU1/OU2 BHHRA (Amec, 2015).

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-7								
OU1/2 Risk Characterization Summary - Carcinogens								
Scenario Timeframe: Current/Future **Receptor Population: Outdoor Worker** **Receptor Age: Adult**								
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Carcinogenic Risk**				
				Ingestion	**Inhalation**	**Dermal**	**External (Radiation)**	**Exposure Routes Total**
Soil	Surface Soil / Dust (inhalation)	EA1 OU1	Benzo(a)anthracene	1E-06	3E-11	8E-07	NA	1.8E-06
			Benzo(a)pyrene	7E-06	2E-10	6E-06	NA	1.3E-05
			Benzo(b)fluoranthene	9E-07	2E-11	8E-07	NA	1.7E-06
			Bis(2-Ethylhexyl)phthalate	2E-07	5E-12	1E-07	NA	2.8E-07
			Carbazole	2E-09	NC	1E-09	NA	3.6E-09
			Dibenz(a,h)anthracene	5E-07	2E-11	5E-07	NA	9.9E-07
			Indeno(1,2,3-cd)pyrene	4E-07	1E-11	4E-07	NA	7.9E-07
			Aroclor-1260	1E-06	6E-11	1E-06	NA	2.2E-06
			Arsenic	3E-06	3E-09	1E-06	NA	4.1E-06
			Chromium, Hexavalent	NC	5E-09	NC	NA	4.8E-09
			Cobalt	NC	2E-09	NC	NA	2.3E-09
							Exposure Risk Total =	2E-05
Soil	Surface Soil / Dust (inhalation)	EA2 OU1	Benzo(a)anthracene	4E-08	1E-12	4E-08	NA	8.0E-08
			Benzo(a)pyrene	3E-07	9E-12	3E-07	NA	6.3E-07
			Benzo(b)fluoranthene	5E-08	1E-12	4E-08	NA	8.7E-08
			Bis(2-Ethylhexyl)phthalate	4E-07	1E-11	3E-07	NA	6.6E-07
			Dibenz(a,h)anthracene	5E-07	1E-11	4E-07	NA	9.1E-07
			Indeno(1,2,3-cd)pyrene	3E-08	8E-13	3E-08	NA	5.7E-08
			Arsenic	2E-06	2E-09	8E-07	NA	3.2E-06
			Cobalt	NC	2E-09	NC	NA	1.8E-09
							Exposure Risk Total =	6E-06
Soil	Surface Soil / Dust (inhalation)	EA3 OU1	Benzo(a)anthracene	2E-08	5E-13	2E-08	NA	3.5E-08
			Benzo(a)pyrene	2E-07	6E-12	2E-07	NA	3.9E-07
			Benzo(b)fluoranthene	3E-08	8E-13	3E-08	NA	5.6E-08
			Bis(2-Ethylhexyl)phthalate	2E-08	6E-13	1E-08	NA	3.3E-08
			Dibenz(a,h)anthracene	5E-07	1E-11	4E-07	NA	8.9E-07
			Indeno(1,2,3-cd)pyrene	2E-08	6E-13	2E-08	NA	4.1E-08
			Aroclor-1260	9E-08	4E-12	8E-08	NA	1.7E-07
			Arsenic	2E-06	2E-09	7E-07	NA	2.7E-06
			Cobalt	NC	3E-09	NC	NA	2.9E-09
			Chromium, Hexavalent	NC	1E-09	NC	NA	1.1E-09
							Exposure Risk Total =	3E-06

Table G-7

OU1/2 Risk Characterization Summary - Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface Soil	EA6 OU1	Benzo(a)anthracene	4E-08	NA	4E-08	NA	8.0E-08
			Benzo(a)pyrene	8E-07	NA	7E-07	NA	1.5E-06
			Benzo(b)fluoranthene	4E-08	NA	3E-08	NA	7.4E-08
			Bis(2-Ethylhexyl)phthalate	2E-07	NA	1E-07	NA	2.6E-07
			Carbazole	1E-10	NA	8E-11	NA	2.1E-10
			Dibenz(a,h)anthracene	2E-07	NA	2E-07	NA	3.4E-07
			Indeno(1,2,3-cd)pyrene	4E-08	NA	4E-08	NA	8.1E-08
			Arsenic	2E-06	NA	8E-07	NA	3.0E-06
							Exposure Risk Total =	5E-06
Soil	Surface Soil / Dust (inhalation)	EA7	Benzo(a)anthracene	1E-08	4E-13	1E-08	NA	2.6E-08
			Benzo(a)pyrene	2E-07	4E-12	1E-07	NA	3.0E-07
			Benzo(b)fluoranthene	2E-08	5E-13	2E-08	NA	3.5E-08
			Bis(2-Ethylhexyl)phthalate	2E-08	5E-13	1E-08	NA	2.8E-08
			Indeno(1,2,3-cd)pyrene	3E-08	8E-13	3E-08	NA	5.6E-08
			Arsenic	4E-06	3E-09	1E-06	NA	5.1E-06
			Chromium, Hexavalent	NC	8E-10	NC	NA	7.5E-10
			Cobalt	NC	2E-09	NC	NA	2.2E-09
							Exposure Risk Total =	6E-06

Key

EA - Exposure Area

NA - Exposure route not applicable for this chemical/exposure medium.

NC - Not carcinogenic by this exposure route.

OU - Operable Unit

-- - Not calculated; dose-response data and/or dermal absorption values not available.

This table provides risk estimates for the significant routes of exposure for the current/future outdoor worker exposed to soils. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of adult outdoor workers' exposure to soil and dust, as well as the toxicity of the chemicals of concern.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-8

OU1/2 Risk Characterization Summary - Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface Soil / Dust (inhalation)	EA1 OU1	Benzo(a)anthracene	1E-07	1E-11	6E-08	NA	2E-07
			Benzo(a)pyrene	1E-06	7E-11	4E-07	NA	1E-06
			Benzo(b)fluoranthene	1E-07	9E-12	5E-08	NA	2E-07
			Bis(2-Ethylhexyl)phthalate	3E-08	2E-12	8E-09	NA	3E-08
			Carbazole	3E-10	NA	1E-10	NA	4E-10
			Dibenz(a,h)anthracene	8E-08	6E-12	3E-08	NA	1E-07
			Indeno(1,2,3-cd)pyrene	6E-08	4E-12	2E-08	NA	9E-08
			Aroclor-1260	2E-07	2E-11	7E-08	NA	2E-07
			Arsenic	5E-07	1E-09	7E-08	NA	5E-07
			Chromium, Hexavalent	NC	2E-09	NC	NA	2E-09
			Cobalt	NC	9E-10	NC	NA	9E-10
							Exposure Risk Total =	3E-06
Soil	Subsurface Soil / Dust (inhalation)	EA3 OU1	Bis(2-Ethylhexyl)phthalate	2E-06	2E-10	7E-07	NA	3E-06
			N-Nitrosodiphenylamine	5E-11	1E-14	--	NA	5E-11
			Arsenic	2E-07	4E-10	3E-08	NA	2E-07
			Chromium, Hexavalent	NC	2E-10	NC	NA	2E-10
			Hydrazine	5E-10	4E-13	--	NA	5E-10
							Exposure Risk Total =	3E-06
Soil	Surface Soil	EA5	Benzo(a)anthracene	8E-08	NA	3E-08	NA	1E-07
			Benzo(a)pyrene	5E-08	NA	2E-08	NA	7E-08
			Benzo(b)fluoranthene	7E-09	NA	3E-09	NA	1E-08
			Bis(2-Ethylhexyl)phthalate	7E-08	NA	2E-08	NA	9E-08
			Carbazole	5E-11	NA	2E-11	NA	7E-11
			Indeno(1,2,3-cd)pyrene	4E-07	NA	2E-07	NA	6E-07
			N-Nitrosodi-n-propylamine	8E-08	NA	--	NA	8E-08
			Arsenic	9E-07	NA	--	NA	1E-06
							Exposure Risk Total =	2E-06
Soil	Subsurface Soil / Dust (inhalation)	EA7 OU1	Benzo(a)anthracene	5E-08	4E-12	2E-08	NA	7E-08
			Benzo(a)pyrene	6E-07	4E-11	2E-07	NA	8E-07
			Benzo(b)fluoranthene	6E-07	4E-11	2E-07	NA	8E-07
			Bis(2-Ethylhexyl)phthalate	2E-07	1E-11	4E-08	NA	2E-07
			Indeno(1,2,3-cd)pyrene	3E-08	2E-12	1E-08	NA	4E-08
			N-Nitrosodiphenylamine	7E-10	2E-13	--	NA	7E-10
			Arsenic	2E-07	5E-10	3E-08	NA	3E-07
			Chromium, Hexavalent	NC	2E-10	NC	NA	2E-10
			Hydrazine	1E-10	7E-14	--	NA	1E-10
							Exposure Risk Total =	2E-06

Key

EA - Exposure Area

NA - Exposure route not applicable for this chemical/exposure medium.

NC - Not carcinogenic by this exposure route.

OU - Operable Unit

-- - Not calculated; dose-response data and/or dermal absorption values not available.

This table provides risk estimates for the significant routes of exposure for the future construction worker exposed to soil on the Olin property. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of construction workers' exposure to soil and dust, as well as the toxicity of the chemicals of concern. Risks for the future construction worker exposed to subsurface soil/dust at EA1, surface soil at EA2, surface soil at EA3, surface soil at EA6, and surface soil at EA7 were below the risk screening threshold of 1x10-6.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-9								
OU1/2 Risk Characterization Summary - Non-Carcinogens								
Scenario Timeframe: Future								
Receptor Population: Construction Worker								
Receptor Age: Adult								
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Primary Target Organ**	**Non-Carcinogenic Hazard Quotient**			
					Ingestion	**Inhalation**	**Dermal**	**Exposure Routes Total**
Soil	Surface Soil / Dust (inhalation)	EA1 OU1	Benzo(a)anthracene	Kidney	5E-05	NA	2E-05	6E-05
			Benzo(a)pyrene	Kidney	3E-05	NA	1E-05	5E-05
			Benzo(b)fluoranthene	Kidney	4E-05	NA	2E-05	6E-05
			Bis(2-Ethylhexyl)phthalate	Reproductive	1E-03	NA	4E-04	2E-03
			C11-C22 Aromatics		5E-03	1E-06	1E-03	6E-03
			Dibenz(a,h)anthracene	Kidney	3E-06	NA	1E-06	3E-06
			Indeno(1,2,3-cd)pyrene	Kidney	2E-05	NA	8E-06	3E-05
			Aroclor-1260	Immune system / Eye	2E-01	NA	8E-02	3E-01
			Antimony	General Toxicity / Hematological	4E-03	NA	--	4E-03
			Arsenic	Skin/Developmental/Cardiovascular/Nervous System	7E-02	1E-03	1E-02	8E-02
			Chromium, Hexavalent	NOAEL / Respiratory	1E-03	4E-05	--	1E-03
			Cobalt	Endocrine / Respiratory	5E-03	4E-04	--	6E-03
			Silver	Skin / Eye / Respiratory	8E-04	NA	--	8E-04
			Thallium	NOAEL	2E-03	NA	--	2E-03
			Nitrogen, as Ammonia	Respiratory	--	8E-07	--	8E-07
							Exposure Point Total =	4E-01
Soil	Subsurface Soil / Dust (inhalation)	EA1 OU1	2,4,4-Trimethyl-1-pentene	Liver	2E-04	2E-08	--	2E-04
			2,4,4-Trimethyl-2-pentene	Liver	2E-05	3E-09	--	2E-05
			Benzo(a)anthracene	Kidney	3E-07	NA	1E-07	4E-07
			Benzo(a)pyrene	Kidney	4E-07	NA	2E-07	6E-07
			Benzo(b)fluoranthene	Kidney	5E-07	NA	2E-07	7E-07
			Benzo(k)fluoranthene	Kidney	3E-07	NA	1E-07	4E-07
			Bis(2-Ethylhexyl)phthalate	Reproductive	5E-03	NA	2E-03	7E-03
			Indeno(1,2,3-cd)pyrene	Kidney	1E-06	NA	5E-07	2E-06
			Aroclor-1260	Immune system / Eye	1E-01	NA	5E-02	2E-01
			Antimony	General Toxicity / Hematological	2E-02	NA	--	2E-02
			Arsenic	Developmental / Cardiovascular/ Nervous System / Skin	3E-02	4E-04	4E-03	3E-02
			Chromium, Hexavalent	NOAEL / Respiratory	8E-04	2E-05	--	8E-04
			Nitrogen, as Ammonia	Respiratory	--	7E-06	--	7E-06
							Exposure Point Total =	2E-01
Soil	Subsurface Soil / Dust (inhalation)	EA3 OU1	2,4,4-Trimethyl-1-pentene	Liver	1E-03	1E-07	--	1E-03
			2,4,4-Trimethyl-2-pentene	Liver	1E-04	2E-08	--	1E-04
			Bis(2-Ethylhexyl)phthalate	Reproductive	1E-01	--	3E-02	1E-01
			C11-C22 Aromatics		2E-02	6E-06	6E-03	3E-02
			Antimony	General Toxicity / Skin	5E-03	--	--	5E-03
			Arsenic	Developmental / Cardiovascular / Nervous System	3E-02	4E-04	4E-03	3E-02
			Chromium, Hexavalent	Respiratory	1E-04	3E-06	--	1E-04
			Nitrogen, as Ammonia	Respiratory	--	1E-07	--	1E-07
			Hydrazine		--	6E-08	--	6E-08
							Exposure Point Total =	2E-01

Table G-9

OU1/2 Risk Characterization Summary - Non-Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	EA5	Benzo(a)anthracene	Kidney	3E-05	NA	1E-05	3E-05
			Benzo(a)pyrene	Kidney	2E-06	NA	6E-07	2E-06
			Benzo(b)fluoranthene	Kidney	2E-06	NA	9E-07	3E-06
			Bis(2-Ethylhexyl)phthalate	Reproductive	3E-03	NA	1E-03	4E-03
			C11-C22 Aromatics		8E-02	NA	2E-02	1E-01
			Indeno(1,2,3-cd)pyrene	Kidney	1E-04	NA	6E-05	2E-04
			Antimony	General Toxicity /	3E-03	NA	--	3E-03
			Arsenic	Skin	2E-01	NA	2E-02	2E-01
			Chromium, Hexavalent	NOAEL	4E-02	NA	--	4E-02
			Cobalt	Endocrine	5E-03	NA	--	5E-03
			Silver	Skin / Eye / Respiratory	7E-01	NA	--	7E-01
			Thallium	NOAEL	3E-02	NA	--	3E-02
							Exposure Point Total =	1E+00

Key

EA - Exposure Area

NA - Toxicity criteria are not available to quantitatively address this route of exposure.

NOAEL - No Observed Adverse Effects Level

OU - Operable Unit

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for future construction workers exposed to soil and dust. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. Results presented use toxicity values and site-specific exposure parameters from the baseline HHRA. Soils and dust at EA2, EA6, EA7 and the Containment Area were at or below a HI of 0.1.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-10								
OU1/2 Risk Characterization Summary - Carcinogens								
Scenario Timeframe: Current/Future **Receptor Population: Trespasser** **Receptor Age: Adult**								
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Carcinogenic Risk**				
				Ingestion	**Inhalation**	**Dermal**	**External (Radiation)**	**Exposure Routes Total**
Soil	Surface Soil	EA1 OU1	Benzo(a)anthracene	1.9E-07	NA	9E-08	NA	3E-07
			Benzo(a)pyrene	1.4E-06	NA	6E-07	NA	2E-06
			Benzo(b)fluoranthene	1.8E-07	NA	8E-08	NA	3E-07
			Bis(2-Ethylhexyl)phthalate	3.3E-08	NA	1E-08	NA	5E-08
			Carbazole	4.2E-10	NA	2E-10	NA	6E-10
			Dibenz(a,h)anthracene	1.0E-07	NA	5E-08	NA	2E-07
			Indeno(1,2,3-cd)pyrene	8.3E-08	NA	4E-08	NA	1E-07
			Aroclor-1260	2.2E-07	NA	1E-07	NA	3E-07
			Arsenic	6.0E-07	NA	1E-07	NA	7E-07
							Exposure Risk Total =	4E-06
Soil	Surface Soil	EA5	Benzo(a)anthracene	1.0E-07	NA	5E-08	NA	2E-07
			Benzo(a)pyrene	6.8E-08	NA	3E-08	NA	1E-07
			Benzo(b)fluoranthene	9.3E-09	NA	4E-09	NA	1E-08
			Bis(2-Ethylhexyl)phthalate	8.8E-08	NA	3E-08	NA	1E-07
			Carbazole	6.8E-11	NA	3E-11	NA	9E-11
			Indeno(1,2,3-cd)pyrene	5.8E-07	NA	3E-07	NA	9E-07
			N-Nitrosodi-n-propylamine	1.1E-07	NA	--	NA	1E-07
			Arsenic	1.2E-06	NA	2E-07	NA	2E-06
							Exposure Risk Total =	3E-06
Sediment	Sediment	Lower South Ditch Stream	Benzo(a)anthracene	5E-08	NA	3E-08	NA	7E-08
			Benzo(a)pyrene	2E-08	NA	8E-09	NA	2E-08
			Bis(2-Ethylhexyl)phthalate	3E-07	NA	1E-07	NA	4E-07
			Dibenz(a,h)anthracene	4E-08	NA	2E-08	NA	6E-08
			Arsenic	2E-07	NA	3E-08	NA	2E-07
Surface Water	Surface Water	Lower South Ditch Stream	Chloroform	1.7E-10	NA	2E-10	NA	4E-10
			Benzo(a)pyrene	2.2E-08	NA	5E-06	NA	5E-06
			Bis(2-Ethylhexyl)phthalate	1.7E-09	NA	3E-08	NA	3E-08
			N-Nitrosodimethylamine	1.2E-07	NA	4E-09	NA	1E-07
			Arsenic	9.5E-08	NA	1E-08	NA	1E-07
			Hydrazine	4.9E-09	NA	3E-11	NA	5E-09
							Exposure Risk Total =	6E-06

Table G-10

OU1/2 Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Sediment	Sediment	Off-Property West Ditch Stream	Benzo(a)anthracene	3E-09	NA	1E-09	NA	4E-09
			Benzo(a)pyrene	3E-08	NA	2E-08	NA	5E-08
			Benzo(b)fluoranthene	5E-09	NA	3E-09	NA	7E-09
			Bis(2-Ethylhexyl)phthalate	3E-11	NA	1E-11	NA	5E-11
			Carbazole	2E-11	NA	9E-12	NA	3E-11
			Dibenz(a,h)anthracene	9E-09	NA	5E-09	NA	1E-08
			Arsenic	4E-07	NA	5E-08	NA	5E-07
Surface Water	Surface Water	Off-Property West Ditch Stream	Benzo(a)anthracene	3E-08	NA	4E-06	NA	4E-06
			Benzo(a)pyrene	3E-07	NA	8E-05	NA	8E-05
			Benzo(b)fluoranthene	6E-08	NA	2E-05	NA	2E-05
			Benzo(k)fluoranthene	4E-09	NA	--	NA	4E-09
			Chrysene	4E-10	NA	6E-08	NA	6E-08
			Dibenz(a,h)anthracene	2E-07	NA	7E-05	NA	7E-05
			Indeno(1,2,3-cd)pyrene	3E-08	NA	8E-06	NA	8E-06
			N-Nitrosodimethylamine	8E-08	NA	3E-09	NA	8E-08
			Arsenic	3E-07	NA	3E-08	NA	3E-07
							Exposure Risk Total =	2E-04
Sediment	Sediment	East Ditch Stream	Benzo(a)anthracene	1E-08	NA	6E-09	NA	2E-08
			Benzo(a)pyrene	1E-07	NA	8E-08	NA	2E-07
			Benzo(b)fluoranthene	2E-08	NA	1E-08	NA	4E-08
			Bis(2-Ethylhexyl)phthalate	3E-09	NA	1E-09	NA	4E-09
			Carbazole	1E-10	NA	4E-11	NA	1E-10
			Dibenz(a,h)anthracene	6E-09	NA	3E-09	NA	9E-09
			Arsenic	1E-05	NA	2E-06	NA	2E-05
Surface Water	Surface Water	East Ditch Stream	Trichloroethene	2E-09	NA	3E-09	NA	5E-09
			Vinyl chloride	2E-08	NA	1E-08	NA	3E-08
			Bis(2-Ethylhexyl)phthalate	4E-10	NA	7E-09	NA	8E-09
			Dibenz(a,h)anthracene	3E-08	NA	9E-06	NA	9E-06
			Indeno(1,2,3-cd)pyrene	3E-09	NA	6E-07	NA	6E-07
			N-Nitrosodimethylamine	7E-09	NA	2E-10	NA	7E-09
			N-Nitrosodi-n-propylamine	5E-10	NA	2E-10	NA	7E-10
			Arsenic	2E-07	NA	3E-08	NA	3E-07
							Exposure Risk Total =	3E-05

Table G-10

OU1/2 Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Sediment	Sediment	Maple Meadow Brook	Benzo(a)anthracene	3E-09	NA	1E-09	NA	4E-09
			Benzo(a)pyrene	3E-08	NA	1E-08	NA	4E-08
			Benzo(b)fluoranthene	3E-09	NA	2E-09	NA	5E-09
			Bis(2-Ethylhexyl)phthalate	6E-11	NA	2E-11	NA	8E-11
			Carbazole	3E-11	NA	1E-11	NA	5E-11
			Dibenz(a,h)anthracene	2E-08	NA	8E-09	NA	2E-08
			Arsenic	7E-07	NA	9E-08	NA	8E-07
Surface Water	Surface Water	Maple Meadow Brook	Trichloroethene	4E-10	NA	7E-10	NA	1E-09
			Benzo(a)pyrene	2E-08	NA	5E-06	NA	5E-06
			Benzo(b)fluoranthene	2E-09	NA	5E-07	NA	5E-07
			Indeno(1,2,3-cd)pyrene	3E-09	NA	7E-07	NA	7E-07
			N-Nitrosodimethylamine	5E-10	NA	2E-11	NA	5E-10
			N-Nitrosodi-n-propylamine	1E-10	NA	4E-11	NA	2E-10
			Arsenic	2E-07	NA	2E-08	NA	2E-07
			Hydrazine	4E-09	NA	2E-11	NA	4E-09
							Exposure Risk Total =	7E-06
Sediment	Sediment	North Pond	Benzo(a)anthracene	1E-08	NA	5E-09	NA	2E-08
			Benzo(a)pyrene	1E-07	NA	6E-08	NA	2E-07
			Benzo(b)fluoranthene	2E-08	NA	9E-09	NA	3E-08
			Bis(2-Ethylhexyl)phthalate	1E-09	NA	4E-10	NA	2E-09
			Carbazole	7E-11	NA	3E-11	NA	9E-11
			Arsenic	4E-07	NA	5E-08	NA	5E-07
Surface Water	Surface Water	North Pond	Benzo(a)anthracene	1.8E-09	NA	2E-07	NA	3E-07
			Benzo(a)pyrene	2.5E-08	NA	6E-06	NA	6E-06
			Benzo(b)fluoranthene	4.0E-09	NA	1E-06	NA	1E-06
			Benzo(k)fluoranthene	2.2E-10	NA	--	NA	2E-10
			Bis(2-Ethylhexyl)phthalate	6.5E-10	NA	1E-08	NA	1E-08
			Chrysene	4.3E-11	NA	6E-09	NA	6E-09
							Exposure Risk Total =	8E-06

Key

EA - Exposure Area

NA - Exposure route not applicable for this chemical/exposure medium.

NC - Not carcinogenic by this exposure route.

OU - Operable Unit

-- - Not calculated; dose-response data and/or dermal absorption values not available.

This table provides risk estimates for the significant routes of exposure for the current/future trespasser exposed to soil, sediment and surface water. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of adult trespassers' exposure to Site media, as well as the toxicity of the chemicals of concern. Risks for the current/future adult trespasser exposed to surface soil at EA2, surface soil at EA3, surface soil at EA4, surface soil at EA6, surface soil at EA7, sediment at the On-Property West Ditch Stream, sediment and surface water at Upper South Ditch Stream, surface water and sediment at the Detention Basin, surface water and sediment at Central Pond, were at or below the risk screening threshold of 1x10-6.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-11

OU1/2 Risk Characterization Summary - Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface Soil	EA1 OU1	Benzo(a)anthracene	6E-07	NA	6E-07	NA	1E-06
			Benzo(a)pyrene	5E-06	NA	4E-06	NA	9E-06
			Benzo(b)fluoranthene	6E-07	NA	5E-07	NA	1E-06
			Bis(2-Ethylhexyl)phthalate	4E-08	NA	3E-08	NA	6E-08
			Carbazole	5E-10	NA	3E-10	NA	8E-10
			Dibenz(a,h)anthracene	4E-07	NA	3E-07	NA	7E-07
			Indeno(1,2,3-cd)pyrene	3E-07	NA	2E-07	NA	5E-07
			Aroclor-1260	3E-07	NA	2E-07	NA	5E-07
			Arsenic	7E-07	NA	2E-07	NA	9E-07
							Exposure Risk Total =	1E-05
Soil	Surface Soil	EA2 OU1	Benzo(a)anthracene	3E-08	NA	2E-08	NA	5E-08
			Benzo(a)pyrene	2E-07	NA	2E-07	NA	4E-07
			Benzo(b)fluoranthene	3E-08	NA	3E-08	NA	6E-08
			Bis(2-Ethylhexyl)phthalate	9E-08	NA	6E-08	NA	2E-07
			Dibenz(a,h)anthracene	3E-07	NA	3E-07	NA	6E-07
			Indeno(1,2,3-cd)pyrene	2E-08	NA	2E-08	NA	4E-08
			Arsenic	5E-07	NA	2E-07	NA	7E-07
							Exposure Risk Total =	2E-06
Soil	Surface Soil	EA3 OU1	Benzo(a)anthracene	1E-08	NA	1E-08	NA	2E-08
			Benzo(a)pyrene	1E-07	NA	1E-07	NA	3E-07
			Benzo(b)fluoranthene	2E-08	NA	2E-08	NA	4E-08
			Bis(2-Ethylhexyl)phthalate	5E-09	NA	3E-09	NA	7E-09
			Dibenz(a,h)anthracene	3E-07	NA	3E-07	NA	6E-07
			Indeno(1,2,3-cd)pyrene	2E-08	NA	1E-08	NA	3E-08
			Aroclor-1260	2E-08	NA	2E-08	NA	4E-08
			Arsenic	4E-07	NA	2E-07	NA	6E-07
							Surface Soil Risk Total =	2E-06
Soil	Surface Soil	EA4 OU1	Benzo(a)anthracene	4E-08	NA	3E-08	NA	7E-08
			Benzo(a)pyrene	4E-07	NA	3E-07	NA	7E-07
			Benzo(b)fluoranthene	3E-08	NA	3E-08	NA	6E-08
			Bis(2-Ethylhexyl)phthalate	3E-08	NA	2E-08	NA	5E-08
			Dibenz(a,h)anthracene	4E-07	NA	3E-07	NA	7E-07
			Indeno(1,2,3-cd)pyrene	4E-08	NA	4E-08	NA	8E-08
			Arsenic	8E-07	NA	3E-07	NA	1E-06
							Exposure Risk Total =	3E-06

Table G-11

OU1/2 Risk Characterization Summary - Carcinogens

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

Soil	Surface Soil	EA5	Benzo(a)anthracene	4E-07	NA	3E-07	NA	7E-07
			Benzo(a)pyrene	2E-07	NA	2E-07	NA	4E-07
			Benzo(b)fluoranthene	3E-08	NA	3E-08	NA	6E-08
			Bis(2-Ethylhexyl)phthalate	1E-07	NA	7E-08	NA	2E-07
			Carbazole	8E-11	NA	5E-11	NA	1E-10
			Indeno(1,2,3-cd)pyrene	2E-06	NA	2E-06	NA	4E-06
			N-Nitrosodi-n-propylamine	1E-07	NA	--	NA	1E-07
			Arsenic	1E-06	NA	5E-07	NA	2E-06
							Exposure Risk Total =	7E-06
Soil	Surface Soil	EA6 OU1	Benzo(a)anthracene	3E-08	NA	2E-08	NA	5E-08
			Benzo(a)pyrene	6E-07	NA	5E-07	NA	1E-06
			Benzo(b)fluoranthene	3E-08	NA	2E-08	NA	5E-08
			Bis(2-Ethylhexyl)phthalate	4E-08	NA	2E-08	NA	6E-08
			Carbazole	3E-11	NA	2E-11	NA	5E-11
			Dibenz(a,h)anthracene	1E-07	NA	1E-07	NA	2E-07
			Indeno(1,2,3-cd)pyrene	3E-08	NA	3E-08	NA	5E-08
			Arsenic	5E-07	NA	2E-07	NA	7E-07
							Exposure Risk Total =	2E-06
Sediment	Sediment	Upper South Ditch Stream	Bromodichloromethane	6E-10	NA	4E-10	NA	1E-09
			Chloroform	6E-10	NA	4E-10	NA	1E-09
			Azobenzene	1E-09	NA	--	NA	1E-09
			Bis(2-Ethylhexyl)phthalate	6E-10	NA	6E-09	NA	7E-09
			N-Nitrosodimethylamine	7E-07	NA	1E-08	NA	7E-07
			N-Nitrosodi-n-propylamine	1E-09	NA	2E-10	NA	1E-09
			Arsenic	1E-07	NA	8E-09	NA	1E-07
			Hydrazine	5E-09	NA	2E-11	NA	5E-09
Surface Water	Surface Water	Upper South Ditch Stream	Bromodichloromethane	6E-10	NA	4E-10	NA	1E-09
			Chloroform	6E-10	NA	4E-10	NA	1E-09
			Azobenzene	1E-09	NA	--	NA	1E-09
			Bis(2-Ethylhexyl)phthalate	6E-10	NA	6E-09	NA	7E-09
			N-Nitrosodimethylamine	7E-07	NA	1E-08	NA	7E-07
			N-Nitrosodi-n-propylamine	1E-09	NA	2E-10	NA	1E-09
			Arsenic	1E-07	NA	8E-09	NA	1E-07
			Hydrazine	5E-09	NA	2E-11	NA	5E-09
							Exposure Risk Total =	2E-06

Table G-11

OU1/2 Risk Characterization Summary - Carcinogens

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

Sediment	Sediment	Lower South Ditch Stream	Benzo(a)anthracene	2E-07	NA	2E-07	NA	4E-07
			Benzo(a)pyrene	5E-08	NA	6E-08	NA	1E-07
			Bis(2-Ethylhexyl)phthalate	3E-07	NA	3E-07	NA	6E-07
			Dibenz(a,h)anthracene	1E-07	NA	2E-07	NA	3E-07
			Arsenic	2E-07	NA	7E-08	NA	3E-07
Surface Water	Surface Water	Lower South Ditch Stream	Chloroform	2E-10	NA	1E-10	NA	3E-10
			Benzo(a)pyrene	8E-08	NA	1E-05	NA	1E-05
			Bis(2-Ethylhexyl)phthalate	2E-09	NA	2E-08	NA	2E-08
			N-Nitrosodimethylamine	4E-07	NA	9E-09	NA	4E-07
			Arsenic	1E-07	NA	7E-09	NA	1E-07
			Hydrazine	6E-09	NA	2E-11	NA	6E-09
							Exposure Risk Total =	1E-05
Sediment	Sediment	Off-Property West Ditch Stream	Benzo(a)anthracene	8.6E-09	NA	1.1E-08	NA	1.9E-08
			Benzo(a)pyrene	1.0E-07	NA	1.3E-07	NA	2.3E-07
			Benzo(b)fluoranthene	1.6E-08	NA	1.9E-08	NA	3.5E-08
			Bis(2-Ethylhexyl)phthalate	3.9E-11	NA	3.7E-11	NA	7.6E-11
			Carbazole	2.4E-11	NA	2.2E-11	NA	4.6E-11
			Dibenz(a,h)anthracene	3.1E-08	NA	3.8E-08	NA	6.9E-08
			Arsenic	4.9E-07	NA	1.4E-07	NA	6.2E-07
Surface Water	Surface Water	Off-Property West Ditch Stream	Benzo(a)anthracene	1E-07	NA	9E-06	NA	9E-06
			Benzo(a)pyrene	1E-06	NA	2E-04	NA	2E-04
			Benzo(b)fluoranthene	2E-07	NA	3E-05	NA	3E-05
			Benzo(k)fluoranthene	1E-08	NA	--	NA	1E-08
			Chrysene	2E-09	NA	1E-07	NA	1E-07
			Dibenz(a,h)anthracene	6E-07	NA	1E-04	NA	1E-04
			Indeno(1,2,3-cd)pyrene	1E-07	NA	2E-05	NA	2E-05
			N-Nitrosodimethylamine	3E-07	NA	6E-09	NA	3E-07
			Arsenic	3E-07	NA	2E-08	NA	3E-07
							Exposure Risk Total =	4E-04

Table G-11

OU1/2 Risk Characterization Summary - Carcinogens

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

Sediment	Sediment	East Ditch Stream	Benzo(a)anthracene	4E-08	NA	5E-08	NA	9E-08
			Benzo(a)pyrene	5E-07	NA	6E-07	NA	1E-06
			Benzo(b)fluoranthene	8E-08	NA	1E-07	NA	2E-07
			Bis(2-Ethylhexyl)phthalate	3E-09	NA	3E-09	NA	6E-09
			Carbazole	1E-10	NA	1E-10	NA	2E-10
			Dibenz(a,h)anthracene	2E-08	NA	2E-08	NA	4E-08
			Arsenic	2E-05	NA	5E-06	NA	2E-05
Surface Water	Surface Water	East Ditch Stream	Trichloroethene	2E-09	NA	2E-09	NA	4E-09
			Vinyl chloride	2E-08	NA	8E-09	NA	2E-08
			Bis(2-Ethylhexyl)phthalate	5E-10	NA	5E-09	NA	6E-09
			Dibenz(a,h)anthracene	9E-08	NA	2E-05	NA	2E-05
			Indeno(1,2,3-cd)pyrene	9E-09	NA	1E-06	NA	1E-06
			N-Nitrosodimethylamine	2E-08	NA	5E-10	NA	3E-08
			N-Nitrosodi-n-propylamine	5E-10	NA	1E-10	NA	7E-10
			Arsenic	3E-07	NA	2E-08	NA	3E-07
							Exposure Risk Total =	4E-05
Sediment	Sediment	Maple Meadow Brook	Benzo(a)anthracene	9E-09	NA	1E-08	NA	2E-08
			Benzo(a)pyrene	9E-08	NA	1E-07	NA	2E-07
			Benzo(b)fluoranthene	1E-08	NA	1E-08	NA	3E-08
			Bis(2-Ethylhexyl)phthalate	6E-11	NA	6E-11	NA	1E-10
			Carbazole	4E-11	NA	4E-11	NA	7E-11
			Dibenz(a,h)anthracene	5E-08	NA	6E-08	NA	1E-07
			Arsenic	8E-07	NA	2E-07	NA	1E-06
Surface Water	Surface Water	Maple Meadow Brook	Trichloroethene	4E-10	NA	5E-10	NA	9E-10
			Benzo(a)pyrene	7E-08	NA	1E-05	NA	1E-05
			Benzo(b)fluoranthene	7E-09	NA	1E-06	NA	1E-06
			Indeno(1,2,3-cd)pyrene	1E-08	NA	2E-06	NA	2E-06
			N-Nitrosodimethylamine	2E-09	NA	4E-11	NA	2E-09
			N-Nitrosodi-n-propylamine	1E-10	NA	3E-11	NA	2E-10
			Arsenic	2E-07	NA	1E-08	NA	2E-07
			Hydrazine	4E-09	NA	1E-11	NA	4E-09
							Exposure Risk Total =	1E-05

Table G-11

OU1/2 Risk Characterization Summary - Carcinogens

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

Sediment	Sediment	North Pond	Benzo(a)anthracene	3E-08	NA	4E-08	NA	8E-08
			Benzo(a)pyrene	4E-07	NA	4E-07	NA	8E-07
			Benzo(b)fluoranthene	6E-08	NA	7E-08	NA	1E-07
			Bis(2-Ethylhexyl)phthalate	1E-09	NA	1E-09	NA	2E-09
			Carbazole	7E-11	NA	7E-11	NA	1E-10
			Arsenic	5E-07	NA	1E-07	NA	6E-07
Surface Water	Surface Water	North Pond	Benzo(a)anthracene	6E-09	NA	5E-07	NA	5E-07
			Benzo(a)pyrene	9E-08	NA	1E-05	NA	1E-05
			Benzo(b)fluoranthene	1E-08	NA	2E-06	NA	2E-06
			Benzo(k)fluoranthene	8E-10	NA	--	NA	8E-10
			Bis(2-Ethylhexyl)phthalate	7E-10	NA	8E-09	NA	8E-09
			Chrysene	2E-10	NA	1E-08	NA	1E-08
							Exposure Risk Total =	2E-05

Key

EA - Exposure Area

NA - Exposure route not applicable for this chemical/exposure medium.

NC - Not carcinogenic by this exposure route.

OU - Operable Unit

-- - Not calculated; dose-response data and/or dermal absorption values not available.

This table provides risk estimates for the significant routes of exposure for the current/future adolescent trespasser exposed to Site media. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of adolescent trespasser exposure to soil and dust, as well as the toxicity of the chemicals of concern. Risks for the current/future adult trespasser exposed to surface soil at EA7, sediment at the On-Property West Ditch Stream, surface water and sediment at the Detention Basin, surface water and sediment at Central Pond were at or below the risk screening threshold of 1x10-6.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-12

OU1/2 Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Outdoor Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Subsurface Soil / dust (inhalation)	EA1 OU1	Benzo(a)anthracene	7E-09	2E-13	6E-09	NA	1E-08
			Benzo(a)pyrene	9E-08	2E-12	8E-08	NA	2E-07
			Benzo(b)fluoranthene	1E-08	3E-13	1E-08	NA	2E-08
			Benzo(k)fluoranthene	6E-10	2E-13	5E-10	NA	1E-09
			Bis(2-Ethylhexyl)phthalate	7E-07	2E-11	5E-07	NA	1E-06
			Carbazole	1E-10	NC	7E-11	NA	2E-10
			Indeno(1,2,3-cd)pyrene	3E-08	7E-13	2E-08	NA	5E-08
			N-Nitrosodiphenylamine	4E-07	4E-11	--	NA	4E-07
			Aroclor-1260	7E-07	3E-11	6E-07	NA	1E-06
			Arsenic	1E-06	1E-09	4E-07	NA	2E-06
			Chromium, Hexavalent	NC	3E-09	NC	NA	3E-09
							Exposure Risk Total =	5E-06
Soil	Subsurface Soil / dust (inhalation)	EA3 OU1	Bis(2-Ethylhexyl)phthalate	2E-05	5E-10	1E-05	NA	3E-05
			N-Nitrosodiphenylamine	4E-10	3E-14	--	NA	4E-10
			Arsenic	1E-06	1E-09	4E-07	NA	2E-06
			Chromium, Hexavalent	NC	4E-10	NC	NA	4E-10
			Hydrazine	4E-09	1E-12	NC	NA	4E-09
							Exposure Risk Total =	3E-05
Soil	Surface Soil	EA5	Benzo(a)anthracene	5E-07	NA	5E-07	NA	1E-06
			Benzo(a)pyrene	4E-07	NA	3E-07	NA	7E-07
			Benzo(b)fluoranthene	5E-08	NA	4E-08	NA	9E-08
			Bis(2-Ethylhexyl)phthalate	5E-07	NA	3E-07	NA	8E-07
			Carbazole	4E-10	NA	2E-10	NA	6E-10
			Indeno(1,2,3-cd)pyrene	3E-06	NA	3E-06	NA	6E-06
			N-Nitrosodi-n-propylamine	6E-07	NA	--	NA	6E-07
			Arsenic	6E-06	NA	2E-06	NA	9E-06
							Exposure Risk Total =	2E-05
Soil	Subsurface Soil / dust (inhalation)	EA7 OU1	Benzo(a)anthracene	4E-07	9E-12	3E-07	NA	7E-07
			Benzo(a)pyrene	4E-06	1E-10	3E-06	NA	7E-06
			Benzo(b)fluoranthene	4E-06	1E-10	3E-06	NA	7E-06
			Bis(2-Ethylhexyl)phthalate	1E-06	3E-11	7E-07	NA	2E-06
			Indeno(1,2,3-cd)pyrene	2E-07	5E-12	2E-07	NA	3E-07
			N-Nitrosodiphenylamine	4E-09	4E-13	--	NA	4E-09
			Arsenic	2E-06	1E-09	5E-07	NA	2E-06
			Chromium, Hexavalent	NC	6E-10	NC	NA	6E-10
			Hydrazine	7E-10	2E-13	NC	NA	7E-10
							Exposure Risk Total =	2E-05

Table G-12

OU1/2 Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Outdoor Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface Soil / dust (inhalation)	Containment Area OU1	Benzo(a)anthracene	4E-09	1E-13	4E-09	NA	8E-09
			Benzo(a)pyrene	4E-08	1E-12	3E-08	NA	7E-08
			Benzo(b)fluoranthene	6E-09	2E-13	5E-09	NA	1E-08
			Bis(2-Ethylhexyl)phthalate	5E-09	1E-13	3E-09	NA	8E-09
			Arsenic	4E-06	3E-09	1E-06	NA	5E-06
			Cobalt	NC	2E-09	NC	NA	2E-09
			Chromium, Hexavalent	NC	3E-09	NC	NA	3E-09
							Exposure Risk Total =	5E-06

Key

EA - Exposure Area

NA - Exposure route not applicable for this chemical/exposure medium.

NC - Not carcinogenic by this exposure route.

OU - Operable Unit

-- - Not calculated; dose-response data and/or dermal absorption values not available.

This table provides risk estimates for the significant routes of exposure for the future outdoor worker exposed to soil and dust. Future (non-current) exposures include subsurface soil as well as surface soil at the Containment Area (currently capped) and EA5 (not currently accessible to outdoor workers). These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of adult outdoor workers' exposure to soil and dust, as well as the toxicity of the chemicals of concern.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-13

OU1/2 Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Outdoor Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Subsurface Soil / dust (inhalation)	EA3	2,4,4-Trimethyl-1-pentene	Liver	3E-03	1E-07	--	3E-03
			2,4,4-Trimethyl-2-pentene	Liver	3E-04	2E-08	--	3E-04
			Bis(2-Ethylhexyl)phthalate	Liver	2E-01	6E-06	1E-01	3E-01
			C11-C22 Aromatics		6E-02	--	3E-02	9E-02
			Antimony	General Toxicity /	1E-03	--	--	1E-03
			Arsenic	Skin / Hematologica	7E-03	4E-05	2E-03	1E-02
			Chromium, Hexavalent	NOAEL	2E-04	9E-07	--	2E-04
			Nitrogen, as Ammonia	Respiratory	--	1E-08	--	1E-08
			Hydrazine		--	2E-08	--	2E-08
							Exposure Point Total =	4E-01
Soil	Surface Soil	EA5	Benzo(a)anthracene	Kidney	7E-05	NA	6E-05	1E-04
			Benzo(a)pyrene	Kidney	5E-06	NA	4E-06	8E-06
			Benzo(b)fluoranthene	Kidney	6E-06	NA	5E-06	1E-05
			Bis(2-Ethylhexyl)phthalate	Liver	5E-03	NA	3E-03	8E-03
			C11-C22 Aromatics		2E-01	NA	1E-01	4E-01
			Indeno(1,2,3-cd)pyrene	Kidney	4E-04	NA	3E-04	7E-04
			Antimony	General Toxicity /	8E-04	NA	--	8E-04
			Arsenic	Skin / Hematologica	4E-02	NA	1E-02	5E-02
			Chromium, Hexavalent	NOAEL	7E-02	NA	--	7E-02
			Cobalt	Endocrine	2E-02	NA	--	2E-02
			Silver	Skin / Eye / Respiratory	2E-01	NA	--	2E-01
			Thallium	NOAEL	7E-01	NA	--	7E-01
							Exposure Point Total =	1E+00

Key

EA - Exposure Area

NA - Toxicity criteria are not available to quantitatively address this route of exposure.

NOAEL - No Observed Adverse Effects Level

OU - Operable Unit

-- - Not calculated; dose-response data and/or dermal absorption values not available.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for future outdoor workers exposed to soil and dust. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. Results presented use toxicity values and site-specific exposure parameters from the baseline HHRA. Soils and dust at EA1, EA2, EA3 (surface soil only), EA6, EA7 and the Containment Area were at or below a HI of 0.1.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-14

OU1/2 Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Indoor Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface Soil	EA3 OU1	Benzo(a)anthracene	1E-08	NA	6E-09	NA	2E-08
			Benzo(a)pyrene	1E-07	NA	7E-08	NA	2E-07
			Benzo(b)fluoranthene	2E-08	NA	1E-08	NA	3E-08
			Bis(2-Ethylhexyl)phthalate	1E-08	NA	5E-09	NA	2E-08
			Dibenz(a,h)anthracene	3E-07	NA	2E-07	NA	4E-07
			Indeno(1,2,3-cd)pyrene	1E-08	NA	7E-09	NA	2E-08
			Aroclor-1260	5E-08	NA	3E-08	NA	8E-08
			Arsenic	1E-06	NA	3E-07	NA	1E-06
							Surface Soil Risk Total =	2E-06
Soil	Subsurface Soil	EA3 OU1	Bis(2-Ethylhexyl)phthalate	9E-06	NA	4E-06	NA	1E-05
			N-Nitrosodiphenylamine	2E-10	NA	--	NA	2E-10
			Arsenic	6E-07	NA	2E-07	NA	8E-07
			Hydrazine	2E-09	NA	--	NA	2E-09
							Surface Soil Risk Total =	1E-05
Soil	Surface Soil	EA7 OU1	Benzo(a)anthracene	8E-09	NA	5E-09	NA	1E-08
			Benzo(a)pyrene	9E-08	NA	5E-08	NA	2E-07
			Benzo(b)fluoranthene	1E-08	NA	6E-09	NA	2E-08
			Bis(2-Ethylhexyl)phthalate	1E-08	NA	4E-09	NA	1E-08
			Indeno(1,2,3-cd)pyrene	2E-08	NA	1E-08	NA	3E-08
			Arsenic	2E-06	NA	5E-07	NA	3E-06
							Surface Soil Risk Total =	3E-06
Soil	Subsurface Soil	EA7 OU1	Benzo(a)anthracene	2E-13	NA	0E+00	NA	2E-13
			Benzo(a)pyrene	2E-12	NA	0E+00	NA	2E-12
			Benzo(b)fluoranthene	2E-12	NA	0E+00	NA	2E-12
			Bis(2-Ethylhexyl)phthalate	6E-07	NA	3E-07	NA	8E-07
			Indeno(1,2,3-cd)pyrene	1E-13	NA	0E+00	NA	1E-13
			N-Nitrosodiphenylamine	3E-09	NA	--	NA	3E-09
			Arsenic	8E-07	NA	2E-07	NA	1E-06
			Hydrazine	4E-10	NA	--	NA	4E-10
							Surface Soil Risk Total =	2E-06

Table G-14								
OU1/2 Risk Characterization Summary - Carcinogens								

Scenario Timeframe: Future
Receptor Population: Indoor Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface Soil	Containment Area	Benzo(a)anthracene	2E-09	NA	2E-09	NA	4E-09
			Benzo(a)pyrene	2E-08	NA	1E-08	NA	4E-08
			Benzo(b)fluoranthene	3E-09	NA	2E-09	NA	6E-09
			Bis(2-Ethylhexyl)phthalate	3E-09	NA	1E-09	NA	4E-09
			Arsenic	2E-06	NA	5E-07	NA	3E-06
							Surface Soil Risk Total =	3E-06

Key

EA - Exposure Area

NA - Exposure route not applicable for this chemical/exposure medium.

OU - Operable Unit

-- - Not calculated; dose-response data and/or dermal absorption values not available.

This table provides risk estimates for the significant routes of exposure for the future indoor worker exposed to soil. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of adult indoor workers' exposure to soil as well as the toxicity of the chemicals of concern.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-15								
OU1/2 Risk Characterization Summary - Carcinogens								
Scenario Timeframe: Future **Receptor Population: Trespasser** **Receptor Age: Adult**								
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Carcinogenic Risk**				
				Ingestion	**Inhalation**	**Dermal**	**External (Radiation)**	**Exposure Routes Total**
Soil	Subsurface Soil	EA3 OU1	Bis(2-Ethylhexyl)phthalate	3E-06	NA	1E-06	NA	4E-06
			N-Nitrosodiphenylamine	7E-11	NA	--	NA	7E-11
			Arsenic	2E-07	NA	4E-08	NA	3E-07
			Hydrazine	7E-10	NA	--	NA	7E-10
							Surface Soil Risk Total =	4E-06
Soil	Subsurface Soil	EA7 OU1	Benzo(a)anthracene	7E-08	NA	3E-08	NA	1E-07
			Benzo(a)pyrene	8E-07	NA	4E-07	NA	1E-06
			Benzo(b)fluoranthene	8E-07	NA	4E-07	NA	1E-06
			Bis(2-Ethylhexyl)phthalate	2E-07	NA	7E-08	NA	3E-07
			Indeno(1,2,3-cd)pyrene	4E-08	NA	2E-08	NA	5E-08
			N-Nitrosodiphenylamine	9E-10	NA	--	NA	9E-10
			Arsenic	3E-07	NA	5E-08	NA	3E-07
			Hydrazine	1E-10	NA	--	NA	1E-10
							Surface Soil Risk Total =	3E-06

Key

EA - Exposure Area

NA - Exposure route not applicable for this chemical/exposure medium.

OU - Operable Unit

-- - Not calculated; dose-response data and/or dermal absorption values not available.

This table provides risk estimates for the significant routes of exposure for the future adult trespasser exposed to soil. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of adult trespasser exposure to soil as well as the toxicity of the chemicals of concern. Risks for the future adult trespasser exposed to subsurface soil/dust at EA1 and were below the risk screening threshold of 1x10-6.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-16

OU1/2 Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Subsurface Soil	EA3 OU1	Bis(2-Ethylhexyl)phthalate	3E-06	NA	2E-06	NA	6E-06
			N-Nitrosodiphenylamine	8E-11	NA	--	NA	8E-11
			Arsenic	3E-07	NA	8E-08	NA	3E-07
			Hydrazine	8E-10	NA	--	NA	8E-10
							Exposure Risk Total =	6E-06
Soil	Subsurface Soil	EA7 OU1	Benzo(a)anthracene	2E-07	NA	2E-07	NA	4E-07
			Benzo(a)pyrene	3E-06	NA	2E-06	NA	5E-06
			Benzo(b)fluoranthene	3E-06	NA	2E-06	NA	5E-06
			Bis(2-Ethylhexyl)phthalate	2E-07	NA	1E-07	NA	4E-07
			Indeno(1,2,3-cd)pyrene	1E-07	NA	1E-07	NA	2E-07
			Arsenic	3E-07	NA	1E-07	NA	4E-07
			Hydrazine	2E-10	NA	--	NA	2E-10
							Exposure Risk Total =	1E-05

Key

EA - Exposure Area

NA - Exposure route not applicable for this chemical/exposure medium.

OU - Operable Unit

-- - Not calculated; dose-response data and/or dermal absorption values not available.

This table provides risk estimates for the significant routes of exposure for the future adolescent trespasser exposed to soil. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of adolescent trespasser exposure to soil, as well as the toxicity of the chemicals of concern. Risks for the future adolescent trespasser exposed to subsurface soil at EA1 and the Containment Area were at or below the risk screening threshold of 1x10-6.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-17

OU3 Risk Characterization Summary - Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Overburden Groundwater / Shower Air	Ipswich Aquifer Plume Core - Overburden	**Volatile Organic Compounds**					
			1,1-Dichloroethane	5.4E-08	3.7E-07	4.1E-09	NA	4.3E-07
			1,2,4-Trichlorobenzene	2.7E-07	NC	3.7E-07	NA	6.4E-07
			1,2-Dichloroethane	4.3E-06	2.7E-05	2.0E-07	NA	3.2E-05
			1,4-Dichlorobenzene	1.6E-08	6.7E-07	1.1E-08	NA	7.0E-07
			Benzene	3.4E-07	4.8E-06	5.2E-08	NA	5.2E-06
			Chloroform	1.1E-07	1.9E-06	9.8E-09	NA	2.0E-06
			Methyl Tertbutyl Ether	4.1E-07	1.2E-06	9.2E-09	NA	1.6E-06
			Naphthalene	7.3E-07	3.3E-06	4.6E-07	NA	4.5E-06
			Trichloroethene	2.6E-05	5.4E-05	4.2E-06	NA	8.4E-05
			Vinyl chloride	7.6E-04	1.4E-04	5.9E-05	NA	9.6E-04
			Semi-Volatile Organic Compounds					
			4-Chlorophenyl phenyl ether	8.9E-09	NC	1.3E-08	NA	2.2E-08
			Biphenyl	8.2E-08	NC	1.2E-07	NA	2.0E-07
			N-Nitrosodimethylamine	6.8E-03	5.3E-04	1.7E-05	NA	7.3E-03
			Metals					
			Arsenic	3.4E-04	NC	1.9E-06	NA	3.4E-04
			Specialty Compounds					
			Formaldehyde	NC	1.1E-07	NC	NA	1.1E-07
							Exposure Risk Total =	9E-03

Table G-17

OU3 Risk Characterization Summary - Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Bedrock Groundwater / Shower Air	Ipswich Aquifer Plume Core - Bedrock	**Volatile Organic Compounds**					
			1,2,4-Trichlorobenzene	1.8E-07	NC	2.5E-07	NA	4.3E-07
			1,2-Dichloroethane	6.1E-06	3.8E-05	2.9E-07	NA	4.4E-05
			1,4-Dichlorobenzene	1.9E-08	8.1E-07	1.3E-08	NA	8.4E-07
			Benzene	2.0E-07	2.9E-06	3.1E-08	NA	3.1E-06
			Bromodichloromethane	1.2E-07	1.3E-06	8.0E-09	NA	1.4E-06
			Chloroform	1.3E-06	2.2E-05	1.1E-07	NA	2.3E-05
			Methylene chloride	5.8E-08	7.4E-09	2.1E-09	NA	6.8E-08
			Trichloroethene	3.5E-05	7.2E-05	5.6E-06	NA	1.1E-04
			Vinyl chloride	1.5E-05	2.7E-06	1.1E-06	NA	1.9E-05
			Semi-Volatile Organic Compounds					
			Benzo(a)anthracene	3.1E-07	1.9E-07	NC	NA	5.0E-07
			Benzo(a)pyrene	2.4E-06	NC	NC	NA	2.4E-06
			Dibenz(a,h)anthracene	3.1E-06	NC	NC	NA	3.1E-06
			N-Nitrosodimethylamine	1.4E-02	1.1E-03	3.5E-05	NA	1.5E-02
			Pentachlorophenol	3.2E-06	NC	1.4E-05	NA	1.7E-05
			Metals					
			Arsenic	7.2E-05	NC	4.0E-07	NA	7.2E-05
			Chromium, Hexavalent	6.1E-06	NC	2.3E-06	NA	8.4E-06
			Specialty					
			Formaldehyde	NC	1.2E-07	NC	NA	1.2E-07
			Hydrazine	1.7E-06	4.1E-07	6.1E-10	NA	2.1E-06
							Exposure Risk Total =	2E-02

Key

NA - Exposure route not applicable for this chemical/exposure medium.

NC - Not carcinogenic by this expsoure route.

This table provides risk estimates for the significant routes of exposure for the future adult residents exposed to groundwater in the Ipswich Watershed. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of adult resident exposure to groundwater, as well as the toxicity of the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-18

OU3 Risk Characterization Summary - Non-Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Overburden Groundwater / Shower Air	Ipswich Aquifer Plume Core - Overburden	**Volatile Organic Compounds**					
			1,1-Dichloroethane	Kidney	0.00016	NA	0.000013	0.00017
			1,2,4-Trichlorobenzene	Endocrine / Urinary	0.0033	0.29	0.0044	0.30
			1,2-Dichloroethane	Undetermined / Nervous System	0.028	0.53	0.0013	0.56
			1,4-Dichlorobenzene	Liver	0.00015	0.00027	0.00010	0.00052
			2,4,4-Trimethyl-1-pentene	Liver	0.0078	0.047	0.018	0.073
			2,4,4-Trimethyl-2-pentene	Liver	0.0023	0.014	0.0054	0.022
			Benzene	Immune System	0.020	0.072	0.0030	0.10
			Chloroform	Liver	0.0013	0.0029	0.00011	0.0043
			Cis-1,2-Dichloroethene	Kidney / General Toxicity / Liver	1.6	0.39	0.19	2.18
			Methyl Tertbutyl Ether	Liver / Kidney	NC	0.0055	NC	0.006
			Naphthalene	General Toxicity / Nervous System / Respiratory	0.0011	0.11	0.00067	0.11
			Trichloroethene	Developmental / Immune System / Cardiovascular / Kidney	3.3	19	0.53	23
			Vinyl chloride	Liver	0.61	0.55	0.048	1.2
			Semi-Volatile Organic Compounds					
			4-Chlorophenyl phenyl ether	Respiratory / Liver / Kidney	0.0000078	0.15	0.000012	0.15
			Biphenyl	Respiratory / Liver / Kidney	0.000072	1.2	0.00011	1.2
			Diphenyl ether	Eye / Respiratory		8.1		8.1
			N-Nitrosodimethylamine	Developmental	29	NC	0.072	29
			Petroleum Hydrocarbons					
			C9-C10 Aromatics	Respiratory	0.082	1.8	0.081	2.0
			C9-C12 Aliphatics	Liver / Kidney / Endocrine	0.020	0.047	NC	0.067
			Metals					
			Aluminum	Nervous System	0.0022	NC	0.000012	0.0022
			Antimony	Hematological / General Toxicity	1.1	NC	0.042	1.1
			Arsenic	Skin / Cardiovascular	2.6	NC	0.015	2.6
			Cadmium	Kidney	0.036	NC	0.0040	0.040
			Cobalt	Endocrine	10	NC	0.023	10
			Iron	GI System	2.0	NC	0.011	2.0
			Manganese	Nervous System	25	NC	3.5	29
			Nickel	General Toxicity	0.18	NC	0.0050	0.19
			Vanadium	Skin	0.060	NC	0.013	0.073
			Zinc	Immune System / Hematological	0.0039	NC	0.000013	0.0039
			Inorganics, Total					
			Nitrate as N	Hematological	0.00060	NC	0.0000033	0.00060
			Nitrite as N	Hematological	0.0063	NC	0.000035	0.0063
			Specialty Compounds					
			Formaldehyde	Kidney / GI System / General Toxicity / Eye / Respiratory	0.0018	0.0030	0.000026	0.0048
							Exposure Point Total =	113

Table G-18								

OU3 Risk Characterization Summary - Non-Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Bedrock Groundwater	Ipswich Aquifer Plume Core - Bedrock	**Volatile Organic Compounds**					
			1,2,4-Trichlorobenzene	Endocrine / Urinary	0.0022	0.20	0.0030	0.21
			1,2-Dichloroethane	Undetermined / Nervous System	0.039	0.74	0.0018	0.78
			1,4-Dichlorobenzene	Liver	0.00018	0.00032	0.00012	0.00062
			2,4,4-Trimethyl-1-pentene	Liver	0.025	0.15	0.058	0.23
			Benzene	Immune System	0.012	0.043	0.0018	0.057
			Bromodichloromethane	Kidney	0.00033	NC	0.000023	0.00035
			Chloroform	Liver	0.015	0.034	0.0013	0.050
			Cis-1,2-Dichloroethene	Kidney / General Toxicity / Liver	0.22	0.055	0.027	0.30
			Methylene chloride	Liver	0.0085	0.0022	0.00031	0.011
			Trichloroethene	Developmental / Immune System /Cardiovascular / Kidney	4.4	25	0.71	30.11
			Vinyl chloride	Liver	0.012	0.011	0.00093	0.024
			Semi-Volatile Organic Compounds					
			Benzo(a)pyrene	Developmental	0.014	NC	NC	0.014
			Diphenyl ether	Eye / Respiratory	NC	13	NC	13
			N-Nitrosodimethylamine	Developmental	60	NC	0.15	60
			Pentachlorophenol	Liver	0.0056	NC	0.024	0.030
			Metals					
			Antimony	Hematological / General Toxicity	0.90	NC	0.033	0.93
			Arsenic	Skin / Cardiovascular	0.56	NC	0.0031	0.56
			Chromium, Hexavalent	Undetermined	0.0071	NC	0.0032	0.010
			Cobalt	Endocrine	51	NC	0.11	51
			Iron	GI System	1.8	NC	0.010	1.8
			Manganese	Nervous System	36	NC	5.1	41
			Nickel	General Toxicity	0.21	NC	0.0059	0.22
			Vanadium	Skin	0.059	NC	0.013	0.072
			Specialty Compounds					
			Dimethylformamide	Liver	0.0060	0.00023	0.0000077	0.0062
			Formaldehyde	Kidney / GI System / General Toxicity / Eye / Respiratory	0.0019	0.0033	0.000028	0.0052
			Hydrazine	Liver	NC	0.0097	NC	0.0097
							Exposure Point Total =	201

Key

GI - Gastrointestinal

NA - Toxicity criteria are not available to quantitatively address this route of exposure.

NC - Not Calculated

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for significant routes of exposure for adult residents exposed to Ipswich Aquifer groundwater. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. Results presented use toxicity values and site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-19

OU3 Risk Characterization Summary - Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Overburden Groundwater / Shower Air	Ipswich Aquifer Plume Core - Overburden	**Volatile Organic Compounds**					
			1,1-Dichloroethane	2.7E-08	6.7E-08	1.8E-09	NA	9.6E-08
			1,2,4-Trichlorobenzene	1.4E-07	NC	1.7E-07	NA	3.1E-07
			1,2-Dichloroethane	2.2E-06	5.0E-06	9.3E-08	NA	7.3E-06
			1,4-Dichlorobenzene	8.1E-09	1.2E-07	5.1E-09	NA	1.3E-07
			Benzene	1.7E-07	8.7E-07	2.3E-08	NA	1.1E-06
			Chloroform	5.6E-08	3.4E-07	4.4E-09	NA	4.0E-07
			Methyl Tertbutyl Ether	2.1E-07	2.2E-07	4.1E-09	NA	4.3E-07
			Naphthalene	3.6E-07	6.0E-07	2.1E-07	NA	1.2E-06
			Trichloroethene	2.0E-05	1.6E-05	3.0E-06	NA	3.9E-05
			Vinyl chloride	1.0E-03	6.6E-05	6.8E-05	NA	1.1E-03
			Semi-Volatile Organic Compounds					
			4-Chlorophenyl phenyl ether	4.4E-09	NC	6.1E-09	NA	1.1E-08
			Biphenyl	4.1E-08	NC	5.6E-08	NA	9.7E-08
			N-Nitrosodimethylamine	9.0E-03	2.5E-04	2.0E-05	NA	9.3E-03
			Metals					
			Arsenic	1.7E-04	NC	7.4E-07	NA	1.7E-04
			Specialty Compounds				NA	0.0E+00
			Formaldehyde	NC	2.0E-08	NC	NA	2.0E-08
							Exposure Risk Total =	1E-02

Table G-19								
OU3 Risk Characterization Summary - Carcinogens								

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Bedrock Groundwater / Shower Air	Ipswich Aquifer Plume Core - Bedrock	**Volatile Organic Compounds**					
			1,2,4-Trichlorobenzene	9.2E-08	NC	1.1E-07	NA	2.0E-07
			1,2-Dichloroethane	3.0E-06	6.9E-06	1.3E-07	NA	1.0E-05
			1,4-Dichlorobenzene	9.7E-09	1.5E-07	6.1E-09	NA	1.7E-07
			Benzene	1.0E-07	5.2E-07	1.4E-08	NA	6.3E-07
			Bromodichloromethane	5.8E-08	2.4E-07	3.6E-09	NA	3.0E-07
			Chloroform	6.5E-07	4.0E-06	5.1E-08	NA	4.7E-06
			Methylene chloride	7.7E-08	3.6E-09	2.5E-09	NA	8.3E-08
			Trichloroethene	2.7E-05	2.2E-05	3.9E-06	NA	5.3E-05
			Vinyl chloride	2.0E-05	1.3E-06	1.3E-06	NA	2.3E-05
			Semi-Volatile Organic Compounds					
			Benzo(a)anthracene	4.1E-07	9.0E-08	NC	NA	5.0E-07
			Benzo(a)pyrene	3.2E-06	NC	NC	NA	3.2E-06
			Dibenz(a,h)anthracene	4.1E-06	NC	NC	NA	4.1E-06
			N-Nitrosodimethylamine	1.8E-02	5.2E-04	4.0E-05	NA	1.9E-02
			Pentachlorophenol	1.6E-06	NC	6.1E-06	NA	7.7E-06
			Metals					
			Arsenic	3.6E-05	NC	1.6E-07	NA	3.6E-05
			Chromium, Hexavalent	8.0E-06	NC	2.4E-06	NA	1.0E-05
			Specialty Compounds					
			Formaldehyde	NC	2.2E-08	NC		2.2E-08
			Hydrazine	8.6E-07	7.4E-08	2.6E-10	NA	9.3E-07
							Exposure Risk Total =	2E-02

Key

NA - Exposure route not applicable for this chemical/exposure medium.

NC - Not carcinogenic by this expsoure route.

This table provides risk estimates for the significant routes of exposure for the future child residents exposed to groundwater in the Ipswich Watershed. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of child resident exposure to groundwater, as well as the toxicity of the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-20

OU3 Risk Characterization Summary - Non-Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Overburden Groundwater / Shower Air	Ipswich Aquifer Plume Core - Overburden	**Volatile Organic Compounds**					
			1,1-Dichloroethane	Kidney	0.00027	NC	0.000019	0.00029
			1,2,4-Trichlorobenzene	Endocrine / Urinary	0.0055	0.18	0.0067	0.19
			1,2-Dichloroethane	Nervous System	0.046	0.32	0.0020	0.37
			1,4-Dichlorobenzene	Liver	0.00025	0.00016	0.00016	0.00057
			2,4,4-Trimethyl-1-pentene	Liver	0.013	0.029	0.027	0.069
			2,4,4-Trimethyl-2-pentene	Liver	0.0039	0.0086	0.0081	0.021
			Benzene	Immune System	0.033	0.043	0.0044	0.080
			Chloroform	Liver	0.0021	0.0018	0.00017	0.0041
			Cis-1,2-Dichloroethene	Kidney / General Toxicity / Liver	2.6	0.23	0.29	3.1
			Methyl Tertbutyl Ether	Liver / Kidney	NA	0.0033	NA	0.0033
			Naphthalene	General Toxicity / Nervous System / Respiratory	0.0018	0.069	0.0010	0.072
			Trichloroethene	Developmental / Immune System / Cardiovascular / Kidney	5.5	11	0.80	17
			Vinyl chloride	Liver	1.0	0.33	0.069	1.4
			Semi-Volatile Organic Compounds					
			4-Chlorophenyl phenyl ether	Respiratory / Liver / Kidney	0.000013	0.091	0.000018	0.091
			Biphenyl	Respiratory / Liver / Kidney	0.00012	0.71	0.00016	0.71
			Diphenyl ether	Eye / Respiratory	NA	4.9	NA	4.9
			N-Nitrosodimethylamine	Developmental	49	NC	0.11	49
			Petroleum Hydrocarbons					
			C9-C10 Aromatics	Respiratory	0.14	1.1	0.12	1.4
			C9-C12 Aliphatics	Liver / Kidney / Endocrine	0.033	0.028	NC	0.061
			Metals					
			Aluminum	Nervous System	0.0036	NC	0.000016	0.0036
			Antimony	Hematological / General Toxicity	1.9	NC	0.055	2.0
			Arsenic	Skin / Cardiovascular	4.4	NC	0.019	4.4
			Cadmium	Kidney	0.060	NC	0.0053	0.065
			Cobalt	Endocrine	17	NC	0.031	17
			Iron	GI System	3.3	NC	0.015	3.3
			Manganese	Nervous System	41	NC	4.6	46
			Nickel	General Toxicity	0.30	NC	0.0066	0.31
			Vanadium	Skin	0.10	NC	0.017	0.12
			Zinc	Immune System / Hematological	0.0065	NC	0.000017	0.0065
			Inorganics, Total					
			Nitrate as N	Hematological	0.0010	NC	0.0000044	0.0010
			Nitrite as N	Hematological	0.010	NC	0.000046	0.010
			Specialty Compounds					
			Formaldehyde	Kidney / GI System / General Toxicity / Eye / Respiratory	0.0030	0.0018	0.000038	0.0048
							Exposure Point Total =	152

Table G-20

OU3 Risk Characterization Summary - Non-Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Bedrock Groundwater / Shower Air	Ipswich Aquifer Plume Core - Bedrock	**Volatile Organic Compounds**					
			1,2,4-Trichlorobenzene	Endocrine / Urinary	0.0037	0.12	0.0045	0.13
			1,2-Dichloroethane	Nervous System	0.065	0.44	0.0028	0.51
			1,4-Dichlorobenzene	Liver	0.00030	0.00019	0.00019	0.00068
			2,4,4-Trimethyl-1-pentene	Liver	0.042	0.092	0.088	0.22
			Benzene	Immune System	0.020	0.026	0.0026	0.049
			Bromodichloromethane	Kidney	0.00055	NC	0.000034	0.00058
			Chloroform	Liver	0.024	0.021	0.0019	0.047
			Cis-1,2-Dichloroethene	Kidney / General Toxicity / Liver	0.37	0.033	0.041	0.444
			Methylene chloride	Liver	0.014	0.0013	0.00046	0.016
			Trichloroethene	Cardiovascular / Kidney	7.3	15	1.1	23
			Vinyl chloride	Liver	0.020	0.0065	0.0013	0.028
			Semi-Volatile Organic Compounds					
			Benzo(a)pyrene	Developmental	0.023	NC	NC	0.023
			Diphenyl ether	Eye / Respiratory	NC	7.7	NC	7.7
			N-Nitrosodimethylamine	Developmental	100	NC	0.22	100
			Pentachlorophenol	Liver	0.0094	NC	0.036	0.045
			Metals					
			Antimony	Hematological / General Toxicity	1.5	NC	0.044	1.5
			Arsenic	Skin / Cardiovascular	0.93	NC	0.0041	0.93
			Chromium, Hexavalent	Undetermined	0.012	NC	0.0042	0.016
			Cobalt	Endocrine	85	NC	0.15	85
			Iron	GI System	3.1	NC	0.014	3.1
			Manganese	Nervous System	60	NC	6.6	67
			Nickel	General Toxicity	0.35	NC	0.0078	0.36
			Vanadium	Skin	0.098	NC	0.017	0.12
			Specialty Compounds					
			Dimethylformamide	Liver	0.010	0.00014	0.000011	0.010
			Formaldehyde	Kidney / GI System / General Toxicity / Eye / Respiratory	0.0032	0.0020	0.000041	0.0052
			Hydrazine	Liver	NC	0.0058	NC	0.0058
							Exposure Point Total =	291

Key

GI - Gastrointestinal

NA - Toxicity criteria are not available to quantitatively address this route of exposure.

NC - Not Calculated

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for significant routes of exposure for future child residents exposed to groundwater. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. Results presented use toxicity values and site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-21

OU3 Risk Characterization Summary - Carcinogens

Scenario Timeframe: Hypothetical Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Overburden Groundwater / Shower Air	Aberjona Aquifer Plume Core - Overburden	**Volatile Organic Compounds**					
			1,1-Dichloroethane	7.8E-08	5.4E-07	5.9E-09	NA	6.2E-07
			1,2,4-Trichlorobenzene	5.0E-07	NC	6.7E-07	NA	1.2E-06
			1,2-Dichloroethane	2.4E-06	1.5E-05	1.1E-07	NA	1.8E-05
			1,4-Dichlorobenzene	2.4E-08	1.0E-06	1.7E-08	NA	1.0E-06
			Benzene	8.0E-08	1.1E-06	1.2E-08	NA	1.2E-06
			Bromodichloromethane	9.6E-07	1.1E-05	6.6E-08	NA	1.2E-05
			Bromoform	5.7E-07	1.0E-06	4.0E-08	NA	1.6E-06
			Carbon tetrachloride	1.9E-06	3.4E-06	4.8E-07	NA	5.8E-06
			Chloroform	6.1E-07	1.0E-05	5.3E-08	NA	1.1E-05
			Dibromochloromethane	3.2E-06	1.3E-05	2.1E-07	NA	1.6E-05
			Ethylbenzene	2.1E-08	1.1E-07	1.2E-08	NA	1.4E-07
			Naphthalene	3.6E-07	1.6E-06	2.3E-07	NA	2.2E-06
			Trichloroethene	3.2E-07	6.7E-07	5.2E-08	NA	1.0E-06
			Semi-Volatile Organic Compounds					
			4-Bromophenyl phenyl ether	2.4E-07	NC	3.6E-07	NA	6.0E-07
			4-Chlorophenyl phenyl ether	1.2E-07	NC	1.8E-07	NA	3.0E-07
			Benzo(a)pyrene	2.2E-06	NC	NC	NA	2.2E-06
			Benzo(b)fluoranthene	2.6E-07	NC	NC	NA	2.6E-07
			Biphenyl	1.4E-07	NC	2.1E-07	NA	3.5E-07
			Bis(2-Ethylhexyl)phthalate	2.0E-07	NC	NC	NA	2.0E-07
			Dibenz(a,h)anthracene	1.7E-06	NC	NC	NA	1.7E-06
			N-Nitrosodimethylamine	3.1E-03	2.4E-04	7.7E-06	NA	3.3E-03
			N-Nitrosodiphenylamine	1.1E-06	NC	3.4E-07	NA	1.4E-06
			Metals					
			Arsenic	3.3E-04	NC	1.9E-06	NA	3.3E-04
			Chromium, Hexavalent	5.3E-06	NC	2.0E-06	NA	7.3E-06
			Specialty Compounds					
			Formaldehyde	NC	1.6E-07	NC	NA	1.6E-07
			Hydrazine	5.9E-03	1.4E-03	2.1E-06	NA	7.3E-03
			Monomethylhydrazine (MMH)	NC	1.6E-06	NC	NA	1.6E-06
							Exposure Risk Total =	1E-02

Table G-21

OU3 Risk Characterization Summary - Carcinogens

Scenario Timeframe: Hypothetical Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Bedrock Groundwater / Shower Air	Aberjona Aquifer Plume Core - Bedrock	**Volatile Organic Compounds**					
			1,1-Dichloroethane	1.9E-08	1.3E-07	1.4E-09	NA	1.5E-07
			1,2-Dichloroethane	2.6E-06	1.6E-05	1.2E-07	NA	1.9E-05
			Benzene	3.0E-07	4.1E-06	4.4E-08	NA	4.4E-06
			Bromodichloromethane	3.5E-06	4.0E-05	2.4E-07	NA	4.4E-05
			Bromoform	1.1E-06	2.0E-06	8.2E-08	NA	3.2E-06
			Chloroform	6.6E-06	1.1E-04	5.8E-07	NA	1.2E-04
			Dibromochloromethane	4.6E-06	1.9E-05	3.0E-07	NA	2.4E-05
			Ethylbenzene	7.3E-08	4.1E-07	4.3E-08	NA	5.3E-07
			Methylene chloride	8.9E-08	1.1E-08	3.2E-09	NA	1.0E-07
			Trichloroethene	2.8E-07	5.8E-07	4.5E-08	NA	9.1E-07
			Semi-Volatile Organic Compounds					
			Azobenzene	5.4E-07	1.9E-07	5.3E-07	NA	1.3E-06
			Bis(2-Ethylhexyl)phthalate	9.2E-07	NC	NC	NA	9.2E-07
			N-Nitrosodimethylamine	2.9E-03	2.3E-04	7.2E-06	NA	3.1E-03
			Metals					
			Arsenic	1.3E-04	NC	7.5E-07	NA	1.3E-04
			Specialty Compounds					
			Formaldehyde	NC	5.2E-07	NC	NA	5.2E-07
			Hydrazine	1.9E-06	4.6E-07	6.8E-10	NA	2.4E-06
							Exposure Risk Total =	4E-03
DAPL	DAPL / Shower Air	Site-Wide	**Volatile Organic Compounds**					
			1,2-Dichloroethane	1.3E-05	8.3E-05	6.2E-07	NA	9.7E-05
			1,4-Dichlorobenzene	3.5E-08	1.4E-06	2.4E-08	NA	1.5E-06
			Benzene	1.1E-06	1.6E-05	1.7E-07	NA	1.7E-05
			Bromodichloromethane	1.4E-06	1.6E-05	9.6E-08	NA	1.7E-05
			Bromoform	1.3E-06	2.3E-06	9.1E-08	NA	3.7E-06
			Chloroform	1.4E-05	2.3E-04	1.2E-06	NA	2.5E-04
			Dibromochloromethane	6.1E-05	2.5E-04	4.0E-06	NA	3.2E-04
			Ethylbenzene	3.3E-07	1.8E-06	1.9E-07	NA	2.3E-06
			Methylene chloride	6.0E-07	7.7E-08	2.2E-08	NA	7.0E-07
			Naphthalene	1.3E-05	6.1E-05	8.4E-06	NA	8.2E-05
			Trichloroethene	2.4E-05	4.9E-05	3.8E-06	NA	7.7E-05
			Vinyl chloride	4.6E-06	8.3E-07	3.5E-07	NA	5.8E-06
			Semi-Volatile Organic Compounds					
			4-Bromophenyl phenyl ether	5.8E-08	NC	8.7E-08	NA	1.5E-07
			4-Chloroaniline	1.5E-06	NC	9.8E-08	NA	1.6E-06
			Benzo(a)pyrene	5.1E-06	NC	NC	NA	5.1E-06
			Benzo(b)fluoranthene	8.7E-07	NC	NC	NA	8.7E-07
			Biphenyl	3.6E-07	NC	5.4E-07	NA	9.0E-07
			Dibenz(a,h)anthracene	1.5E-06	NC	NC	NA	1.5E-06
			Indeno(1,2,3-cd)pyrene	4.5E-07	NC	NC	NA	4.5E-07
			N-Nitrosodimethylamine	1.2E-02	9.0E-04	2.9E-05	NA	1.3E-02

Table G-21								
OU3 Risk Characterization Summary - Carcinogens								
Scenario Timeframe: Hypothetical Future **Receptor Population: Resident** **Receptor Age: Adult**								
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Carcinogenic Risk**				
				Ingestion	**Inhalation**	**Dermal**	**External (Radiation)**	**Exposure Routes Total**
			Metals					
			Arsenic	2.2E-03	NC	1.3E-05	NA	2.2E-03
			Chromium, Hexavalent	3.2E-04	NC	1.2E-04	NA	4.4E-04
			Specialty Compounds					
			Acetaldehyde	NC	8.0E-06	NC	NA	8.0E-06
			Formaldehyde	NC	1.1E-05	NC	NA	1.1E-05
			Hydrazine	4.4E-06	1.1E-06	1.6E-09	NA	5.5E-06
							Exposure Risk Total =	2E-02

Key

DAPL - Dense aqueous phase liquid

NA - Exposure route not applicable for this chemical/exposure medium.

NC - Not carcinogenic by this expsoure route.

This table provides risk estimates for the significant routes of exposure for the hypothetical future adult resident exposure to groundwater or DAPL. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of adult resident exposure to groundwater, as well as the toxicity of the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-22

OU3 Risk Characterization Summary - Non-Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Overburden Groundwater / Shower Air	Aberjona Aquifer Plume Core - Overburden	**Volatile Organic Compounds**					
			1,1-Dichloroethane	Kidney	0.00024	NC	0.000018	0.00026
			1,2,4-Trichlorobenzene	Endocrine / Urinary	0.0060	0.53	0.0081	0.54
			1,2,4-Trimethylbenzene	Nervous System	0.0010	0.0040	0.0012	0.0062
			1,2-Dichloroethane	Undetermined / Nervous System	0.015	0.29	0.00073	0.31
			1,4-Dichlorobenzene	Liver	0.00022	0.00040	0.00015	0.00077
			2,4,4-Trimethyl-1-pentene	Liver	0.39	2.4	0.90	3.7
			2,4,4-Trimethyl-2-pentene	Liver	0.12	0.73	0.28	1.1
			Benzene	Immune System	0.0046	0.017	0.00070	0.022
			Bromodichloromethane	Kidney	0.0027	NC	0.00019	0.0029
			Bromoform	Liver	0.013	NC	0.00090	0.014
			Carbon tetrachloride	Liver	0.023	0.020	0.0061	0.049
			Chloroform	Liver	0.0069	0.016	0.00060	0.024
			Dibromochloromethane	Liver	0.0066	0.02	0.00043	0.027
			Dibromomethane	Hematological	NC	0.53	NC	0.53
			Ethylbenzene	Liver / Kidney / Developmental	0.000066	0.00016	0.000038	0.00026
			Naphthalene	General Toxicity / Nervous System / Respiratory	0.00052	0.057	0.00033	0.058
			Toluene	Kidney / Nervous System	0.0014	0.00057	0.00046	0.0024
			Trichloroethene	Developmental / Immune System / Cardiovascular / Kidney	0.041	0.23	0.0065	0.28
			Xylene, o-	General Toxicity / Nervous System	0.000037	0.0018	0.000021	0.0019
			Semi-Volatile Organic Compounds					
			4-Bromophenyl phenyl ether	Respiratory / Liver / Kidney	0.00021	1.7	0.00032	1.7
			4-Chlorophenyl phenyl ether	Respiratory / Liver / Kidney	0.00010	2.0	0.00015	2.0
			Benzo(a)pyrene	Developmental	0.013	NC	NC	0.013
			Biphenyl	Respiratory / Liver / Kidney	0.00012	2.0	0.00018	2.0
			Bis(2-Ethylhexyl)phthalate	Liver	0.0025	NC	NC	0.0025
			Diphenyl ether	Eye / Respiratory	NC	24	NC	24
			N-Nitrosodimethylamine	Developmental	13	NC	0.033	13
			Metals					
			Aluminum	Nervous System	0.24	NC	0.0013	0.24
			Arsenic	Skin / Cardiovascular	2.6	NC	0.014	2.6
			Beryllium	GI System	0.031	NC	0.025	0.056
			Cadmium	Kidney	0.15	NC	0.017	0.17
			Chromium	Undetermined	0.022	NC	0.012	0.034
			Chromium, Hexavalent	Undetermined	0.0062	NC	0.0028	0.0090
			Cobalt	Endocrine	9.5	NC	0.021	9.5
			Copper	GI System	0.13	NC	0.00071	0.13
			Iron	GI System	1.3	NC	0.0074	1.3
			Manganese	Nervous System	4.3	NC	0.61	4.9
			Nickel	General Toxicity	0.13	NC	0.0038	0.13
			Silver	Skin	0.22	NC	0.018	0.24
			Thallium	Skin	2.3	NC	0.013	2.3
			Tin	Liver / Kidney	0.10	NC	0.00056	0.10
			Vanadium	Skin	0.40	NC	0.085	0.49
			Zinc	Immune System / Hematological	0.015	NC	0.000051	0.015
			Inorganics					
			Nitrate as N	Hematological	0.018	NC	0.00010	0.018
			Perchlorate	Endocrine	0.24	NC	0.0013	0.24
			Specialty Compounds					
			Dimethylformamide	Liver	0.01	0.00029	0.00	0.0078
			Formaldehyde	Kidney / GI System / General Toxicity / Eye / Respiratory	0.003	0.0043	0.000037	0.0068
			Hydrazine	Liver	NC	33	NC	33
			Monomethylhydrazine (MMH)	Developmental / Hematological / Liver	0.0093	0.28	0.000014	0.29
			UDMH	Eye / Reproductive	0.2	22	0.000	22
							Exposure Point Total =	127

Table G-22								
OU3 Risk Characterization Summary - Non-Carcinogens								
Scenario Timeframe: Future								
Receptor Population: Resident								
Receptor Age: Adult								
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Primary Target Organ**	**Non-Carcinogenic Hazard Quotient**			
					Ingestion	**Inhalation**	**Dermal**	**Exposure Routes Total**
Groundwater	Bedrock Groundwater / Shower Air	Aberjona Aquifer Plume Core - Bedrock	**Volatile Organic Compounds**					
			1,1-Dichloroethane	Kidney	0.000057	NC	0.0000043	0.000061
			1,2-Dichloroethane	Undetermined / Nervous System	0.016	0.31	0.00078	0.33
			2,4,4-Trimethyl-1-pentene	Liver	0.18	1.1	0.41	1.7
			2,4,4-Trimethyl-2-pentene	Liver	0.054	0.33	0.12	0.50
			Benzene	Immune System	0.017	0.062	0.0026	0.082
			Bromodichloromethane	Kidney	0.0099	NC	0.00068	0.011
			Bromoform	Liver	0.025	NC	0.0018	0.027
			Chloroform	Liver	0.075	0.17	0.0066	0.25
			Dibromochloromethane	Liver	0.0096	0.030	0.00063	0.040
			Dibromomethane	Hematological	NC	1.1	NC	1.1
			Ethylbenzene	Liver / Kidney / Developmental	0.00023	0.00057	0.00014	0.00094
			Methylene chloride	Liver	0.013	0.0033	0.00047	0.017
			Toluene	Kidney / Nervous System	0.0024	0.00096	0.00079	0.0042
			Trichloroethene	Developmental / Immune System/ Cardiovascular / Kidney	0.035	0.20	0.0057	0.24
			Xylene, o	General Toxicity / Nervous System	0.000030	0.0014	0.000017	0.0014
			Semi-Volatile Organic Compounds					
			Bis(2-Ethylhexyl)phthalate	Liver	0.012	NC	NC	0.012
			Diphenyl ether	Eye / Respiratory	NC	3.3	NC	3.3
			N-Nitrosodimethylamine	Developmental	13	NC	0.031	13
			Metals					
			Aluminum	Nervous System	3.6	NC	0.020	3.6
			Antimony	Hematological / General Toxicity	0.38	NC	0.014	0.39
			Arsenic	Skin / Cardiovascular	1.0	NC	0.0058	1.0
			Beryllium	GI System	0.21	NC	0.17	0.38
			Cadmium	Kidney	0.72	NC	0.080	0.80
			Chromium	Undetermined	0.56	NC	0.31	0.87
			Cobalt	Endocrine	78	NC	0.17	78
			Copper	GI System	0.17	NC	0.00096	0.17
			Iron	GI System	12	NC	0.065	12
			Manganese	Nervous System	27	NC	3.8	31
			Nickel	General Toxicity	1.2	NC	0.034	1.2
			Silver	Skin	2.9	NC	0.25	3.2
			Thallium	Skin	3.9	NC	0.022	3.9
			Zinc	Immune System / Hematological	2.5	NC	0.0084	2.5
			Inorganics					
			Perchlorate	Endocrine	0.43	NC	0.0024	0.43
			Specialty Compounds					
			Dimethylformamide	Liver	0.0099	0.00038	0.000013	0.010
			Formaldehyde	Kidney / GI System / General Toxicity	0.0084	0.014	0.00012	0.023
			Hydrazine	Liver	NA	0.011	NA	0.011
							Exposure Point Total =	160

Table G-22

OU3 Risk Characterization Summary - Non-Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
DAPL	DAPL / Shower Air	Site-Wide	**Volatile Organic Compounds**					
			1,2,4-Trimethylbenzene	Nervous System	0.010	0.040	0.011	0.061
			1,2-Dichloroethane	Undetermined / Nervous System	0.085	1.6	0.0040	1.7
			1,4-Dichlorobenzene	Liver	0.00032	0.00057	0.00022	0.0011
			2,4,4-Trimethyl-1-pentene	Liver	0.050	0.30	0.12	0.47
			2,4,4-Trimethyl-2-pentene	Liver	0.039	0.24	0.090	0.37
			Benzene	Immune System	0.067	0.24	0.010	0.32
			Bromodichloromethane	Kidney	0.0039	NC	0.00027	0.0042
			Bromoform	Liver	0.028	NC	0.0020	0.030
			Chloroform	Liver	0.15	0.36	0.013	0.52
			Cis-1,2-Dichloroethene	Kidney / General Toxicity / Liver	0.10	0.025	0.013	0.14
			Dibromochloromethane	Liver	0.13	0.39	0.0083	0.53
			Dibromomethane	Hematological	NC	1.1	NC	1.1
			Ethylbenzene	Liver / Kidney / Developmental	0.0010	0.0025	0.00060	0.0041
			Methylene chloride	Liver	0.087	0.022	0.0032	0.11
			Naphthalene	General Toxicity / Nervous System / Respiratory	0.019	2.1	0.012	2.1
			Toluene	Kidney / Nervous System	0.033	0.013	0.011	0.057
			Trichloroethene	Developmental / Immune System /Cardiovascular / Kidney	3.0	17	0.48	20
			Vinyl chloride	Liver	0.0037	0.0033	0.00029	0.0073
			Semi-Volatile Organic Compounds					
			4-Bromophenyl phenyl ether	Respiratory / Liver / Kidney	0.000050	0.41	0.000076	0.41
			4-Chloroaniline	Immune System	0.0064	NC	0.00043	0.0068
			Benzo(a)pyrene	Developmental	0.030	NC	NC	0.030
			Biphenyl	Respiratory / Liver / Kidney	0.00031	5.2	0.00048	5.2
			Diphenyl ether	Eye / Respiratory	NC	15	NC	15
			N-Nitrosodimethylamine	Developmental	50	NC	0.12	50
			Phthalic acid	Urinary	0.072	NC	0.0049	0.077
			Petroleum Hydrocarbons					
			C9-C10 Aromatics	Respiratory	0.011	0.24	0.011	0.3
			Metals					
			Aluminum	Nervous System	57	NC	0.32	57
			Arsenic	Skin / Cardiovascular	17	NC	0.098	17
			Barium	Urinary	0.16	NC	0.013	0.17
			Beryllium	GI System	1.5	NC	1.2	2.7
			Cadmium	Kidney	4.0	NC	0.44	4.4
			Chromium	Undetermined	46	NC	26	72
			Chromium, Hexavalent	Undetermined	0.37	NC	0.17	0.54
			Cobalt	Endocrine	573	NC	1.3	574
			Copper	GI System	3.5	NC	0.020	3.5
			Iron	GI System	141	NC	0.79	142
			Manganese	Nervous System	212	NC	30	242
			Mercury	Immune System / Urinary	0.31	NC	0.025	0.34
			Nickel	General Toxicity	7.3	NC	0.20	7.5
			Silver	Skin	61	NC	5.1	66
			Thallium	Skin	17	NC	0.10	17
			Tin	Liver / Kidney	44	NC	0.25	44
			Vanadium	Skin	1.5	NC	0.32	1.8
			Zinc	Immune System / Hematological	0.88	NC	0.0029	0.88
			Inorganics, Total					
			Nitrate as N	Hematological	0.23	NC	0.0013	0.23
			Nitrite as N	Hematological	0.30	NC	0.0017	0.30
			Perchlorate	Endocrine	0.60	NC	0.0033	0.60
			Specialty Compounds					
			Acetaldehyde	Nervous System / Respiratory	NC	1.4	NC	1.4
			Dimethylformamide	Liver	0.075	0.0029	0.000096	0.078
			Formaldehyde	Kidney / GI System / General Toxicity / Eye / Respiratory	0.19	0.31	0.0027	0.50
			Hydrazine	Liver	NC	0.025	NC	0.025
			UDMH	Eye / Reproductive	18	1933	0.012	1951
							Exposure Point Total =	3307

Table G-22								
OU3 Risk Characterization Summary - Non-Carcinogens								
Scenario Timeframe: Future **Receptor Population: Resident** **Receptor Age: Adult**								
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Primary Target Organ**	**Non-Carcinogenic Hazard Quotient**			
					Ingestion	**Inhalation**	**Dermal**	**Exposure Routes Total**

Key

DAPL - Dense aqueous phase liquid

GI - Gastrointestinal

NA - Toxicity criteria are not available to quantitatively address this route of exposure.

NC - Not Calculated

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for significant routes of exposure for hypothetical future adult residents exposed to groundwater or DAPL. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. Results presented use toxicity values and site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-23

OU3 Risk Characterization Summary - Carcinogens

Scenario Timeframe: Hypothetical Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Overburden Groundwater / Shower Air	Aberjona Aquifer Plume Core - Overburden	**Volatile Organic Compounds**					
			1,1-Dichloroethane	3.9E-08	9.8E-08	2.7E-09	NA	1.4E-07
			1,2,4-Trichlorobenzene	2.5E-07	NC	3.0E-07	NA	5.5E-07
			1,2-Dichloroethane	1.2E-06	2.8E-06	5.2E-08	NA	4.1E-06
			1,4-Dichlorobenzene	1.2E-08	1.8E-07	7.5E-09	NA	2.0E-07
			Benzene	4.0E-08	2.0E-07	5.3E-09	NA	2.5E-07
			Bromodichloromethane	4.8E-07	2.0E-06	3.0E-08	NA	2.5E-06
			Bromoform	2.8E-07	1.8E-07	1.8E-08	NA	4.8E-07
			Carbon tetrachloride	9.3E-07	6.2E-07	2.2E-07	NA	1.8E-06
			Chloroform	3.0E-07	1.9E-06	2.4E-08	NA	2.2E-06
			Dibromochloromethane	1.6E-06	2.4E-06	9.4E-08	NA	4.1E-06
			Ethylbenzene	1.0E-08	2.1E-08	5.4E-09	NA	3.6E-08
			Naphthalene	1.8E-07	3.0E-07	1.0E-07	NA	5.8E-07
			Trichloroethene	2.5E-07	2.0E-07	3.6E-08	NA	4.9E-07
			Semi-Volatile Organic Compounds					
			4-Bromophenyl phenyl ether	1.2E-07	NC	1.6E-07	NA	2.8E-07
			4-Chlorophenyl phenyl ether	5.8E-08	NC	8.0E-08	NA	1.4E-07
			Benzo(a)pyrene	2.9E-06	NC	NC	NA	2.9E-06
			Benzo(b)fluoranthene	3.4E-07	NC	NC	NA	3.4E-07
			Biphenyl	6.9E-08	NC	9.5E-08	NA	1.6E-07
			Bis(2-Ethylhexyl)phthalate	1.0E-07	NC	NC	NA	1.0E-07
			Dibenz(a,h)anthracene	2.3E-06	NC	NC	NA	2.3E-06
			N-Nitrosodimethylamine	4.1E-03	1.2E-04	8.9E-06	NA	4.2E-03
			N-Nitrosodiphenylamine	5.4E-07	NC	1.5E-07	NA	6.9E-07
			Metals					
			Arsenic	1.7E-04	NC	7.3E-07	NA	1.7E-04
			Chromium, Hexavalent	7.0E-06	NC	2.1E-06	NA	9.1E-06
			Specialty Compounds					
			Formaldehyde	NC	2.8E-08	NC	NA	2.8E-08
			Hydrazine	2.9E-03	2.5E-04	9.0E-07	NA	3.2E-03
			Monomethylhydrazine (MMH)	NC	2.8E-07	NC	NA	2.8E-07
							Exposure Risk Total =	8E-03

Table G-23

OU3 Risk Characterization Summary - Carcinogens

Scenario Timeframe: Hypothetical Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Bedrock Groundwater / Shower Air	Aberjona Aquifer Plume Core - Bedrock	**Volatile Organic Compounds**					
			1,1-Dichloroethane	9.3E-09	2.3E-08	6.4E-10	NA	3.3E-08
			1,2-Dichloroethane	1.3E-06	2.9E-06	5.5E-08	NA	4.3E-06
			Benzene	1.5E-07	7.5E-07	2.0E-08	NA	9.2E-07
			Bromodichloromethane	1.7E-06	7.3E-06	1.1E-07	NA	9.1E-06
			Bromoform	5.7E-07	3.7E-07	3.7E-08	NA	9.8E-07
			Chloroform	3.3E-06	2.0E-05	2.6E-07	NA	2.4E-05
			Dibromochloromethane	2.3E-06	3.5E-06	1.4E-07	NA	5.9E-06
			Ethylbenzene	3.7E-08	7.3E-08	1.9E-08	NA	1.3E-07
			Methylene chloride	1.2E-07	5.5E-09	3.9E-09	NA	1.3E-07
			Trichloroethene	2.2E-07	1.7E-07	3.2E-08	NA	4.2E-07
			Semi-Volatile Organic Compounds					
			Azobenzene	2.7E-07	3.5E-08	2.4E-07	NA	5.5E-07
			Bis(2-Ethylhexyl)phthalate	4.6E-07	NC	NC	NA	4.6E-07
			N-Nitrosodimethylamine	3.9E-03	1.1E-04	8.4E-06	NA	4.0E-03
			Metals					
			Arsenic	6.7E-05	NC	3.0E-07	NA	6.7E-05
			Specialty Compounds					
			Formaldehyde	NC	9.3E-08	NC	NA	9.3E-08
			Hydrazine	9.6E-07	8.2E-08	2.9E-10	NA	1.0E-06
							Exposure Risk Total =	4E-03
DAPL	DAPL / Shower Air	Site-Wide	**Volatile Organic Compounds**					
			1,2-Dichloroethane	6.6E-06	1.5E-05	2.8E-07	NA	2.2E-05
			1,4-Dichlorobenzene	1.7E-08	2.6E-07	1.1E-08	NA	2.9E-07
			Benzene	5.7E-07	2.9E-06	7.6E-08	NA	3.5E-06
			Bromodichloromethane	7.0E-07	2.9E-06	4.3E-08	NA	3.6E-06
			Bromoform	6.4E-07	4.1E-07	4.1E-08	NA	1.1E-06
			Chloroform	6.8E-06	4.1E-05	5.4E-07	NA	4.8E-05
			Dibromochloromethane	3.0E-05	4.6E-05	1.8E-06	NA	7.8E-05
			Ethylbenzene	1.6E-07	3.3E-07	8.6E-08	NA	5.8E-07
			Methylene chloride	7.9E-07	3.7E-08	2.6E-08	NA	8.5E-07
			Naphthalene	6.7E-06	1.1E-05	3.8E-06	NA	2.2E-05
			Trichloroethene	1.9E-05	1.5E-05	2.7E-06	NA	3.7E-05
			Vinyl chloride	6.0E-06	4.0E-07	4.1E-07	NA	6.8E-06
			Semi-Volatile Organic Compounds					
			4-Bromophenyl phenyl ether	2.9E-08	NC	3.9E-08	NA	6.8E-08
			4-Chloroaniline	7.3E-07	NC	4.4E-08	NA	7.7E-07
			Benzo(a)pyrene	6.8E-06	NC	NC	NA	6.8E-06
			Benzo(b)fluoranthene	1.2E-06	NC	NC	NA	1.2E-06
			Biphenyl	1.8E-07	NC	2.5E-07	NA	4.3E-07
			Dibenz(a,h)anthracene	1.9E-06	NC	NC	NA	1.9E-06
			Indeno(1,2,3-cd)pyrene	5.9E-07	NC	NC	NA	5.9E-07
			N-Nitrosodimethylamine	1.5E-02	4.3E-04	3.3E-05	NA	1.5E-02

Table G-23

OU3 Risk Characterization Summary - Carcinogens

Scenario Timeframe: Hypothetical Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
			Metals					
			Arsenic	1.1E-03	NC	4.9E-06	NA	1.1E-03
			Chromium, Hexavalent	4.2E-04	NC	1.2E-04	NA	5.4E-04
			Specialty Compounds					
			Acetaldehyde	NC	1.4E-06	NC	NA	1.4E-06
			Formaldehyde	NC	2.1E-06	NC	NA	2.1E-06
			Hydrazine	2.2E-06	1.9E-07	6.8E-10	NA	2.4E-06
							Exposure Risk Total =	2E-02

Key

DAPL - Dense aqueous phase liquid

NA - Exposure route not applicable for this chemical/exposure medium.

NC - Not carcinogenic by this expsoure route.

This table provides risk estimates for the significant routes of exposure for the hypothetical child resident exposed to groundwater or DAPL. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of child resident exposure, as well as the toxicity of the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-24

OU3 Risk Characterization Summary - Non-Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Overburden Groundwater / Shower Air	Aberjona Aquifer Plume Core - Overburden	**Volatile Organic Compounds**					
			1,1-Dichloroethane	Kidney	0.00040	NC	0.000027	0.00043
			1,2,4-Trichlorobenzene	Endocrine / Urinary	0.010	0.32	0.012	0.34
			1,2,4-Trimethylbenzene	Nervous System	0.0017	0.0024	0.0017	0.0058
			1,2-Dichloroethane	Undetermined / Nervous System	0.026	0.18	0.0011	0.21
			1,4-Dichlorobenzene	Liver	0.00037	0.00024	0.00023	0.00084
			2,4,4-Trimethyl-1-pentene	Liver	0.65	1.4	1.4	3.5
			2,4,4-Trimethyl-2-pentene	Liver	0.20	0.44	0.42	1.1
			Benzene	Immune System	0.0077	0.010	0.0010	0.019
			Bromodichloromethane	Kidney	0.0045	NC	0.00028	0.0048
			Bromoform	Liver	0.021	NC	0.0013	0.022
			Carbon tetrachloride	Liver	0.039	0.012	0.0091	0.060
			Chloroform	Liver	0.011	0.0096	0.00091	0.022
			Dibromochloromethane	Liver	0.011	0.01	0.00065	0.022
			Dibromomethane	Hematological	NC	0.32	NC	0.32
			Ethylbenzene	Liver / Kidney / Developmental	0.00011	0.000097	0.000058	0.00027
			Naphthalene	General Toxicity / Nervous System / Respiratory	0.00087	0.034	0.00050	0.035
			Toluene	Kidney / Nervous System	0.0023	0.00034	0.00070	0.0033
			Trichloroethene	Developmental / Immune System /Cardiovascular / Kidney	0.068	0.14	0.0099	0.218
			Xylene, o-	General Toxicity	0.000062	0.0011	0.000031	0.0012
			Semi-Volatile Organic Compounds					
			4-Bromophenyl phenyl ether	Respiratory / Liver / Kidney	0.00035	1.0	0.00048	1.0
			4-Chlorophenyl phenyl ether	Respiratory / Liver / Kidney	0.00017	1.2	0.00023	1.2
			Benzo(a)pyrene	Developmental	0.022	NC	NC	0.022
			Biphenyl	Respiratory / Liver / Kidney	0.00020	1.2	0.00028	1.2
			Bis(2-Ethylhexyl)phthalate	Liver	0.0042	NC	NC	0.0042
			Diphenyl ether	Eye / Respiratory	NC	14	NC	14
			N-Nitrosodimethylamine	Developmental	22	NC	0.048	22
			Metals					
			Aluminum	Nervous System	0.40	NC	0.0018	0.40
			Arsenic	Skin / Cardiovascular	4.3	NC	0.019	4.3
			Beryllium	GI System	0.052	NC	0.032	0.084
			Cadmium	Kidney	0.25	NC	0.022	0.27
			Chromium	Undetermined	0.036	NC	0.016	0.052
			Chromium, Hexavalent	Undetermined	0.010	NC	0.0036	0.014
			Cobalt	Endocrine	16	NC	0.028	16
			Copper	GI System	0.21	NC	0.00093	0.21
			Iron	GI System	2.2	NC	0.0097	2.2
			Manganese	Nervous System	7.2	NC	0.80	8.0
			Nickel	General Toxicity	0.22	NC	0.0049	0.22
			Silver	Skin	0.36	NC	0.024	0.38
			Thallium	Skin	3.8	NC	0.017	3.8
			Tin	Liver / Kidney	0.17	NC	0.00073	0.17
			Vanadium	Skin	0.66	NC	0.11	0.77
			Zinc	Immune System / Hematological	0.025	NC	0.000067	0.025
			Inorganics					
			Nitrate as N	Hematological	0.030	NC	0.00013	0.030
			Perchlorate	Endocrine	0.39	NC	0.0017	0.39
			Specialty Compounds					
			Dimethylformamide	Liver	0.012	0.00018	0.000014	0.012
			Formaldehyde	Kidney / GI System / General Toxicity / Eye / Respiratory	0.0042	0.0026	0.000053	0.0069
			Hydrazine	Liver	NA	20	NA	20
			Monomethylhydrazine (MMH)	Developmental / Hematological / Liver	0.015	0.17	0.000020	0.19
			UDMH	Eye / Reproductive	0.34	13	0.00020	13
							Exposure Point Total =	117

Table G-24

OU3 Risk Characterization Summary - Non-Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Bedrock Groundwater / Shower Air	Aberjona Aquifer Plume Core - Bedrock	**Volatile Organic Compounds**					
			1,1-Dichloroethane	Kidney	0.000095	NC	0.0000065	0.00010
			1,2-Dichloroethane	Undetermined / Nervous System	0.027	0.19	0.0012	0.218
			2,4,4-Trimethyl-1-pentene	Liver	0.29	0.65	0.62	1.56
			2,4,4-Trimethyl-2-pentene	Liver	0.090	0.20	0.19	0.48
			Benzene	Immune System	0.029	0.037	0.0038	0.070
			Bromodichloromethane	Kidney	0.016	NC	0.0010	0.017
			Bromoform	Liver	0.042	NC	0.0027	0.045
			Chloroform	Liver	0.12	0.10	0.0099	0.23
			Dibromochloromethane	Liver	0.016	0.018	0.00095	0.035
			Dibromomethane	Hematological	NC	0.64	NC	0.640
			Ethylbenzene	Liver / Kidney / Developmental	0.00039	0.00034	0.00020	0.00093
			Methylene chloride	Liver	0.022	0.0020	0.00071	0.025
			Toluene	Kidney / Nervous System	0.0039	0.00058	0.0012	0.0057
			Trichloroethene	Developmental / Immune System / Cardiovascular / Kidney	0.059	0.12	0.0086	0.188
			Xylene, o	General Toxicity / Nervous System	0.000050	0.00087	0.000025	0.000945
			Semi-Volatile Organic Compounds					0
			Bis(2-Ethylhexyl)phthalate	Liver	0.019	NC	NC	0.019
			Diphenyl ether	Eye / Respiratory	NC	2.0	NC	2.000
			N-Nitrosodimethylamine	Developmental	21	NC	0.045	21
			Metals					0
			Aluminum	Nervous System	6.0	NC	0.026	6.0
			Antimony	Hematological / General Toxicity	0.64	NC	0.019	0.66
			Arsenic	Skin / Cardiovascular	1.7	NC	0.0077	1.7
			Beryllium	GI System	0.35	NC	0.22	0.57
			Cadmium	Kidney	1.2	NC	0.11	1.3
			Chromium	Undetermined	0.93	NC	0.41	1.3
			Cobalt	Endocrine	130	NC	0.23	130
			Copper	GI System	0.29	NC	0.0013	0.29
			Iron	GI System	19	NC	0.085	19
			Manganese	Nervous System	46	NC	5.0	51
			Nickel	General Toxicity	2.0	NC	0.044	2.0
			Silver	Skin	4.9	NC	0.32	5.2
			Thallium	Skin	6.5	NC	0.029	6.5
			Zinc	Immune System / Hematological	4.2	NC	0.011	4.2
			Inorganics					0
			Perchlorate	Endocrine	0.71	NC	0.0031	0.71
			Specialty Compounds					0
			Dimethylformamide	Liver	0.016	0.00023	0.000018	0.016
			Formaldehyde	Kidney / GI System / General Toxicity / Eye / Respiratory	0.014	0.0085	0.00018	0.023
			Hydrazine	Liver	NC	0.0065	NC	0.007
							Exposure Point Total =	257

Table G-24

OU3 Risk Characterization Summary - Non-Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
DAPL	DAPL / Shower Air	Site-Wide	**Volatile Organic Compounds**					
			1,2,4-Trimethylbenzene	Nervous System	0.017	0.024	0.017	0.058
			1,2-Dichloroethane	Undetermined / Nervous System	0.14	0.97	0.0060	1.12
			1,4-Dichlorobenzene	Liver	0.00053	0.00034	0.00034	0.0012
			2,4,4-Trimethyl-1-pentene	Liver	0.083	0.18	0.17	0.43
			2,4,4-Trimethyl-2-pentene	Liver	0.065	0.14	0.14	0.35
			Benzene	Immune System	0.11	0.14	0.015	0.27
			Bromodichloromethane	Kidney	0.0065	NC	0.00041	0.0069
			Bromoform	Liver	0.047	NC	0.0031	0.050
			Chloroform	Liver	0.26	0.21	0.020	0.49
			Cis-1,2-Dichloroethene	Kidney / General Toxicity / Liver	0.17	0.015	0.019	0.20
			Dibromochloromethane	Liver	0.21	0.24	0.013	0.46
			Dibromomethane	Liver / Hematological	NC	0.64	NC	0.64
			Ethylbenzene	Liver / Kidney / Developmental	0.0017	0.0015	0.00091	0.0041
			Methylene chloride	Liver	0.15	0.013	0.0048	0.17
			Naphthalene	General Toxicity / Nervous System / Respiratory	0.032	1.3	0.019	1.4
			Toluene	Kidney / Nervous System	0.055	0.0081	0.017	0.080
			Trichloroethene	Developmental / Immune System /Cardiovascular / Kidney	5.0	10	0.73	16
			Vinyl chloride	Liver	0.0061	0.0020	0.00041	0.0085
			Semi-Volatile Organic Compounds					
			4-Bromophenyl phenyl ether	Respiratory / Liver / Kidney	0.000084	0.25	0.00011	0.25
			4-Chloroaniline	Immune System	0.011	NC	0.00064	0.012
			Benzo(a)pyrene	Developmental	0.050	NC	NC	0.050
			Biphenyl	Respiratory / Liver / Kidney	0.00052	3.1	0.00072	3.1
			Diphenyl ether	Eye / Respiratory	NC	8.8	NC	8.8
			N-Nitrosodimethylamine	Developmental	83	NC	0.18	83
			Phthalic acid	Urinary	0.12	NC	0.0073	0.13
			Petroleum Hydrocarbons					
			C9-C10 Aromatics	Respiratory	0.019	0.15	0.017	0.19
			Metals					
			Aluminum	Nervous System	95	NC	0.42	95
			Arsenic	Skin / Cardiovascular	29	NC	0.13	29
			Barium	Urinary	0.27	NC	0.017	0.29
			Beryllium	GI System	2.5	NC	1.6	4.1
			Cadmium	Kidney	6.6	NC	0.58	7.2
			Chromium	Undetermined	76	NC	34	110
			Chromium, Hexavalent	Undetermined	0.61	NC	0.22	0.83
			Cobalt	Endocrine	953	NC	1.7	955
			Copper	GI System	5.9	NC	0.026	5.9
			Iron	GI System	235	NC	1.0	236
			Manganese	Nervous System	352	NC	39	391
			Mercury	Immune System / Urinary	0.52	NC	0.032	0.55
			Nickel	General Toxicity	12	NC	0.27	12
			Silver	Skin	102	NC	6.7	109
			Thallium	Skin	28	NC	0.13	28
			Tin	Liver / Kidney	73	NC	0.32	73
			Vanadium	Skin	2.5	NC	0.42	2.9
			Zinc	Immune System / Hematological	1.5	NC	0.0039	1.5
			Inorganics					
			Nitrate as N	Hematological	0.39	NC	0.0017	0.39
			Nitrite as N	Hematological	0.50	NC	0.0022	0.50
			Perchlorate	Endocrine	1.0	NC	0.0044	1.0
			Specialty Compounds					
			Acetaldehyde	Nervous System / Respiratory	NC	0.85	NC	0.85
			Dimethylformamide	Liver	0.12	0.0018	0.00014	0.12
			Formaldehyde	Kidney / GI System / General Toxicity / Eye / Respiratory	0.31	0.19	0.0039	0.50
			Hydrazine	Liver	NC	0.015	NC	0.02
			UDMH	Eye / Reproductive	31	1164	0.018	1195
							Exposure Point Total =	3379

Table G-24
Key
DAPL - Dense aqueous phase liquid
GI - Gastrointestinal
NA - Toxicity criteria are not available to quantitatively address this route of exposure.
NC - Not Calculated
This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for significant routes of exposure for hypothetical future child residents exposed to groundwater or DAPL. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. Results presented use toxicity values and site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-25

OU3 Risk Characterization Summary - Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Groundwater / Excavation Air	Shallow Overburden Groundwater - Plant B	**Volatile Organic Compounds**					
			1,4-Dichlorobenzene	3.3E-12	5.4E-08	3.5E-10	NA	5.4E-08
			Benzene	2.3E-11	1.9E-07	6.0E-10	NA	1.9E-07
			Ethylbenzene	8.7E-11	2.3E-07	8.1E-09	NA	2.4E-07
			Methyl Tertbutyl Ether	4.3E-11	7.0E-08	NC	NA	7.0E-08
			Naphthalene	1.0E-09	2.1E-06	1.0E-07	NA	2.2E-06
			Semi-Volatile Organic Compounds					
			2,6-Dinitrotoluene	8.7E-09	NC	9.3E-08	NA	1.0E-07
			Biphenyl	1.3E-10	NC	3.1E-08	NA	3.1E-08
			Bis(2-Ethylhexyl)phthalate	2.3E-10	NC	NC	NA	2.3E-10
			N-Nitrosodimethylamine	9.3E-10	5.1E-08	4.2E-10	NA	5.2E-08
			N-Nitrosodiphenylamine	2.0E-10	NC	NC	NA	2.0E-10
			Metals					
			Arsenic	6.6E-09	NC	8.9E-09	NA	1.6E-08
			Chromium, Hexavalent	2.2E-10	NC	1.8E-11	NA	2.4E-10
							Exposure Risk Total =	3E-06
Groundwater	Groundwater / Excavation Air	Shallow Overburden - On-Property	**Volatile Organic Compounds**					
			1,2,4-Trichlorobenzene	1.2E-11	NC	2.5E-09	NA	2.5E-09
			1,2-Dichloroethane	5.5E-11	1.8E-07	4.5E-10	NA	1.8E-07
			Bromodichloromethane	6.8E-11	2.9E-07	7.1E-10	NA	2.9E-07
			Bromoform	4.1E-11	2.2E-08	4.3E-10	NA	2.2E-08
			Dibromochloromethane	2.3E-10	3.1E-07	2.2E-09	NA	3.1E-07
			Methylene chloride	2.3E-11	1.6E-09	1.5E-10	NA	1.8E-09
			Naphthalene	2.6E-11	5.3E-08	2.5E-09	NA	5.6E-08
			Trichloroethene	1.5E-11	1.3E-08	3.9E-10	NA	1.3E-08
			Semi-Volatile Organic Compounds					
			2,6-Dinitrotoluene	5.8E-10	NC	6.2E-09	NA	6.8E-09
			4-Bromophenyl phenyl ether	1.0E-11	NC	2.4E-09	NA	2.4E-09
			Benzo(a)pyrene	9.2E-11	NC	NC	NA	9.2E-11
			Benzo(b)fluoranthene	1.8E-11	NC	NC	NA	1.8E-11
			Biphenyl	7.3E-12	NC	1.7E-09	NA	1.7E-09
			Dibenz(a,h)anthracene	1.7E-10	NC	NC	NA	1.7E-10
			Indeno(1,2,3-cd)pyrene	1.8E-11	NC	NC	NA	1.8E-11
			N-Nitrosodimethylamine	1.9E-08	1.1E-06	8.7E-09	NA	1.1E-06
			N-Nitrosodiphenylamine	8.5E-12	NC	NC	NA	8.5E-12
			Metals					0.0E+00
			Arsenic	6.7E-09	NC	9.0E-09	NA	1.6E-08
			Chromium, Hexavalent	2.5E-10	NC	2.1E-11	NA	2.7E-10
			Specialty Compounds					
			Formaldehyde	NC	1.2E-08	NC	NA	1.2E-08
			Hydrazine	5.8E-08	1.5E-05	NC	NA	1.5E-05
			Monomethylhydrazine (MMH)	NC	1.0E-07	NC	NA	1.0E-07
							Exposure Risk Total =	2E-05

Table G-25

OU3 Risk Characterization Summary - Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Groundwater / Excavation Air	Shallow Overburden - Off-Property	**Volatile Organic Compounds**					
			1,1-Dichloroethane	3.3E-12	1.1E-08	4.3E-11	NA	1.1E-08
			1,4-Dichlorobenzene	1.7E-11	2.8E-07	1.8E-09	NA	2.8E-07
			1,4-Dioxane	5.2E-09	1.1E-07	3.2E-09	NA	1.2E-07
			Benzene	5.1E-10	4.2E-06	1.4E-08	NA	4.2E-06
			Chloroform	1.1E-11	7.9E-08	1.5E-10	NA	7.9E-08
			Ethylbenzene	4.2E-10	1.1E-06	3.9E-08	NA	1.1E-06
			Methylene chloride	1.7E-11	1.2E-09	1.1E-10	NA	1.3E-09
			Naphthalene	2.1E-10	4.2E-07	2.0E-08	NA	4.4E-07
			Trichloroethene	2.3E-11	2.0E-08	5.9E-10	NA	2.1E-08
			Vinyl chloride	3.3E-10	4.1E-08	4.8E-09	NA	4.6E-08
			Semi-Volatile Organic Compounds					
			Atrazine	1.3E-10	NC	2.5E-09	NA	2.6E-09
			Benzo(a)anthracene	1.5E-11	3.6E-09	1.5E-11	NA	3.6E-09
			Benzo(a)pyrene	1.1E-10	NC	1.1E-10	NA	2.2E-10
			Benzo(b)fluoranthene	1.7E-11	NC	1.7E-11	NA	3.4E-11
			Bis(2-Ethylhexyl)phthalate	6.7E-12	NC	6.7E-12	NA	1.3E-11
			Dibenz(a,h)anthracene	1.2E-10	NC	1.2E-10	NA	2.4E-10
			Indeno(1,2,3-cd)pyrene	1.5E-11	NC	1.5E-11	NA	3.0E-11
			N-Nitrosodimethylamine	3.3E-10	1.8E-08	4.8E-10	NA	1.9E-08
			Metals					
			Arsenic	1.4E-08	NC	1.8E-08	NA	3.2E-08
			Chromium, Hexavalent	3.4E-10	NC	2.8E-11	NA	3.7E-10
			Specialty Compounds					
			Formaldehyde	NC	1.2E-08	NC	NA	1.2E-08
			Hydrazine	9.9E-11	2.5E-08	9.9E-11	NA	2.5E-08
							Exposure Risk Total =	6E-06

Key

NA - Exposure route not applicable for this chemical/exposure medium.

NC - Not carcinogenic by this expsoure route.

This table provides risk estimates for the significant routes of exposure for the hypothetical future adult construction worker exposure to groundwater. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of construction worker exposure to groundwater, as well as the toxicity of the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-26								
OU3 Risk Characterization Summary - Non-Carcinogens								
Scenario Timeframe: Future								
Receptor Population: Construction Worker								
Receptor Age: Adult								
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Primary Target Organ**	**Non-Carcinogenic Hazard Quotient**			
					Ingestion	**Inhalation**	**Dermal**	**Exposure Routes Total**
Groundwater	Groundwater / Excavation Air	Shallow Overburden - Plant B	**Volatile Organic Compounds**					
			1,4-Dichlorobenzene	Liver	0.00000061	0.00029	0.000065	0.00036
			2,4,4-Trimethyl-1-pentene	Liver	0.00037	1.0	1.3	2.3
			2,4,4-Trimethyl-2-pentene	Liver	0.00013	0.36	0.44	0.80
			Benzene	Hematological	0.000011	0.021	0.00071	0.022
			Ethylbenzene	Liver / Nervous System	0.000011	0.00072	0.00051	0.0012
			Naphthalene	Developmental / Nervous System / Respiratory	0.0000010	1.5	0.0029	1.5
			Xylene, o	General Toxicity / Nervous System	0.0000032	0.037	0.00057	0.038
			Semi-Volatile Organic Compounds					
			2,6-Dinitrotoluene	Endocrine	0.00014	NA	0.015	0.015
			Biphenyl	Developmental / Respiratory / Liver / Kidney	0.000012	1.6	0.00054	1.6
			Bis(2-Ethylhexyl)phthalate	Liver	0.000057	NA	NC	0.000057
			Diphenyl ether	Eye / Respiratory	NC	9.6	NC	9.6
			N-Nitrosodimethylamine	Developmental / General Toxicity	0.00016	0.0063	0.000072	0.0065
			Petroleum Hydrocarbons					
			C11-C22 Aromatics Adjusted	Respiratory / Reproductive	0.0046	0.13	0.69	0.82
			C5-C8 Aliphatics	Nervous System	0.00013	0.29	NC	0.29
			C9-C12 Aliphatics	Liver / Kidney / Respiratory	0.000026	0.25	NC	0.25
			Metals					
			Aluminum	Nervous System	0.000095	NC	0.00013	0.00023
			Antimony	General Toxicity	0.00028	NC	0.0026	0.0029
			Arsenic	GI System	0.000062	NC	0.0014	0.0015
			Cadmium	Kidney	0.000097	NC	0.0027	0.0028
			Chromium, Hexavalent	Undetermined	0.000010	NC	0.0011	0.0011
			Cobalt	Endocrine	0.000074	NC	0.00042	0.00049
			Iron	GI System	0.00022	NC	0.00031	0.00053
			Manganese	Nervous System	0.00084	NC	0.029	0.030
			Vanadium	Kidney	0.0014	NC	0.011	0.012
			Inorganics, Total					
			Nitrate as N	Hematological	0.000021	NC	0.000075	0.000096
			Nitrite as N	Hematological	0.00013	NC	0.00019	0.00032
							Exposure Point Total =	17

Table G-26

OU3 Risk Characterization Summary - Non-Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater / Excavation Air	Shallow Overburden - On-Property	**Volatile Organic Compounds**					
			1,2,4-Trichlorobenzene	Urinary / Liver	0.00000033	0.0094	0.00061	0.010
			1,2-Dichloroethane	Nervous System / Kidney	0.0000021	0.0068	0.000057	0.0069
			2,4,4-Trimethyl-1-pentene	Liver	0.000011	0.030	0.036	0.066
			2,4,4-Trimethyl-2-pentene	Liver	0.0000038	0.011	0.013	0.024
			Bromodichloromethane	Kidney / Reproductive	0.0000096	0.028	0.000040	0.028
			Bromoform	Liver	0.000012		0.00019	0.00020
			Dibromochloromethane	Liver	0.0000027	0.004	0.000093	0.0041
			Dibromomethane	Hematological	0.000020	0.027	NC	0.027
			Methylene chloride	Nervous System	0.0000041	0.011	0.00088	0.012
			Naphthalene	Nervous System / Respiratory / Developmental	0.000000025	0.036	0.000073	0.036
			Trichloroethene	Developmental / Immune System /Cardiovascular / Kidney	0.000047	0.11	0.0012	0.11
			Semi-Volatile Organic Compounds					
			2,6-Dinitrotoluene	Endocrine	0.0000090		0.00096	0.00097
			4-Bromophenyl phenyl ether	Respiratory / Liver / Kidney / Developmental	0.00000090	0.050	0.000042	0.050
			Benzo(a)pyrene	Developmental	0.000021	NC	NC	0.000021
			Biphenyl	Respiratory / Liver / Kidney / Developmental	0.00000064	0.087	0.000030	0.087
			Diphenyl ether	Eye / Respiratory	NC	0.22	NC	0.22
			N-Nitrosodimethylamine	General Toxicity / Developmental	0.0033	0.13	0.0015	0.13
			Metals					
			Aluminum	Nervous System	0.000049	NC	0.000069	0.00012
			Antimony	General Toxicity	0.00020	NC	0.0019	0.0021
			Arsenic	GI System	0.000063	NC	0.0015	0.0016
			Beryllium	GI System	0.000011	NC	0.0022	0.0022
			Cadmium	Kidney	0.000083	NC	0.0023	0.0024
			Chromium, Hexavalent	Undetermined	0.000012	NC	0.0013	0.0013
			Cobalt	Endocrine	0.00027	NC	0.0015	0.0018
			Copper	GI System	0.00012	NC	0.000042	0.00016
			Iron	GI System	0.00073	NC	0.0010	0.0017
			Manganese	Nervous System	0.0044	NC	0.16	0.16
			Nickel	General Toxicity	0.000018	NC	0.00012	0.0001
			Silver	Skin	0.00015	NC	0.0033	0.0035
			Thallium	Skin	0.00033	NC	0.0019	0.0022
			Vanadium	Kidney	0.0016	NC	0.012	0.014
			Zinc	Immune System / Hematological	0.000032	NC	0.000027	0.000059
			Inorganics, Total					
			Nitrate as N	Hematological	0.000032	NC	0.00011	0.00014
			Nitrite as N	Hematological	0.0000086	NC	0.000012	0.000021
			Perchlorate	Endocrine	0.000042	NC	0.000059	0.00
			Specialty Compounds					
			Dimethylformamide	Liver / Reproductive	0.0000036	0.00013	0.0000025	0.00014
			Formaldehyde	Eye / Respiratory / Kidney / GI System / General Toxicity	0.0000036	0.0018	0.000011	0.0018
			Hydrazine	Liver	NC	2.3	NC	2.3
			Kempore (Azodicarbonamide)	Reproductive	0.00022		0.000012	0.00023
			Monomethylhydrazine (MMH)	Hematological / Liver / Developmental	0.000013	0.024	0.0000039	0.024
			UDMH	Reproductive / Eye	0.00030	6.0	0.000037	6.0
							Exposure Point Total =	9.0

Table G-26

OU3 Risk Characterization Summary - Non-Carcinogens

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

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater / Excavation Air	Shallow Overburden - Off-Property	**Volatile Organic Compounds**					
			1,1-Dichloroethane	Kidney	0.000000020	NC	0.0000026	0.0000026
			1,2,4-Trimethylbenzene	Nervous System	0.000064	0.11	0.011	0.12
			1,4-Dichlorobenzene	Liver	0.0000031	0.0015	0.00033	0.0018
			1,4-Dioxane	Eye	0.0000073	0.0022	0.000075	0.0023
			2,4,4-Trimethyl-1-pentene	Liver	0.000047	0.13	0.16	0.29
			2,4,4-Trimethyl-2-pentene	Liver	0.000012	0.032	0.040	0.072
			Benzene	Hematological	0.00024	0.47	0.016	0.49
			Chlorobenzene	Liver / Kidney	0.000053	0.079	0.010	0.089
			Chloroform	Liver	0.00000024	0.0010	0.000034	0.0010
			Cis-1,2-Dichloroethene	Liver / Hematological	0.000000051	0.0032	0.00054	0.0037
			Ethylbenzene	Nervous System / Liver	0.000054	0.0035	0.0025	0.0061
			Methylene chloride	Nervous System	0.0000030	0.0082	0.00065	0.0089
			Naphthalene	Nervous System / Respiratory / Developmental	0.00000020	0.29	0.00059	0.29
			Tetrahydrofuran	Liver / Nervous System / Developmental	0.00017	0.42	0.00038	0.42
			Toluene	Nervous System / Kidney	0.0000096	0.021	0.0054	0.026
			Trichloroethene	Developmental / Immune System /Cardiovascular / Kidney	0.000071	0.17	0.0018	0.17
			Vinyl chloride	Respiratory / Liver	0.000011	0.0085	0.00016	0.0087
			Xylene, o	Nervous System / General Toxicity	0.0000021	0.025	0.00038	0.025
			Xylenes (m&p)	Nervous System / General Toxicity	0.000020	0.24	0.0040	0.24
			Semi-Volatile Organic Compounds					
			4,6-Dinitro-2-methylphenol	Developmental / Eye	0.000059	NC	0.0059	0.0060
			Atrazine	Reproductive	0.000013	NC	0.000022	0.000035
			Benzo(a)pyrene	Developmental	0.000026	NC	NC	0.000026
			Bis(2-Ethylhexyl)phthalate	Liver	0.0000017	NC	NC	0.0000017
			Diphenyl ether	Eye / Respiratory	NC	0.12	NC	0.12
			N-Nitrosodimethylamine	General Toxicity / Developmental	0.000057	0.0022	0.000026	0.0023
			Metals					
			Aluminum	Nervous System	0.0000092	NC	0.000013	0.000022
			Antimony	General Toxicity	0.00062	NC	0.0058	0.0064
			Arsenic	GI System	0.00013	NC	0.0030	0.0031
			Cadmium	Kidney	0.000058	NC	0.0016	0.0017
			Chromium, Hexavalent	Undetermined	0.000016	NC	0.0018	0.0018
			Cobalt	Endocrine	0.00012	NC	0.00070	0.00082
			Iron	GI System	0.0012	NC	0.0017	0.0029
			Manganese	Nervous System	0.0023	NC	0.081	0.083
			Thallium	Skin	0.00043	NC	0.0024	0.0028
			Vanadium	Kidney	0.00038	NC	0.0029	0.0033
			Inorganics					
			Nitrate as N	Hematological	0.000012	NC	0.000043	0.000055
			Specialty Compounds					
			Formaldehyde	Eye / Respiratory / Kidney / GI System / General Toxicity	0.0000036	0.0018	0.000011	0.0018
			Hydrazine	Liver	NC	0.0040	NC	0.0040
							Exposure Point Total =	2.5

Key

GI - Gastrointestinal

NA - Toxicity criteria are not available to quantitatively address this route of exposure.

NC - Not Calculated

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for significant routes of exposure for future construction workers exposed to groundwater. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. Results presented use toxicity values and site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-27

OU3 Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Groundwater / Shower Air	Residential Well - Maximum Concentration	**Semi-Volatile Organic Compounds**					
			Benzo(a)anthracene	1.9E-07	1.1E-07	NC	NA	3.0E-07
			N-Nitrosodimethylamine	2.2E-05	1.7E-06	5.4E-08	NA	2.4E-05
			Metals					
			Chromium, Hexavalent	8.1E-05	NC	3.0E-05	NA	1.1E-04
							Exposure Risk Total =	1E-04

Key

NA - Exposure route not applicable for this chemical/exposure medium.

NC - Not carcinogenic by this expsoure route.

This table provides risk estimates for the significant routes of exposure for the current adult resident exposure to groundwater. Risks from irrigation were below $1x10^{-6}$ and not included. Risks were originally calculated on a per-residence basis; maximum risks are shown. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of residential exposure to groundwater, as well as the toxicity of the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-28								
OU3 Risk Characterization Summary - Carcinogens								
Scenario Timeframe: Current **Receptor Population: Resident** **Receptor Age: Child**								
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Carcinogenic Risk**				
				Ingestion	**Inhalation**	**Dermal**	**External (Radiation)**	**Exposure Routes Total**
Groundwater	Groundwater / Shower Air	Residential Well - Maximum Concentration	**Semi-Volatile Organic Compounds**					
			Benzo(a)anthracene	2.5E-07	5.5E-08	NC	NA	3.1E-07
			N-Nitrosodimethylamine	2.9E-05	8.2E-07	6.3E-08	NA	3.0E-05
			Metals					
			Chromium, Hexavalent	1.1E-04	NC	3.2E-05	NA	1.4E-04
							Exposure Risk Total =	2E-04
Groundwater	Irrigation/ Recreation	Residential Well - Maximum Concentration	**Metals**					
			Chromium, Hexavalent	9.4E-08	NC	2.4E-06	NA	2.5E-06
							Exposure Risk Total =	3E-06

Key

NA - Exposure route not applicable for this chemical/exposure medium.

NC - Not carcinogenic by this expsoure route.

This table provides risk estimates for the significant routes of exposure for the current child resident exposure to groundwater. Risks were originally calculated on a per-residence basis; maximum risks are shown. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of residential exposure to groundwater, as well as the toxicity of the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-Eco1

Occurrence, Distribution, and Selection of Surface Water Contaminants of Concern

Exposure Medium: Surface Water

Exposure Area	Chemical of Concern	Concentration Detected (mg/kg)		Mean (mg/kg)	95% UCL[2] (mg/L)	Reference (mg/L)		Screening Toxicity Value (mg/L)	Screening Toxicity Value Source[3]	HQ Value[4]	
		Minimum	Maximum			Maximum	Average			RME	CTE
South Ditch Stream	**Semivolatile Organics**										
	Azobenzene	0.00046	0.00053	0.0017	0.00056	NA	NA	NA	NA	NA	NA
	Benzo(a)pyrene	0.00015	0.00015	0.00016	NC	NA	NA	0.000014	ORNL - SCV	0.63	0.63
	Bis(2-Ethylhexyl)phthalate	0.0018	0.0061	0.0024	0.0034	NA	NA	0.003	ORNL - SCV	0.13	0.090
	N-Nitrosodi-n-propylamine	0.0000049	0.0000093	0.0000035	0.0000066	NA	NA	NA	NA	NA	NA
	Metals, Total										
	Aluminum	0.076	280	4.9	19	NA	NA	0.087	AWQC - CCC	**25**	**6.5**
	Barium	0.013	0.032	0.024	0.027	NA	NA	0.004	ORNL - SCV	0.24	0.22
	Beryllium	0.0003	0.0011	0.00061	0.00084	NA	NA	0.00066	ORNL - SCV	0.024	0.017
	Chromium [d]	0.0085	64	1.1	3.3	NA	NA	0.12	AWQC - CCC	**2.2**	0.73
	Cobalt	0.0053	0.05	0.028	0.037	NA	NA	0.023	ORNL - SCV	0.024	0.019
	Copper [d]	0.00021	0.026	0.0090	0.017	NA	NA	0.019	AWQC - CCC	0.63	0.35
	Iron	1.5	13	5.9	7.9	NA	NA	1	AWQC - CCC	NA	NA
	Lead [d]	0.00028	0.0021	0.00063	0.00094	NA	NA	0.0018	AWQC - CCC	0.0086	0.0057
	Manganese	0.5	2.2	1.5	1.8	NA	NA	0.12	ORNL - SCV	0.78	0.65
	Silver	0.000017	0.000017	0.00027	NC	NA	NA	0.000012	EPA Region 4 - Chronic	0.014	0.014
	Metals, Filtered										
	Aluminum	0.02	22	0.69	1.5	NA	NA	0.087	AWQC - CCC	**25**	**6.5**
	Chromium	0.004	5	0.20	0.40	NA	NA	0.10	AWQC - CCC	**7.2**	**2.4**
	Inorganics										
	Bromide	0.14	0.48	0.32	0.40	NA	NA	NA	NA	NA	NA
	Chloride	60	300	164	172	NA	NA	230	AWQC - CCC	0.20	0.19
	Nitrite as N	0.01	0.043	0.031	0.021	NA	NA	NA	NA	NA	NA
	Nitrogen, as Ammonia [e]	14	250	56	73	NA	NA	3.0	AWQC - CCC	**2.0**	**1.6**
Central Pond	**Metals, Total**										
	Aluminum	0.21	0.21	0.21	NC	NA	NA	0.087	AWQC - CCC	0.28	0.28
	Barium	0.049	0.049	0.049	NC	NA	NA	0.004	ORNL - SCV	0.45	0.45
	Manganese	0.7	0.7	0.70	NC	NA	NA	0.12	ORNL - SCV	0.30	0.30
	Silver	0.000015	0.000015	0.000015	NC	NA	NA	0.000012	EPA Region 4 - Chronic	0.012	0.012
	Inorganics										
	Bromide	0.13	0.13	0.13	NC	NA	NA	NA	NA	NA	NA
	Nitrite as N	0.075	0.075	0.075	NC	NA	NA	NA	NA	NA	NA
	Nitrogen, as Ammonia [e]	28	28	28	NC	NA	NA	3.0	AWQC - CCC	0.78	0.78

Table G-Eco1

Occurrence, Distribution, and Selection of Surface Water Contaminants of Concern

Exposure Medium: Surface Water

Exposure Area	Chemical of Concern	Concentration Detected (mg/kg)		Mean (mg/kg)	95% UCL[2] (mg/L)	Reference (mg/L)		Screening Toxicity Value (mg/L)	Screening Toxicity Value Source[3]	HQ Value[4]	
		Minimum	Maximum			Maximum	Average			RME	CTE
Storm Water Detention Basin	**Semivolatile Organics**										
	N-Nitrosodiphenylamine	0.0000074	0.0000074	0.0000074	NC	NA	NA	NA	EPA Region 3	0.0000019	0.0000019
	Metals, Total										
	Aluminum	0.9	0.9	0.90	NC	NA	NA	0.087	AWQC - CCC	**1.2**	**1.2**
	Barium	0.026	0.026	0.026	NC	NA	NA	0.004	ORNL - SCV	0.24	0.24
	Iron	1.5	1.5	1.5	NC	NA	NA	1	AWQC - CCC	NA	NA
	Lead [d]	0.003	0.003	0.0030	NC	NA	NA	0.0014	AWQC - CCC	0.035	0.035
	Silver	0.000056	0.000056	0.000056	NC	NA	NA	0.000012	EPA Region 4 - Chronic	0.046	0.046
	Inorganics										
	Nitrite as N	0.026	0.026	0.026	NC	NA	NA	NA	NA	NA	NA
	Nitrogen, as Ammonia [e]	7.5	7.5	7.5	NC	NA	NA	3.0	AWQC - CCC	0.21	0.21
Off-PWD Stream	**Volatile Organics**										
	Carbon disulfide	0.001	0.0025	0.0033	0.0025	NA	NA	0.00092	ORNL - SCV	0.15	0.15
	Semivolatile Organics										
	3 & 4 Methylphenol	0.00073	0.00076	0.0018	0.00078	NA	NA	NA	NA	NA	NA
	Benzo(a)anthracene	0.00024	0.002	0.00047	NC	NA	NA	0.000027	ORNL - SCV	**4.1**	0.95
	Benzo(a)pyrene	0.00012	0.0042	0.00089	0.0023	NA	NA	0.000014	ORNL - SCV	**9.5**	**3.7**
	Benzo(b)fluoranthene	0.00019	0.0077	0.0016	0.0040	NA	NA	0.0006	ECOSAR - CSV	0.67	0.27
	Benzo(ghi)perylene	0.00011	0.0046	0.00099	0.0026	NA	NA	0.0002	ECOSAR - CSV	**1.3**	0.50
	Benzo(k)fluoranthene	0.0005	0.0026	0.00061	0.0026	NA	NA	0.0006	ECOSAR - CSV	0.43	0.10
	Chrysene	0.00018	0.0053	0.0012	0.0027	NA	NA	0.0019	ECOSAR - CSV	0.14	0.064
	Dibenz(a,h)anthracene	0.0012	0.0012	0.00039	NC	NA	NA	0.0002	ECOSAR - CSV	0.60	0.20
	Indeno(1,2,3-cd)pyrene	0.000098	0.004	0.00088	0.0040	NA	NA	0.0002	ECOSAR - CSV	**2.0**	0.44
	Phenanthrene	0.000081	0.0025	0.00053	0.0013	NA	NA	0.0004	EPA Region 3	**3.3**	**1.3**
	Pyrene	0.00022	0.012	0.0031	0.0063	NA	NA	0.000025	EPA Region 3	**253**	**122**
	Metals, Total										
	Aluminum	0.1	1.6	0.82	1.3	NA	NA	0.087	AWQC - CCC	**1.7**	**1.1**
	Barium	0.026	0.046	0.035	0.041	NA	NA	0.004	ORNL - SCV	0.37	0.31
	Chromium [d]	0.0061	0.13	0.050	0.093	NA	NA	0.051	AWQC - CCC	0.15	0.081
	Iron	5	30	16.4	25	NA	NA	1	AWQC - CCC	NA	NA
	Lead [d]	0.00082	0.0058	0.0027	0.0043	NA	NA	0.00047	AWQC - CCC	0.15	0.092
	Manganese	0.27	1.5	0.85	1.3	NA	NA	0.12	ORNL - SCV	0.55	0.37
	Zinc [d]	0.009	0.12	0.038	0.095	NA	NA	0.069	AWQC - CCC	**1.4**	0.54
	Inorganics										
	Bromide	0.1	0.21	0.15	0.20	NA	NA	NA	NA	NA	NA
	Nitrite as N	0.02	0.02	0.023	NC	NA	NA	NA	NA	NA	NA
	Nitrogen, as Ammonia [e]	17	66	45	60	NA	NA	3.0	AWQC - CCC	**1.7**	**1.2**

Table G-Eco1

Occurrence, Distribution, and Selection of Surface Water Contaminants of Concern

Exposure Medium: Surface Water

Exposure Area	Chemical of Concern	Concentration Detected (mg/kg)		Mean (mg/kg)	95% UCL[2] (mg/L)	Reference (mg/L)		Screening Toxicity Value (mg/L)	Screening Toxicity Value Source[3]	HQ Value[4]	
		Minimum	Maximum			Maximum	Average			RME	CTE
MMB Wetland	**Semivolatile Organics**										
	Benzo(a)pyrene	0.000096	0.00013	0.000094	0.00014	ND	ND	0.000014	ORNL - SCV	0.54	0.39
	Caprolactam	0.00066	0.00066	0.0021	NC	0.00056	0.001405	NA	NA	NA	NA
	N-Nitrosodi-n-propylamine	0.00000044	0.00000078	0.0000041	0.00000080	ND	ND	NA	NA	NA	NA
	Metals, Total										
	Aluminum	0.012	1.8	0.17	0.68	0.44	0.24	0.087	AWQC - CCC	0.90	0.23
	Barium	0.015	0.15	0.037	0.046	0.05	0.038	0.004	ORNL - SCV	0.41	0.33
	Copper [d]	0.00077	0.054	0.0048	0.015	0.0039	0.0026	0.009	AWQC - CCC	**1.4**	0.44
	Iron	0.39	29	3.4	9.9	2.0	1.1	1	AWQC - CCC	NA	NA
	Lead [d]	0.00016	0.11	0.0065	0.038	0.0013	0.0011	0.00058	AWQC - CCC	**1.0**	0.18
	Manganese	0.03	9.3	0.91	2.7	0.59	0.31	0.12	ORNL - SCV	**1.2**	0.39
	Inorganics										
	Bromide	0.1	0.12	0.055	0.10	ND	ND	NA	NA	NA	NA
North Pond	**Semivolatile Organics**										
	Benzo(a)anthracene	0.000076	0.00012	0.00012	NC	NA	NA	0.000027	ORNL - SCV	0.24	0.24
	Benzo(a)pyrene	0.00013	0.00017	0.00012	NC	NA	NA	0.000014	ORNL - SCV	0.71	0.51
	Caprolactam	0.00033	0.00033	0.0019	NC	NA	NA	NA	NA	NA	NA
	Pyrene	0.000094	0.00039	0.00080	NC	NA	NA	0.000025	EPA Region 3	**16**	**16**
	Metals, Total										
	Aluminum	0.11	0.22	0.15	NC	NA	NA	0.087	AWQC - CCC	0.29	0.20
	Barium	0.026	0.041	0.034	NC	NA	NA	0.004	ORNL - SCV	0.37	0.31
	Iron	0.57	2.9	1.9	NC	NA	NA	1	AWQC - CCC	NA	NA
	Lead [d]	0.00022	0.0013	0.00093	NC	NA	NA	0.00097	AWQC - CCC	0.02	0.02
	Manganese	0.32	0.49	0.39	NC	NA	NA	0.12	ORNL - SCV	0.21	0.17
	Silver	0.000022	0.000022	0.00038	NC	NA	NA	0.000012	EPA Region 4 - Chronic	0.018	0.018
	Inorganics										
	Bromide	0.27	0.65	0.28	NC	NA	NA	NA	NA	NA	NA
	Chloride	120	320	190	NC	NA	NA	230	AWQC - CCC	0.37	0.22

Table G-Eco1											
Occurrence, Distribution, and Selection of Surface Water Contaminants of Concern											
Exposure Medium: Surface Water											
Exposure Area	**Chemical of Concern**	**Concentration Detected (mg/kg)**		**Mean (mg/kg)**	**95% UCL[2] (mg/L)**	**Reference (mg/L)**		**Screening Toxicity Value (mg/L)**	**Screening Toxicity Value Source[3]**	**HQ Value[4]**	
		Minimum	**Maximum**			**Maximum**	**Average**			**RME**	**CTE**

Key

µg/L - microgram per liter

NA - Not Applicable

ND - Not Detected

PWD - Property West Ditch

[1] Minimum/maximum/mean detected concentration above the sample quantitation limit

[2] The 95% Upper Confidence Limit (UCL) represents the RME concentration

[b] AWQC-CCC for aluminum is for waters with pH between 6.5 and 9.0.

[c] AWQC-CCC is for the dissolved fraction of the metal.

[d] Hardness dependent criteria. AWQC-CCC are calculated for exposure area specific average hardness using the equations presented in USEPA (2013).

[e] WQC-CCC for ammonia in freshwater are pH, temperature, and receptor and receptor life-stage dependent and are calculated using the equations presented in EPA, 2013

[3] Surface Water Screening benchmark sources in order of preference:

1. AWQC - CCC - EPA, Freshwater Ambient Water Quality Criteria (AWQC) Chronic Continuous Concentration (CCC) (EPA, 2013).
2. ORNL - SCV - Oak Ridge National Laboratory (ORNL) Tier II Secondary Chronic Values (SCVs) from Suter and Tsao, 1996 as cited in Buchman, 2008, Screening Quick Reference Tables (SQuiRTs from NOAA).
3. EPA Region 4 - Chronic - (EPA, 2001)
4. EPA Region 3 (EPA, 2006)
5. Estimated benchmarks using EPA, 2012 Ecological Structure Activity Relationships (ECOSTAR) Database v. 1.11 chronic toxicity value equal to a LC50÷10 were restored to LC50s and factors of 10 for non-persistent chemicals, 20 for persistnent non-bioaccumulating chemicals, and 100 for persistent and bioaccumulating chemicals were applied to convert to NOAELs. Methodology derived from the Texas Surface Water Quality Standards(30 TAC §307.6(c).(7), as amended TNRCC, 2000b).

[4] HQ (Hazard Quotient) calculated by dividing the exposure point concentration by the effects benchmark.

Surface water chemicals of concern based on initial screening in Table 3.13-4 through 3.13-10 of Baseline Ecological Risk Assessment, OU1-OU2 RI. Average [arithmetic mean] calclated using one-half the detection limit for non-detects. 95% UCL from Table 4.1-4 through 4.1-9. Landfill brook was not fully evaluated because the RI determined that it was not impacted by contamination from the Site. Reference and HQ values from Table 4.3-4 through 4.3-9. HQ values above 1 are **bold.**

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-Eco2

Occurrence, Distribution, and Selection of Sediment Contaminants of Concern

Exposure Medium: Sediment

Exposure Area	Chemical of Concern	Concentration Detected (mg/kg)		Mean (mg/kg)	95% UCL[2] (mg/L)	Reference (mg/kg)		Screening Toxicity Value (mg/kg)	Screening Toxicity Value Source[3]	HQ Value[4]	
		Minimum	Maximum			Maximum	Average			RME	CTE
Upper South Ditch	**Volatile Organics**										
Stream	2,4,4-Trimethyl-1-pentene	0.03	0.03	0.010	NC	NA	NA	NA	NA	NA	NA
	2,4,4-Trimethyl-2-pentene	0.003	0.003	0.0031	NC	NA	NA	NA	NA	NA	NA
	4-iso-Propyltoluene	0.0026	0.0026	0.0018	NC	NA	NA	NA	NA	NA	NA
	Acetaldehyde	0.052	0.083	0.11	NC	NA	NA	NA	NA	NA	NA
	Formaldehyde	0.27	1.09	0.57	NC	NA	NA	NA	NA	NA	NA
	Semivolatile Organics										
	3 & 4 Methylphenol	0.61	3	1.3	3.0	NA	NA	NA	NA	NA	NA
	Acetophenone	0.09	0.09	0.43	NC	NA	NA	NA	NA	NA	NA
	Benzaldehyde	0.2	0.62	0.35	NC	NA	NA	NA	NA	NA	NA
	Caprolactam	0.053	0.053	0.10	NC	NA	NA	NA	NA	NA	NA
	Diphenyl ether	0.17	0.22	0.15	NC	NA	NA	NA	NA	NA	NA
	Di-n-octylphthalate	0.15	0.15	0.42	NC	NA	NA	NA	NA		
	Diphenylmethanone	0.0305	0.0305	0.098	NC	NA	NA	NA	NA	NA	NA
	Phenol	0.22	0.96	0.72	0.96	NA	NA	0.42	EPA Region 3	**2.3**	**1.7**
	Metals										
	Arsenic	2.1	13	5.3	10	NA	NA	9.79	TEC	0.30	0.16
	Barium	7	86	27	70	NA	NA	NA	NA	NA	NA
	Beryllium	0.21	1	0.44	0.71	NA	NA	NA	NA	NA	NA
	Chromium	20	1,800	405	926	NA	NA	43.4	TEC	**8.3**	**3.6**
	Chromium, Hexavalent	2.6	25	7.0	25	NA	NA	NA	NA	NA	NA
	Iron	4,200	23,000	12,445	13,895	NA	NA	20,000	OMEE - LEL	0.35	0.31
	Silver	1.6	35	7.5	19	NA	NA	2	EPA Region 4	**9.5**	**3.7**
	Vanadium	5.4	18	10	15	NA	NA	NA	NA	NA	NA
	Inorganics										
	Chloride	41.5	140	74	NC	NA	NA	NA	NA	NA	NA
	Nitrogen, as Ammonia	54	240	148	215	NA	NA	NA	NA	NA	NA
	Sulfate	210	640	454	NC	NA	NA	NA	NA	NA	NA
	Specialty Compounds										
	Hydrazine	0.00091	0.0013	0.0013	NC	NA	NA	NA	NA	NA	NA
	Dimethylformamide	0.3	0.3	0.13	NC	NA	NA	NA	NA	NA	NA
	Petroleum Hydrocarbons										
	C11-C22 Aromatics	11	1,100	288	NC	NA	NA	0.09	MassDEP	**267**	**190**
	C19-C36 Aliphatics	14	690	194	NC	NA	NA	9.88	MassDEP	**4.4**	**2.9**
	C9-C18 Aliphatics	96	96	26	NC	NA	NA	3.17	MassDEP	**30**	**8.2**

Table G-Eco2												
Occurrence, Distribution, and Selection of Sediment Contaminants of Concern												
Exposure Medium: Sediment												
Exposure Area	**Chemical of Concern**	**Concentration Detected (mg/kg)**		**Mean (mg/kg)**	**95% UCL[2] (mg/L)**	**Reference (mg/kg)**		**Screening Toxicity Value (mg/kg)**	**Screening Toxicity Value Source[3]**	**HQ Value[4]**	
		Minimum	**Maximum**			**Maximum**	**Average**			**RME**	**CTE**
Lower South Ditch	**Volatile Organics**										
Stream	2,4,4-Trimethyl-1-pentene	0.0096	0.02	0.011	NC	NA	NA	NA	NA	NA	NA
	2,4,4-Trimethyl-2-pentene	0.0035	0.0035	0.0037	NC	NA	NA	NA	NA	NA	NA
	Acetaldehyde	0.063	0.063	0.11	NC	NA	NA	NA	NA	NA	NA
	Acetone	0.12	0.12	0.168	NC	NA	NA	0.0091	ORNL - LCV	**13.2**	**13.2**
	Formaldehyde	0.27	0.6	0.44	NC	NA	NA	NA	NA	NA	NA
	Semivolatile Organics										
	Aniline	0.23	0.23	3.7	NC	NA	NA	NA	NA	NA	NA
	Benzaldehyde	0.12	0.12	0.99	NC	NA	NA	NA	NA	NA	NA
	Bis(2-Ethylhexyl)phthalate	11	920	322	602	NA	NA	433	434	0.14	0.074
	Di-n-octylphthalate	0.15	0.15	1.1	NC	NA	NA	NA	NA	NA	NA
	Diphenyl ether	0.22	2.6	1.8	NC	NA	NA	NA	NA	NA	NA
	Diphenylamine	0.095	0.095	0.062	NC	NA	NA	NA	NA	NA	NA
	Pesticides										
	4,4`-DDT	0.062	0.062	0.025	NC	NA	NA	0.00416	TEC	0.99	0.39
	Hexachlorobenzene	0.037	0.037	0.016	NC	NA	NA	0.02	OMEE - LEL	0.15	0.07
	Metals										
	Barium	7	23	12.8	17.4	NA	NA	NA	NA	NA	NA
	Beryllium	0.64	1.9	0.96	1.5	NA	NA	NA	NA	NA	NA
	Cadmium	0.32	1.2	0.56	1.0	NA	NA	0.99	TEC	0.21	0.11
	Chromium	570	3,000	1,922	2,764	NA	NA	43.4	TEC	**25**	**17.3**
	Chromium, Hexavalent	7.9	28	14.5	26	NA	NA	NA	NA	NA	NA
	Mercury	0.045	0.39	0.18	0.29	NA	NA	0.18	TEC	0.27	0.17
	Nickel	7.3	24	14.1	19.6	NA	NA	22.7	TEC	0.40	0.29
	Silver	35	62	25	62	NA	NA	2	EPA Region 4	**31**	**12.6**
	Tin	1.6	1.6	3.7	NC	NA	NA	NA	NA	NA	NA
	Vanadium	5.4	14	8.7	11.1	NA	NA	NA	NA	NA	NA
	Inorganics										
	Chloride	130	140	133	NC	NA	NA	NA	NA	NA	NA
	Nitrogen, as Ammonia	54	290	172	252	NA	NA	NA	NA	NA	NA
	Sulfate	600	830	690	NC	NA	NA	NA	NA	NA	NA
	Petroleum Hydrocarbons										
	C11-C22 Aromatics	1100	9,400	5,250	NC	NA	NA	0.09	MassDEP	**104,444**	**58,333**
	C19-C36 Aliphatics	690	6,400	3,545	NC	NA	NA	9.88	MassDEP	**648**	**359**
	C9-C18 Aliphatics	96	770	433	NC	NA	NA	3.17	MassDEP	**243**	**137**
	Specialty Compounds										
	Hydrazine	0.0013	0.0024	0.0019	NC	NA	NA	NA	NA	NA	NA
On-PWD	**Volatile Organics**										
Stream/West Ditch	Acetone	0.095	0.34	7.6	0.45	NA	NA	0.0091	ORNL - LCV	**37**	**37**
Wetland	Benzene	4.4	4.4	0.93	NC	NA	NA	16	EPA NIO ESBs	0.037	0.0077
	Metals										
	Barium	3.4	37.6	18.0	NC	NA	NA	NA	NA	NA	NA
	Beryllium	0.61	0.61	0.25	NC	NA	NA	NA	NA	NA	NA
	Cadmium	0.229	1.2	0.57	0.94	NA	NA	0.99	TEC	0.19	0.12
	Chromium	4.5	69	24	30	NA	NA	43.4	TEC	0.27	0.22
	Lead	4.6	110	50	76	NA	NA	35.8	TEC	0.59	0.39
	Mercury	0.23	0.44	0.23	0.34	NA	NA	0.18	TEC	0.32	0.22
	Vanadium	3	27	15.7	NC	NA	NA	NA	NA	NA	NA

Table G-Eco2

Occurrence, Distribution, and Selection of Sediment Contaminants of Concern

Exposure Medium: Sediment

Exposure Area	Chemical of Concern	Concentration Detected (mg/kg)		Mean (mg/kg)	95% UCL[2] (mg/L)	Reference (mg/kg)		Screening Toxicity Value (mg/kg)	Screening Toxicity Value Source[3]	HQ Value[4]	
		Minimum	Maximum			Maximum	Average			RME	CTE
Central Pond	**Volatile Organics**										
	2,4,4-Trimethyl-1-pentene	0.011	0.011	0.0068	NC	NA	NA	NA	NA	NA	NA
	2,4,4-Trimethyl-2-pentene	0.0088	0.0088	0.0057	NC	NA	NA	NA	NA	NA	NA
	Acetone	0.11	0.12	0.12	NC	NA	NA	0.0091	ORNL - LCV	**13.2**	**12.6**
	Methyl Tertbutyl Ether	0.0017	0.0017	0.0016	NC	NA	NA	NA	NA	NA	NA
	Semivolatile Organics										
	3 & 4 Methylphenol	4.3	6.1	5.2	NC	NA	NA	NA	NA	NA	NA
	Acetophenone	0.15	0.26	0.21	NC	NA	NA	NA	NA	NA	NA
	Benzaldehyde	1.4	1.9	1.7	NC	NA	NA	NA	NA	NA	NA
	Phenol	1.7	2.2	2.0	NC	NA	NA	0.42	EPA Region 3	**5.2**	**4.6**
	Polyaromatic Hydrocarbons										
	Benzo(b)fluoranthene	0.14	0.14	0.19	NC	NA	NA	979	EPA PAH ESBs	NA	NA
	Fluoranthene	0.21	0.29	0.25	NC	NA	NA	707	EPA PAH ESBs	0.13	0.11
	Phenanthrene	0.21	0.21	0.22	NC	NA	NA	596	EPA PAH ESBs	0.18	0.18
	Pyrene	0.18	0.23	0.21	NC	NA	NA	697	EPA PAH ESBs	0.15	0.13
	Metals										
	Barium	45	46	46	NC	NA	NA	NA	NA	NA	NA
	Beryllium	0.09	0.094	0.092	NC	NA	NA	NA	NA	NA	NA
	Chromium	18	140	36	95	NA	NA	43.4	TEC	**1.3**	0.35
	Chromium, Hexavalent	0.21	0.27	0.24	NC	NA	NA	NA	NA	NA	NA
	Lead	50	51	51	NC	NA	NA	35.8	TEC	0.40	0.39
	Manganese	440	590	515	NC	NA	NA	460	OMEE - LEL	0.54	0.47
	Tin	2.1	2.2	2.2	NC	NA	NA	NA	NA	NA	NA
	Vanadium	16	17	16.5	NC	NA	NA	NA	NA	NA	NA
	Inorganics										
	Chloride	18	24	21	NC	NA	NA	NA	NA	NA	NA
	Nitrogen, as Ammonia	17	35	26	NC	NA	NA	NA	NA	NA	NA
	Sulfate	510	1,200	855	NC	NA	NA	NA	NA	NA	NA

Table G-Eco2

Occurrence, Distribution, and Selection of Sediment Contaminants of Concern

Exposure Medium: Sediment

Exposure Area	Chemical of Concern	Concentration Detected (mg/kg)		Mean (mg/kg)	95% UCL[2] (mg/L)	Reference (mg/kg)		Screening Toxicity Value (mg/kg)	Screening Toxicity Value Source[3]	HQ Value[4]	
		Minimum	Maximum			Maximum	Average			RME	CTE
Storm Water	**Volatile Organics**										
Detention Basin	2,4,4-Trimethyl-1-pentene	0.0024	0.0078	0.0051	NC	NA	NA	NA	NA	NA	NA
	2,4,4-Trimethyl-2-pentene	0.0014	0.0039	0.0027	NC	NA	NA	NA	NA	NA	NA
	Acetone	0.13	0.15	0.14	NC	NA	NA	0.0091	ORNL - LCV	**16.5**	**15.4**
	Semivolatile Organics										
	3 & 4 Methylphenol	1.8	4	2.9	NC	NA	NA	NA	NA	NA	NA
	Acetophenone	0.16	0.16	0.23	NC	NA	NA	NA	NA	NA	NA
	Benzaldehyde	0.62	1.3	0.96	NC	NA	NA	NA	NA	NA	NA
	Phenol	1.4	1.9	1.7	NC	NA	NA	0.42	EPA Region 3	4.5	3.9
	Polyaromatic Hydrocarbons										
	Benzo(a)pyrene	0.22	0.22	0.24	NC	NA	NA	965	EPA PAH ESBs	0.15	0.15
	Metals										
	Arsenic	9.4	12	10.7	NC	NA	NA	9.79	TEC	0.36	0.32
	Barium	48	51	50	NC	NA	NA	NA	NA	NA	NA
	Beryllium	0.089	0.12	0.10	NC	NA	NA	NA	NA	NA	NA
	Chromium	33	50	42	NC	NA	NA	43.4	TEC	0.45	0.37
	Tin	2.2	2.3	2.3	NC	NA	NA	NA	NA	NA	NA
	Vanadium	19	22	21	NC	NA	NA	NA	NA	NA	NA
	Inorganics										
	Chloride	6.3	13	9.7	NC	NA	NA	NA	NA	NA	NA
	Nitrogen, as Ammonia	14	22	18.0	NC	NA	NA	NA	NA	NA	NA
	Sulfate	900	1,900	1,400	NC	NA	NA	NA	NA	NA	NA
Off-PWD Stream	**Volatile Organics**										
	2,4,4-Trimethyl-1-pentene	0.06	0.06	0.023	NC	NA	NA	NA	NA	NA	NA
	2,4,4-Trimethyl-2-pentene	0.008	0.008	0.0060	NC	NA	NA	NA	NA	NA	NA
	Formaldehyde	0.4	0.61	0.51	NC	NA	NA	NA	NA	NA	NA
	Semivolatile Organics										
	4-Chlorophenyl phenyl ether	0.061	0.061	0.044	NC	NA	NA	NA	NA	NA	NA
	Carbazole	0.039	0.051	0.045	NC	NA	NA	NA	NA	NA	NA
	Diphenyl ether	0.094	0.86	0.33	NC	NA	NA	NA	NA	NA	NA
	Diphenylmethanone	0.028	0.2	0.091	NC	NA	NA	NA	NA	NA	NA
	Metals										
	Arsenic	6.7	14	10.0	NC	NA	NA	9.79	TEC	0.42	0.30
	Barium	9.1	16	11.7	NC	NA	NA	NA	NA	NA	NA
	Beryllium	1.1	1.4	1.2	NC	NA	NA	NA	NA	NA	NA
	Chromium	250	2,400	1,350	NC	NA	NA	43.4	TEC	**22**	**12.2**
	Copper	16	39	25	NC	NA	NA	31.6	TEC	0.26	0.17
	Silver	3.7	41	23.6	NC	NA	NA	2	EPA Region 4	**20.5**	**11.8**
	Vanadium	9.2	15	11.7	NC	NA	NA	NA	NA	NA	NA
	Inorganics										
	Chloride	91	240	147	NC	NA	NA	NA	NA	NA	NA
	Nitrogen, as Ammonia	93	540	254	NC	NA	NA	NA	NA	NA	NA
	Sulfate	280	1500	697	NC	NA	NA	NA	NA	NA	NA
	Specialty Compounds										
	Hydrazine	0.0013	0.0013	0.0017	NC	NA	NA	NA	NA	NA	NA

Table G-Eco2

Occurrence, Distribution, and Selection of Sediment Contaminants of Concern

Exposure Medium: Sediment

Exposure Area	Chemical of Concern	Concentration Detected (mg/kg)		Mean (mg/kg)	95% UCL[2] (mg/L)	Reference (mg/kg)		Screening Toxicity Value (mg/kg)	Screening Toxicity Value Source[3]	HQ Value[4]	
		Minimum	Maximum			Maximum	Average			RME	CTE
MMB Wetland	**Volatile Organics**										
	Acetaldehyde	0.22	0.42	0.35	0.33	ND	ND	NA	NA	NA	NA
	Acetone	0.035	1.7	0.72	0.96	2.0	2.0	0.0091	ORNL - LCV	106	79
	Formaldehyde	0.31	4	2.2	2.8	ND	ND	NA	NA	NA	NA
	Semivolatile Organics										
	3 & 4 Methylphenol	0.2	0.32	0.12	0.32	ND	0.12	NA	NA	NA	NA
	4-Nitrophenol	0.091	0.091	0.43	NC	ND	0.55	NA	NA	NA	NA
	Benzaldehyde	0.056	0.3	0.12	0.20	0.33	0.33	NA	NA	NA	NA
	Benzoic Acid	0.21	1.4	0.59	0.76	0.54	0.54	0.65	EPA Region 3	**1.2**	0.90
	Benzyl alcohol	0.35	0.35	0.20	NC	ND	0.23	0.073	ORNL - LCV	**4.8**	**2.7**
	Caprolactam	0.088	0.088	0.068	0.20	ND	ND	NA	NA	NA	NA
	Carbazole	0.025	0.097	0.093	0.097	ND	0.12	NA	NA	NA	NA
	Metals										
	Aluminum	5,400	28,000	12,969	17,498	5,500	5,500	25,500	ARCs - TEC	0.30	0.22
	Arsenic	3.5	52	17.2	26	6.6	6.6	9.79	EPA Region 4	0.79	0.52
	Barium	22	190	103	131	84	84	NA	NA	NA	NA
	Beryllium	0.17	2.6	0.98	1.4	0.7	0.7	NA	NA	NA	NA
	Cadmium	0.082	4.8	2.1	2.9	0.9	0.9	0.99	TEC	0.59	0.41
	Copper	7.4	90	39	53	15	15	31.6	TEC	0.36	0.26
	Iron	6,400	95,000	25,508	38,554	7,500	7,500	20,000	OMEE - LEL	0.96	0.64
	Lead	7.2	415	138	204	46	46	35.8	TEC	**1.6**	**1.1**
	Manganese	110	2,100	788	1,267	500	500	460	OMEE - LEL	**1.2**	0.72
	Mercury	0.22	0.51	0.26	0.41	ND	ND	0.18	TEC	0.39	0.24
	Nickel	5.4	44	18.6	25	6.1	6.1	22.7	TEC	0.51	0.38
	Thallium	1.4	1.4	2.6	NC	ND	ND	NA	NA	NA	NA
	Tin	7.1	16	8.6	10.1	7.3	7.3	NA	NA	NA	NA
	Vanadium	8.9	58	32	41	11	11	NA	NA	NA	NA
	Zinc	22	500	207	288	73	73	121	TEC	0.63	0.45
	Inorganics										
	Chloride	34	1,000	485	658	420	420	NA	NA	NA	NA
	Nitrogen, as Ammonia	62	1,500	567	771	830	830	NA	NA	NA	NA
	Sulfate	120	1,400	600	834	420	420	NA	NA	NA	NA

Table G-Eco2											
Occurrence, Distribution, and Selection of Sediment Contaminants of Concern											
Exposure Medium: Sediment											
Exposure Area	**Chemical of Concern**	**Concentration Detected (mg/kg)**		**Mean (mg/kg)**	**95% UCL[2] (mg/L)**	**Reference (mg/kg)**		**Screening Toxicity Value (mg/kg)**	**Screening Toxicity Value Source[3]**	**HQ Value[4]**	
		Minimum	**Maximum**			**Maximum**	**Average**			**RME**	**CTE**
North Pond	**Volatile Organics**										
	2,4,4-Trimethyl-1-pentene	0.002	0.002	0.0038	NC	NA	NA	NA	NA	NA	NA
	Acetone	0.12	0.33	0.21	NC	NA	NA	0.0091	ORNL - LCV	**36**	**23**
	Carbon disulfide	0.0073	0.0073	0.0036	NC	NA	NA	0.001	EPA Region 3	NA	NA
	Semivolatile Organics										
	Carbazole	0.16	0.16	0.34	NC	NA	NA	NA	NA	NA	NA
	Metals										
	Arsenic	5.05	13	8.3	NC	NA	NA	9.79	EPA Region 4	0.39	0.25
	Barium	28	62	41	NC	NA	NA	NA	NA	NA	NA
	Beryllium	0.37	0.53	0.48	NC	NA	NA	NA	NA	NA	NA
	Cadmium	0.25	2.2	1.4	NC	NA	NA	0.99	TEC	0.44	0.28
	Chromium	20	780	278	NC	NA	NA	43.4	TEC	**7.0**	**2.5**
	Chromium, Hexavalent	0.285	0.9	0.59	NC	NA	NA	NA	NA	NA	NA
	Copper	11.55	68	45	NC	NA	NA	31.6	TEC	0.46	0.30
	Iron	9,000	23,000	15,500	NC	NA	NA	20,000	OMEE - LEL	0.58	0.39
	Lead	31	110	69	NC	NA	NA	35.8	TEC	0.86	0.54
	Manganese	120	1250	420	NC	NA	NA	460	OMEE - LEL	**1.1**	0.38
	Thallium	0.82	0.82	0.76	NC	NA	NA	NA	NA	NA	NA
	Tin	0.7	11	5.9	NC	NA	NA	NA	NA	NA	NA
	Vanadium	17	26	23	NC	NA	NA	NA	NA	NA	NA
	Zinc	110	360	288	NC	NA	NA	121	TEC	0.78	0.63
	Inorganics										
	Chloride	55.5	320	184	NC	NA	NA	NA	NA	NA	NA
	Nitrogen, as Ammonia	3.2	23	12	NC	NA	NA	NA	NA	NA	NA
	Sulfate	200	270	183	NC	NA	NA	NA	NA	NA	NA

Table G-Eco2											
Occurrence, Distribution, and Selection of Sediment Contaminants of Concern											
Exposure Medium: Sediment											
Exposure Area	**Chemical of Concern**	**Concentration Detected (mg/kg)**		**Mean (mg/kg)**	**95% UCL[2] (mg/L)**	**Reference (mg/kg)**		**Screening Toxicity Value (mg/kg)**	**Screening Toxicity Value Source[3]**	**HQ Value[4]**	
		Minimum	**Maximum**			**Maximum**	**Average**			**RME**	**CTE**

Key

µg/L - microgram per liter

NA - Not Applicable

NC - Not Calculated - dataset too small to calculate or only one detection

ND - Not Detected

PWD - Property West Ditch

[1] Minimum/maximum/mean detected concentration above the sample quantitation limit

[2] The 95% Upper Confidence Limit (UCL) represents the RME concentration

[3] Sediment Screening benchmark sources in order of preference:

1. EPA PAH ESBs - Equilibrium Sediment Partitioning Benchmarks for PAHs (COC,PAHi,FCVi) (EPA, 2003)
2. EPA NIO ESBs - Equilibrium Sediment Partitioning Benchmarks for Nonionic Organics Freshwater Conventional ESBs (EPA, 2008)
3. TECs - Threshold Effects Concentrations (MacDonald, et al., 2000).
4. EPA Region 4 (EPA, 2001)
5. OEMEE LELEs - Ontario Ministry of Energy and Environment Low-Effect Levels (Persaud et al., 1993)
6. ARCs TECs - Assessment and Remediation of Contaminated Sediments Program Threshold Effects Concentrations (EPA, 1996).
7. EPA Region 3 (EPA, 2006)
8. ORNL - LCVs - Oak Ridge National Laboratory Lowest Chronic Values (Jones, Suter, and Hull, 1997).
9. MassDEP - Sediment Benchmarks for Current MassDEP Petroleum Hydrocarbon Fractions (MassDEP, 2007).
10. REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) database. Values selected are No Observed Effects Concentrations for aquatic invertebrates

[4] HQ (Hazard Quotient) calculated by dividing the exposure point concentration by the effects benchmark.

[b] Value is for 1,2-Dichloroethene.

[c] Calcium, magnesium, potassium, and sodium are considered essential nutrients; therefore benchmarks are not applicable.

Sediment chemicals of concern based on initial screening in Table 3.13-11 through 3.13-19 of Baseline Ecological Risk Assessment, OU1-OU2 RI. Average [arithmetic mean] calculated using one-half the detection limit for non-detects. 95% UCL from Table 4.1-10 through 4.1-17. Landfill brook was not fully evaluated because the RI determined that it was not impacted by contamination from the Site. Reference and HQ values from Table 4.3-10 through 4.3-17. HQ values above 1 are bold.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-Eco3											
Occurrence, Distribution, and Selection of Soil Contaminants of Concern											
Exposure Medium: Soil											
Exposure Area	**Chemical of Potential Ecological Concern**	**Concentration Detected (mg/kg)[1]**		**Mean (mg/kg)**	**95% UCL (mg/L)**	**Background (mg/kg)**		**Screening Toxicity Value (mg/kg)**	**Screening Toxicity Value Source[3]**	**HQ Value[4]**	
		Minimum	**Maximum**			**RME**	**CTE**			**RME**	**CTE**
EA2	**Volatile Organics**										
	Acetaldehyde	0.044	0.2	0.26	NC	ND	ND	NA	NA	NA	NA
	Semivolatile Organics										
	Benzaldehyde	0.086	1.9	2.2	0.79	0.098	0.063	NA	NA	NA	NA
	Benzo(a)pyrene	0.021	0.24	0.25	0.15	0.022	0.019	0.1	EPA Region 4	0.009	0.015
	Bis(2-Ethylhexyl)phthalate	0.022	340	22	110	0.031	0.019	0.925	REACH	0.85	0.17
	Diphenyl ether	0.12	0.12	2.1	NC	ND	ND	NA	NA	NA	NA
	Fluoranthene	0.037	0.94	1.7	0.40	0.043	0.026	0.1	EPA Region 4	0.023	0.054
	Phenanthrene	0.026	0.68	1.8	0.27	0.035	0.022	0.1	EPA Region 4	0.015	0.038
	Pyrene	0.042	0.66	1.7	0.31	0.049	0.028	0.1	EPA Region 4	0.018	0.038
	Pesticides										
	4,4'-DDD	0.039	0.039	0.056	NC	NA	NA	0.0025	EPA Region 4	0.002	0.002
	4,4'-DDE	0.049	0.049	0.059	NC	NA	NA	0.0025	EPA Region 4	0.002	0.002
	4,4'-DDT	0.68	0.68	0.27	NC	NA	NA	0.021	Eco-SSL - Mammals	0.035	0.014
	Metals										
	Aluminum	1,200	24,000	8,715	13,090	13,000	7,378	50	ORNL - Plants	**1.8**	**27**
	Arsenic	1.7	15	6.7	8.8	10	5.0	10	ORNL - Plants	0.49	0.37
	Cadmium	0.14	1.1	0.51	0.69	0.26	0.15	0.36	Eco-SSL - Mammals	0.022	0.016
	Chromium	10	275	39	116	10	6.2	0.4	ORNL - Invertebrates	0.37	0.13
	Copper	5.2	35	17.9	22	5.8	4.1	28	Eco-SSL - Mammals	0.32	0.26
	Iron	710	36,000	10,908	22,493	12,000	6,314	200	EPA Region 4	NA	NA
	Lead	3.85	80	40	53	26	15.6	11	Eco-SSL - Birds	0.44	0.33
	Mercury	0.01	0.35	0.15	0.16	0.11	0.077	0.1	ORNL - Invertebrates	**1.6**	**1.5**
	Selenium	0.93	3.6	1.1	2.4	0.60	0.41	0.52	Eco-SSL - Plants	**4.6**	**2.1**
	Vanadium	14	44	24	29	21	11.9	2	ORNL - Plants	**14.7**	**11.8**
	Zinc	6.7	140	49	70	18	8.5	46	Eco-SSL - Birds	0.58	0.41
	Inorganics										
	Chloride	25.85	550	79	242	ND	ND	8.7	ECOSAR - CSV	**2.8**	0.90
	Nitrogen, as Ammonia	23	1,200	439	625	200	128	NA	NA	NA	NA

Table G-Eco3

Occurrence, Distribution, and Selection of Soil Contaminants of Concern

Exposure Medium: Soil

Exposure Area	Chemical of Potential Ecological Concern	Concentration Detected (mg/kg)[1]		Mean (mg/kg)	95% UCL (mg/L)	Background (mg/kg)		Screening Toxicity Value (mg/kg)	Screening Toxicity Value Source[3]	HQ Value[4]	
		Minimum	Maximum			RME	CTE			RME	CTE
EA4	**Volatile Organics**										
	Acetaldehyde	0.046	0.046	0.12	NC	ND	ND	NA	NA	NA	NA
	Semivolatile Organics										
	Benzaldehyde	0.012	1.2	0.24	0.61	0.098	0.063	NA	NA	NA	NA
	Benzo(a)pyrene	0.011	3.4	0.33	0.35	0.022	0.019	0.1	EPA Region 4	0.021	0.020
	Bis(2-Ethylhexyl)phthalate	0.014	200	9.0	30	0.031	0.019	0.925	REACH	0.23	0.069
	Fluoranthene	0.011	1.9	0.85	0.41	0.043	0.026	0.1	EPA Region 4	0.023	0.049
	Naphthalene	0.008	0.21	0.82	0.065	ND	ND	0.0994	EPA Region 5	0.004	0.012
	Phenanthrene	0.012	0.69	0.78	0.14	0.035	0.022	0.1	EPA Region 4	0.008	0.039
	Pyrene	0.013	1.3	0.82	0.22	0.049	0.028	0.1	EPA Region 4	0.013	0.047
	Pesticides										
	4,4'-DDD	0.00012	0.16	0.021	0.016	NA	NA	0.0025	EPA Region 4	0.0008	0.0011
	4,4'-DDE	0.00053	0.011	0.017	0.0038	NA	NA	0.0025	EPA Region 4	0.0002	0.0005
	4,4'-DDT	0.0014	0.15	0.025	0.068	NA	NA	0.021	Eco-SSL - Mammals	0.0035	0.0013
	Alpha-BHC	0.0002	0.0058	0.015	0.0020	NA	NA	0.0025	EPA Region 4	0.00007	0.0002
	Gamma-BHC/Lindane	0.00011	0.13	0.019	0.012	NA	NA	0.00005	EPA Region 4	**2.5**	**3.9**
	Metals										
	Aluminum	640	59,000	7,016	8,804	13,000	7,378	50	ORNL - Plants	**176**	**140**
	Arsenic	2	32	7.6	9.1	10.0	5.0	10	ORNL - Plants	0.51	0.42
	Cadmium	0.026	5.8	0.42	0.48	0.26	0.15	0.36	Eco-SSL - Mammals	0.015	0.013
	Chromium	1.1	5,000	272	583	10.0	6.2	0.4	ORNL - Invertebrates	**1.9**	0.88
	Chromium, Hexavalent	8.9	95	11	38	NA	NA	81	Eco-SSL - Mammals	NA	NA
	Cobalt	0.16	45.5	5.0	16.2	2.9	1.6	13	Eco-SSL - Plants	**1.2**	0.39
	Copper	0.94	79.5	14	27	5.8	4.1	28	Eco-SSL - Birds	0.39	0.20
	Iron	81	100,000	8,973	19,245	12,000	6,314	200	EPA Region 4	NA	NA
	Lead	1.5	210	24	43	26	15.6	11	Eco-SSL - Birds	0.36	0.20
	Manganese	2.8	1035	84	171	69	28	220	ECO-SSL- Plants	0.78	0.38
	Mercury	0.034	0.49	0.12	0.14	0.11	0.077	0.1	ORNL - Invertebrates	**1.4**	**1.2**
	Nickel	0.66	67	10	25	7.3	4.0	30	ORNL - Plants	0.66	0.27
	Vanadium	4.1	54	17	20	21	11.9	2	ORNL - Plants	10.2	8.4
	Zinc	1.2	180	23	48	18	8.5	46	Eco-SSL - Birds	0.40	0.19
	Inorganics										
	Chloride	26.3	560	54	119	NA	NA	8.7	ECOSAR - CSV	**1.4**	0.62
	Cyanide, Total	3.7	9.05	5.8	7.9	NA	NA	0.9	EPA Region 4	0.088	0.065
	Nitrogen, as Ammonia	27	1,800	262	356	200	128	NA	NA	NA	NA
	Sulfate	13.4	23,900	1,095	10,004	63	28	46	ECOSAR - CSV	**22**	**2.4**
	Petroleum Hydrocarbons										
	C11-C22 Aromatics	6.8	130	32	56	NA	NA	NA	NA	NA	NA
	C19-C36 Aliphatics	5.9	190	42	81	NA	NA	NA	NA	NA	NA
	C9-C18 Aliphatics	6.7	17	6.5	16.3	NA	NA	NA	NA	NA	NA

Table G-Eco3											
Occurrence, Distribution, and Selection of Soil Contaminants of Concern											
Exposure Medium: Soil											
Exposure Area	**Chemical of Potential Ecological Concern**	**Concentration Detected (mg/kg)[1]**		**Mean (mg/kg)**	**95% UCL (mg/L)**	**Background (mg/kg)**		**Screening Toxicity Value (mg/kg)**	**Screening Toxicity Value Source[3]**	**HQ Value[4]**	
		Minimum	**Maximum**			**RME**	**CTE**			**RME**	**CTE**
EA5	**Volatile Organics**										
	Acetaldehyde	0.048	0.13	0.082	NC	NA	NA	NA	NA	NA	NA
	Semivolatile Organics										
	Aniline	0.12	0.12	12.7	NC	NA	NA	NA	NA	NA	NA
	Benzaldehyde	0.029	0.33	0.12	0.21	NA	NA	NA	NA	NA	NA
	Benzo(a)pyrene	0.014	0.44	0.072	0.15	NA	16.4	0.1	EPA Region 4	0.0092	0.004399407
	Bis(2-Ethylhexyl)phthalate	0.026	216	31	103	130	130	0.925	REACH	0.80	0.24
	Diphenyl ether	1.6	1.9	0.37	1.9	NA	NA	NA	NA	NA	NA
	Fluoranthene	0.018	2.6	0.44	2.5	NA	17.5	0.1	EPA Region 4	0.14	0.025
	N-Nitrosodi-n-propylamine	0.26	0.26	2.5	NC	NA	NA	NA	NA	NA	NA
	Phenanthrene	0.023	0.41	0.26	0.15	NA	17.7	0.1	EPA Region 4	0.0082	0.015
	Pyrene	0.024	0.79	0.28	0.56	NA	17.5	0.1	EPA Region 4	0.032	0.016
	Pesticides										
	4,4'-DDT	0.045	0.045	0.045	NC	NA	19.6	0.021	Eco-SSL - Mammals	0.0023	0.0023
	Hexachlorobenzene	0.029	0.029	0.029	NC	NA	19.7	0.0025	EPA Region 4	0.0015	0.0015
	Metals										
	Aluminum	2,500	43,000	10,789	20,005	50	NA	50	ORNL - Plants	**400**	**216**
	Antimony	0.29	0.34	0.88	0.36	5.0	78	0.27	Eco-SSL - Mammals	0.068	0.068
	Arsenic	4.5	42	19.4	27	18	60	10	ORNL - Plants	**1.5**	**1.1**
	Cadmium	0.093	0.52	0.65	0.42	32	140	0.36	Eco-SSL - Mammals	0.013	0.016
	Chromium	7.2	62,000	6,648	26,344	310	310	0.4	ORNL - Invertebrates	**85**	**21**
	Chromium, Hexavalent	19	1,100	79	559	NA	NA	81	Eco-SSL - Mammals	NA	NA
	Copper	3.8	190	38	97	70	80	28	Eco-SSL - Birds	**1.4**	0.55
	Iron	3,700	31,000	14,067	20,139	NA	NA	200	USEPA Region 4	NA	NA
	Lead	27	150	71	93	120	1,700	11	Eco-SSL - Birds	0.78	0.59
	Mercury	0.047	3.1	0.64	1.9	0.3	0.1	0.1	ORNL - Invertebrates	**19.3**	**6.4**
	Silver	10	1,100	103	1,439	560	NA	2	ORNL - Plants	**2.0**	0.18
	Thallium	7.4	7.4	1.9	NC	1.0	NA	1	ORNL - Plants	**7.4**	**1.9**
	Tin	4.5	26,000	2924	31,853	50	NA	50	ORNL - Plants	**520**	**58**
	Vanadium	12	150	39	69	2.0	NA	2	ORNL - Plants	**35**	**19.5**
	Zinc	3.4	47	17.0	31	160	120	46	Eco-SSL - Birds	0.26	0.14
	Inorganics										
	Cyanide, Total	6.5	6.5	6.5	NC	NA	89	0.9	USEPA Region 4	0.073	0.073
	Nitrogen, as Ammonia	150	1,100	406	749	NA	NA	NA	NA	NA	NA
	Sulfate	120	230	74	230	NA	465	46	ECOSAR - CSV	0.49	0.16
	Petroleum Hydrocarbons										
	C11-C22 Aromatics	1,400	7,500	4450	NC	NA	11.616	NA	NA	**646**	**383**
	C19-C36 Aliphatics	1,800	4,900	3350	NC	NA	NA	NA	NA	NA	NA
	C9-C18 Aliphatics	200	780	490	NC	NA	NA	NA	NA	NA	NA

Table G-Eco3											
Occurrence, Distribution, and Selection of Soil Contaminants of Concern											
Exposure Medium: Soil											
Exposure Area	**Chemical of Potential Ecological Concern**	**Concentration Detected (mg/kg)[1]**		**Mean (mg/kg)**	**95% UCL (mg/L)**	**Background (mg/kg)**		**Screening Toxicity Value (mg/kg)**	**Screening Toxicity Value Source[3]**	**HQ Value[4]**	
		Minimum	**Maximum**			**RME**	**CTE**			**RME**	**CTE**

Key

CTE = central tendency exposure

EA = exposure area

µg/L - microgram per liter

NA = Not Applicable

NC = Not Calculated - dataset too small to calculate or only one detection

RME = reasonable maximum exposure

[1] Minimum/maximum/mean detected concentration above the sample quantitation limit

[3] Soil Screening benchmark sources in order of preference:

1. Lowest value in these sources
   - Eco-SSLs - Ecological Soil Screening Levels, EPA, 2013
   - ORNL - Invertebrates - Oak Ridge National Laboratory (Efroymson, Will, & Suter, 1997)
   - ORNL - Plants (Efroymson, et al., 1997)
2. Lowest value in these sources
   - EPA Region 4 (from EPA, 2001)
   - EPA Region 5 (EPA, 2003)
3. Estimated benchmarks using EPA, 2012 Ecological Structure Activity Relationships (ECOSTAR) Database v. 1.11 using 14 day LC50s for earthworms and factors of 10 for non-persistent chemicals, 20 for persistnent non-bioaccumulating chemicals, and 100 for persistent and bioaccumulating chemicals to convert to NOAELs.
4. In lieu of other benchmarks, the benchmark for formaldehyde was selected from Sample et al., 1996 value for shrew.
5. REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) database. Values selected are No Observed Effects Concentrations for invertebrates
6. Chlordane (technical) used as a surrogagte for alpha-chlordane
7. Calcium, magnesium, potassium and sodium considered essential nutrients; benchmarks are not applicable

[4] HQ (Hazard Quotient) calculated by dividing the exposure point concentration by the effects benchmark.

Soil chemicals of concern based on initial screening in Table 3.13-1 through 3.13-3 of Baseline Ecological Risk Assessment, OU1-OU2 RI. 95% UCL from Table 4.1-1 through 4.1-3. Screening benchmarks from table 3.12-1. Background and HQ values from Table 4.3-1 through 4.3-3. HQ based on largest value for plants and invertebrates; HQ values above 1 are **bold.**

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table G-Eco4

Ecological Exposure Pathways and Endpoints

Exposure Media	Sensitive Environment Flag (Y or N)	Receptor	Exposure Routes	Assessment Endpoints	Measurement Endpoints
Terrestrial Exposure Areas: EA2, EA4 and EA5 (Soil)	N	Terrestrial Plants	Soil	Sustainability of terrestrial plant community	Compare bulk soil concentrations to soil effects benchmarks and reference area conditions
	N	Soil Invertebrates	Soil	Sustainability of soil invertebrate community	Compare bulk soil concentrations to soil effects benchmarks and reference area conditions
	N	Terrestrial Birds - American Robin	Soil, Plants, Prey	Sustainability of invertivorous bird populations	Compare estimated daily does based on prey and soil ingestion to published avian TRVs and reference area conditions
	N	Terrestrial Birds - Red-Tailed Hawk	Soil, Prey	Sustainability of bird of prey populations	Compare estimated daily does based on prey and soil ingestion to published avian TRVs and reference area conditions
	N	Terrestrial Mammals - Short-Tailed Shrew	Soil, Plants, Prey	Sustainability of ominvorous small mammal populations	Compare estimated daily does based on prey and soil ingestion to published mammalian TRVs and reference area conditions
	N	Terrestrial Mammals - Red Fox	Soil, Prey	Sustainability of carnivorous mammal populations	Compare estimated daily does based on prey and soil ingestion to published mammalian TRVs and reference area conditions
Aquatic Exposure Areas: Central Pond, Storm Water Detention Basin, On-PWD Stream/ Wetland, Off-PWD Stream, MMB Wetland, Lanfill Brook, North Pond	Y	Benthic Macroinvertebrates	Surface Water, Sediment	Sustainability of benthic invertebrate community	Compare sediment/surface water concentrations to effects benchmarks. Compare sediment toxicity test results for South Ditch to reference samples.
	Y	Amphibians	Surface Water, Sediment	Sustainability of amphibian populations	Compare sediment/surface water concentrations to effects benchmarks.
	Y	Semi-Aquatic Birds - Marsh Wren	Surface Water, Sediment, Prey	Sustainability of semi-aquatic bird populations	Compare estimated daily doses based on ingestion of prey, sediment and surface water to published avian TRVs.
	Y	Semi-Aquatic Birds - Green Heron	Surface Water, Sediment, Prey	Sustainability of semi-aquatic bird populations	Compare estimated daily doses based on ingestion of prey, sediment and surface water to published avian TRVs.
	Y	Semi-Aquatic Mammals - Muskrat	Surface Water, Sediment, Plants	Sustainability of semi-aquatic mammal populations	Compare estimated daily doses based on ingestion of plants, sediment and surface water to published mammalian TRVs.
	Y	Semi-Aquatic Mammals - Raccoon	Surface Water, Sediment, Prey	Sustainability of semi-aquatic mammal populations	Compare estimated daily doses based on ingestion of prey, sediment and surface water to published mammalian TRVs.

Key

NA = Not Applicable

MMB = Maple Meadow Brook

PWD = Property West Ditch

TRV = Toxicity Reference Value

Note: no endangered or threatened species have been identified at the Site. Assessment endpoints described on page 3-13 and 3-14 of OU1/OU2 BERA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-Eco5

Target Contaminant of Concern Concentrations for Protection of Ecological Receptors

Habitat Type/ Name	Exposure Medium	COC	Protective Level	Units	Basis	Assessment Endpoint
Upland (Terrestrial)	Upland Soil	Bis(2-ethylhexyl)phthalate	3	mg/kg	A	Sustainability of invertivorous birds and omnivorous small mammals
		Chromium	1,000	mg/kg	B	
Wetland	Wetland Soil	Bis(2-ethylhexyl)phthalate	20	mg/kg	C	Sustainability of semi-aquatic birds
		Chromium	600	mg/kg	D	
Surface Water Bodies	Streambank Soil and Aquatic Sediment	Bis(2-ethylhexyl)phthalate	100	mg/kg	E	Sustainability of semi-aquatic birds
		Chromium	100	mg/kg	F	
	Surface Water	Chromium	0.1	mg/L	G	Sustainability of aquatic life based on ambient water quality criteria
		Ammonia	15	mg/L	H	

Key

ccc - criterion continuous concentration

COC - chemical of concern

mg - milligram

kg - kilogram

L - liter

LOAEL - lowest adverse effects level

NOAEL - no observed adverse effects level

PRG - preliminary remediation goal

A: Geometric mean of NOAEL-PRG & LOAEL-PRG for American robin (most sensitive receptor) at EA-5.

B: Geometric mean of NOAEL-PRG & LOAEL-PRG for American robin (most sensitive receptor) at EA-5, rounded down to 1000 mg/kg

C: Geometric mean of NOAEL-PRG & LOAEL-PRG for marsh wren at Lower South Ditch (21 mg/kg rounded to 20 mg/kg); applicable to all wetland soil

D: Geometric mean of NOAEL-PRG & LOAEL-PRG for marsh wren at Off-Property West Ditch Stream (641 mg/kg rounded to 600 mg/kg); applicable to all wetland soil

E: Conclusion from REACH dossier (https://echa.europa.eu/registration-dossier/-/registered dossier/15358/6/1)

F: Probable Effect Concentration (110 mg/kg) and conclusion from REACH dossier (100 mg/kg) rounded to 100 mg/kg

G: Arithmetic mean of hardness-adjusted CCC at seven water bodies at Site (Table 3.12-3 of BERA [AMEC, 2015c]), rounded to 0.1

H: CCC for Site-specific pH and temperature during Spring months at East Ditch, applied to all surface water at Site

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1

Table K-1

Comparative Analysis of Remedial Alternatives

ALTERNATIVES BY MEDIUM	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short-Term Effectiveness	Implementability	Costs[1] Capital Cost	O&M Cost	Total (Net Present Value)
DAPL/Groundwater Interim Action									
Alternative DAPL/GWHS-1: No action	X	X	N/A	N/A	-	+ +	$0	$0	$0
Alternative DAPL/GWHS-2: DAPL extraction (approx. 5 wells), groundwater hot spot extraction targeting 11,000 ng/L (approx. 2-3 wells), on-site treatment at new treatment system	✓	✓	-	+	+	+	$10,253,755	$21,701,568	$22,518,229
Alternative DAPL/GWHS-3: DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting 5,000 ng/L (approx. 6 wells), on-site treatment at new treatment system	✓	✓	+	+ +	+	+	$15,625,318	$24,620,268	$35,497,565
Alternative DAPL/GWHS-4: DAPL extraction (approx. 20 wells), groundwater hot spot extraction targeting 1,100 ng/L (approx. 12 wells), on-site treatment at new treatment system	✓	✓	+ +	+ +	-	-	$19,289,931	$26,519,632	$40,464,350
LNAPL/Surface Water Final Action									
Alternative LNAPL-SW-1: No action	X	X	N/A	N/A	-	+ +	$0	$0	$0
Alternative LNAPL/SW-2: MPE for LNAPL with treatment at Plant B, groundwater extraction to prevent discharge to surface water, on-site treatment at new treatment system	✓	✓	-	+	-	+	$4,638,520	$6,534,000	$9,005,134
Alternative LNAPL/SW-3: Demolition of Plant B, MPE for LNAPL, targeted groundwater extraction to prevent discharge to surface water, on-site treatment at new treatment system	✓	✓	+	+ +	+	+ +	$2,278,032	$7,356,000	$6,644,452
Alternative LNAPL/SW-4: Excavation of LNAPL with off- site disposal, PRBs to treat groundwater before discharge into surface water	✓	✓	+ +	+	- -	-	$5,313,855	$6,726,091	$8,976,238
Soil/Sediment Final Action									
Alternative SOIL/SED-1: No action alternative	X	X	N/A	N/A	-	+ +	$0	$0	$0
Alternative SOIL/SED-2: Containment Area cap, upland soil covers, excavation with off-site disposal and restoration of wetland soil and sediments, limited action for TMPs (Institutional Controls, including vapor intrusion evaluations or vapor barriers/sub-slab depressurization systems)	✓	✓	+	-	+	+ +	$5,614,205	$1,127,600	$6,072,515
Alternative SOIL/SED-3: Containment Area cap, excavation (0-1 ft) with off-site disposal and clean soil cover for upland soil, excavation with off-site disposal and restoration of wetland soil and sediments, air sparging and SVE for TMPs	✓	✓	+	+	-	+	$6,686,227	$1,522,200	$7,470,417
Alternative SOIL/SED-4: Excavation (0-10 ft) with off-site disposal and clean soil cover for Containment Area and upland soil, excavation with off-site disposal and restoration of wetland soil and sediments, excavation and off-site disposal for TMPs	✓	✓	+ +	-	- -	+	$34,045,584	$330,400	$34,174,675

Key:

× Fails	- - Poor	+ Good	DAPL = Dense Aqueous Phase Liquid	MPE = multi-phase extraction	SVE = soil vapor extraction	ARARs = Applicable or Relevant and Appropriate Requirements	
✓ Passes	- Fair	++ Very Good	LNAPL = Light Non-Aqueous Phase Liquid	PRB = permeable reactive barrier	TMPs = trimethylpentenes	ng/L = nanograms per liter	SW = Surface Water
			SED = Sediment	GWHS = Groundwater Hot Spot	N/A = Not Applicable	ft = feet	O&M = Operations and Maintenance

Note: (1) "Present Value" is the amount of money set aside today to ensure that enough money is available over the expected life of the project, assuming certain conditions (e.g., inflation). Cost information was presumed over a 30-year period, using a 7% discount rate.

Table L-1
OU1-OU2 Performance Standards:
Protection of Human Health

Chemical of Concern	Performance Standard	Units	Basis
Upland Soil (indoor air impacts)			
Trimethylpentenes	0.175	mg/m^3	A
Surface Water			
Benzo(a)pyrene	0.0009	mg/L	B

Key:

A: Vapor intrusion risks were only qualitatively evaluated due to uncertainty in future use scenario; instead, the OU1/OU2 FS derived a target level from toxicological calculations.

B: CR = 5×10^{-4} and HI = 0.2 for Trespasser Off-Property West Ditch (Ingestion & Dermal Contact)

mg/m^3 = Milligrams per meter cubed

mg/L = Milligrams per liter

DAPL = Dense Aqueous Phase Liquid

CR = Cancer Risk

HI = Hazard Index

NDMA = n-nitrosodimethylamine

OU = Operable Unit

FS = Feasibility Study

Note: DAPL (excess lifetime cancer risk = $3x10^{-2}$ and hazard index = 3,379) and groundwater hot spots (excess lifetime cancer risk = $3x10^{-2}$ and hazard index = 291) are addressed as an interim remedy focused on mass removal. The key risk driver for exposure to these sources is NDMA. Upland soil risks posed by metals and benzo(a)pyrene will be addressed by Institutional Controls to restrict residential use; cleanup levels have therefore not been established for upland soil.

Table L-2
OU1-OU2 Cleanup Levels and Performance Standards: Protection of Ecological Receptors

Exposure Medium	Chemical of Concern	Cleanup Level	Units	Basis
Upland Soil				
	Bis(2-ethylhexyl)phthalate	3	mg/kg	A
	Chromium	1,000	mg/kg	B
Wetland Soil				
	Bis(2-ethylhexyl)phthalate	20	mg/kg	C
	Chromium	600	mg/kg	D
Streambank Soil and Aquatic Sediment				
	Bis(2-ethylhexyl)phthalate	100	mg/kg	E
	Chromium	100	mg/kg	F
Exposure Medium	**Chemical of Concern**	**Performance Standard**	**Units**	**Basis**
Surface Water				
	Chromium	0.1	mg/L	G
	Ammonia	9	mg/L	H

Key:

A: Geometric mean of NOAEL-PRG & LOAEL-PRG for American robin (most sensitive receptor) at EA-5.

B: Geometric mean of NOAEL-PRG & LOAEL-PRG for American robin (most sensitive receptor) at EA-5, rounded down to 1000 mg/kg

C: Geometric mean of NOAEL-PRG & LOAEL-PRG for marsh wren at Lower South Ditch Stream (21 mg/kg rounded to 20 mg/kg); applicable to all wetland soil

D: Geometric mean of NOAEL-PRG & LOAEL-PRG for marsh wren at Off-PWD (641 mg/kg rounded to 600 mg/kg); applicable to all wetland soil

E: Conclusion from REACH dossier (https://echa.europa.eu/registration-dossier/-/registered dossier/15358/6/1)

F: Probable Effect Concentration (110 mg/kg) and conclusion from REACH dossier (100 mg/kg) rounded to 100 mg/kg

G: Arithmetic mean of hardness-adjusted CCC at seven water bodies at Site (Table 3.12-3 of BERA [AMEC, 2015c]), rounded to 0.1

H: CCC for Site-specific pH and temperature during Spring months (mid-May to June) at East Ditch Stream, applied to all surface water at Site

mg/kg = Milligrams per kilogram

mg/L = Milligrams per liter

NOAEL = No Observed Adverse Effect Level

LOAEL = Lowest Observed Adverse Effect Level

BERA = Baseline Ecological Risk Assessment

REACH = Registration, Evaluation, Authorisation and restriction of Chemicals

EA = Exposure Area

Off-PWD = Off-Property West Ditch Stream

Site = Olin Property

CCC = Criterion Continuous Concentration

Appendix C

Figures

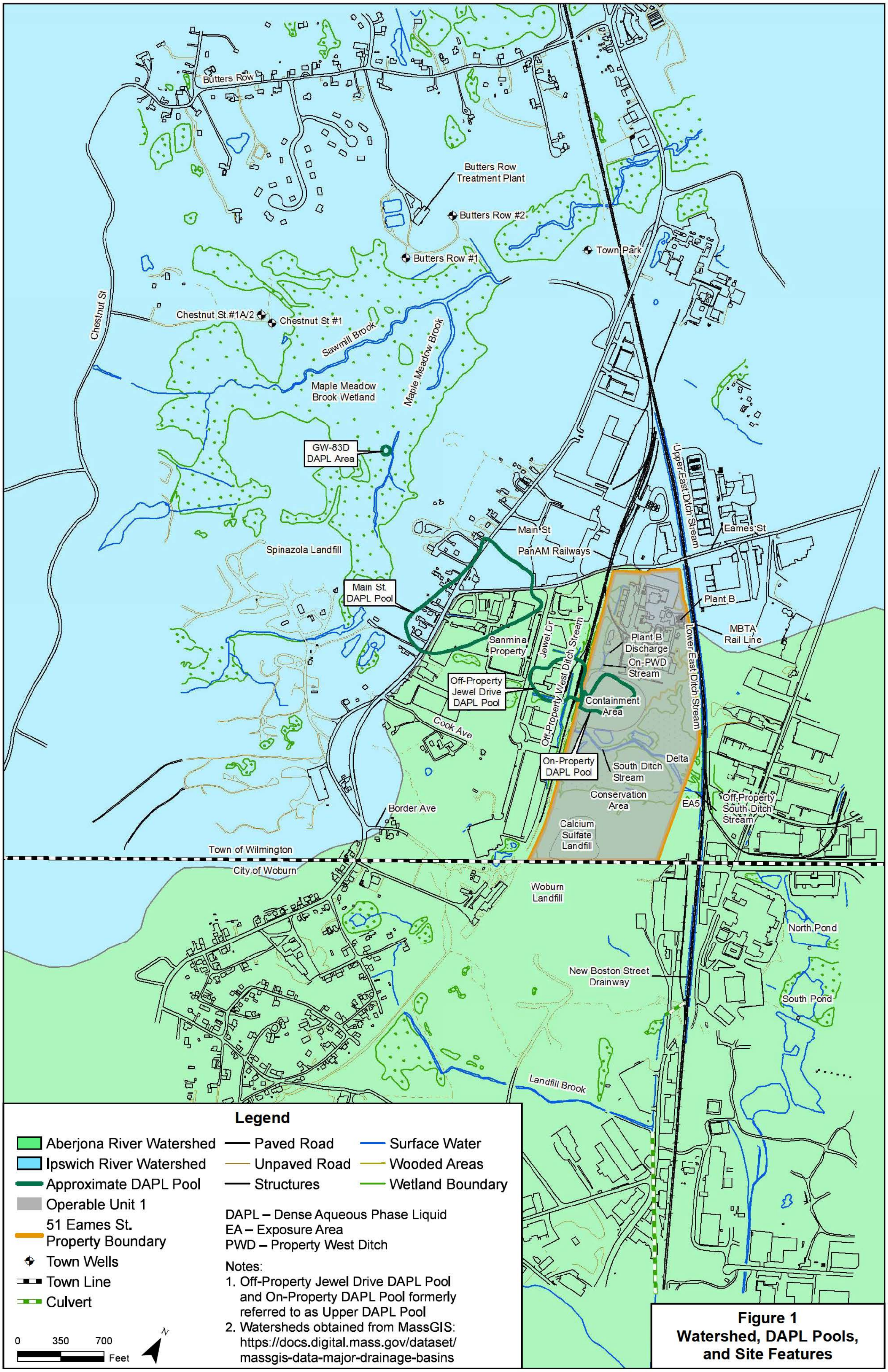
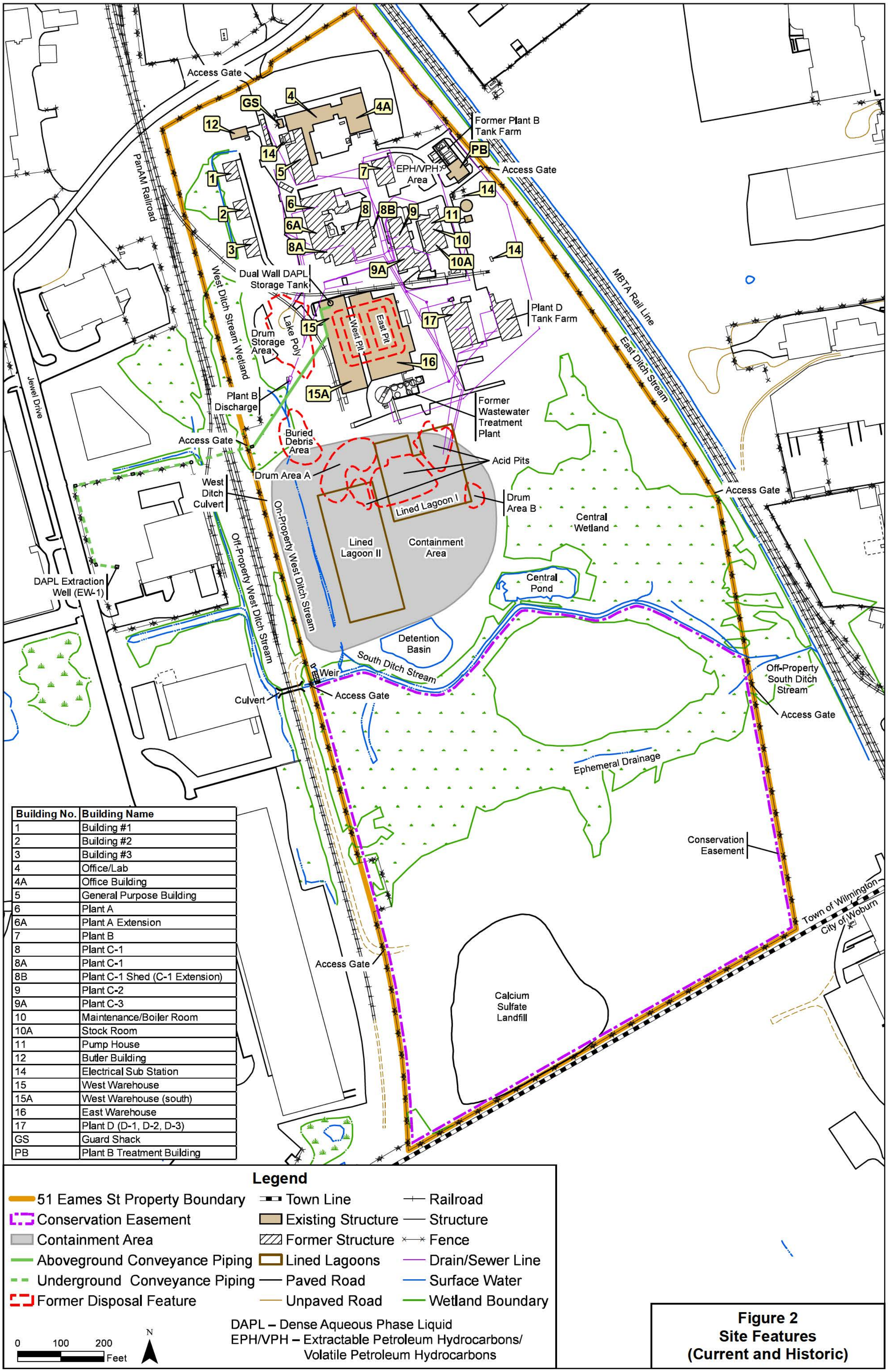
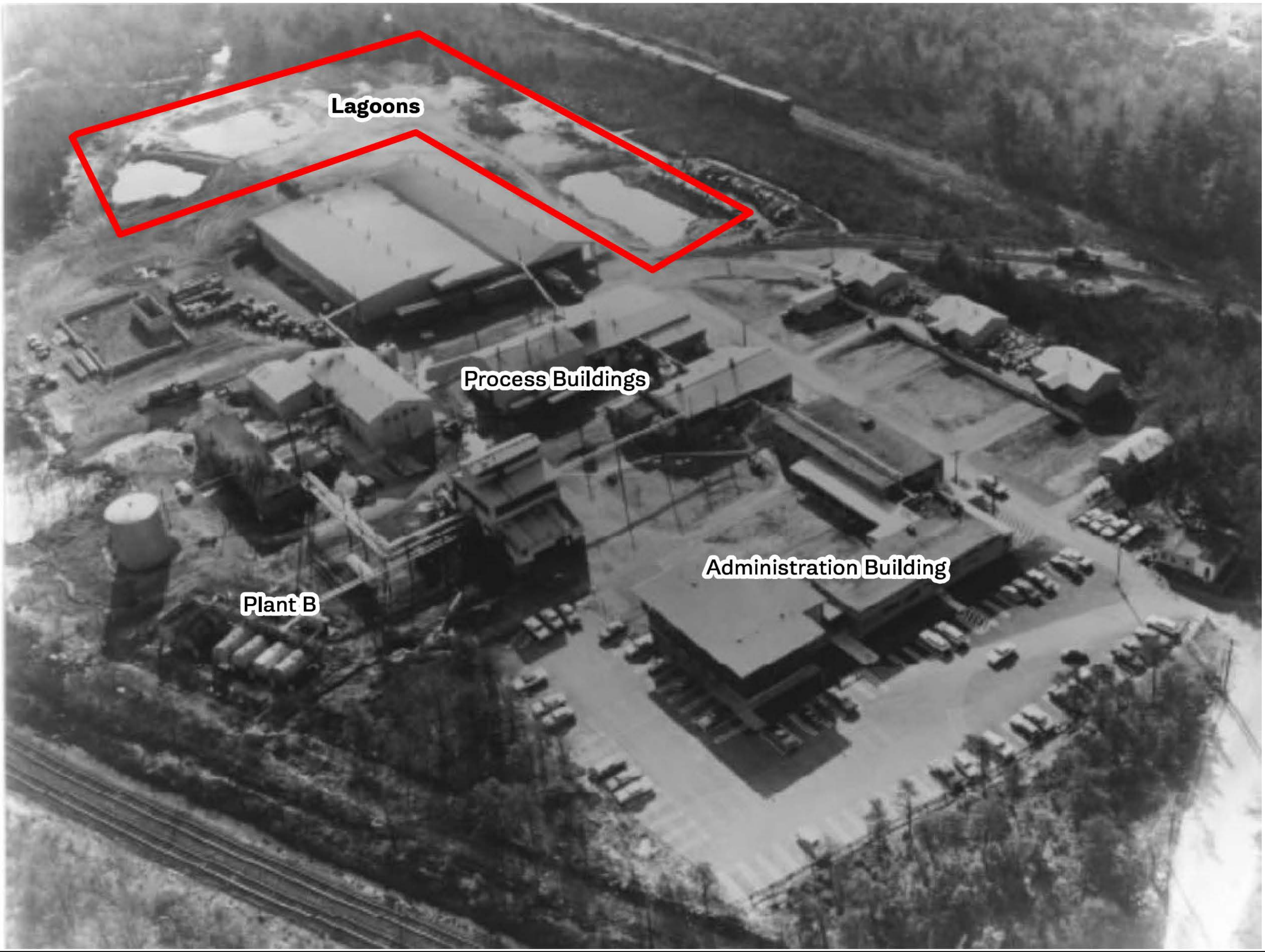


Figure 1
Watershed, DAPL Pools, and Site Features



Building No.	Building Name
1	Building #1
2	Building #2
3	Building #3
4	Office/Lab
4A	Office Building
5	General Purpose Building
6	Plant A
6A	Plant A Extension
7	Plant B
8	Plant C-1
8A	Plant C-1
8B	Plant C-1 Shed (C-1 Extension)
9	Plant C-2
9A	Plant C-3
10	Maintenance/Boiler Room
10A	Stock Room
11	Pump House
12	Butler Building
14	Electrical Sub Station
15	West Warehouse
15A	West Warehouse (south)
16	East Warehouse
17	Plant D (D-1, D-2, D-3)
GS	Guard Shack
PB	Plant B Treatment Building

Figure 2
Site Features
(Current and Historic)



Notes:

1. Olin property circa 1967, looking south.

nobis

Nobis Group® - 585 Middlesex Street
Lowell, MA 01851 - (978) 683-0891
www.nobis-group.com

FIGURE 2a

OLIN AERIAL OVERVIEW
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

PREPARED BY: CA	CHECKED BY: JB
PROJECT NO. D0001	DATE: March 2021

F:\80000 Task Orders\80021 Olin Chemical\Technical Data (TD)\GIS_Data\Maps_Figures\For_EPA\Olin Aerial Overview.mxd 3/19/2021 14:24 canderson

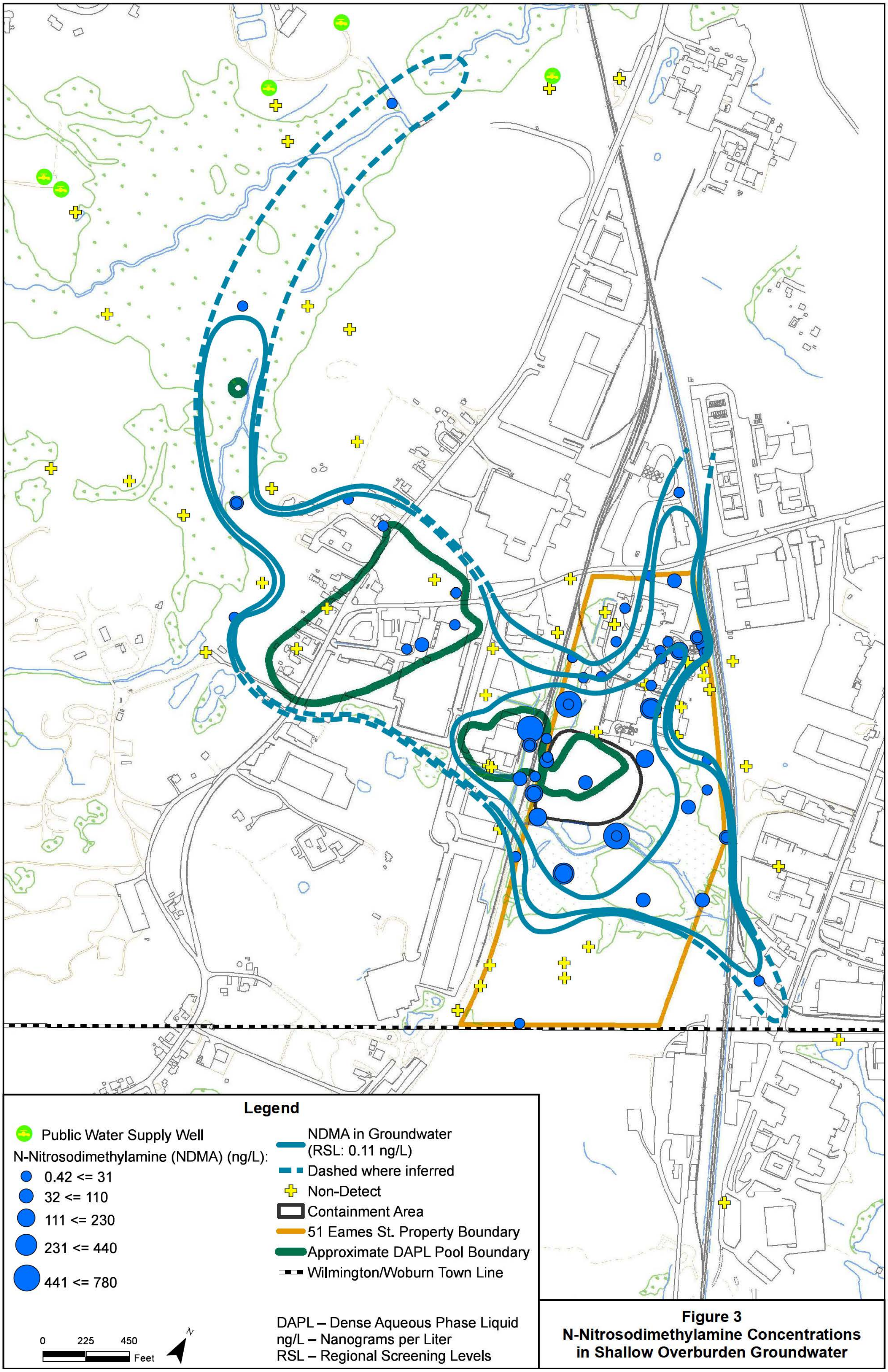


Figure 3
N-Nitrosodimethylamine Concentrations in Shallow Overburden Groundwater

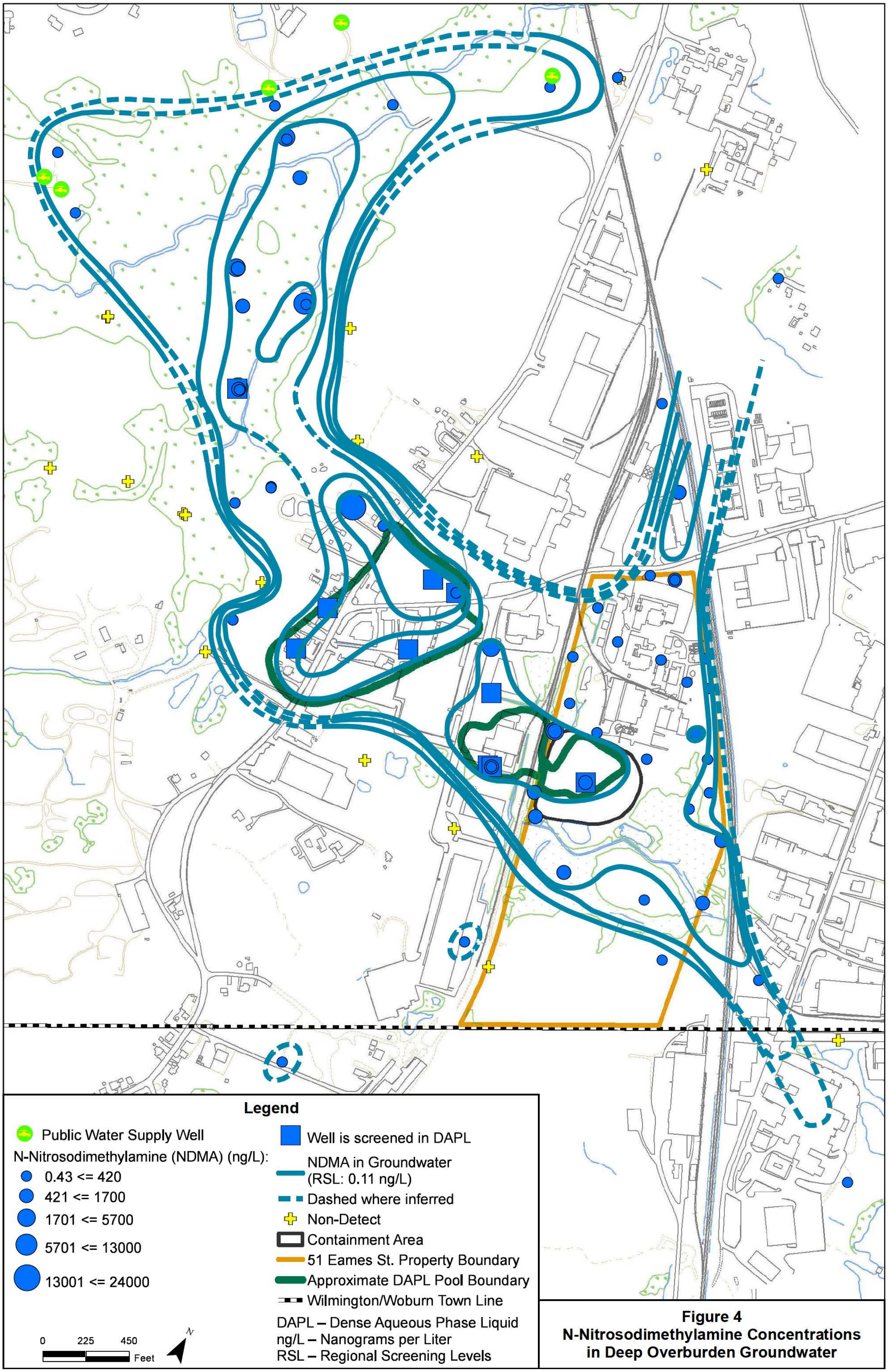
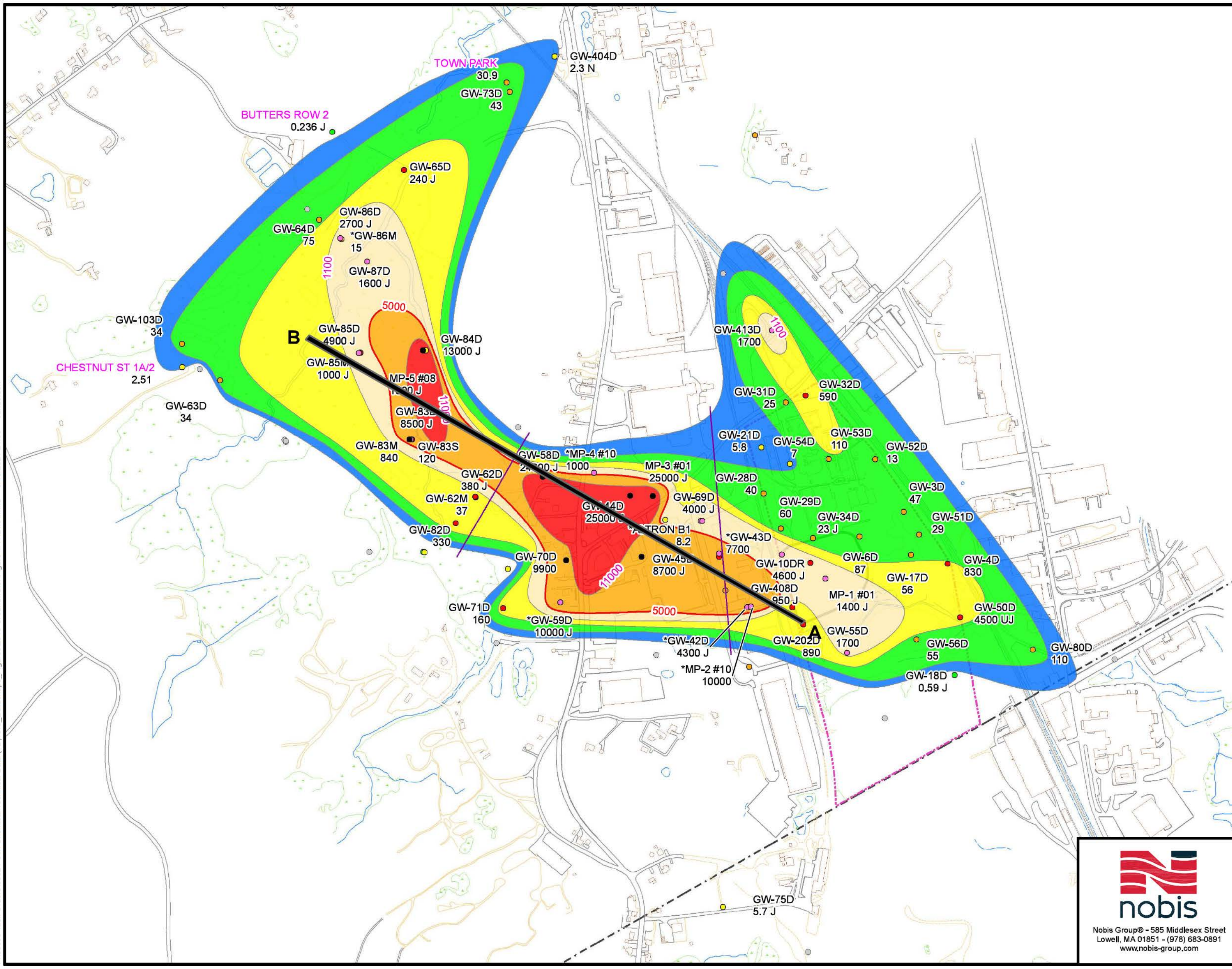


Figure 4
N-Nitrosodimethylamine Concentrations in Deep Overburden Groundwater



Notes:

1. Maximum result from 2010-2017 sampling events is labeled. If data are not available from 2010-2017, the most recent detection from 2003-2017 is included and labeled with an asterisk.
2. All concentrations shown are in nanograms per liter (ng/L).
3. Locations of site features depicted hereon are approximate and given for illustrative purposes only.
4. EPA10^{-4} risk level is 47 ng/L.
5. Former Public Supply Wells are shown in pink.

Legend

- > 1.1 ng/L
- > 11 ng/L
- > 110 ng/L
- > 1100 ng/L
- > 5000 ng/L
- > 11000 ng/L

N

0 300 600 1,200

Feet

1 inch = 600 feet

nobis

Nobis Group® - 585 Middlesex Street
Lowell, MA 01851 - (978) 683-0891
www.nobis-group.com

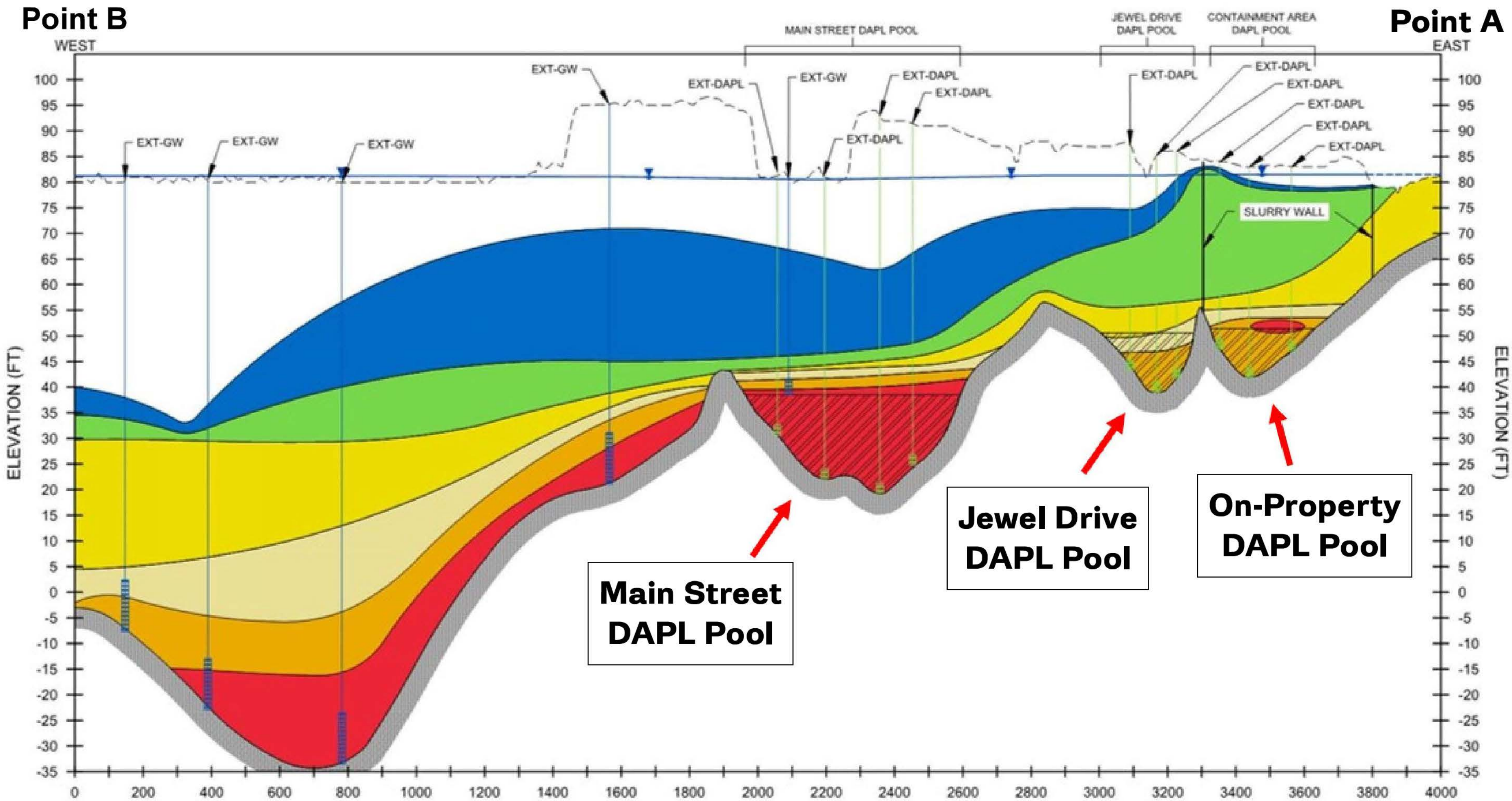
FIGURE 4a

EXTENT OF N-NITROSODIMETHYLAMINE (NDMA) IN DEEP OVERBURDEN GROUNDWATER
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

PREPARED BY: CA	CHECKED BY: JB
PROJECT NO. D0001	DATE: March 2021

F:\80000 Task Orders\80021 Olin Chemical\Technical Data (TD)\GIS_Data\Maps_Figures\2018 Groundwater\Figure 4A NDMA.mxd 3/18/2021 21:53 canderson

Dense Aqueous Phase Liquid (DAPL) Pools



Legend:

- >1.1 ng/L
- >11 ng/L
- >110 ng/L
- >1,100 ng/L
- >5,00 ng/L
- >11,0 00 ng/L

Notes:

1. Cross section transect location shown on Figure 4a.
2. EPA10-4 risk level is 47 ng/L.

nobis
Nobis Group® - 585 Middlesex Street
Lowell, MA 01851 - (978) 683-0891
www.nobis-group.com

FIGURE 4b

DAPL POOLS - CONCEPTUAL SITE MODEL
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

PREPARED BY: CA	CHECKED BY: JB
PROJECT NO. D0001	DATE: March 2021

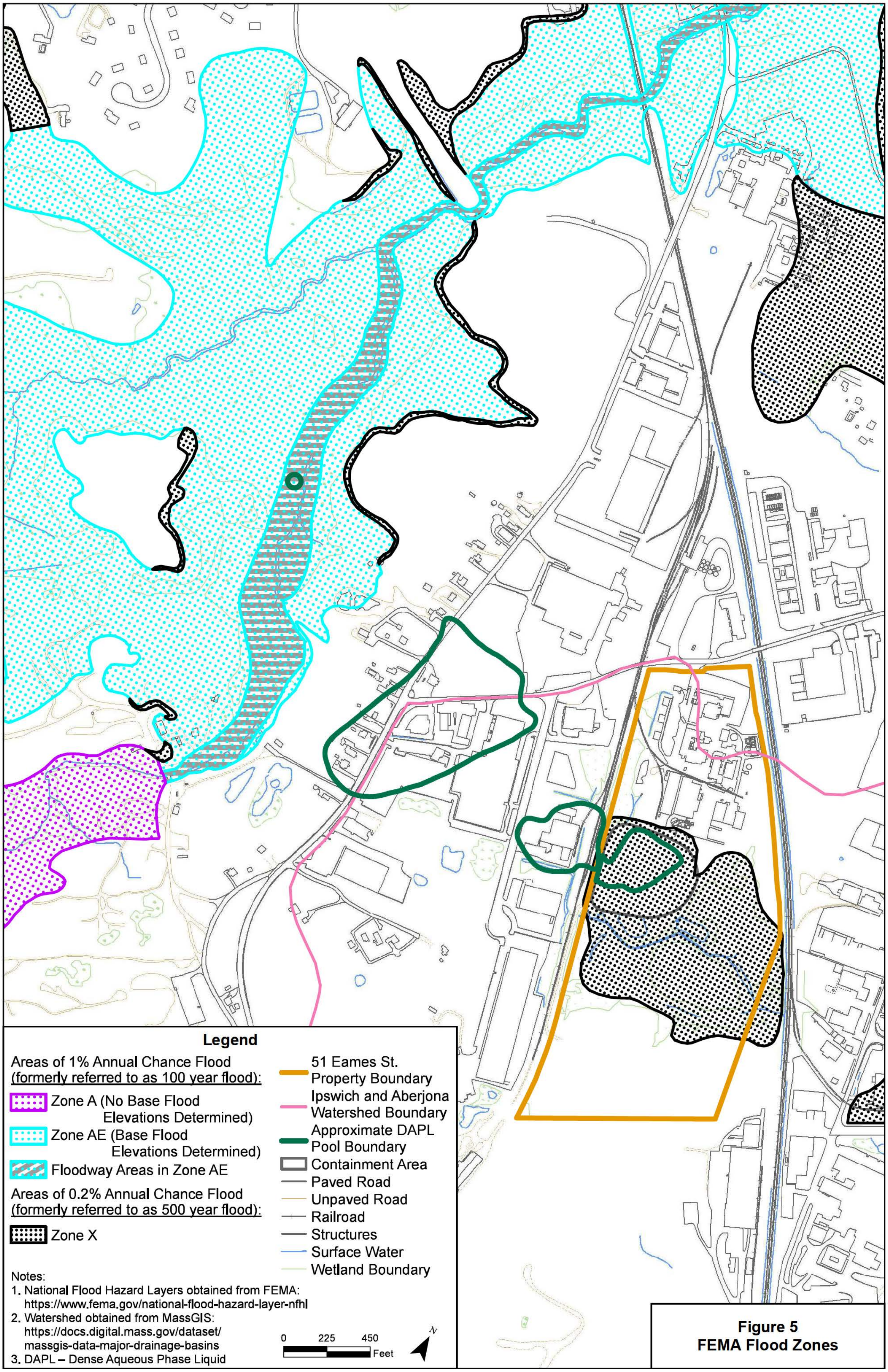


Figure 5
FEMA Flood Zones

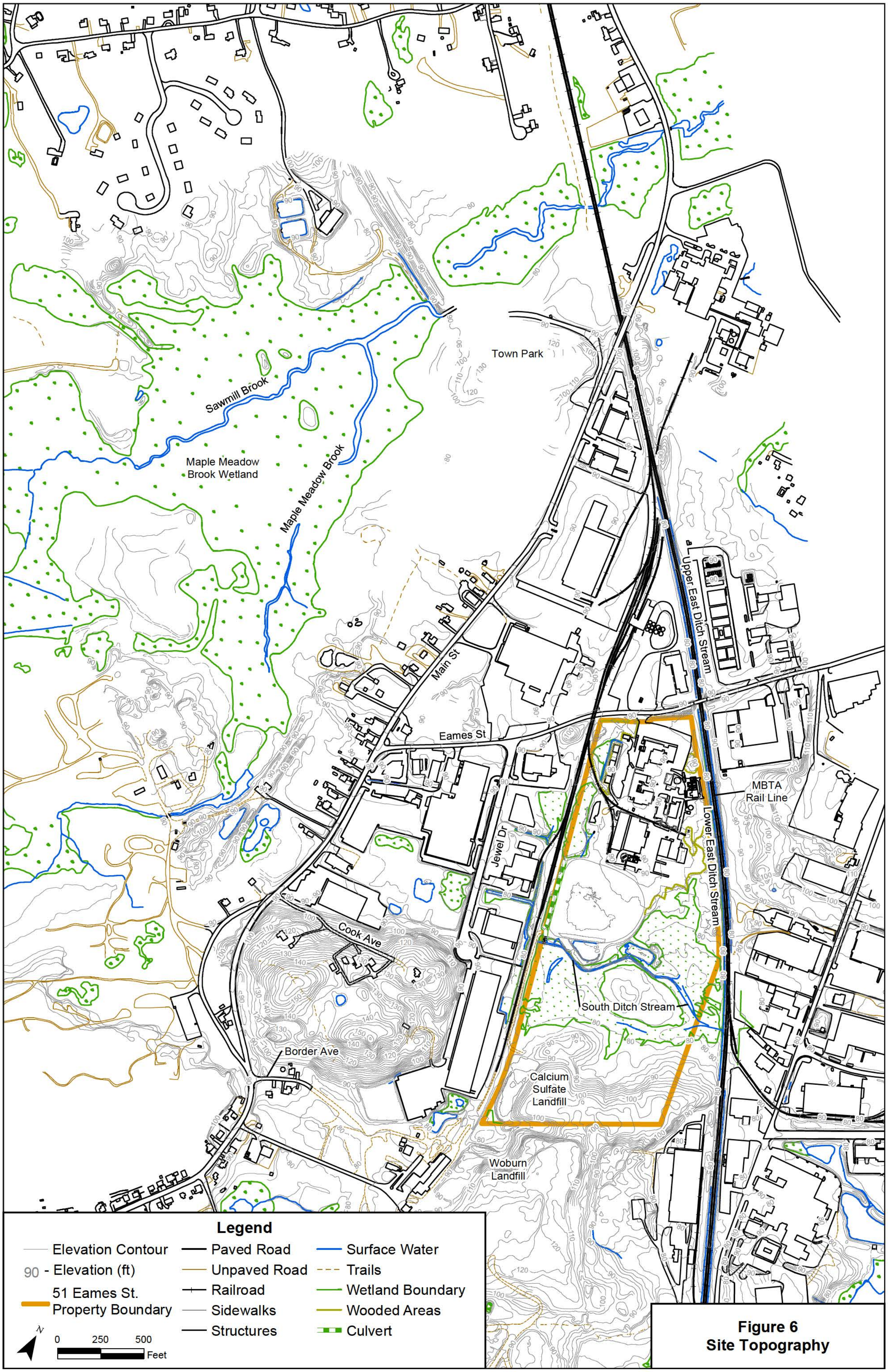


Figure 6
Site Topography

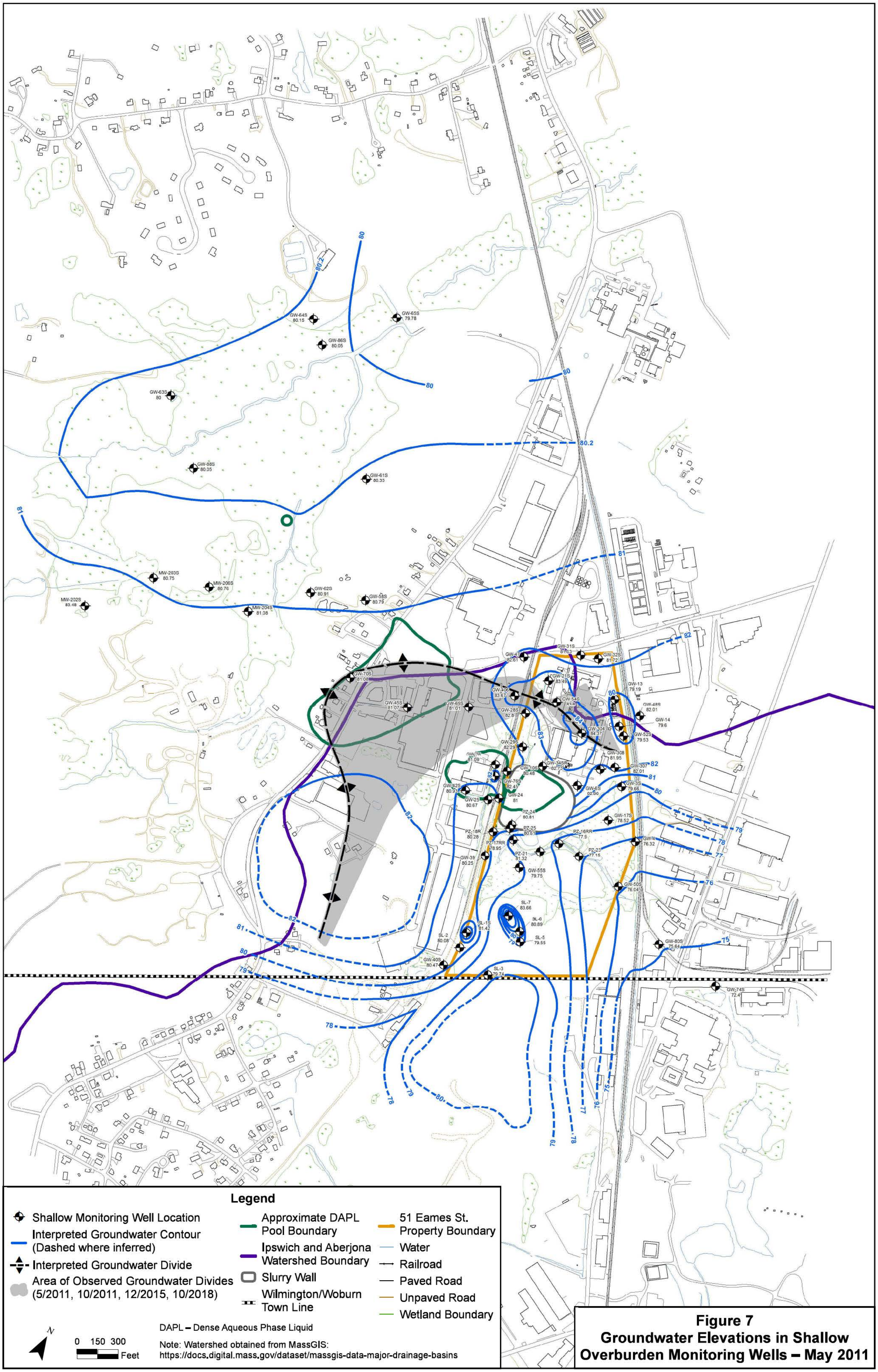


Figure 7
Groundwater Elevations in Shallow Overburden Monitoring Wells – May 2011

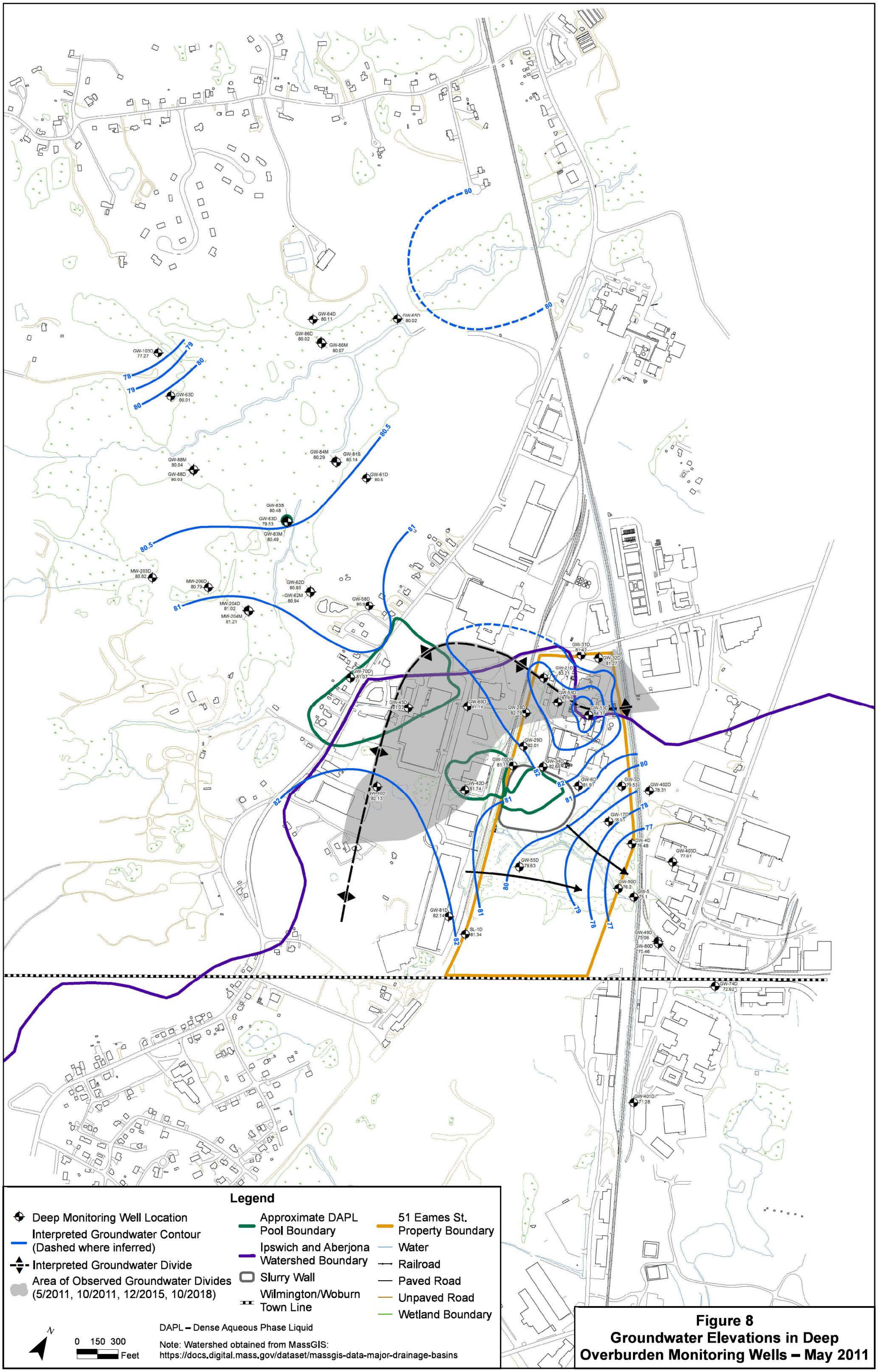


Figure 8
Groundwater Elevations in Deep Overburden Monitoring Wells – May 2011

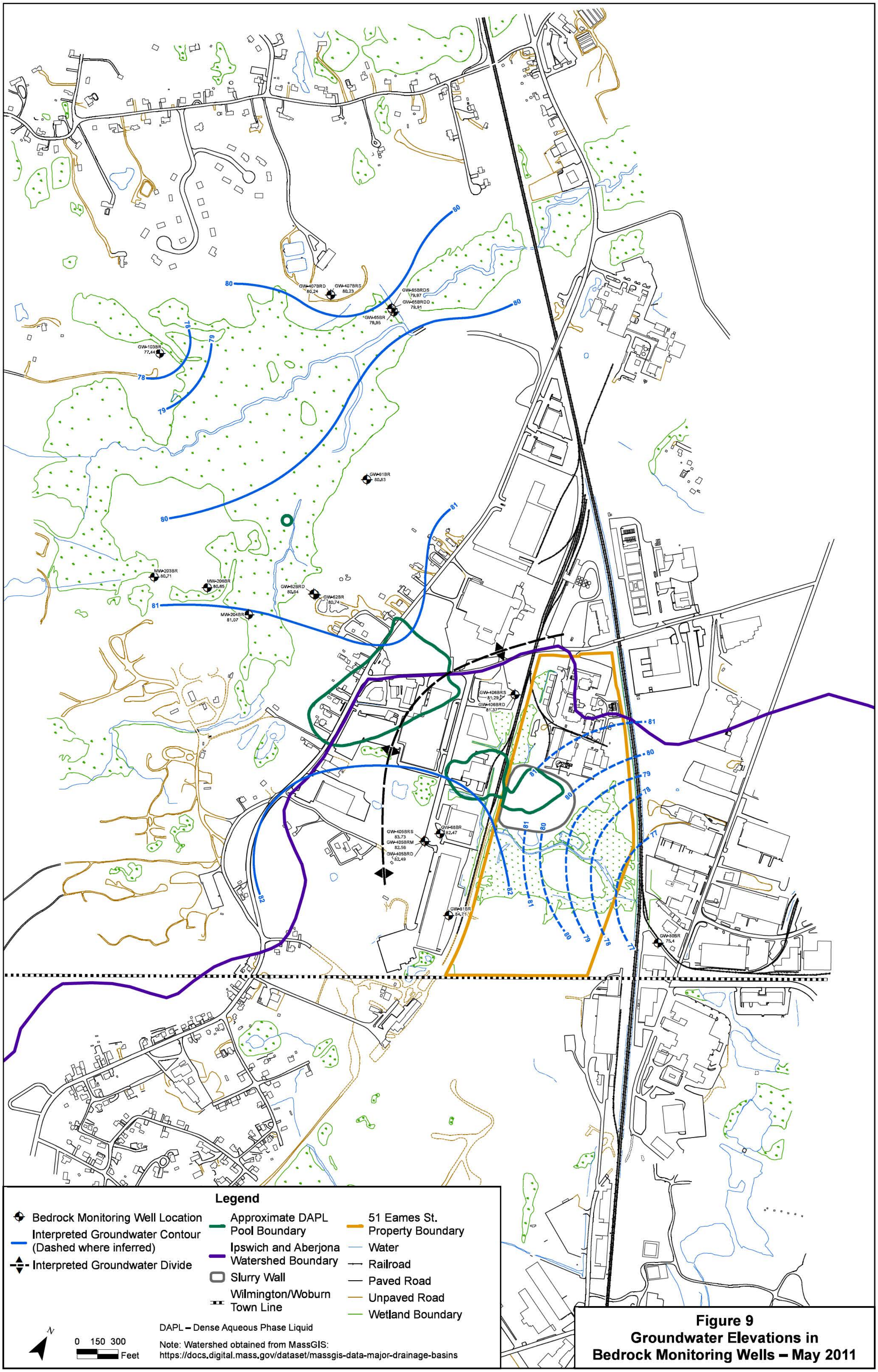


Figure 9
Groundwater Elevations in Bedrock Monitoring Wells – May 2011

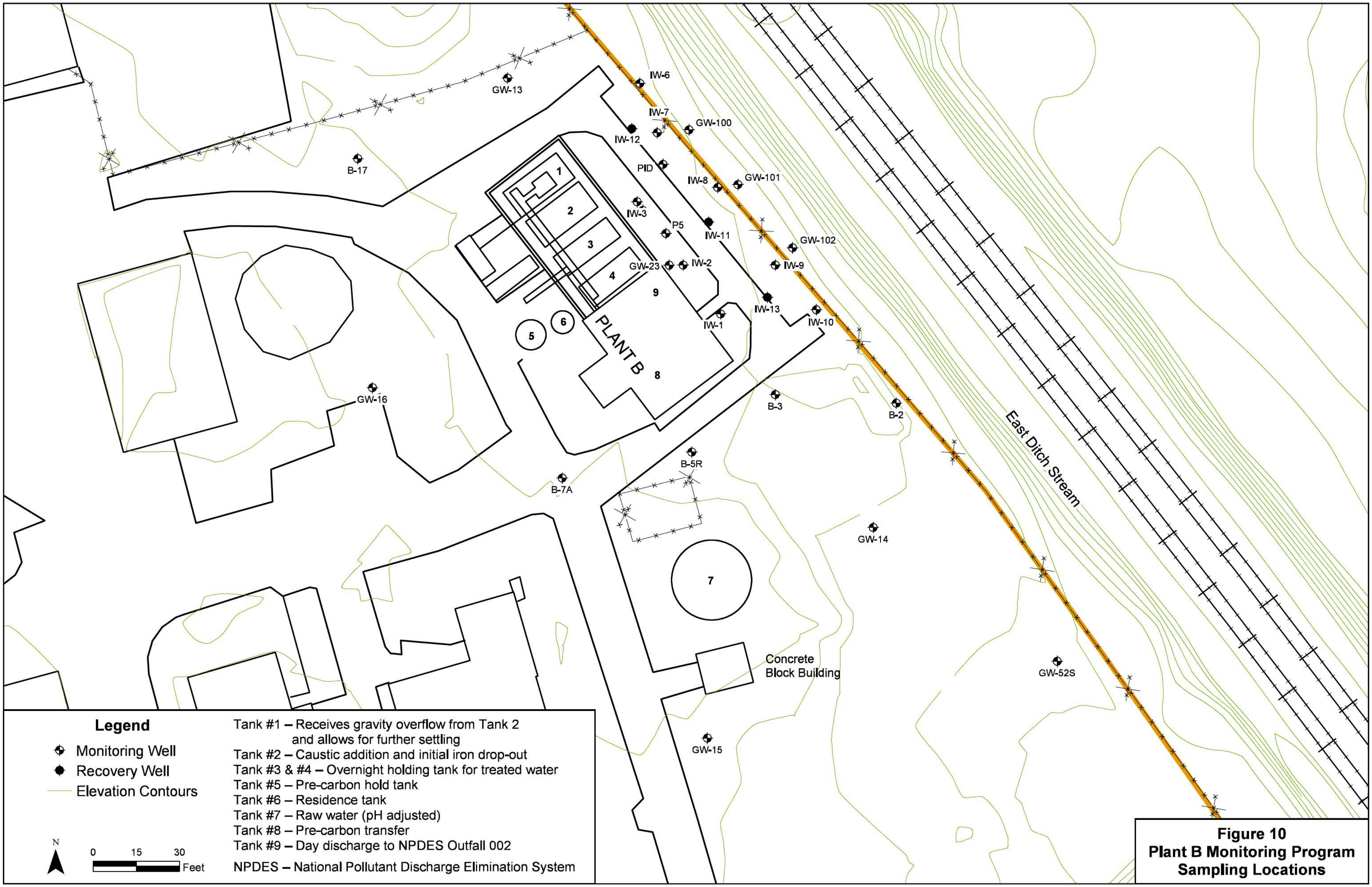


Figure 10
Plant B Monitoring Program Sampling Locations

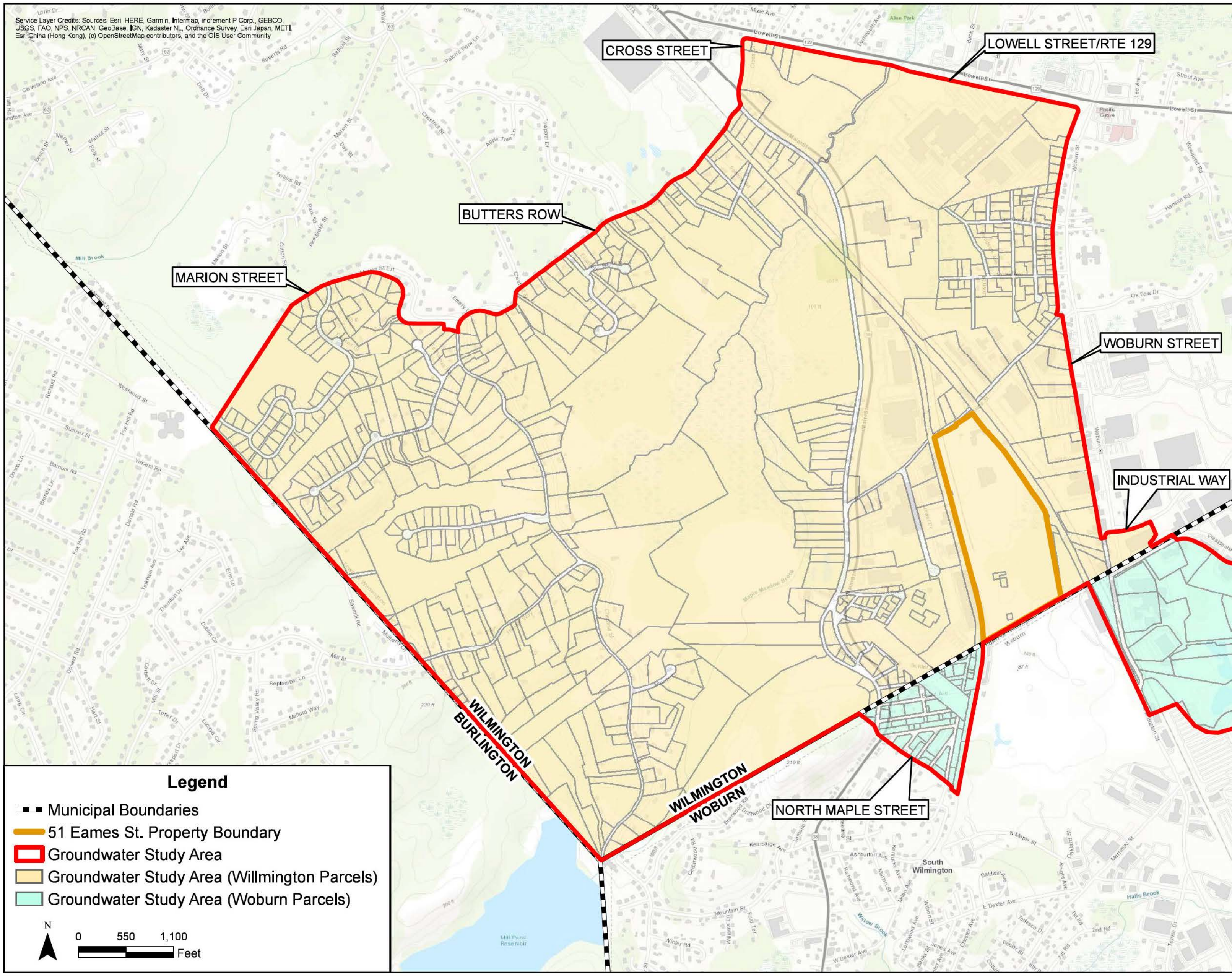


Figure 11
Groundwater Study Area
Operable Unit 3 (OU3)
Olin Chemical Superfund Site

Figure 12
Human Health Risk Assessment Exposure Areas

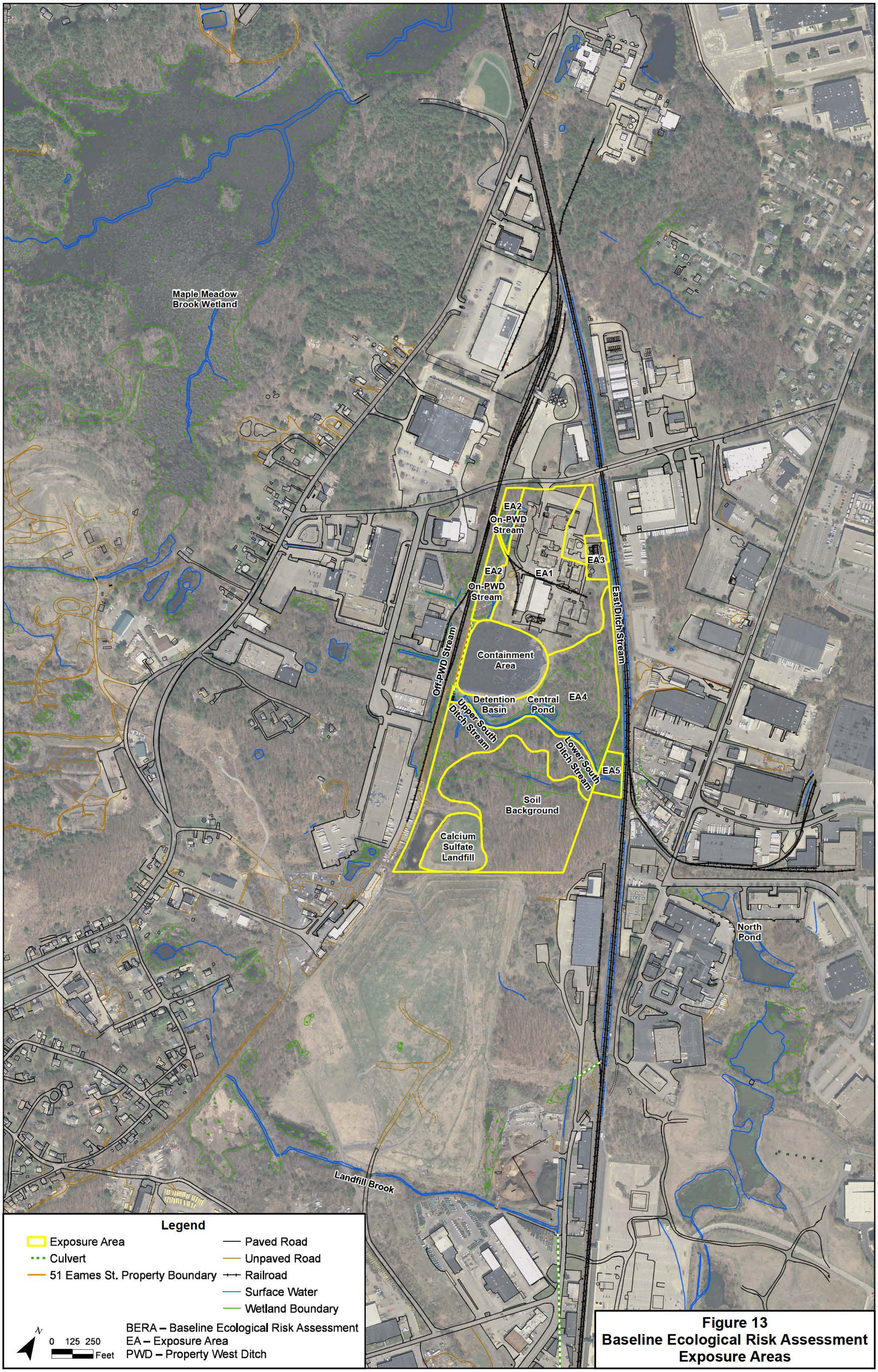


Figure 13
Baseline Ecological Risk Assessment Exposure Areas

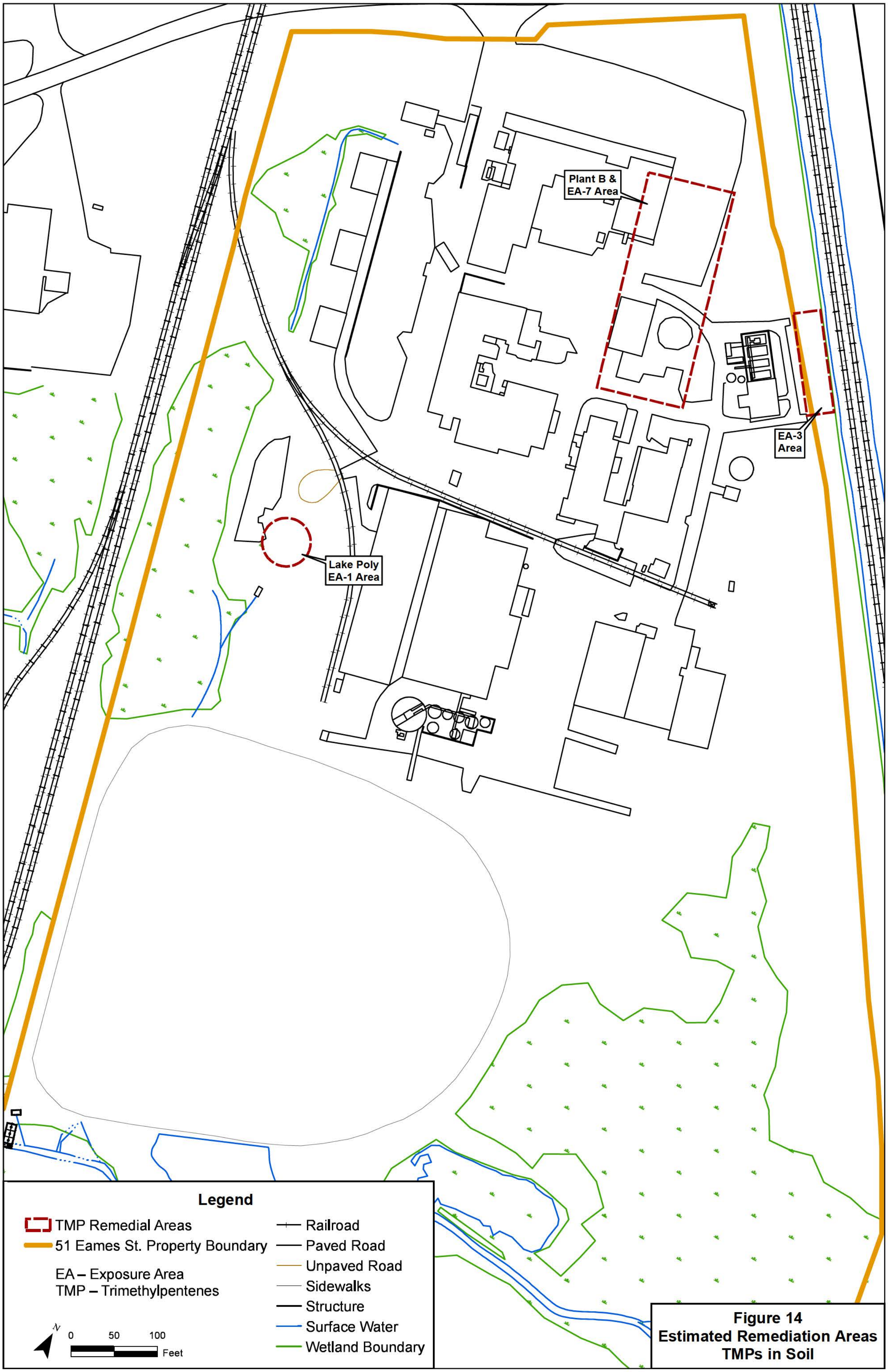


Figure 14
Estimated Remediation Areas
TMPs in Soil

Legend

Upland Soils 0-1 ft:
- Below Both Performance Standards
- Above BEHP Performance Standard
- Above Chromium Performance Standard
- Above Both Performance Standards
- Estimated Remediation Areas

- Containment Area Soil
- Upland Soil
- Wetland Soil
- Considered to be Sediment
- 51 Eames St. Property Boundary

- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Performance Standards: Soils:	BEHP	Chromium
	3 mg/kg	1000 mg/kg

BEHP – Bis 2-Ethylhexyl Phthalate
mg/kg – Milligrams per Kilogram

N

0 45 90 Feet

Figure 15
Estimated Remediation Areas
Chromium and BEHP
in Upland Surface Soil (0-1 ft)

Figure 16
Estimated Remediation Areas
Chromium and BEHP
in Upland Shallow Subsurface Soil (1-10 ft)

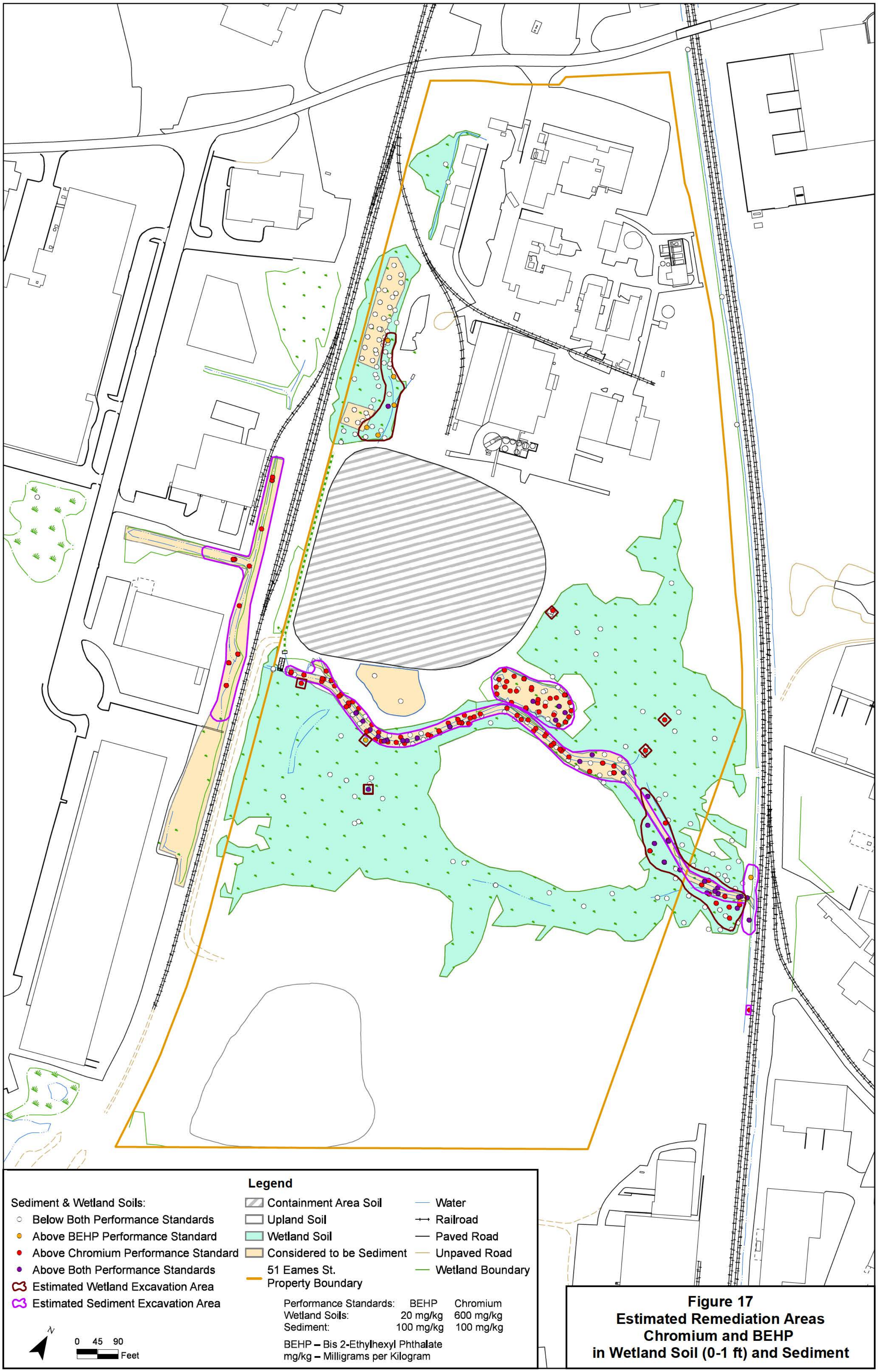


Figure 17
Estimated Remediation Areas
Chromium and BEHP
in Wetland Soil (0-1 ft) and Sediment

Figure 18
Estimated Remediation Areas
Chromium and BEHP
in Wetland Soil (1-10 ft) and Sediment

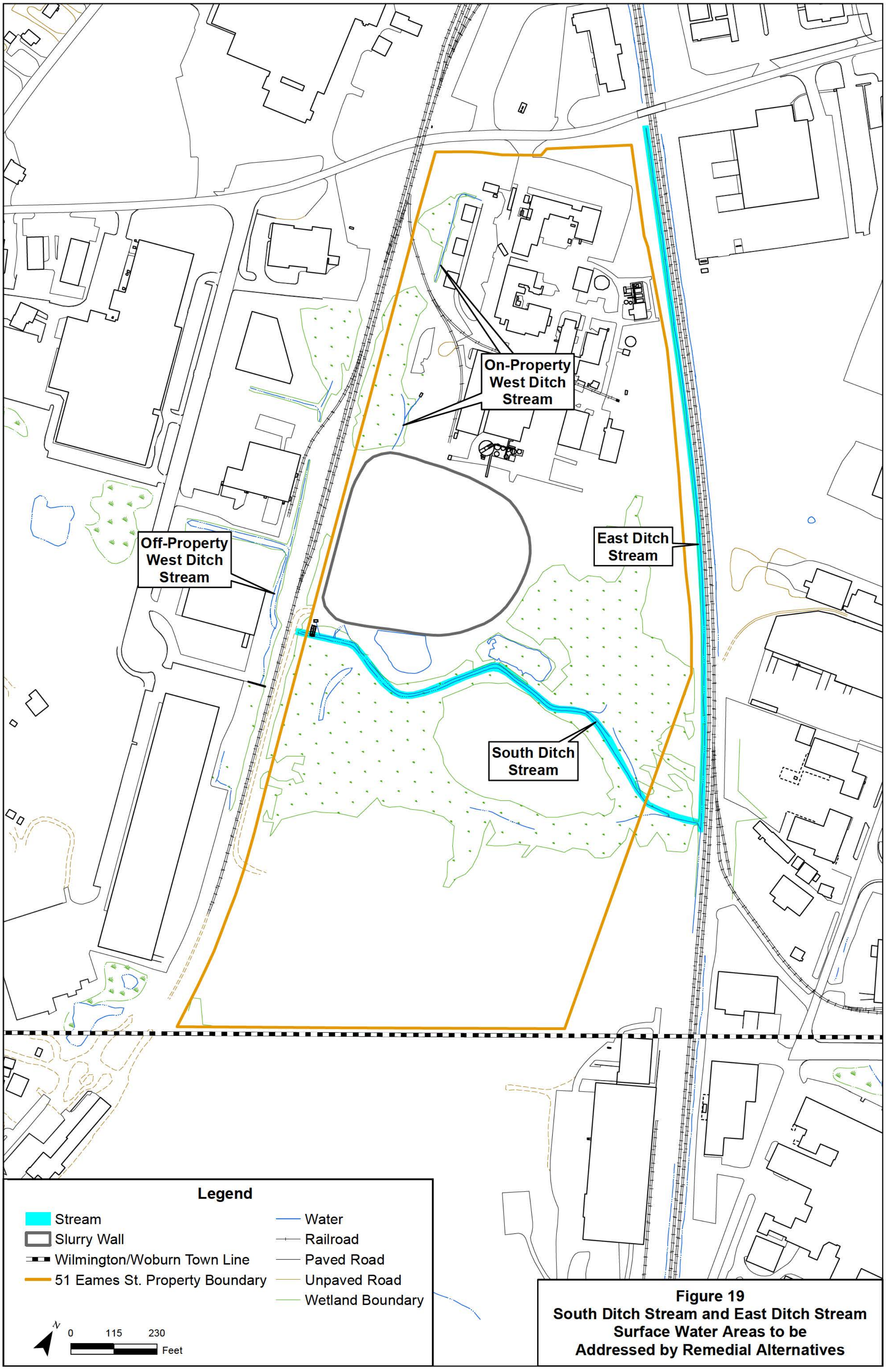


Figure 19
South Ditch Stream and East Ditch Stream Surface Water Areas to be Addressed by Remedial Alternatives

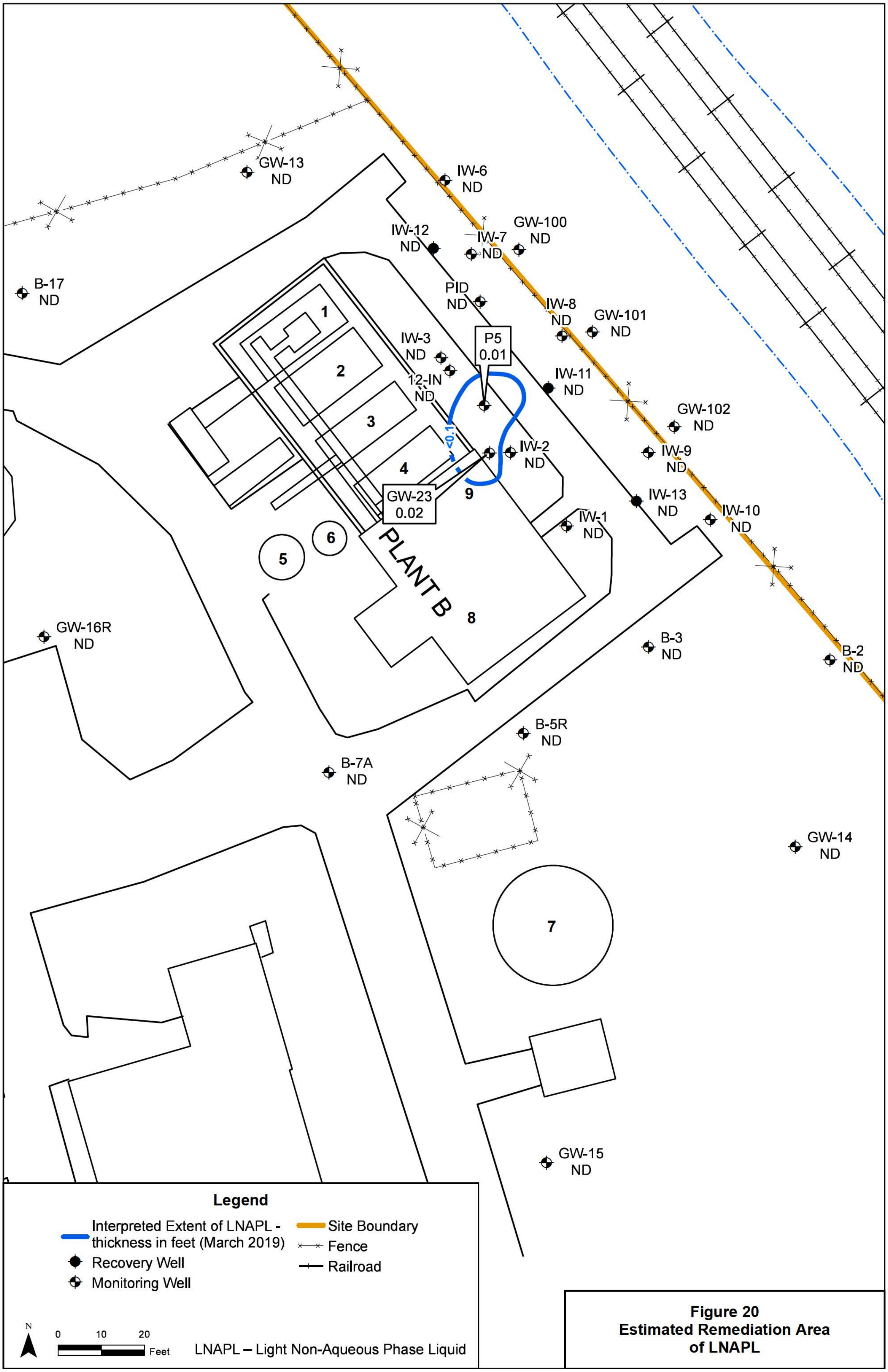


Figure 20
Estimated Remediation Area of LNAPL

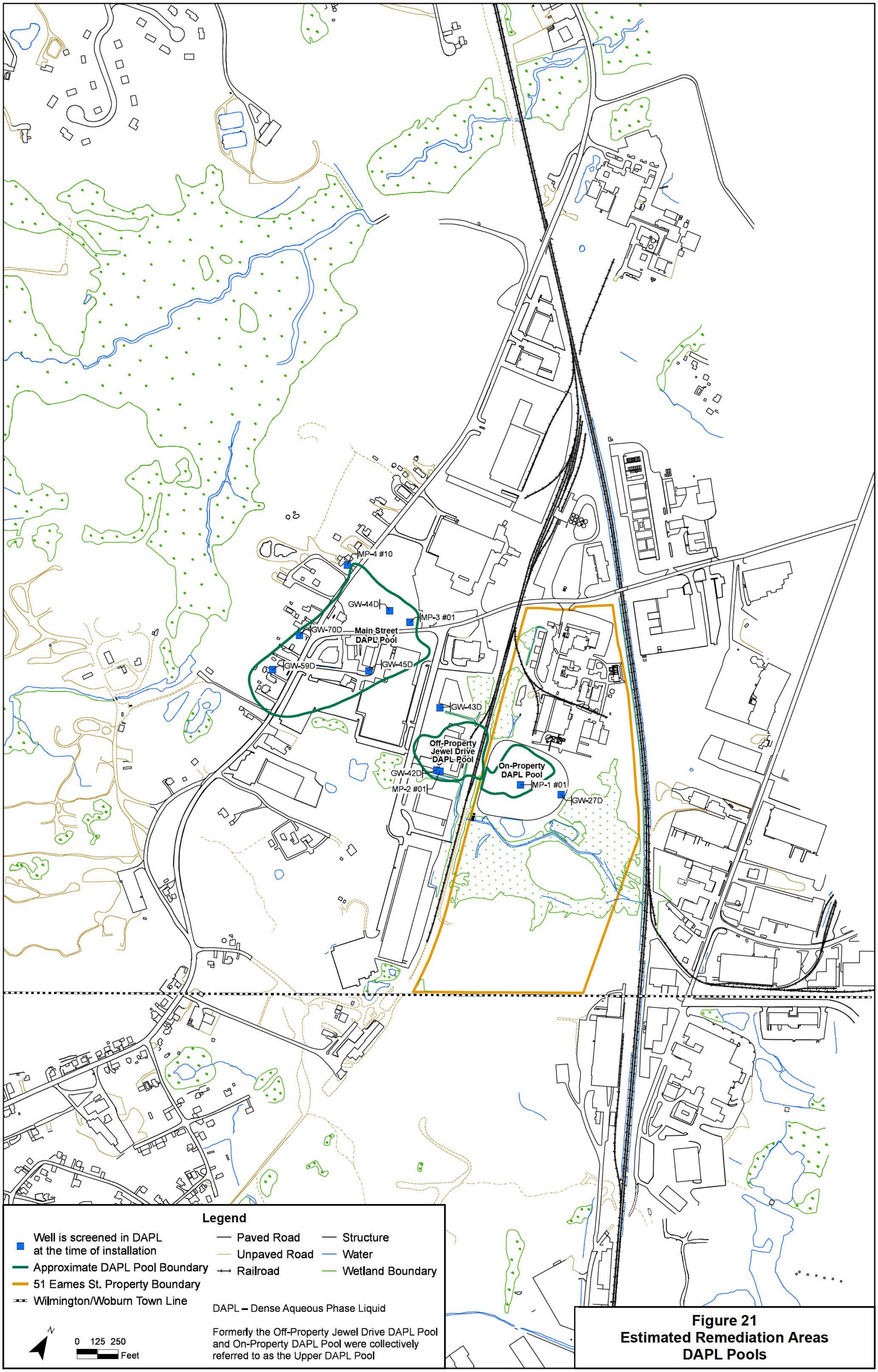
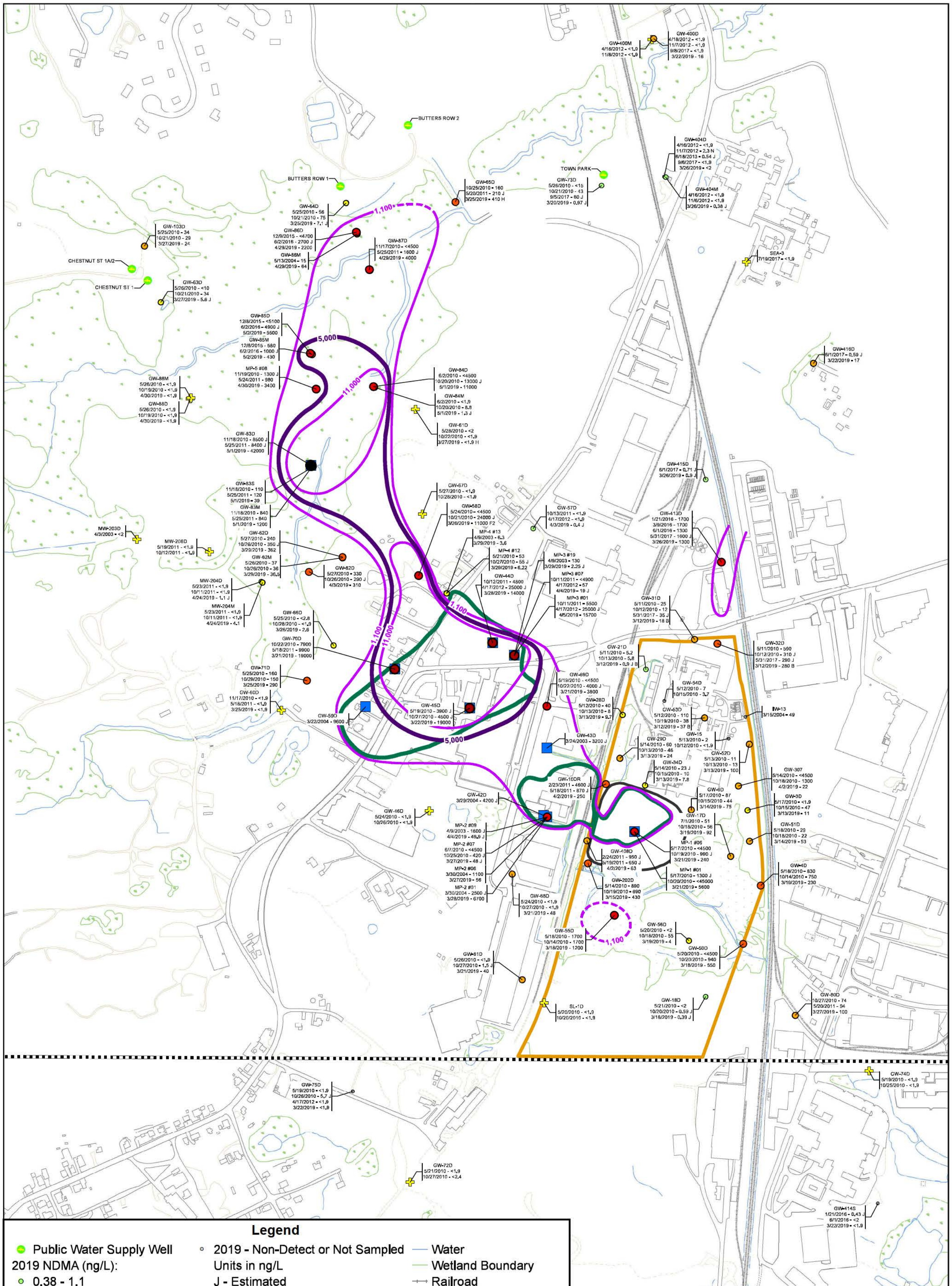


Figure 21
Estimated Remediation Areas
DAPL Pools



Legend

- Public Water Supply Well
- 2019 NDMA (ng/L):
  - 0.38 - 1.1
  - 1.1 - 11
  - 11 - 110
  - 110 - 1,100
  - 1,100 - 11,000
  - 11,000 - 20,000
  - 20,000 - 42,000
- Well is screened in DAPL
- 2019 NDMA in Groundwater (RSL: 0.11 ng/L)
- Dashed where inferred
- Non-Detect

- 2019 - Non-Detect or Not Sampled
- Units in ng/L
- J - Estimated
- N - Presumptively present
- R - Rejected during data validation
- Containment Area
- 51 Eames St. Property Boundary
- Approximate DAPL Pool Boundary

- Water
- Wetland Boundary
- Railroad
- Paved Road
- Unpaved Road
- Wilmington/Woburn Town Line

DAPL – Dense Aqueous Phase Liquid
NDMA – N-Nitrosodimethylamine
ng/L – Nanograms per Liter
RSL – Regional Screening Levels

N
0 125 250
Feet

Note:
Monitoring well symbol is based on highest detection at locations with multiple sample rounds.

Figure 22
Estimated Remediation Area
Groundwater Hot Spot Extraction
Targeting 5,000 Nanograms per Liter (ng/L)
N-Nitrosodimethylamine

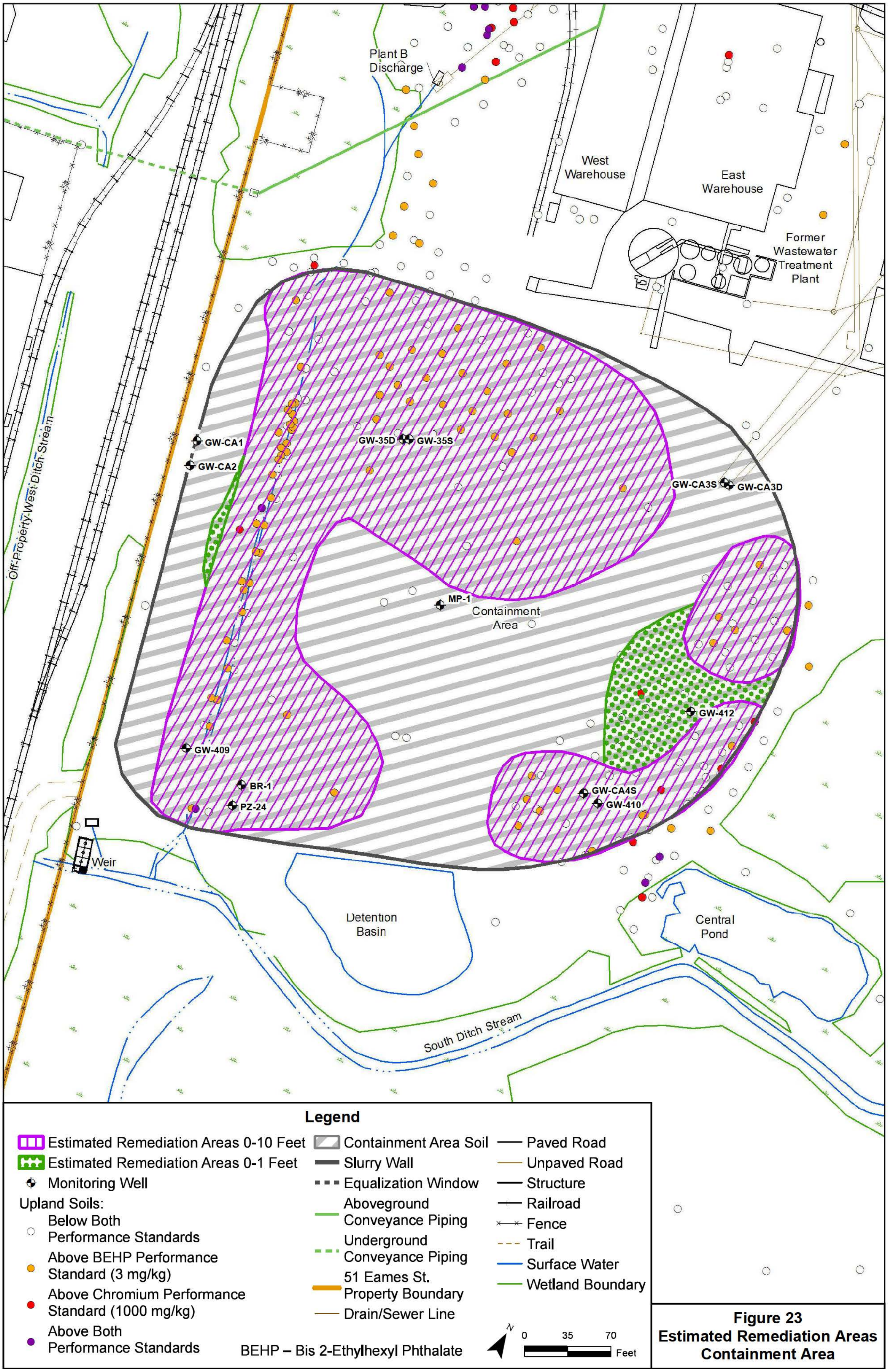
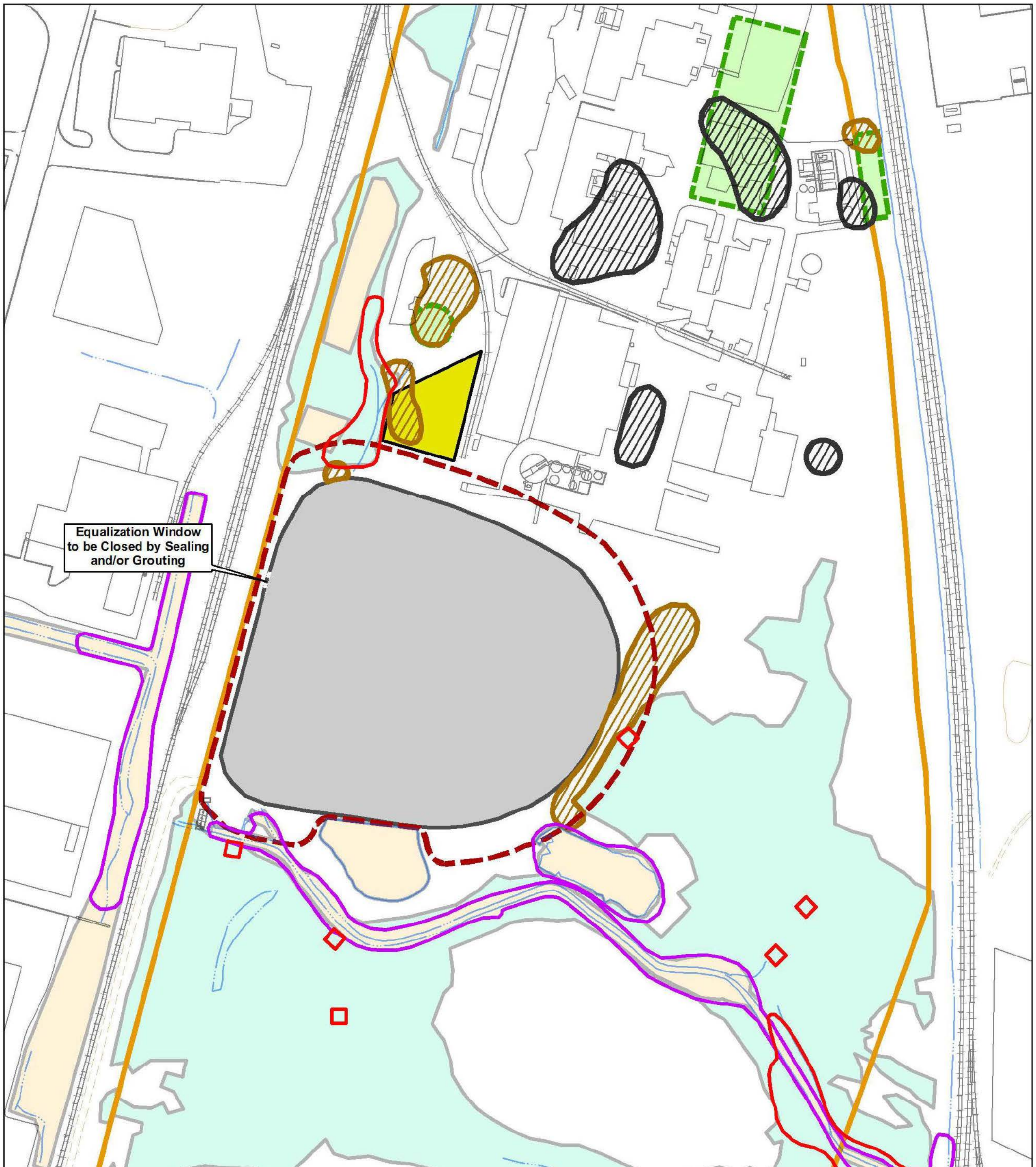


Figure 23
Estimated Remediation Areas
Containment Area



Legend

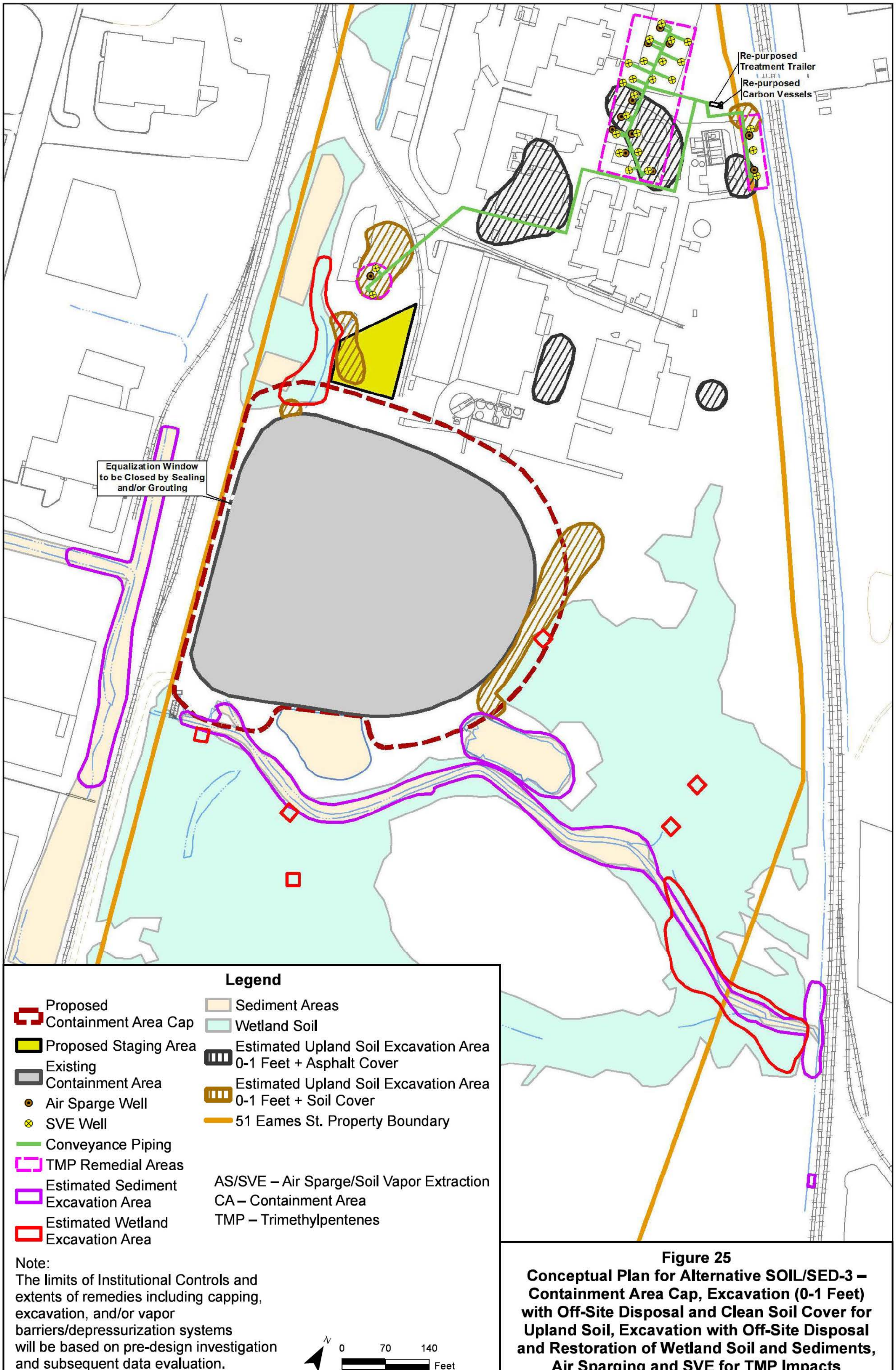
- Proposed Containment Area Cap
- Proposed Staging Area
- Potential TMP Vapor Barrier/SSDS
- Existing Containment Area
- Estimated Sediment Excavation Area
- Estimated Wetland Excavation Area
- Sediment Areas
- Wetland Soil
- Upland Soil Area Proposed for Asphalt Cover
- Upland Soil Area Proposed for Soil Cover
- 51 Eames St. Property Boundary

CA – Containment Area
SSDS – Sub-Slab Depressurization System
TMP – Trimethylpentenes

Note:
The limits of Institutional Controls and extents of remedies including capping, excavation, and/or vapor barriers/depressurization systems will be based on pre-design investigation and subsequent data evaluation.

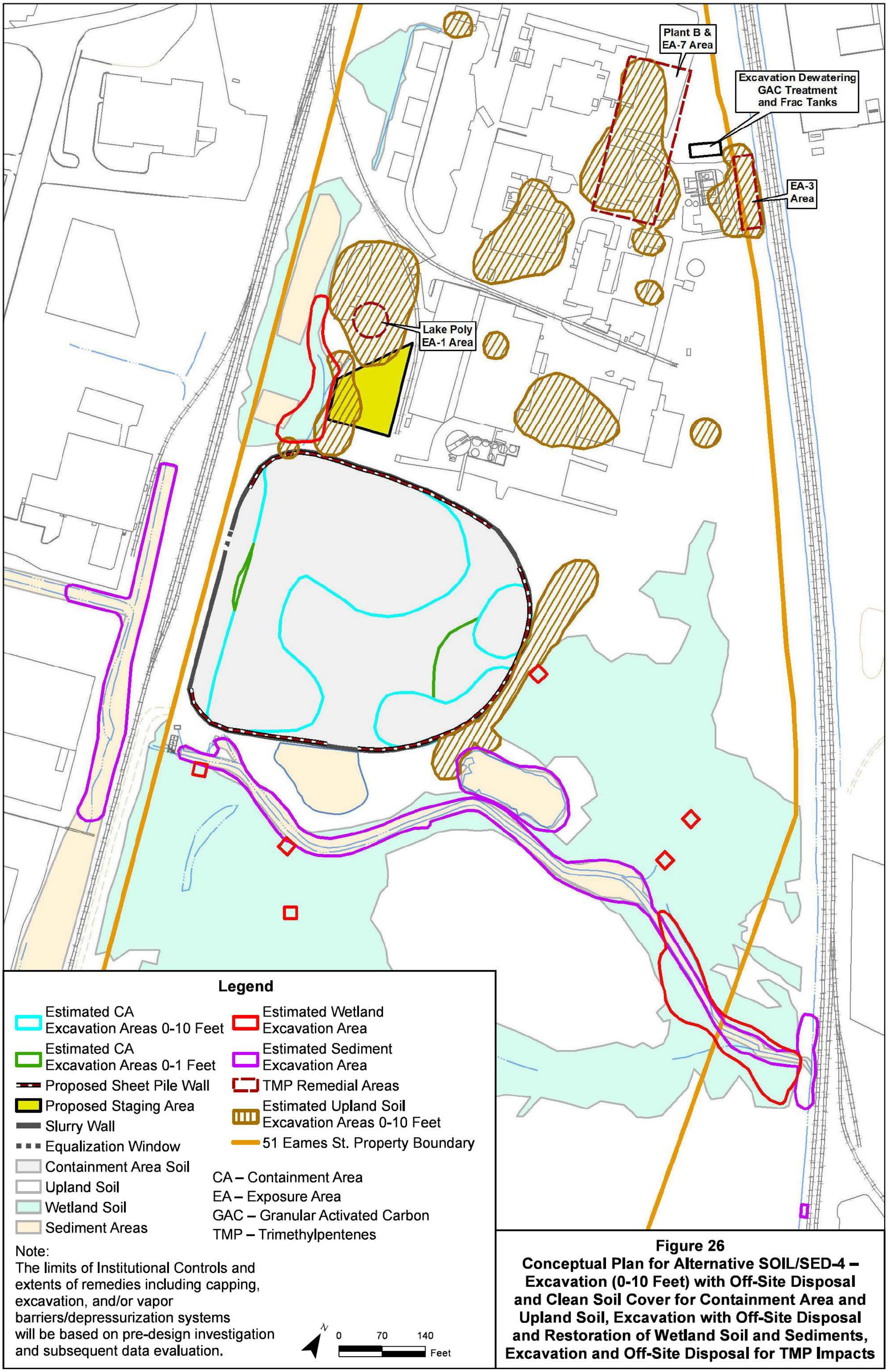
N 0 70 140 Feet

Figure 24
Conceptual Plan for Alternative SOIL/SED-2 – Containment Area Cap, Upland Soil Covers, Excavation with Off-Site Disposal and Restoration of Wetland Soil and Sediments, and Limited Action for Trimethylpentenes (TMPs) – Institutional Controls, Including Vapor Intrusion Evaluations or Vapor Barriers/Sub-Slab Depressurization Systems



Note:
The limits of Institutional Controls and extents of remedies including capping, excavation, and/or vapor barriers/depressurization systems will be based on pre-design investigation and subsequent data evaluation.

Figure 25
Conceptual Plan for Alternative SOIL/SED-3 – Containment Area Cap, Excavation (0-1 Feet) with Off-Site Disposal and Clean Soil Cover for Upland Soil, Excavation with Off-Site Disposal and Restoration of Wetland Soil and Sediments, Air Sparging and SVE for TMP Impacts



Note:
The limits of Institutional Controls and extents of remedies including capping, excavation, and/or vapor barriers/depressurization systems will be based on pre-design investigation and subsequent data evaluation.

Figure 26
Conceptual Plan for Alternative SOIL/SED-4 – Excavation (0-10 Feet) with Off-Site Disposal and Clean Soil Cover for Containment Area and Upland Soil, Excavation with Off-Site Disposal and Restoration of Wetland Soil and Sediments, Excavation and Off-Site Disposal for TMP Impacts

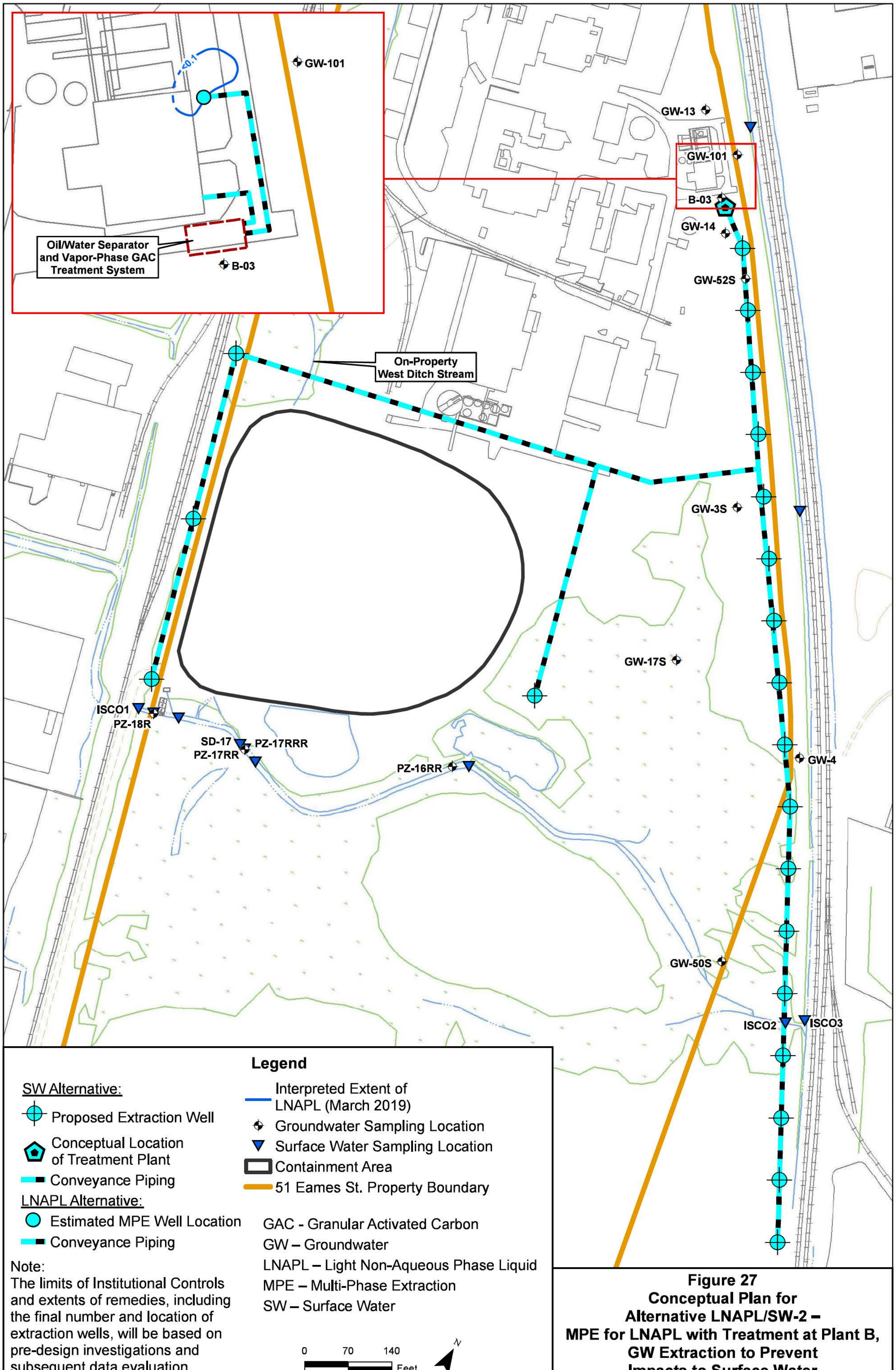


Figure 27
Conceptual Plan for Alternative LNAPL/SW-2 – MPE for LNAPL with Treatment at Plant B, GW Extraction to Prevent Impacts to Surface Water

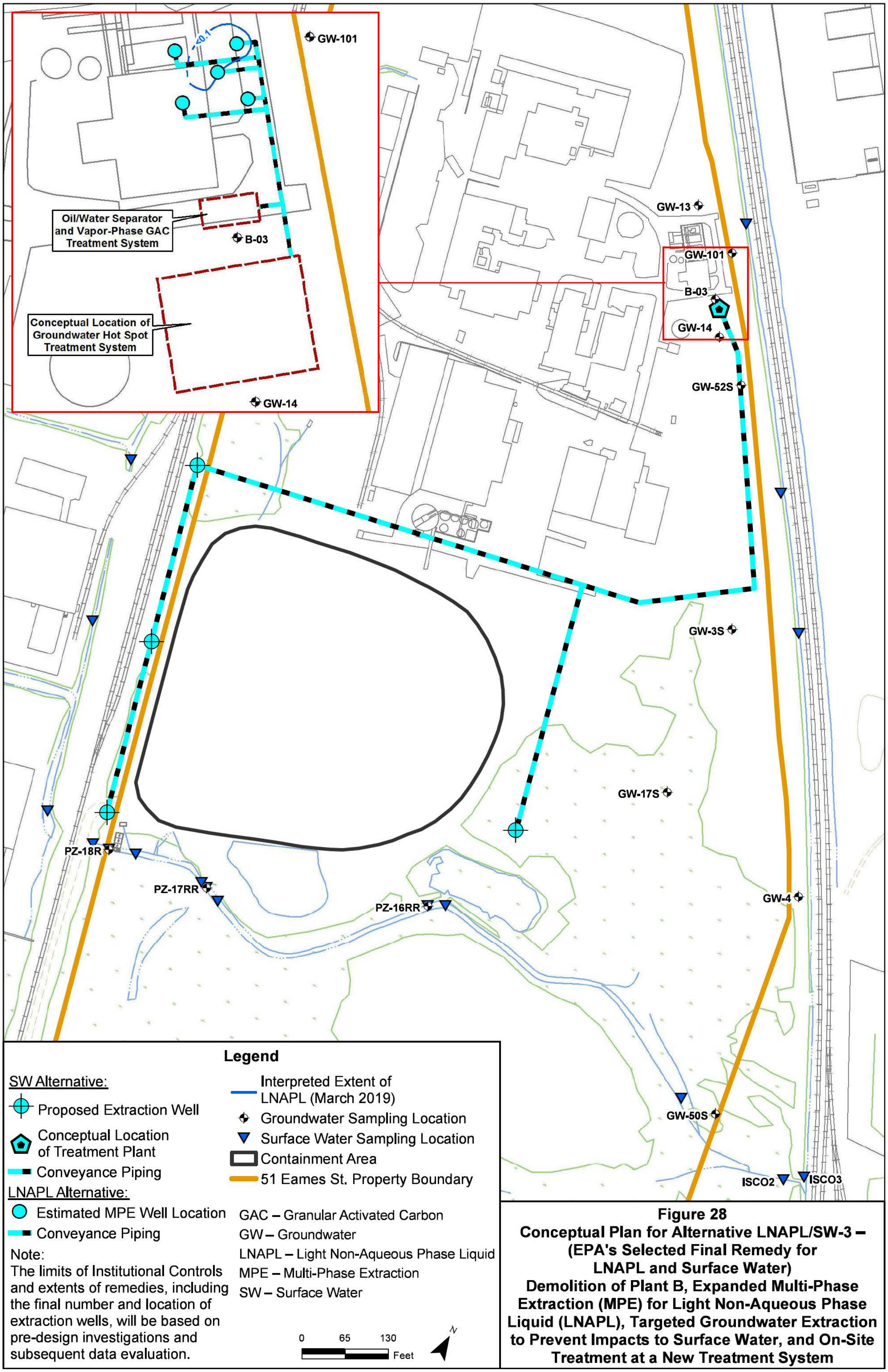


Figure 28
Conceptual Plan for Alternative LNAPL/SW-3 – (EPA's Selected Final Remedy for LNAPL and Surface Water)
Demolition of Plant B, Expanded Multi-Phase Extraction (MPE) for Light Non-Aqueous Phase Liquid (LNAPL), Targeted Groundwater Extraction to Prevent Impacts to Surface Water, and On-Site Treatment at a New Treatment System

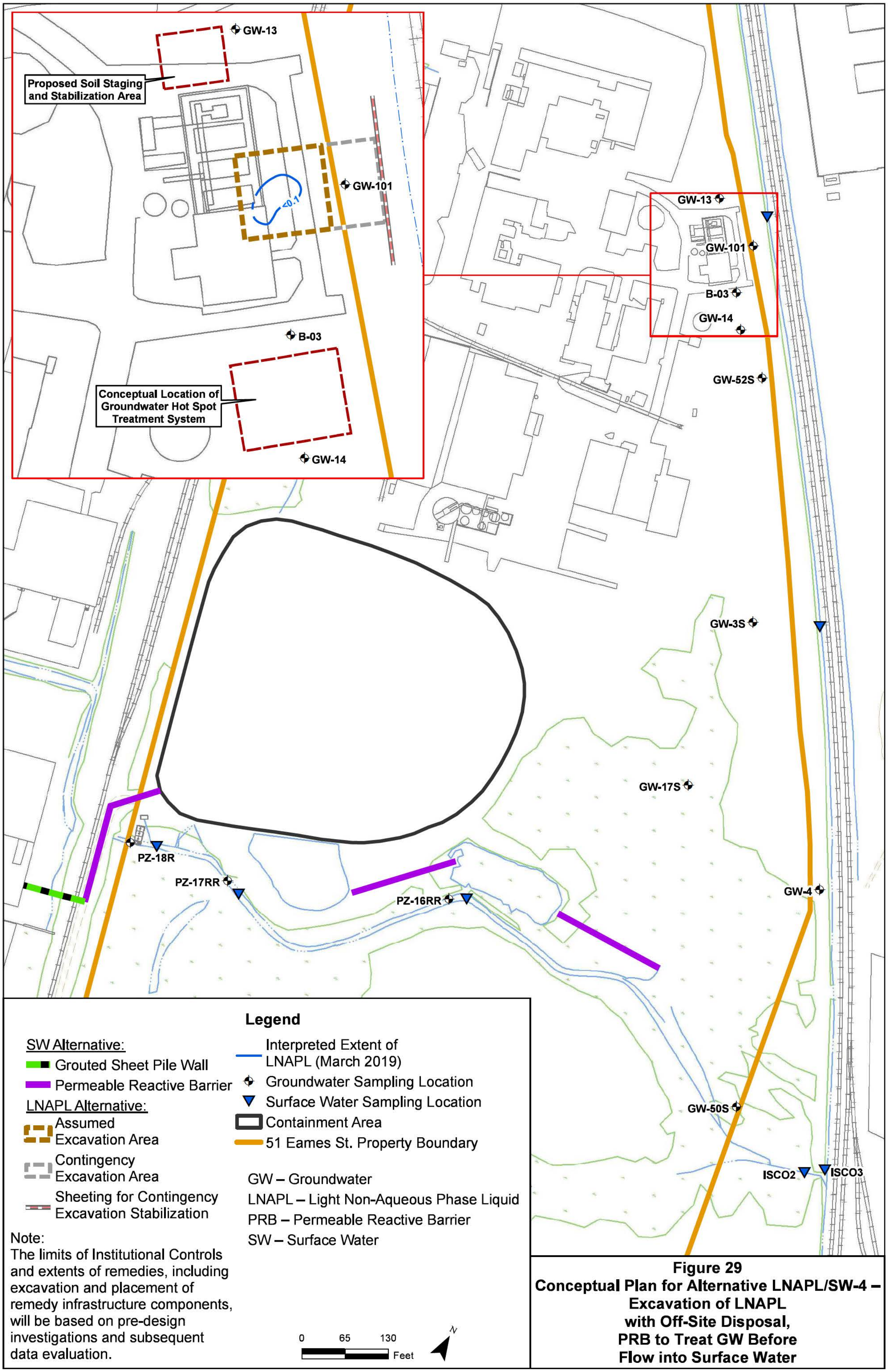


Figure 29
Conceptual Plan for Alternative LNAPL/SW-4 – Excavation of LNAPL with Off-Site Disposal, PRB to Treat GW Before Flow into Surface Water

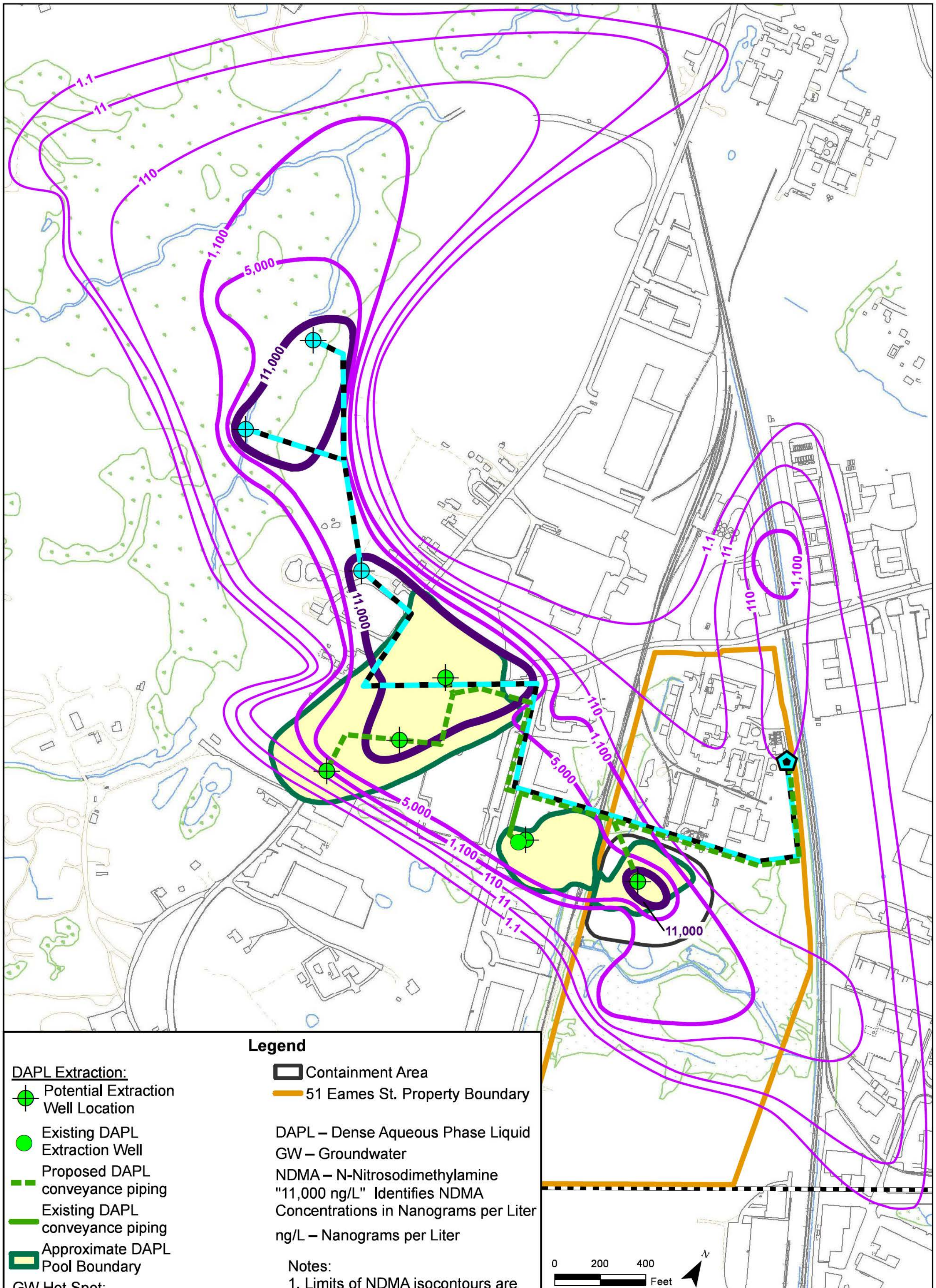


Figure 30
Conceptual Plan for Alternative DAPL/GWHS-2 – Dense Aqueous Phase Liquid (DAPL) Extraction (Approximately 5 Wells), Groundwater Hot Spot Extraction Targeting 11,000 Nanograms per Liter (ng/L) N-Nitrosodimethylamine (NDMA; Approximately 2-3 Wells)

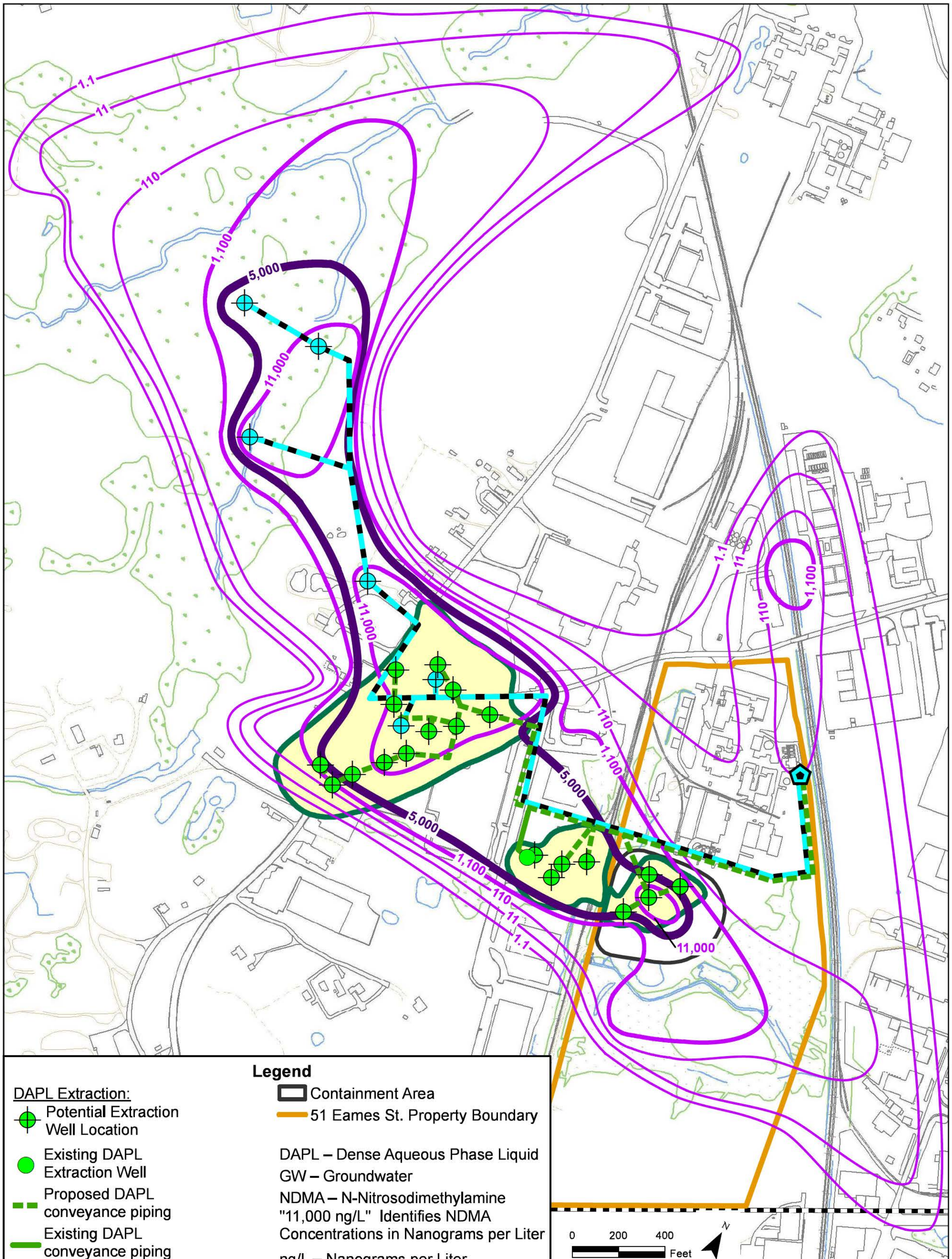
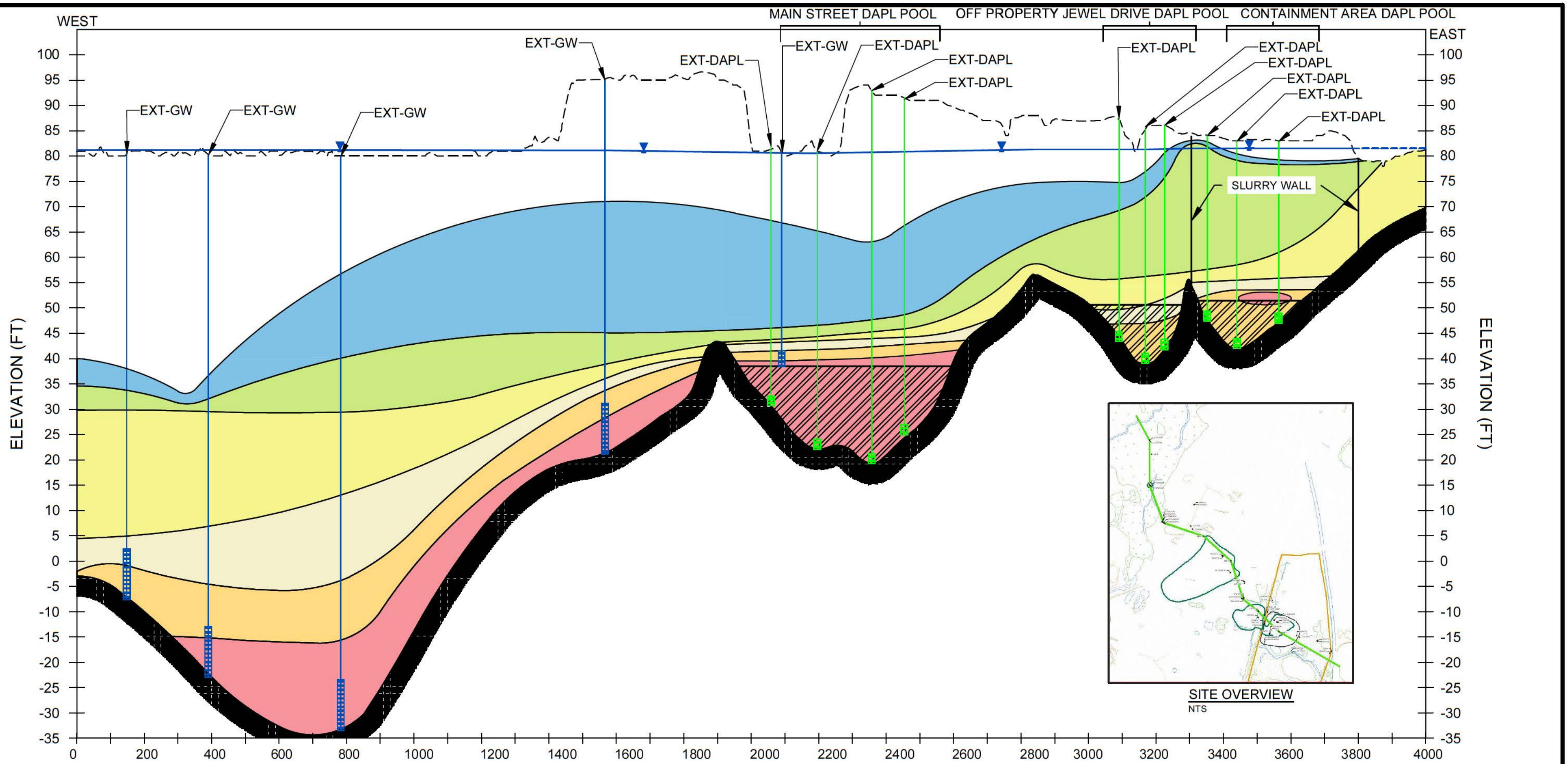


Figure 31
Conceptual Plan for Alternative DAPL/GWHS-3 – (EPA's Selected Interim Remedy for DAPL and Groundwater Hot Spots) Dense Aqueous Phase Liquid (DAPL) Extraction (Approximately 20 Wells), Groundwater Hot Spot Extraction Targeting 5,000 Nanograms per Liter (ng/L) N-Nitrosodimethylamine (NDMA; Approximately 6 Wells); and On-Site Treatment at a New Treatment System



EXPLORATION LEGEND

- B-1 EXPLORATION DESIGNATION
- APPROXIMATE EXISTING GROUND SURFACE
- TOP OF SCREEN
- OBSERVED WATER LEVEL
- 300 NDMA CONCENTRATION IN ng/L
- BOTTOM OF SCREEN
- END OF BORING HOLE

N-NITROSODIMETHYLAMINE (NDMA) CONCENTRATIONS

- 1.1 - 11 ng/L
- 11 - 110 ng/L
- 110 - 1,100 ng/L
- 1,100 - 5,000 ng/L
- 5,000 ng/L - 11,000 ng/L
- > 11,000 ng/L

GROUNDWATER EXTRACTION WELL

DENSE AQUEOUS PHASE LIQUID (DAPL) EXTRACTION WELL

STRATA LEGEND

- BEDROCK
- DAPL POOL

VERTICAL SCALE: 1" = 15'
HORIZONTAL SCALE: 1" = 300'

0 150 300 60
HORIZONTAL SCALE IN FEET 0

Prepared/Date: BRT 03/19/20
Checked/Date: BH 03/05/21

NOTES:

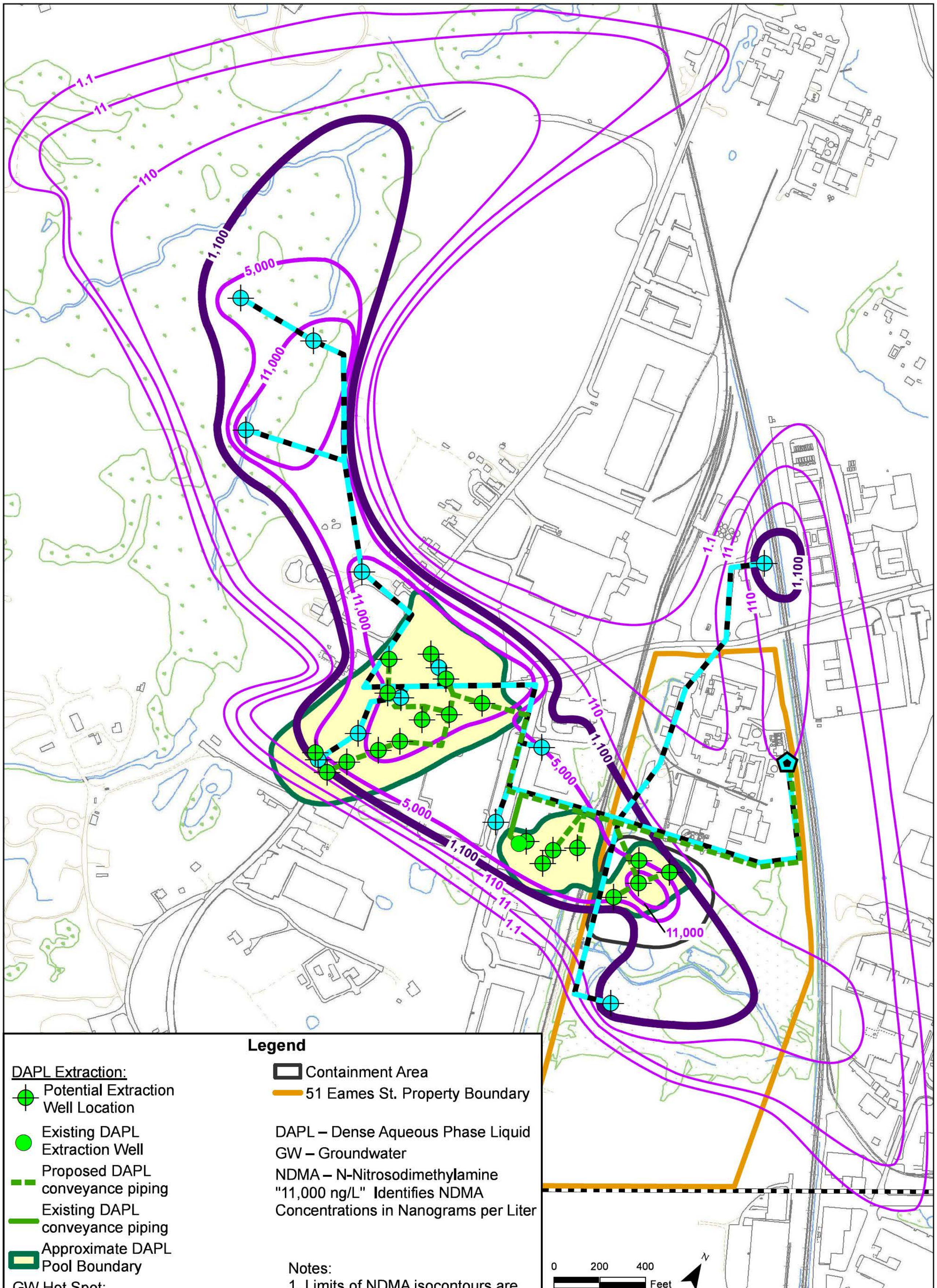
DAPL - Dense Aqueous Phase Liquid
NDMA - N-Nitrosodimethylamine
EXT - Extraction
ng/L - Nanograms per Liter

The limits of Institutional Controls and extents of remedies, including the final number and location of extraction wells, will be based on pre-design investigations and subsequent data evaluation.

Figure 32

Cross-Section of the Conceptual Plan for Alternative DAPL/GWHS-3 (EPA's Selected Interim Remedy for DAPL and Groundwater Hot Spots)Dense Aqueous Phase Liquid (DAPL) Extraction (Approximately 20 Wells), Groundwater Hot Spot Extraction Targeting 5,000 Nanograms per Liter (ng/L) N-Nitrosodimethylamine (NDMA; Approximately 6 Wells); and On-Site Treatment at a New Treatment System

C:\Users\branko.tomic\OneDrive – Wood PLC\Projects\Olin Wilmington\Figure\CROSS-SECT.dwg Thu, 19 Mar 2020 – 1:48pm branko.tomic



Legend

DAPL Extraction:
- Potential Extraction Well Location
- Existing DAPL Extraction Well
- Proposed DAPL conveyance piping
- Existing DAPL conveyance piping
- Approximate DAPL Pool Boundary

GW Hot Spot:
- Proposed Extraction Well
- Conceptual Location of Treatment Plant
- Proposed GW conveyance piping
- NDMA in Groundwater (in ng/L)

- Containment Area
- 51 Eames St. Property Boundary

DAPL – Dense Aqueous Phase Liquid
GW – Groundwater
NDMA – N-Nitrosodimethylamine
"11,000 ng/L" Identifies NDMA Concentrations in Nanograms per Liter

Notes:
1. Limits of NDMA isocontours are based on historically observed NDMA concentrations.
2. The limits of Institutional Controls and extents of remedies, including the final number and location of extraction wells, will be based on pre-design investigations and subsequent data evaluation.

Figure 33
Conceptual Plan for Alternative DAPL/GWHS-4 – Dense Aqueous Phase Liquid (DAPL) Extraction (Approximately 20 Wells), Groundwater Hot Spot Extraction Targeting 1,100 Nanograms per Liter (ng/L) N-Nitrosodimethylamine (NDMA; Approximately 12 Wells)

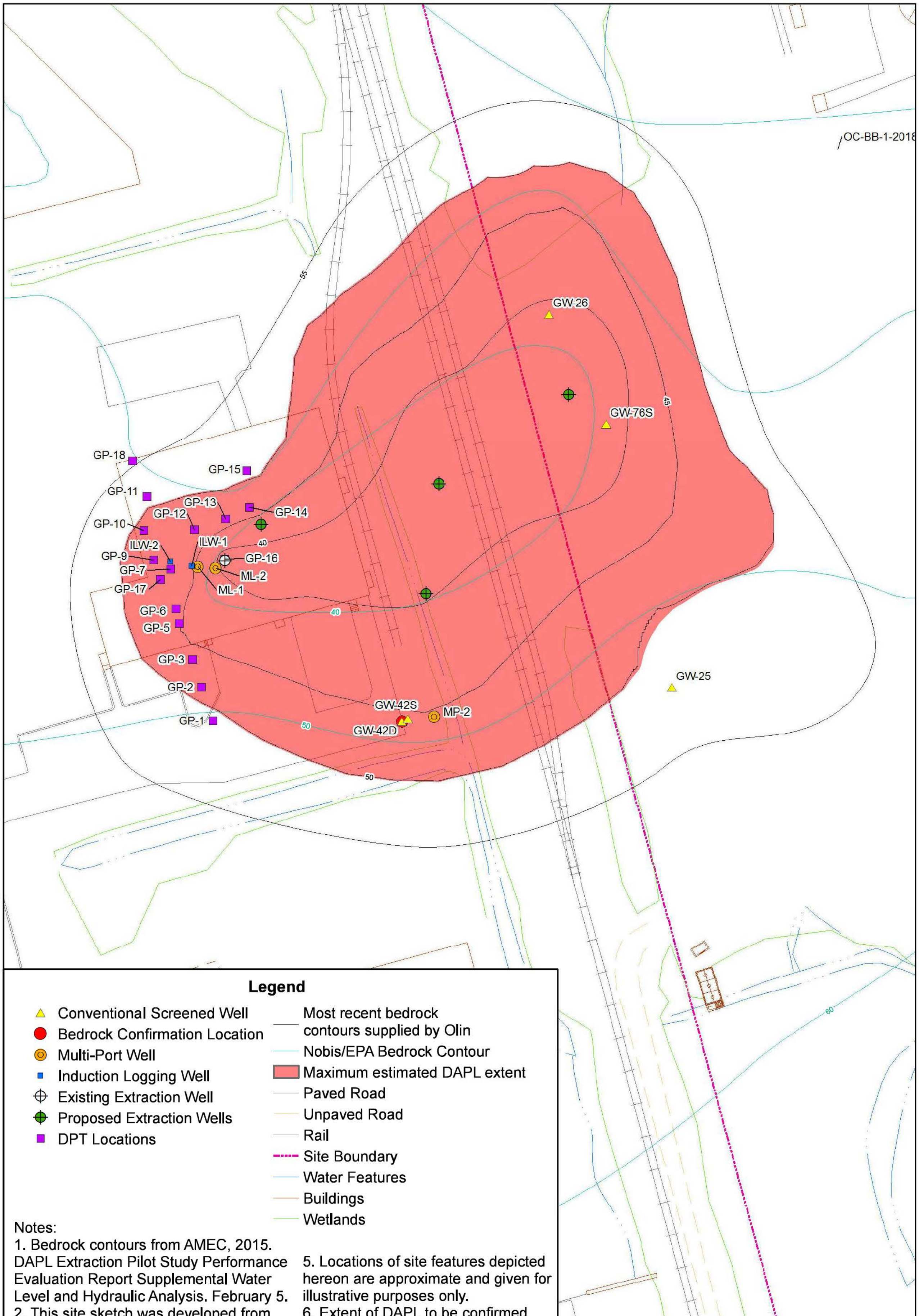
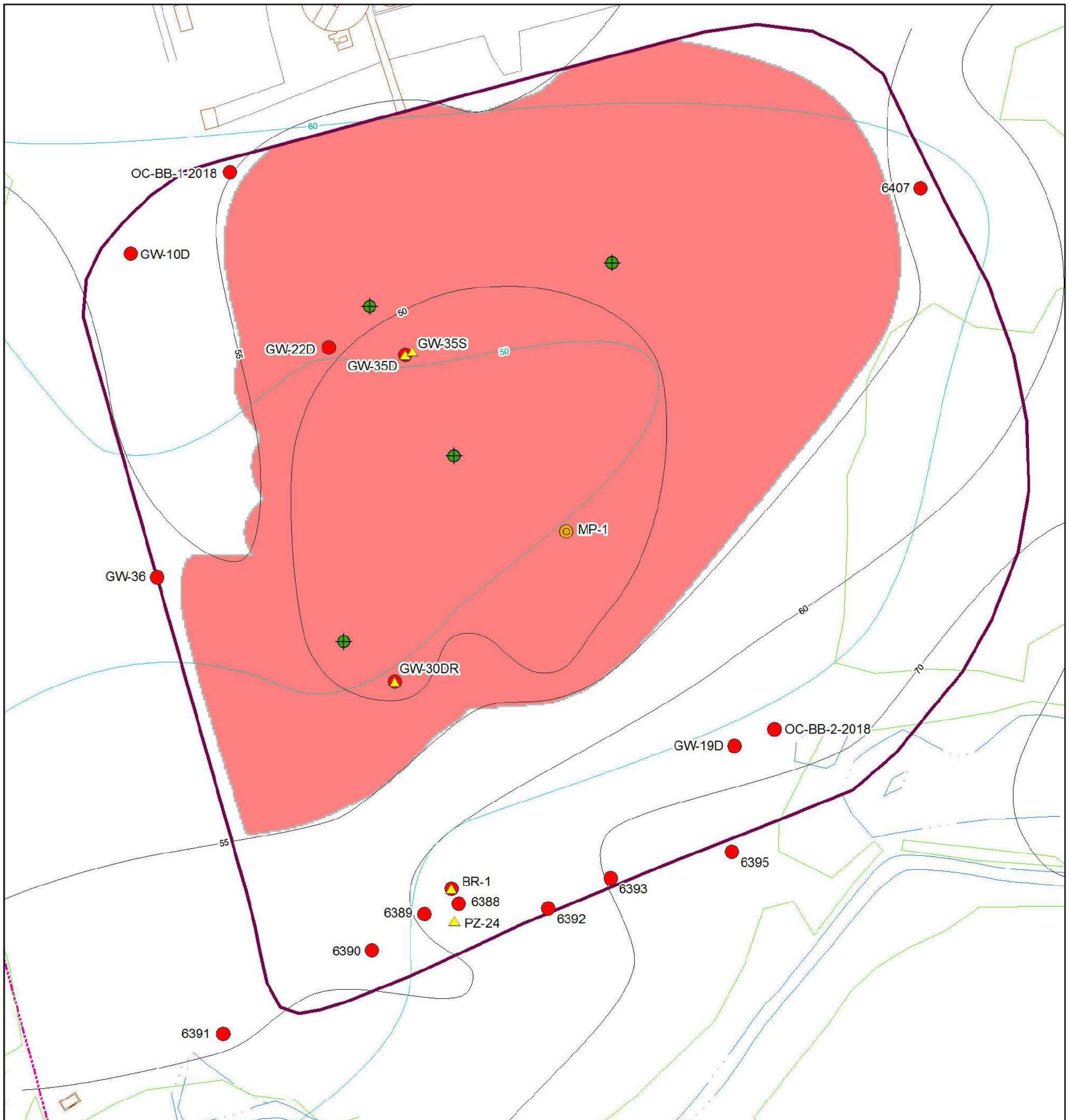


Figure 34
Conceptual Plan for Off-Property Jewel Drive DAPL Pool Component of DAPL/Groundwater Hot Spots Interim Remedy – DAPL Extraction



Legend

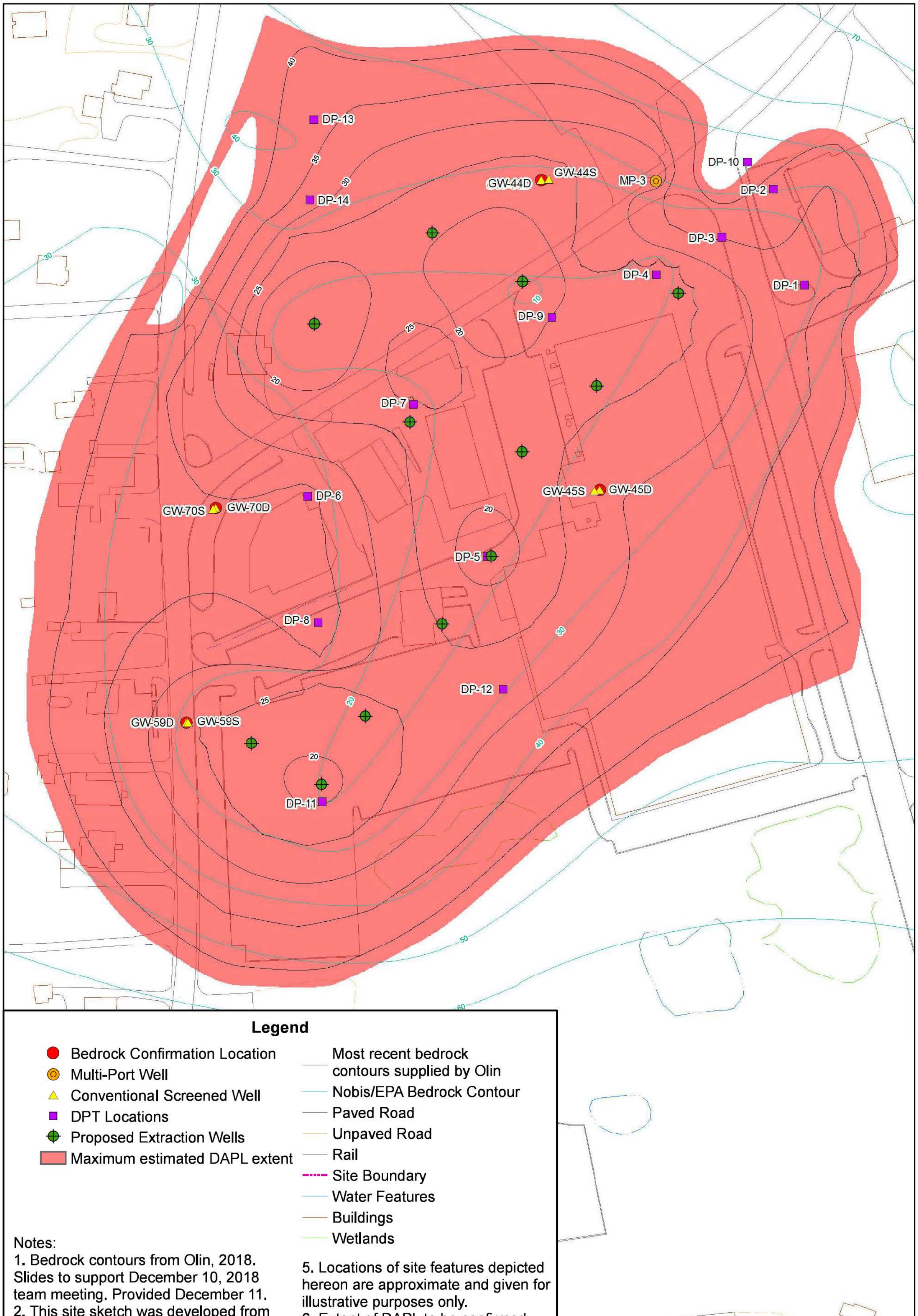
- Conventional Screened Wells
- Bedrock Confirmation Location
- Multi-Port Well
- Existing Extraction Well
- Proposed Extraction Wells
- Most recent bedrock contours supplied by Olin
- Nobis/EPA Bedrock Contour
- Maximum estimated DAPL extent
- Containment Area
- Paved Road
- Unpaved Road
- Rail
- Site Boundary
- Water Features
- Buildings
- Wetlands

Notes:
1. Bedrock contours from Olin, 2018. Results of Containment Area Bedrock Borings, Olin Chemical Superfund Site, (OCSS), Wilmington, MA. May 10.
2. This site sketch was developed from elevation data from Mactec, Amec Foster Wheeler, Wood, and observations made by Nobis.
3. DAPL – Dense Aqueous Phase Liquid
4. DPT – Direct Push Technology
5. Locations of site features depicted hereon are approximate and given for illustrative purposes only.
6. Extent of DAPL to be confirmed during data gaps and pre-design investigations.

0 30 60 Feet

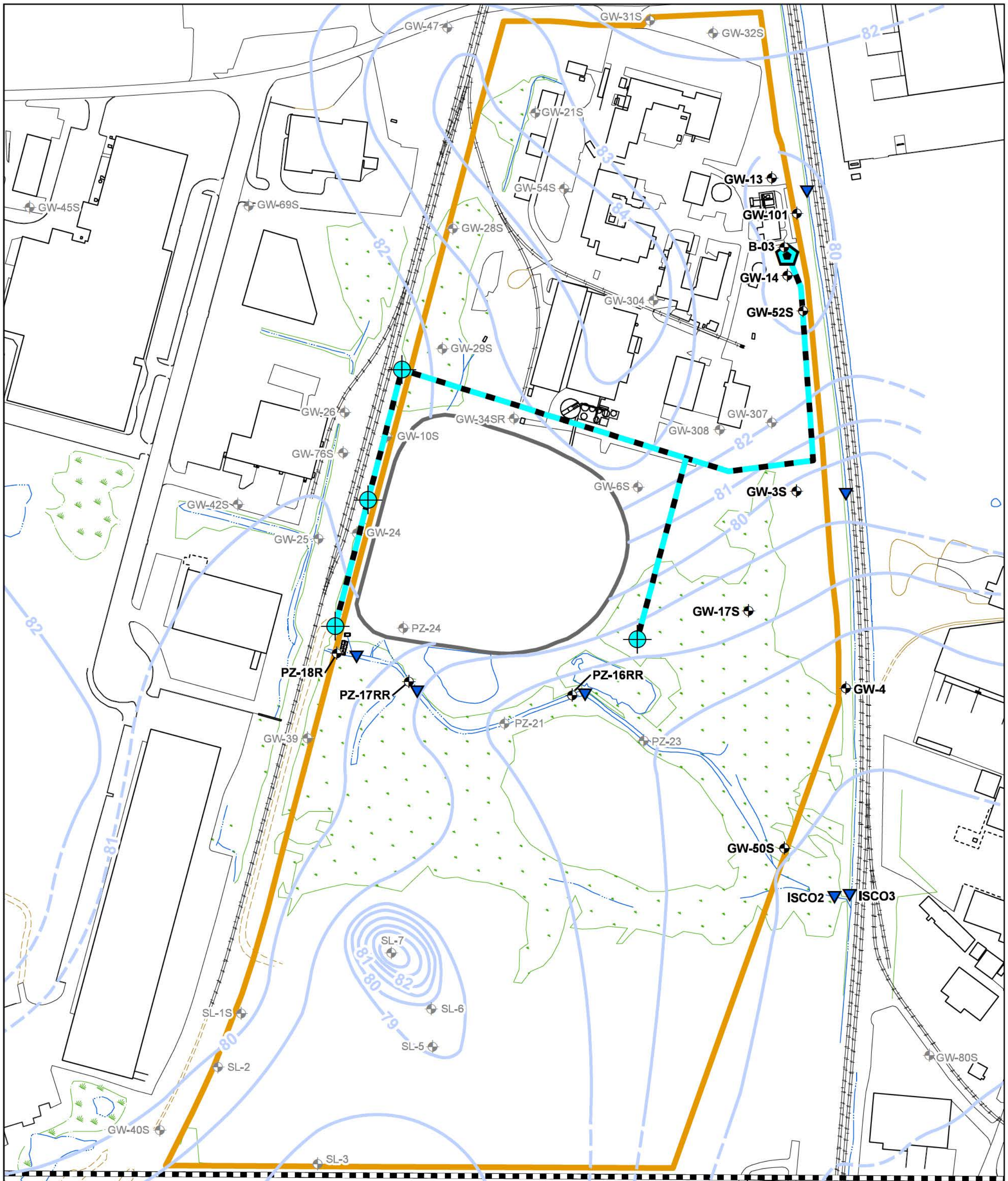
N

Figure 35
Conceptual Plan for Containment Area DAPL Pool Component of DAPL/Groundwater Hot Spots Interim Remedy – DAPL Extraction



Notes:
1. Bedrock contours from Olin, 2018. Slides to support December 10, 2018 team meeting. Provided December 11.
2. This site sketch was developed from elevation data from Mactec, Amec Foster Wheeler, Wood, and observations made by Nobis.
3. DAPL – Dense Aqueous Phase Liquid
4. DPT – Direct Push Technology
5. Locations of site features depicted hereon are approximate and given for illustrative purposes only.
6. Extent of DAPL to be confirmed during data gaps and pre-design investigations.

Figure 36
Conceptual Plan for Main Street DAPL Pool Component of DAPL/Groundwater Hot Spots Interim Remedy – DAPL Extraction



Legend

- Proposed Extraction Well
- Conceptual Location of Treatment Plant
- Proposed Underground Piping
- Groundwater Sampling Location
- Surface Water Sampling Location
- Shallow Monitoring Well Location
- Interpreted Groundwater Contour (Dashed where inferred)
- Slurry Wall
- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

The limits of Institutional Controls and extents of remedies, including the final number and location of extraction wells, will be based on pre-design investigations and subsequent data evaluation.

LNAPL – Light Non-Aqueous Phase Liquid

0 100 200 Feet

N

Figure 37
Conceptual Plan for Surface Water Component of LNAPL/Surface Water Final Remedy – Targeted Groundwater Extraction and Treatment

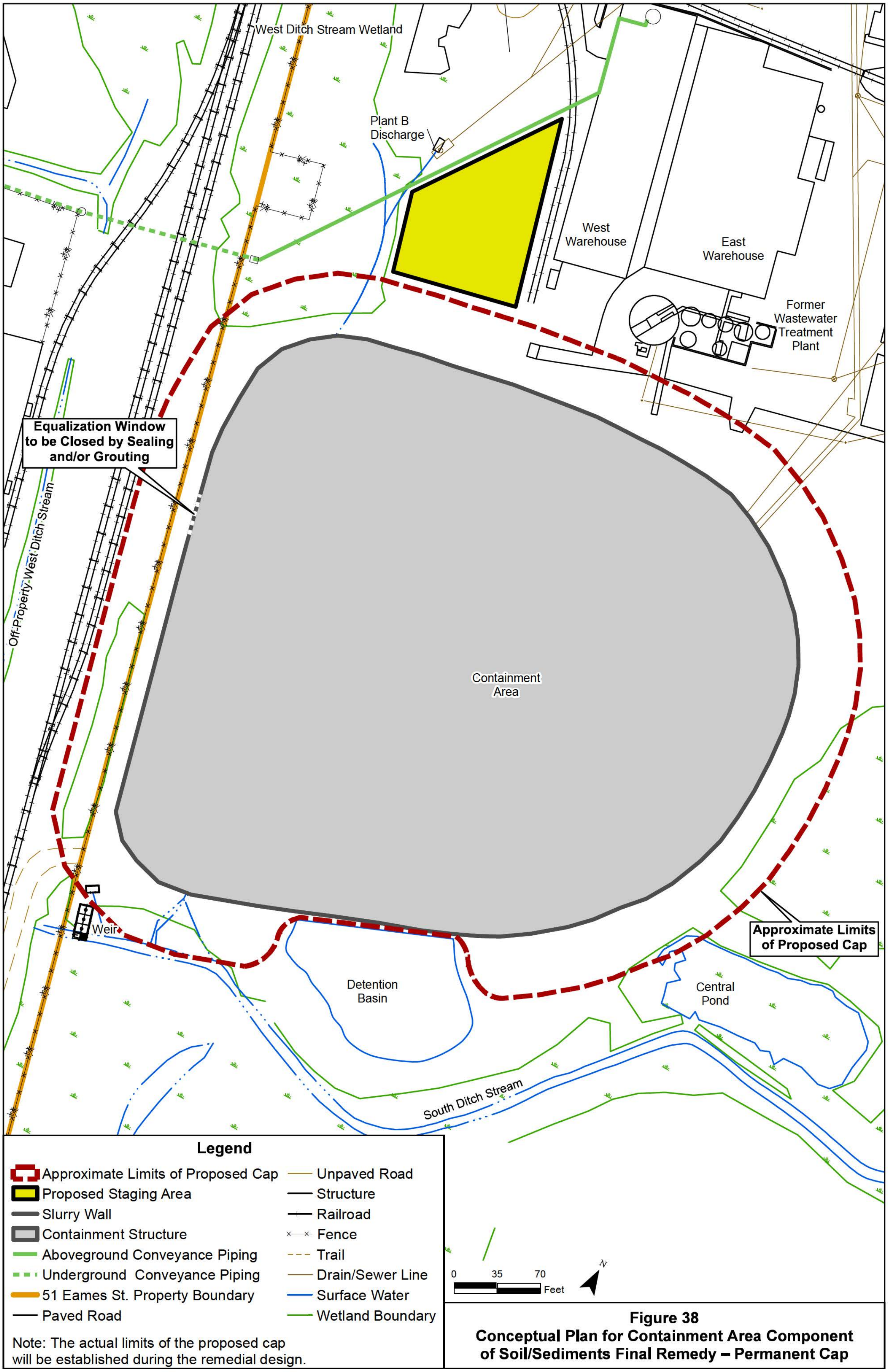
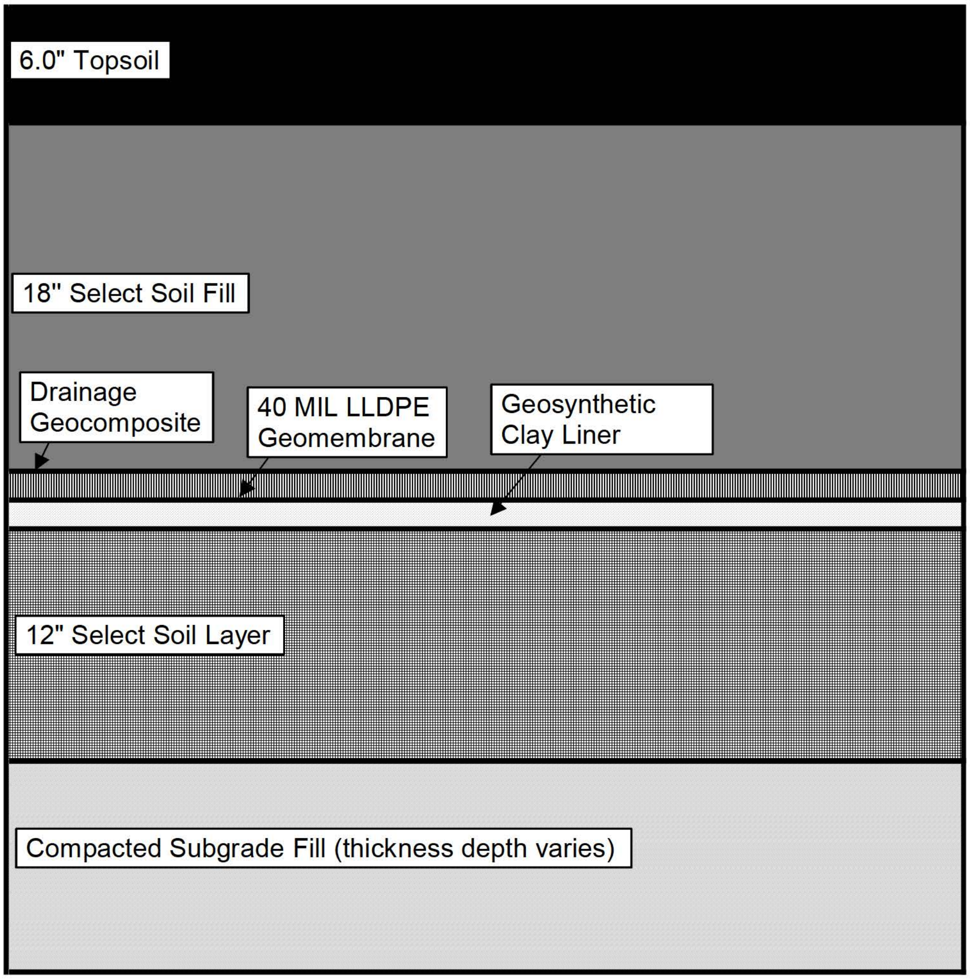


Figure 38
Conceptual Plan for Containment Area Component of Soil/Sediments Final Remedy – Permanent Cap

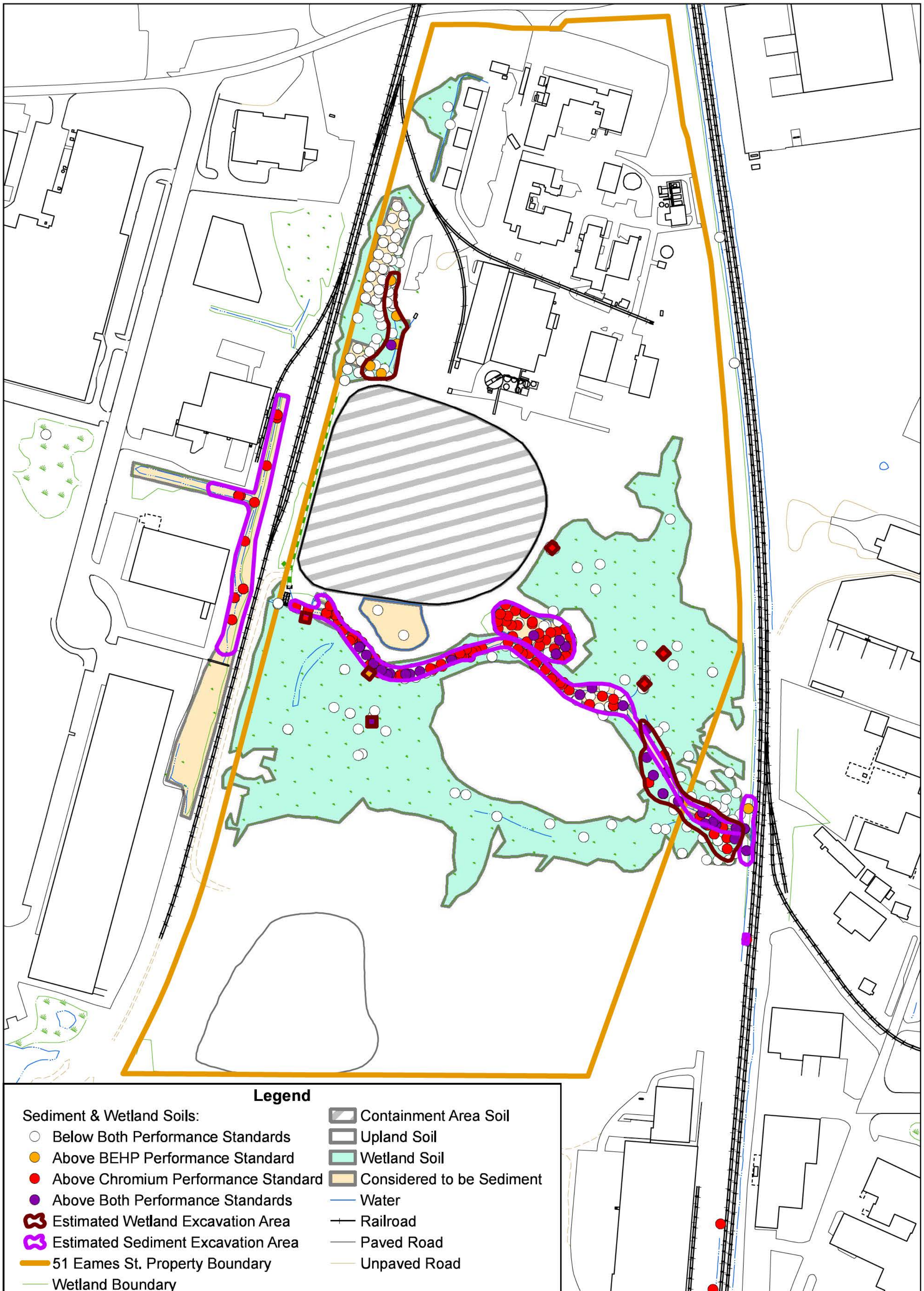


GCL = Geosynthetic Clay Liner
LLDPE = Linear low-density polyethylene

OLIN CHEMICAL SUPERFUND SITE WILMINGTON, MA	Note: Final design of the cap will be determined during the remedial design phase.	Figure 39 Cross Section of Soil/Sediment - 2 Containment Area Cap

Note:
The limits of Institutional Controls and extents of remedies including cover systems will be based on pre-design investigation and subsequent data evaluation.

Figure 40
Conceptual Plan for Upland Soil Component of Soil/Sediments Final Remedy – Cover Systems



Performance Standards:	BEHP	Chromium
Wetland Soils:	20 mg/kg	600 mg/kg
Sediment:	100 mg/kg	100 mg/kg

BEHP – Bis 2-Ethylhexyl Phthalate
mg/kg – Milligrams per Kilogram

0 100 200 Feet

N

Note:
The limits of Institutional Controls and extents of remedies including excavation will be based on pre-design investigation and subsequent data evaluation.

Figure 41
Conceptual Plan for Wetland Soil and Sediments Component of Soil/Sediments Final Remedy – Excavation with Off-Site Disposal and Restoration

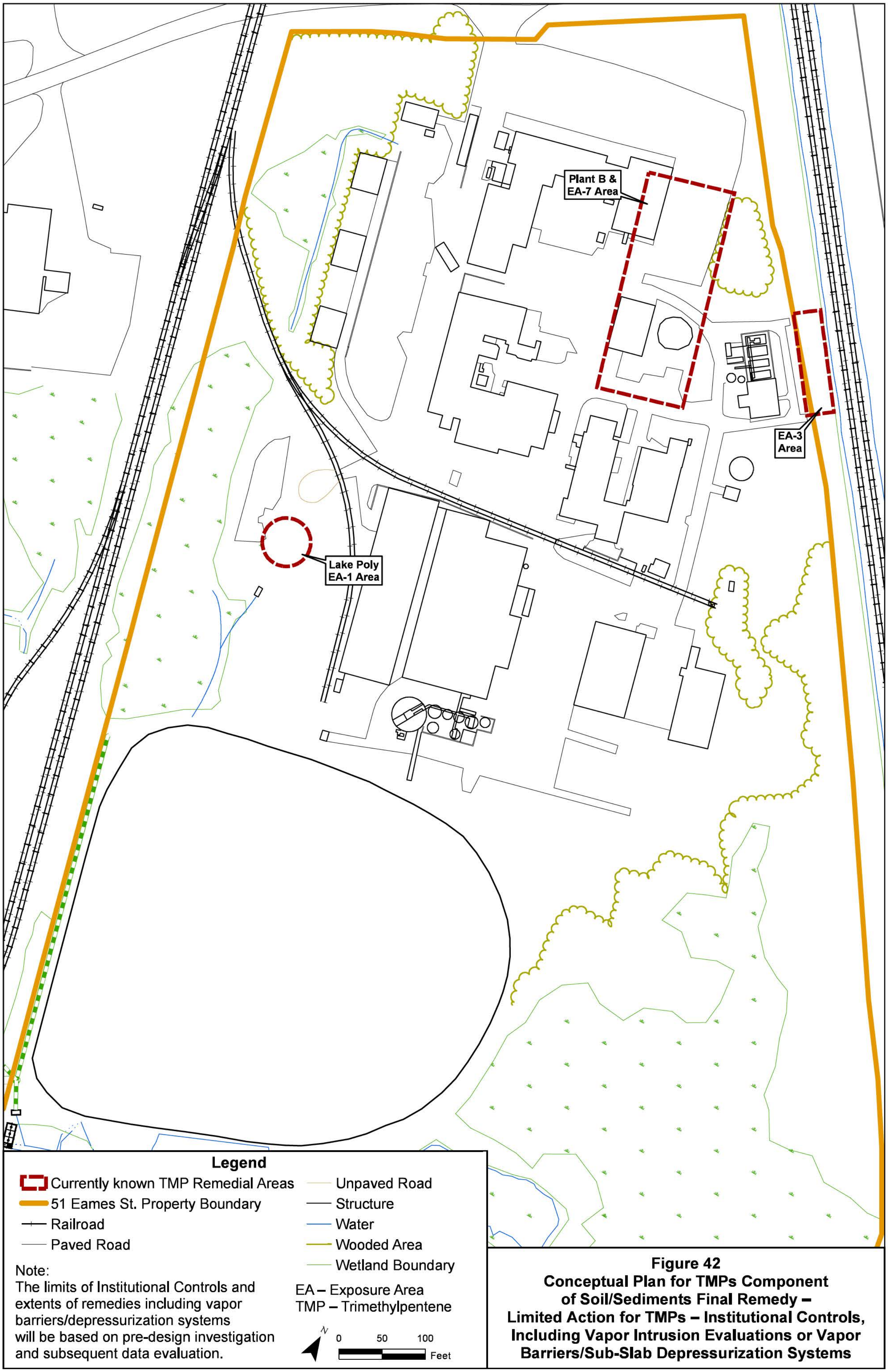


Figure 42
Conceptual Plan for TMPs Component of Soil/Sediments Final Remedy – Limited Action for TMPs – Institutional Controls, Including Vapor Intrusion Evaluations or Vapor Barriers/Sub-Slab Depressurization Systems

Appendix D

ARARs Tables

Table D-1
Action-Specific ARARs, Criteria, Advisories, and Guidance for DAPL/GWHS-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Standards					
Hazardous Waste Treatment, Storage, Disposal	Resource Conservation and Recovery Act (RCRA) Subtitle C; Hazardous Waste Identification; Generator Requirements; Tracking Requirements; Treatment, Storage, and Disposal Requirements; Groundwater Monitoring Requirements; Closure and Post Closure Requirements	42 USC § 6901 et seq.; 40 CFR Parts 260-262, Part 264	Applicable, if hazardous waste is generated	Federal standards used to identify, manage, and dispose of hazardous waste. Massachusetts has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations.	Any wastes generated during the interim action will be analyzed under these standards to determine whether they are listed or characteristic hazardous waste. Any generation, treatment, or storage of hazardous waste will be managed in accordance with these regulations. Non-hazardous wastes will be disposed of appropriately.
Hazardous Waste - Air Emissions	RCRA, Air Emission Standards for Process Vents; Equipment Leaks; Tanks, Surface Impoundments, and Containers	40 CFR Part 264, Subparts AA, BB, and CC	Applicable, if hazardous wastes: will be managed by process vents with volatile organic concentrations of at least 10 parts per million by weight (ppmw) (Subpart AA); will be managed by equipment with organic concentrations of at least 10% by weight (Subpart BB); or will be managed in tanks, surface impoundments, or containers, and thresholds are met (Subpart CC) Relevant and Appropriate, if organics less than thresholds or for non-hazardous waste	RCRA emissions standards not delegated to the State. Standards for process vents for systems that manage hazardous wastes that have organic concentrations of at least 10 ppmw. Standards for air equipment leaks for systems that manage hazardous wastes with organic concentrations of at least 10% by weight. Standards for tanks, surface impoundments, and containers that manage hazardous wastes with average VOC concentrations of 500 ppm or greater	No hazardous waste generated by the interim action is expected to have concentrations over the applicability threshold. Any generation, treatment, or storage of hazardous waste will comply with these regulations. Management of VOCs in DAPL and highly contaminated groundwater will be in accordance with these air emission regulations.
Discharges to Surface Water; Storm Water Controls	Clean Water Act; National Pollutant Discharge Elimination System (NPDES)	40 CFR Parts 122 and 125	Applicable	These requirements include storm water standards for construction activities disturbing more than one acre and requirements for stormwater discharges from hazardous waste treatment, storage, and disposal facilities. These requirements also specify the permissible concentration or level of contaminants in the discharge from any point source to waters of the United States.	Best management practices will be used to control and manage stormwater runoff during construction and operation of the DAPL and groundwater hot spot extraction and treatment systems. The discharge of treated effluent from the treatment of DAPL and highly contaminated groundwater to a surface water will meet the substantive discharge standards (the Massachusetts Surface Water Discharge Permit Program [314 CMR 3.00] has similar requirements).
Discharge to a Publicly Owned Treatment Works (POTW)	General Pretreatment Regulations for Existing and New Sources of Pollution	40 CFR Part 403	Applicable, if discharge to a POTW occurs	Standards for discharge into a Publicly Owned Treatment Works (POTW).	The specifications for the most appropriate discharge method for the DAPL and groundwater hot spot treatment systems will be developed during remedial design. If the interim action results in discharges to a POTW, the discharge will be monitored and treated, if necessary, to comply with regulations.
Underground Injection	SDWA Underground Injection Control (UIC) Program	40 CFR Parts 144, 146, and 147 (including Subpart W)	Applicable, if treated effluent is injected underground	These regulations outline minimum program and performance standards for the UIC program. Technical criteria and standards for siting, operating, closure, and post-closure are set forth in Part 146.	The specifications for the most appropriate discharge method for the DAPL and groundwater hot spot treatment systems will be developed during remedial design. If re-injection or infiltration of treated water were to occur, construction and operation of such re-injection or infiltration would comply with these regulations.
Air Emissions	Clean Air Act (CAA), Hazardous Air Pollutants; National Emission Standards for Hazardous Air Pollutants (NESHAP)	42 USC § 112(b)(1); 40 CFR Part 61	Applicable	These regulations establish emissions standards for 189 hazardous air pollutants.	No air emissions from the interim action, such as soil excavation, will cause air quality standards to be exceeded. Dust standards will be complied with during the interim action. Emissions from well drilling activities, DAPL and groundwater hot spot extraction and treatment system operation, and O&M will be implemented in accordance with these regulations.

Table D-1
Action-Specific ARARs, Criteria, Advisories, and Guidance for DAPL/GWHS-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Institutional Controls	Safe Drinking Water Act (SDWA) National Primary Drinking Water Regulations, Maximum Contaminant Levels (MCLs)	42 USC § 300f et seq.; 40 CFR Part 141, Subparts B and G	Relevant and Appropriate	These regulations establish MCLs for common organic and inorganic contaminants applicable to public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	MCLs were used to determine the extent of required institutional controls to be established for the interim action.
Institutional Controls	Safe Drinking Water Act (SDWA) National Primary Drinking Water Regulations, Maximum Contaminant Level Goals (MCLGs)	42 USC § 300f et seq.; 40 CFR Part 141, Subpart F	Relevant and Appropriate for non-zero MCLGs only; MCLGs set as zero are To Be Considered	These regulations establish MCLGs for several organic and inorganic contaminants in public drinking water supplies. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health-based goals set equal to or lower than MCLs.	MCLGs were used to determine the extent of required institutional controls to be established for the interim action.
Institutional Controls	EPA Risk Reference Doses (RfDs)		To Be Considered	RfDs are considered to be the levels unlikely to cause significant adverse non-cancer health effects associated with a threshold mechanism of action in human exposure for a lifetime. Used in developing risk-based cleanup standards by computing human health hazard resulting from exposure to non-carcinogens at the Site.	RfDs were considered in determining the extent of required institutional controls to be established for the interim action.
Institutional Controls	Human Health Assessment Cancer Slope Factors (CSFs)		To Be Considered	CSFs are estimates of the upper-bound probability on the increased cancer risk from a lifetime exposure to contaminants. Used in developing risk-based cleanup standards by computing the incremental cancer risk from exposure to contaminants at the Site.	CSFs were considered in determining the extent of required institutional controls to be established for the interim action.
Institutional Controls	EPA, Office of Water, Drinking Water Health Advisories		To Be Considered	Health Advisories (HAs) are estimates of acceptable drinking water levels for chemical substances based on health effects information; a HA is not a legally enforceable federal standard, but serves as technical guidance to assist federal, state, and local officials.	HAs were considered in determining the extent of required institutional controls to be established for the interim action.
Institutional Controls	Guidelines for Carcinogenic Risk Assessment	EPA/630/P-03/001F, March 2005	To Be Considered	These guidance values are to be used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	These guidance values were considered in determining the extent of required institutional controls to be established for the interim action.
Institutional Controls	Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens	EPA/630/R-03/003F, March 2005	To Be Considered	These guidance values are to be used to evaluate the potential carcinogenic hazard to children caused by exposure to contaminants.	These guidance values were considered in determining the extent of required institutional controls to be established for the interim action.
Institutional Controls	Regional Screening Levels for Chemical Contaminants at Superfund Sites	USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites	To Be Considered	Regional Screening Levels (RSLs) are risk-based tools for screening contaminants at Superfund sites. RSLs are not intended to be cleanup standards.	These screening levels were considered in determining the extent of required institutional controls to be established for the interim action.
Investigation-Derived Waste (IDW)	Guide to Management of Investigation-Derived Wastes	USEPA OSWER Publication 9345.3-03FS, January 1992	To Be Considered	Guidance on management of IDW in a manner that ensures protection of human health and the environment.	IDW generated as part of the interim action will be managed in accordance with guidance from this publication.
Groundwater Remediation	Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration	OSWER 9283.1- 33 (June 26, 2009)	To Be Considered	Guidance on developing groundwater remedies at CERCLA sites.	The interim action was developed in consideration of this guidance.
State Standards					
Hazardous Waste Identification	Massachusetts Hazardous Waste Management Rules for Identification and Listing of Hazardous Wastes	310 CMR 30.100	Applicable, if hazardous waste is generated	Massachusetts is delegated to administer RCRA through its state regulations. These regulations establish requirements for determining whether wastes are either listed or characteristic hazardous waste.	Any wastes generated during the interim action will be analyzed under these standards to determine whether they are listed or characteristic hazardous wastes. Hazardous and nonhazardous wastes will be managed and disposed of appropriately.
Hazardous Waste - Generator Standards	Massachusetts Hazardous Waste Rules – Requirements for Generators	310 CMR 30.300	Applicable, if hazardous waste is generated	These regulations contain requirements for hazardous waste generators. The regulations apply to generators of sampling waste and also apply to the accumulation of waste prior to off-site disposal.	Any hazardous waste generated during the interim action will be managed in accordance with these regulations.

Table D-1
Action-Specific ARARs, Criteria, Advisories, and Guidance for DAPL/GWHS-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Hazardous Waste - Management Facility Standards	Massachusetts Hazardous Waste Rules – Management Standards for All Hazardous Waste Facilities	310 CMR 30.500	Applicable, if hazardous waste is generated	General facility requirements for waste analysis, security measures, inspections, and training requirements. Section 30.580 addresses closure. Section 30.590 addresses post-closure of hazardous waste facilities. Section 30.513 requires a general waste analysis of any hazardous waste.	Any hazardous waste generated during the interim action will be managed in accordance with these regulations.
Hazardous Waste - Technical Facility Standards	Massachusetts Hazardous Waste Rules – Technical Standards for All Hazardous Waste Facilities	310 CMR 30.600	Applicable, if hazardous waste is managed	Standards for the design, performance, operation, maintenance, and monitoring of hazardous waste facilities, including miscellaneous units.	Any hazardous waste generated during the interim action will be managed in accordance with these regulations.
Hazardous Waste - Wastewater Treatment	Massachusetts Hazardous Waste Rules – Special Requirements for Wastewater Treatment Units	310 CMR 30.605	Applicable, if hazardous waste is managed in a WWTU	This regulation establishes standards for wastewater treatment units (WWTUs) for the treatment of hazardous waste	If the interim action generates hazardous waste that is managed in a WWTU, the WWTU will comply with these regulations.
Hazardous Waste - Groundwater	Massachusetts Hazardous Waste Rules – Groundwater Protection	310 CMR 30.660	Applicable, if hazardous waste is managed in a regulated unit	310 CMR 30.661 through 30.673 prescribe requirements for regulated units that receive hazardous waste, except for certain waste piles, to protect groundwater.	Any hazardous waste generated during the interim action will be managed to prevent contaminant migration to groundwater.
Hazardous Waste - Containers	Massachusetts Hazardous Waste Rules – Use and Management of Containers	310 CMR 30.680	Applicable, if hazardous waste is containerized	310 CMR 30.681 through 30.689 prescribe requirements for the use of containers, such as drums, to store hazardous waste. Provides specifications for inter alia labelling and marking, management of containers, inspections, and closure.	Any hazardous waste generated during the interim action that is managed in containers will comply with these regulations.
Hazardous Waste - Tanks	Massachusetts Hazardous Waste Rules – Storage and Treatment in Tanks	310 CMR 30.690	Applicable, if hazardous waste is stored and/or treated in tanks	310 CMR 30.691 through 30.699 prescribe requirements for the use of tanks to store and treat hazardous waste. Provides specifications for inter alia design and installation, containment and detection of leaks, general operating requirements, inspections, and closure and post-closure care.	Any hazardous waste generated during the interim action that is managed in tanks will comply with these regulations.
Discharges to Surface Waters	Massachusetts Clean Water Act; Surface Water Discharge Permit Regulations	MGL c. 21, §§ 26-53; 314 CMR 3.00	Applicable	These regulations require that discharges to waters of the Commonwealth shall not result in exceedances of Massachusetts Surface Water Quality Standards (MSWQS) (314 CMR 4.00).	Any water discharged to surface waters from the treatment of DAPL and highly contaminated groundwater will be treated to meet the substantive discharge standards.
Discharges to Surface Water	Massachusetts Clean Water Act; MA Surface Water Quality Standards (MSWQS)	MGL c. 21, §§ 26-53; 314 CMR 4.00	Applicable	These standards designate the most sensitive uses for which the various waters of the Commonwealth shall be enhanced, maintained, or protected. Minimum water quality criteria required to sustain the designated uses are established.	Any water discharged to surface waters from the treatment of DAPL and highly contaminated groundwater will be treated to meet the substantive discharge standards
Hazardous Waste - Facility Discharge Standards	Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities	MGL c. 21, §§ 26-53; 314 CMR 8.00	Applicable, if hazardous waste is generated and surface water discharge occurs	This regulation establishes additional requirements that must be satisfied for a RCRA facility (a wastewater treatment works which manages hazardous waste) that has a wastewater discharge permit.	Interim action activities that involve management of hazardous waste prior to discharge to surface waters will comply with these regulations.
Discharge to Publicly Owned Treatment Works (POTW)	Massachusetts Operation, Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Dischargers	314 CMR 12.00	Applicable, if discharges to a POTW occur	Standards for pretreatment requirements for sources to a POTW.	The specifications for the most appropriate discharge method for the DAPL and groundwater hot spot treatment systems will be developed during remedial design. If interim action activities result in discharges to a POTW, the discharge will be monitored and treated, if necessary, to comply with these regulations.
Underground Injection	Massachusetts Underground Injection Control Regulations	310 CMR 27.00	Applicable, if treated effluent is injected underground	These regulations protect underground sources of drinking water by regulating the underground injection of hazardous wastes, fluids used for extraction of minerals, oil, and energy, and any other fluids having potential to contaminate groundwater.	The specifications for the most appropriate discharge method for the DAPL and groundwater hot spot treatment systems will be developed during remedial design. If re-injection or infiltration of treated water were to occur, construction and operation of such re-injection or infiltration would comply with these regulations.

Table D-1
Action-Specific ARARs, Criteria, Advisories, and Guidance for DAPL/GWHS-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Discharge of treated groundwater to groundwater	Massachusetts Groundwater Discharge Permit Program	314 CMR 5.10 and 5.11	Relevant and Appropriate, if treated effluent is injected underground	These regulations require MassDEP to control the discharge of pollutants to groundwaters of the Commonwealth to assure that groundwaters are protected for their actual and potential use as a source of potable water and surface waters are protected for their existing and designated uses.	The specifications for the most appropriate discharge method for the DAPL and groundwater hot spot treatment systems will be developed during remedial design. If treated effluent is discharged to groundwater, the discharge will be controlled so that groundwaters are protected for their actual and potential use as a source of potable water and surface waters are protected for their existing and designated uses in accordance with the substantive discharge standards.
Air Emissions	Massachusetts Ambient Air Quality Standards	310 CMR 6.00	Applicable	These regulations establish primary and secondary standards for emissions of sulfur dioxide, particulate matter, carbon monoxide, ozone, nitrogen dioxide, and lead.	The interim action will be implemented in accordance with these regulations. Emission standards, including for dust, will be complied with during DAPL and groundwater hot spot extraction and treatment.
Air Emissions	Massachusetts Air Pollution Control Regulations	310 CMR 7.00	Applicable	These regulations set emission limits necessary to attain ambient air quality standards including standards for visible emissions (7.06); dust, odor, construction and demolition (7.09); noise (7.10); and asbestos (7.15).	The interim action will be implemented in accordance with these regulations. Emission standards, including for dust, will be complied with during DAPL and groundwater hot spot extraction and treatment.
Institutional Controls	Massachusetts Drinking Water Regulations	310 CMR 22.00	Relevant and Appropriate	These regulations establish MCLs that apply to public drinking water supplies. Massachusetts MCLs and MCLGs are specified for numerous contaminants, including inorganic and organic chemicals. For the most part, the numerical criteria are identical to Federal SDWA MCLs and MCLGs, although there are several additional chemicals that have criteria.	Massachusetts MCLs and MCLGs were used to determine the extent of required institutional controls to be established for the interim action.
Institutional Controls	Massachusetts Drinking Water Guidelines	Drinking Water Guidelines	To Be Considered	Massachusetts DEP's Office of Research and Standards issues guidance for chemicals other than those with Massachusetts MCLs in drinking water.	These Guidelines were considered in determining the extent of required institutional controls to be established for the interim action.
Monitoring Wells	Massachusetts Standard References for Monitoring Wells	WSC-310-91	To Be Considered	Guidance on locating, drilling, installing, sampling and decommissioning monitoring wells	Monitoring wells that are required as part of the interim action will be installed, maintained, or decommissioned in accordance with this guidance.
Sediment/Erosion Control; Stormwater Management	Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas	Prepared for Massachusetts Executive Office of Environmental Affairs (original print March 1997; reprint May 2003)	To Be Considered	Guidance on preventing erosion and sedimentation.	Design, construction, and operation of the interim action will be implemented in accordance with this guidance.
Air Quality	Division of Air Quality Control (DAQC)	DAQC Policy 90-001, re: Noise Regulation	To Be Considered	Guidance on sound emissions.	The interim action will comply with this guidance to assess whether any remedial measures exceed State noise guidance levels, and will follow the suggested noise limit to the extent possible in accordance with this guidance. Construction will be scheduled during daylight hours.

Notes:
ARAR = Applicable or Relevant and Appropriate Requirement
CAA = Clean Air Act
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CSF = cancer slope factor
DEP = Department of Environmental Protection
IDW = Investigation Derived Waste
MCLGs = Maximum Contaminant Level Goals
MCLs = Maximum Contaminant Levels
MGL = Massachusetts General Law
MSWQS = Massachusetts Surface Water Quality Standards
NESHAP = National Emission Standards for Hazardous Air Pollutants
NPDES = National Pollutant Discharge Elimination System
OSWER = Office of Solid Waste and Emergency Response
POTW = Publicly Owned Treatment Works
ppmw = parts per million by weight
RfD = reference dose
RCRA = Resource Conservation and Recovery Act
SDWA = Safe Drinking Water Act
UIC = Underground Injection Control
USC = United States Code
USEPA = United States Environmental Protection Agency
WSC = Waste Site Cleanup

Table D-2
Location-Specific ARARs, Criteria, Advisories, and Guidance for DAPL/GWHS-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Characteristic	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Standards					
Floodplains and Wetlands	Floodplain Management and Protection of Wetlands	44 CFR Part 9 (implementing Executive Orders 11988 and 11990)	Relevant and Appropriate	Federal Emergency Management Agency (FEMA) regulations set forth the policy, procedure, and responsibilities to implement and enforce Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands). These regulations prohibit activities that adversely affect a federally-regulated wetland unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm to wetlands that may result from such use. These regulations require the avoidance of impacts associated with the occupancy and modification of federally-designated 100-year and 500-year floodplains and require the avoidance of development within a floodplain wherever there is a practicable alternative. An assessment of impacts to the 500-year floodplain is required for critical actions, which includes siting waste facilities in a floodplain. These regulations require public notice when proposing any action in or affecting floodplains or wetlands.	If there is no practicable alternative method to work in federal jurisdictional wetlands, or 100-year or 500-year floodplains, then all practicable measures will be taken to minimize and mitigate any adverse impacts. Erosion and sedimentation control measures will be adopted during remedial activities to protect these wetlands and floodplains. The interim action, including the use of extraction wells, access roads, conveyance piping, and associated infrastructure constructed in/adjacent to wetlands and floodplains, will comply with this ARAR through appropriate avoidance, minimization, mitigation and/or restoration. After completion of work within the regulated 100-year and 500-year floodplains, there will be no significant net loss of flood storage capacity and no significant net increase in flood stage or velocities. Floodplain habitat will be restored to the extent practicable.
Wetlands, Aquatic Ecosystem	Clean Water Act (CWA) Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material	33 USC § 1344(b)(1); 40 CFR Parts 230 & 231; 33 CFR Parts 320-323	Applicable	For discharge of dredged or fill material into water bodies or wetlands, there must be no practicable alternative with less adverse impact on aquatic ecosystem; discharge cannot cause or contribute to violation of state water quality standards or toxic effluent standards or jeopardize threatened or endangered species; discharge cannot significantly degrade waters of U.S.; practicable steps must be taken to minimize and mitigate adverse impacts; and impacts on flood level, flood velocity, and flood storage capacity must be evaluated. Sets standards for restoration and mitigation required as a result of unavoidable impacts to aquatic resources. EPA must determine which alternative is the least environmentally damaging practicable alterative to protect wetland and aquatic resources.	The interim action, including the use of extraction wells, access roads, conveyance piping, and associated infrastructure constructed in/adjacent to wetlands, will comply with this ARAR through appropriate avoidance, minimization, mitigation and/or restoration. EPA has determined that the selected remedial alternative is the least environmentally damaging practicable alternative because (a) there is no practicable alternative method that will achieve cleanup objectives with less adverse impact and (b) all practicable measures would be taken to minimize and mitigate any adverse impacts from the work.
Floodplains	RCRA Floodplain Restrictions for Hazardous Waste Facilities	42 USC § 6901 et seq.; 40 CFR § 264.18(b)	Applicable, if hazardous waste is managed within the 100-year floodplain	A hazardous waste treatment, storage, or disposal facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout or to result in no adverse effects on human health or the environment if washout were to occur.	To the extent any hazardous waste is generated during the interim action, including the installation and operation of extraction wells, conveyance piping, and treatment systems, the waste will be managed so that it will not impact floodplain resources.
Floodplains	RCRA Floodplain Restrictions for Solid Waste Disposal Facilities and Practices	40 CFR § 257.3-1	Applicable, if solid waste is managed within the 100-year floodplain	Solid waste practices must not restrict the flow of a 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste, so as to pose a hazard to human life, wildlife, or land or water resources.	Any solid waste generated during the interim action, including the installation and operation of extraction wells, conveyance piping, and treatment systems, will be managed so that it will not impact floodplain resources.
Wetlands	U.S. Army Corps of Engineers, New England District Compensatory Mitigation Guidance (09-07-2016)		To Be Considered	This guidance is to be considered when compensatory mitigation to address impacts to federal jurisdictional wetlands is appropriate for a particular remedial activity.	The interim action, including the installation and operation of extraction wells, conveyance piping, and treatment systems, may impact federal jurisdictional wetlands. Activities affecting federal jurisdictional wetlands will be conducted in accordance with these guidance standards for mitigation and restoration.
Endangered Species	Endangered Species Act	16 U.S.C. §§ 1531 et seq.; 50 CFR §§ 17.11-17.12; 50 CFR Part 402	Applicable, if endangered species are encountered	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	No known endangered or threatened species or their habitats have been identified in the vicinity of the Site. If such species or habitats in the interim action area are identified, interim action activities would be designed and implemented to avoid effects to endangered or threatened species or their habitats.

Table D-2
Location-Specific ARARs, Criteria, Advisories, and Guidance for DAPL/GWHS-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Characteristic	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Historical/ Archeological Resources	National Historic Preservation Act	54 USC §§ 300101 et seq.; 36 CFR Part 800	Applicable, if subject historical resources are present	Pursuant to Section 106 of the NHPA, CERCLA response actions are required to take into account the effects of the response activities on any historic property (any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places, which would be significant in American history, architecture, archeology, engineering, and culture) and to resolve any adverse effects, including avoidance, minimization, or mitigation of the adverse effects.	No protected resources are known to exist in the area impacted by the interim action; however, the Middlesex Canal (Middlesex Canal Historic and Archaeological District) is located in close proximity to Maple Meadow Brook, where extraction wells will be potentially installed. If protected resources are identified in the interim action area, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to these protected resources.
Surface Waters, Wetland/Waterway Habitat for Endangered Species, Migratory Species	Fish and Wildlife Coordination Act	16 USC § 661 et seq.; 40 CFR § 6.302(g)	Applicable	Requires that any federal agency proposing to modify a body of water must consult with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and other related state agencies to prevent, mitigate, or compensate for project-related losses of or damage to endangered species, fish and wildlife resources.	Interim action activities will be designed and implemented to prevent and mitigate project related impacts to fish and wildlife. Consultation with appropriate agencies will be maintained during planning and implementation of interim action activities that may alter protected resource area to ensure that losses of or damage to habitat and wildlife will be prevented, mitigated, or compensated.
Atlantic Flyway	Migratory Bird Treaty Act	16 USC § 703 et seq.	Applicable, if subject protected species are present	Protects migratory birds, their nests and eggs. A depredation permit issued by the U.S. Fish and Wildlife Service is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Interim action activities will be evaluated to protect migratory birds, their nests and eggs. If migratory bird protected areas are identified in the interim action area, measures to avoid, minimize and/or mitigate any impacts to protected resource areas will be implemented in consultation with appropriate agencies.
State Standards					
Floodplains, Wetlands, Surface Waters	Massachusetts Wetland Protection Act and Regulations	MGL c. 131, § 40; 310 CMR 10.00	Applicable if alternative alters wetlands or floodplains	These regulations restrict dredging, filling, altering, or polluting inland wetland resource areas (defined as areas within the 100-year floodplain) and buffer zones (100 feet of a vegetated wetland or 200 feet from a perennial stream), and impose performance standards for work in such areas. Protected resource areas include: 10.54 (Bank); 10.55 (Bordering Vegetated Wetlands); 10.56 (Land under Water Bodies and Waterways); 10.57 (Land Subject to Flooding); and 10.58 (Riverfront Area).	If the interim action, including the use of extraction wells, access roads, conveyance piping, and associated infrastructure constructed in/adjacent to wetlands and floodplains, would alter state regulated wetlands or floodplains, it would comply with this ARAR through appropriate avoidance, minimization, mitigation, and restoration. Any interim action activity conducted within 100 feet of a state regulated wetland resource area or 200 feet from a perennial stream will comply with the substantive requirements of these regulations. Mitigation of impacts on state wetland resource areas will be addressed. All interim action work within any regulated floodplain will result in no net loss of flood storage capacity and no net increase in flood stage or velocities. Floodplain habitat will be restored, to the extent practicable.
Area of Critical Environmental Concern	Massachusetts Areas of Critical Environmental Concern (ACECs) Regulations	301 CMR 12.00	Applicable, if ACEC is identified	An ACEC is of regional, state, or national importance or contains significant ecological systems with critical interrelationships among a number of components. An eligible area must contain features from four or more of the following groups: (1) fisheries, (2) coastal features, (3) estuarine wetlands, (4) inland wetlands, (5) inland surface waters, (6) water supply areas (e.g., aquifer recharge area); (7) natural hazard areas (e.g., floodplain); (8) agricultural areas; (9) historical/archeological resources; (10) habitat resources (e.g., for endangered wildlife); or (11) special use areas. After an area is designated as an ACEC, the aim is to preserve and restore these areas.	No known ACEC has been identified at the Site. If an ACEC is identified in the interim action area, interim action activities will be controlled to minimize impacts to affected species or resources.
Floodplains	Massachusetts Hazardous Waste Regulations, Location Standards for Land Subject to Flooding	310 CMR 30.701	Applicable, if hazardous waste is managed within a floodplain	This regulation sets forth criteria for siting hazardous waste facilities within land subject to flooding (as defined under the Massachusetts Wetland Protection Act standards). Any new or expanded hazardous waste storage or treatment facility (which only receives hazardous waste from on-site sources), the active portion of which is located within the boundary of land subject to flooding from the statistical 100-year frequency storm, shall be flood-proofed. Flood-proofing shall be designed, constructed, operated and maintained to prevent floodwaters from coming into contact with hazardous waste.	To the extent any hazardous waste is generated during the interim action, including the installation and operation of extraction wells, conveyance piping, and treatment systems, the waste will be managed so that it will not impact floodplain resources.

Table D-2
Location-Specific ARARs, Criteria, Advisories, and Guidance for DAPL/GWHS-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Characteristic	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Endangered Species	Massachusetts Endangered Species Regulations	321 CMR 10.00	Applicable, if endangered species are encountered	Requires action to regulate the impact to state listed endangered or threatened species or their habitats. Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	No known endangered or threatened species or their habitats have been identified in the vicinity of the Site. If such species or their habitats in the interim action area are identified, interim action activities would be designed and implemented to avoid adverse effects to endangered or threatened species or their habitats.
Historical/ Archeological Resources	Massachusetts Antiquities Act; Massachusetts Historical Commission Regulations; Protection of Properties Included in the State Register of Historic Places	MGL c. 9, §§ 26-27C; 950 CMR 70.00 and 71.00	Applicable, if subject historical resources are present.	Projects must eliminate, limit, or mitigate adverse effects to properties listed in the State Register of Historic Places (historic and archaeological properties). Establishes coordination with the National Historic Preservation Act.	No protected resources are known to exist in the area impacted by the interim action; however, the Middlesex Canal (Middlesex Canal Historic and Archaeological District) is located in close proximity to Maple Meadow Brook, where extraction wells will be potentially installed. If protected resources are identified in the interim action area, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to these protected resources.

Notes:
ACEC = Area of Critical Environmental Concern
ARAR = Applicable or Relevant and Appropriate Requirement
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
DAPL = Dense Aqueous Phase Liquid
EPA = United States Environmental Protection Agency
FEMA = Federal Emergency Management Agency
MGL = Massachusetts General Law
RCRA = Resource Conservation and Recovery Act
USC = United States Code
USFWS = United States Fish and Wildlife Service

Table D-3
Action-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL/SW-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Standards					
Hazardous Waste Treatment, Storage, Disposal	Resource Conservation and Recovery Act (RCRA) Subtitle C; Hazardous Waste Identification; Generator Requirements; Tracking Requirements; Treatment Storage, and Disposal Requirements; Groundwater Monitoring Requirements; Closure and Post Closure Requirements	42 USC § 6901 et seq.; 40 CFR Parts 260-262, Part 264	Applicable, if hazardous waste is generated.	Federal standards used to identify, manage, and dispose of hazardous waste. Massachusetts has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations.	Any wastes generated during remedial activities will be analyzed under these standards to determine whether they are listed or characteristic hazardous waste. Any generation, treatment, or storage of hazardous waste will be managed in accordance with these regulations. Non-hazardous wastes will be disposed of appropriately.
Hazardous Waste - Air Emissions	RCRA, Air Emission Standards for Process Vents; Equipment Leaks; Tanks, Surface Impoundments, and Containers	40 CFR Part 264, Subparts AA, BB, and CC	Applicable, if hazardous wastes: will be managed by process vents with volatile organic concentrations of at least 10 parts per million by weight (ppmw) (Subpart AA); will be managed by equipment with organic concentrations of at least 10% by weight (Subpart BB); or will be managed in tanks, surface impoundments, or containers, and thresholds are met (Subpart CC). Relevant and Appropriate, if organics less than thresholds or for non-hazardous waste.	RCRA emissions standards not delegated to the State. Standards for process vents for systems that manage hazardous wastes that have organic concentrations of at least 10 ppmw. Standards for air equipment leaks for systems that manage hazardous wastes with organic concentrations of at least 10% by weight. Standards for tanks, surface impoundments, and containers that manage hazardous wastes with average VOC concentrations of 500 ppm or greater.	No hazardous waste generated by remedial activities is expected to have concentrations over the applicability threshold. Any generation, treatment, or storage of hazardous waste above applicability thresholds will comply with these regulations. Management of VOCs in LNAPL will be in accordance with these air emission regulations.
Discharges to Surface Water; Storm Water Controls	Clean Water Act; National Pollutant Discharge Elimination System (NPDES)	40 CFR Parts 122 and 125	Applicable	These requirements include storm water standards for construction activities disturbing more than one acre and requirements for stormwater discharges from hazardous waste treatment, storage, and disposal facilities. These requirements also specify the permissible concentration or level of contaminants in the discharge from any point source to waters of the United States.	Best management practices will be used to control and manage stormwater runoff during construction and operation. Alternatives that incorporate discharges to surface waters will need to have the discharges meet the substantive discharge standards (the Massachusetts Surface Water Discharge Permit Program [314 CMR 3.00] has similar requirements).
Discharge to a Publicly Owned Treatment Works (POTW)	General Pretreatment Regulations for Existing and New Sources of Pollution	40 CFR Part 403	Applicable, if discharge to a POTW occurs	Standards for discharge into a Publicly Owned Treatment Works (POTW).	The specifications for the most appropriate discharge method for effluent from remedial activities will be developed during remedial design. If remedial activities result in discharges to a POTW, the discharge will be monitored and treated, if necessary, to comply with these regulations.
Air Emissions	Clean Air Act (CAA), Hazardous Air Pollutants; National Emission Standards for Asbestos	42 USC § 112(b)(1); 40 CFR Part 61, Subpart M	Applicable, if asbestos containing waste material is present in Plant B	Provides regulations for emission of particular air pollutants from specific sources, including standards for demolition of asbestos-containing materials, and regulations for transport and disposal of asbestos waste	If these regulations apply due to asbestos in Plant B, demolition of Plant B will comply with the work practice standards as well as the standards for collection, processing, packaging, and transportation.
Air Emissions	Clean Air Act (CAA), Hazardous Air Pollutants; National Emission Standards for Hazardous Air Pollutants (NESHAP)	42 USC § 112(b)(1); 40 CFR Part 61	Applicable	These regulations establish emissions standards for 189 hazardous air pollutants.	No air emissions from the remedial activities will cause air quality standards to be exceeded. Dust standards will be complied with during the remedial activities. Emissions from remedial activities will be implemented in accordance with these regulations.

Table D-3
Action-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL/SW-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Underground Injection	SDWA Underground Injection Control (UIC) Program	40 CFR Parts 144, 146, and 147 (including Subpart W)	Applicable, if treated effluent is injected underground	These regulations outline minimum program and performance standards for the UIC program. Technical criteria and standards for siting, operating, closure, and post-closure are set forth in Part 146.	The specifications for the most appropriate discharge method will be developed during remedial design. If re-injection or infiltration of treated water were to occur, construction and operation of such re-injection or infiltration would comply with these regulations.
Monitoring Surface Water	Clean Water Act (CWA) National Recommended Water Quality Criteria (NRWQC); Aquatic Life Criteria		To Be Considered	NRWQC are health-based criteria developed for chemical constituents in surface water. They have been developed to protect aquatic life and human health from harmful effects due to exposure to chemically impacted surface water. Performance standards to be used for monitoring surface water during remedial activities.	NRWQC were used to derive ecological surface water performance standards that would be protective of ecological receptors in surface water, which will be used to monitor surface water during remedial action to ensure that the alternatives are successful in reducing contaminant levels in surface water to be protective of ecological receptors.
Investigation-Derived Waste (IDW)	Guide to Management of Investigation-Derived Wastes	USEPA OSWER Publication 9345.3-03FS, January 1992	To Be Considered	Guidance on management of IDW in a manner that ensures protection of human health and the environment.	IDW generated during remedial activities will be managed in accordance with guidance from this publication.
Groundwater Remediation	Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration	OSWER 9283.1- 33 (June 26, 2009)	To Be Considered	Guidance on developing groundwater remedies at CERCLA sites.	The remedial activities were developed in consideration of this guidance.
Institutional Controls	EPA Risk Reference Doses (RfDs)		To Be Considered	RfDs are considered to be the levels unlikely to cause significant adverse non-cancer health effects associated with a threshold mechanism of action in human exposure for a lifetime. Used in developing risk-based cleanup standards by computing human health hazard resulting from exposure to non-carcinogens at the Site.	RfDs were considered to derive human health surface water performance standards that would be protective of human receptors in surface water, which will be used to monitor surface water during remedial action to ensure that the alternatives are successful in reducing contaminant levels in surface water to be protective of human receptors.
Institutional Controls	Human Health Assessment Cancer Slope Factors (CSFs)		To Be Considered	CSFs are estimates of the upper-bound probability on the increased cancer risk from a lifetime exposure to contaminants. Used in developing risk-based cleanup standards by computing the incremental cancer risk from exposure to contaminants at the Site.	CSFs were considered to derive human health surface water performance standards that would be protective of human receptors in surface water, which will be used to monitor surface water during remedial action to ensure that the alternatives are successful in reducing contaminant levels in surface water to be protective of human receptors.
Institutional Controls	EPA, Office of Water, Drinking Water Health Advisories		To Be Considered	Health Advisories (HAs) are estimates of acceptable drinking water levels for chemical substances based on health effects information; a HA is not a legally enforceable federal standard, but serves as technical guidance to assist federal, state, and local officials.	HAs were considered to derive human health surface water performance standards that would be protective of human receptors in surface water, which will be used to monitor surface water during remedial action to ensure that the alternatives are successful in reducing contaminant levels in surface water to be protective of human receptors.
Institutional Controls	Guidelines for Carcinogenic Risk Assessment	EPA/630/P-03/001F, March 2005	To Be Considered	These guidance values are to be used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	These guidance values were considered to derive human health surface water performance standards that would be protective of human receptors in surface water, which will be used to monitor surface water during remedial action to ensure that the alternatives are successful in reducing contaminant levels in surface water to be protective of human receptors.

Table D-3
Action-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL/SW-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Institutional Controls	Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens	EPA/630/R-03/003F, March 2005	To Be Considered	These guidance values are to be used to evaluate the potential carcinogenic hazard to children caused by exposure to contaminants.	These guidance values were considered to derive human health surface water performance standards that would be protective of human receptors in surface water, which will be used to monitor surface water during remedial action to ensure that the alternatives are successful in reducing contaminant levels in surface water to be protective of human receptors.
Institutional Controls	Regional Screening Levels for Chemical Contaminants at Superfund Sites	USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites	To Be Considered	Regional Screening Levels (RSLs) are risk-based tools for screening contaminants at Superfund sites. RSLs are not intended to be cleanup standards.	These screening levels were considered to derive human health surface water performance standards that would be protective of human receptors in surface water, which will be used to monitor surface water during remedial action to ensure that the alternatives are successful in reducing contaminant levels in surface water to be protective of human receptors.
State Standards					
Hazardous Waste Identification	Massachusetts Hazardous Waste Management Rules for Identification and Listing of Hazardous Wastes	310 CMR 30.100	Applicable, if hazardous waste is generated	Massachusetts is delegated to administer RCRA through its state regulations. These regulations establish requirements for determining whether wastes are either listed or characteristic hazardous waste.	Any wastes generated during remedial activities will be analyzed under these standards to determine whether they are listed or characteristic hazardous wastes. Hazardous and nonhazardous wastes will be managed and disposed of appropriately.
Hazardous Waste - Generator Standards	Massachusetts Hazardous Waste Rules – Requirements for Generators	310 CMR 30.300	Applicable, if hazardous waste is generated	These regulations contain requirements for hazardous waste generators. The regulations apply to generators of sampling waste and also apply to the accumulation of waste prior to off-site disposal.	Any hazardous waste generated during remedial activities will be managed in accordance with these regulations.
Hazardous Waste - Management Facility Standards	Massachusetts Hazardous Waste Rules – Management Standards for All Hazardous Waste Facilities	310 CMR 30.500	Applicable, if hazardous waste is generated	General facility requirements for waste analysis, security measures, inspections, and training requirements. Section 30.580 addresses closure. Section 30.590 addresses post-closure of hazardous waste facilities. Section 30.513 requires a general waste analysis of any hazardous waste.	Any hazardous waste generated during remedial activities will be managed in accordance with these regulations.
Hazardous Waste - Technical Facility Standards	Massachusetts Hazardous Waste Rules – Technical Standards for All Hazardous Waste Facilities	310 CMR 30.600	Applicable, if hazardous waste is managed	Standards for the design, performance, operation, maintenance, and monitoring of hazardous waste facilities, including miscellaneous units.	Any hazardous waste generated during remedial activities will be managed in accordance with these regulations.
Hazardous Waste - Wastewater Treatment	Massachusetts Hazardous Waste Rules – Special Requirements for Wastewater Treatment Units	310 CMR 30.605	Applicable, if hazardous waste is managed in a WWTU	This regulation establishes standards for wastewater treatment units (WWTUs) for the treatment of hazardous waste	Any hazardous waste generated during remedial activities will be managed in accordance with these regulations. If remedial activities generate hazardous waste that is managed in a WWTU, the WWTU will comply with these regulations.
Hazardous Waste - Groundwater	Massachusetts Hazardous Waste Rules – Groundwater Protection	310 CMR 30.660	Applicable, if hazardous waste is managed in a regulated unit	310 CMR 30.661 through 30.673 prescribe requirements for regulated units that receive hazardous waste, except for certain waste piles, to protect groundwater.	Any hazardous waste generated during remedial activities will be managed to prevent contaminant migration to groundwater. Any management of hazardous waste in subject waste piles will comply with these regulations.
Hazardous Waste - Containers	Massachusetts Hazardous Waste Rules – Use and Management of Containers	310 CMR 30.680	Applicable, if hazardous waste is containerized	310 CMR 30.681 through 30.689 prescribe requirements for the use of containers, such as drums, to store hazardous waste. Provides specifications for inter alia labelling and marking, management of containers, inspections, and closure.	Any hazardous waste generated during remedial activities that is managed in containers will comply with these regulations.

Table D-3
Action-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL/SW-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Hazardous Waste - Tanks	Massachusetts Hazardous Waste Rules – Storage and Treatment in Tanks	310 CMR 30.690	Applicable, if hazardous waste is stored and/or treated in tanks	310 CMR 30.691 through 30.699 prescribe requirements for the use of tanks to store and treat hazardous waste. Provides specifications for inter alia design and installation, containment and detection of leaks, general operating requirements, inspections, and closure and post-closure care.	Any hazardous waste generated during remedial activities that is managed in tanks will comply with these regulations.
Hazardous Waste - Waste Piles	Massachusetts Hazardous Waste Rules – Waste Piles	310 CMR 30.640	Applicable, if hazardous waste is managed in waste piles	310 CMR 30.641 through 30.649 prescribe requirements for storage and treatment of hazardous waste in waste piles. Provides specifications for inter alia design and operations, monitoring and inspection, and closure and post-closure care.	Any hazardous waste generated during remedial activities that is managed in waste piles will comply with these regulations.
Discharges to Surface Waters	Massachusetts Clean Water Act; Surface Water Discharge Permit Regulations	MGL c. 21, §§ 26-53; 314 CMR 3.00	Applicable	These regulations require that discharges to waters of the Commonwealth shall not result in exceedances of Massachusetts Surface Water Quality Standards (MSWQS) (314 CMR 4.00).	Any water discharged to surface waters related to excavation and dewatering activities will be treated to meet the substantive discharge standards.
Discharges to Surface Water	Massachusetts Clean Water Act; MA Surface Water Quality Standards (MSWQS)	MGL c. 21, §§ 26-53; 314 CMR 4.00	Applicable	These standards designate the most sensitive uses for which the various waters of the Commonwealth shall be enhanced, maintained, or protected. Minimum water quality criteria required to sustain the designated uses are established.	Any water discharged to surface waters related to excavation and dewatering activities will be treated to meet the substantive discharge standards.
Discharge to Publicly Owned Treatment Works (POTW)	Massachusetts Operation, Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Dischargers	314 CMR 12.00	Applicable, if discharges to a POTW occur	Standards for pretreatment requirements for sources to a POTW.	The specifications for the most appropriate discharge method for effluent from remedial activities will be developed during remedial design. If remedial activities result in discharges to a POTW, the discharge will be monitored and treated, if necessary, to comply with these regulations.
Hazardous Waste - Facility Discharge Standards	Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities	MGL c. 21, §§ 26-53; 314 CMR 8.00	Applicable, if hazardous waste is generated and surface water discharge occurs	This regulation establishes additional requirements that must be satisfied for a RCRA facility (a wastewater treatment works which manages hazardous waste) that has a wastewater discharge permit.	Remedial activities that involve management of hazardous waste prior to discharge to surface waters will comply with these regulations.
Air Emissions	Massachusetts Ambient Air Quality Standards	310 CMR 6.00	Applicable	These regulations establish primary and secondary standards for emissions of sulfur dioxide, particulate matter, carbon monoxide, ozone, nitrogen dioxide, and lead.	Remedial activities will be implemented in accordance with these regulations. Emission standards, including for dust, will be complied with during remedial activities.
Air Quality	Division of Air Quality Control (DAQC)	DAQC Policy 90-001, re: Noise Regulation,	To Be Considered	Guidance on sound emissions.	Remedial activities will comply with this guidance to assess whether any remedial measures exceed State noise guidance levels, and will follow the suggested noise limit to the extent possible in accordance with this guidance. Construction will be scheduled during daylight hours.
Solid Waste	Massachusetts Solid Waste Management Regulations	310 CMR 19.000	Applicable, if solid waste is generated	This regulation establishes requirements for the storage, transfer, processing, treatment, disposal, use and reuse of solid waste (including asbestos), including contracting for disposal or transport of solid waste.	Any wastes generated by remedial activities that are determined to not be hazardous wastes will be managed in accordance with these regulations.
Air Emissions	Massachusetts Air Pollution Control Regulations	310 CMR 7.00	Applicable	These regulations set emission limits necessary to attain ambient air quality standards including standards for visible emissions (7.06); dust, odor, construction and demolition (7.09); noise (7.10); and asbestos (7.15).	Remedial activities will be implemented in accordance with these regulations. Emission standards, including for dust, will be complied with during these remedial activities.
Monitoring Wells	Massachusetts Standard References for Monitoring Wells	WSC-310-91	To Be Considered	Guidance on locating, drilling, installing, sampling and decommissioning monitoring wells	Monitoring wells that are required as part of remedial activities will be installed, maintained, or decommissioned in accordance with this guidance.

Table D-3
Action-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL/SW-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Sediment/Erosion Control; Stormwater Management	Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas	Prepared for Massachusetts Executive Office of Environmental Affairs (original print March 1997; reprint May 2003)	To Be Considered	Guidance on preventing erosion and sedimentation.	Design, construction, and operation of remedial activities will be implemented in accordance with this guidance.
Underground Injection	Massachusetts Underground Injection Control Regulations	310 CMR 27.00	Applicable, if treated effluent is injected underground	These regulations protect underground sources of drinking water by regulating the underground injection of hazardous wastes, fluids used for extraction of minerals, oil, and energy, and any other fluids having potential to contaminate groundwater.	The specifications for the most appropriate discharge method will be developed during remedial design. If re-injection or infiltration of treated water were to occur, construction and operation of such re-injection or infiltration would comply with these regulations.
Discharge of treated groundwater to groundwater	Massachusetts Groundwater Discharge Permit Program	314 CMR 5.10 and 5.11	Relevant and Appropriate, if treated effluent is injected underground	These regulations require MassDEP to control the discharge of pollutants to groundwaters of the Commonwealth to assure that groundwaters are protected for their actual and potential use as a source of potable water and surface waters are protected for their existing and designated uses.	The specifications for the most appropriate discharge method will be developed during remedial design. If treated effluent is discharged to groundwater, the discharge will be controlled so that groundwaters are protected for their actual and potential use as a source of potable water and surface waters are protected for their existing and designated uses in accordance with the substantive discharge standards.

Notes:
ARAR = Applicable or Relevant and Appropriate Requirement
CAA = Clean Air Act
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
DAPL = Dense Aqueous Phase Liquid
IDW = Investigation Derived Waste
MGL = Massachusetts General Law
MSWQS = Massachusetts Surface Water Quality Standards
NAPL = Non-Aqueous Phase Liquid
NESHAP = National Emission Standards for Hazardous Air Pollutant
NPDES = National Pollutant Discharge Elimination System
OSWER = Office of Solid Waste and Emergency Response
POTW = Publicly Owned Treatment Works
ppmw = parts per million by weight
RfD = reference dose
RCRA = Resource Conservation and Recovery Act
USC = United States Code
USEPA = United States Environmental Protection Agency

Table D-4
Location-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL/SW-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Characteristic	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Standards					
Floodplains and Wetlands	Floodplain Management and Protection of Wetlands	44 CFR Part 9 (implementing Executive Orders 11988 and 11990)	Relevant and Appropriate	Federal Emergency Management Agency (FEMA) regulations set forth the policy, procedure, and responsibilities to implement and enforce Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands). These regulations prohibit activities that adversely affect a federally-regulated wetland unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm to wetlands that may result from such use. These regulations require the avoidance of impacts associated with the occupancy and modification of federally-designated 100-year and 500-year floodplains and require the avoidance of development within a floodplain wherever there is a practicable alternative. An assessment of impacts to the 500-year floodplain is required for critical actions, which includes siting waste facilities in a floodplain. These regulations require public notice when proposing any action in or affecting floodplains or wetlands.	If there is no practicable alternative method to work in federal jurisdictional wetlands, or 100-year or 500-year floodplains, then all practicable measures will be taken to minimize and mitigate any adverse impacts. Erosion and sedimentation control measures will be adopted during remedial activities to protect these wetlands and floodplains. Remedial activities will comply with this ARAR through appropriate avoidance, minimization, mitigation and/or restoration. After completion of work within the regulated 100-year and 500-year floodplains, there will be no significant net loss of flood storage capacity and no significant net increase in flood stage or velocities. Floodplain habitat will be restored to the extent practicable. Federal jurisdictional wetlands altered by wetland soil and sediment excavation and soil covers installed adjacent to such wetlands will be restored in place.
Floodplains	RCRA Floodplain Restrictions for Hazardous Waste Facilities	42 USC § 6901 et seq.; 40 CFR § 264.18(b)	Applicable, if hazardous waste is managed within the 100-year floodplain	A hazardous waste treatment, storage, or disposal facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout or to result in no adverse effects on human health or the environment if washout were to occur.	To the extent any hazardous waste is generated during the remedial activities, the waste will be managed so that it will not impact floodplain resources.
Floodplains	RCRA Floodplain Restrictions for Solid Waste Disposal Facilities and Practices	40 CFR § 257.3-1	Applicable, if solid waste is managed within the 100-year floodplain	Solid waste practices must not restrict the flow of a 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste, so as to pose a hazard to human life, wildlife, or land or water resources.	Any solid waste generated from during the remedial action will be managed so that it will not impact floodplain resources.
Wetlands, Aquatic Ecosystem	Clean Water Act (CWA) Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material	33 USC § 1344(b)(1); 40 CFR Parts 230 & 231; 33 CFR Parts 320-323	Applicable	For discharge of dredged or fill material into water bodies or wetlands, there must be no practicable alternative with less adverse impact on aquatic ecosystem; discharge cannot cause or contribute to violation of state water quality standards or toxic effluent standards or jeopardize threatened or endangered species; discharge cannot significantly degrade waters of U.S.; practicable steps must be taken to minimize and mitigate adverse impacts; and impacts on flood level, flood velocity, and flood storage capacity must be evaluated. Sets standards for restoration and mitigation required as a result of unavoidable impacts to aquatic resources. EPA must determine which alternative is the least environmentally damaging practicable alternative to protect wetland and aquatic resources.	Remedial activities will comply with this ARAR through appropriate avoidance, minimization, mitigation and/or restoration. Under these alternatives, groundwater extraction wells and conveyance piping will impact federal jurisdictional wetlands. The remedial activities will be conducted in accordance with these requirements including, but not limited to, appropriate avoidance, minimization, mitigation, and/or restoration. EPA has determined that the selected remedial alternative is the least environmentally damaging practicable alternative because (a) there is no practicable alternative method that will achieve cleanup objectives with less adverse impact and (b) all practicable measures would be taken to minimize and mitigate any adverse impacts from the work.
Wetlands	U.S. Army Corps of Engineers, New England District Compensatory Mitigation Guidance (09-07-2016)		To Be Considered	This guidance is to be considered when compensatory mitigation to address impacts to federal jurisdictional wetlands is appropriate for a particular remedial activity.	Remedial activities may impact federal jurisdictional wetlands. Activities affecting federal jurisdictional wetlands will be conducted in accordance with these guidance standards for mitigation and restoration.

Table D-4
Location-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL/SW-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Characteristic	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Surface Waters, Wetland/Waterway Habitat for Endangered Species, Migratory Species	Fish and Wildlife Coordination Act	16 USC § 661 et seq.; 40 CFR § 6.302(g)	Applicable	Requires that any federal agency proposing to modify a body of water must consult with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and other related state agencies to prevent, mitigate, or compensate for project-related losses of or damage to endangered species, fish and wildlife resources.	Remedial activities will be designed and implemented to prevent and mitigate project related impacts to fish and wildlife. Consultation with appropriate agencies will be maintained during planning and implementation of remedial activities that may alter protected resource area to ensure that losses of or damage to habitat and wildlife will be prevented, mitigated, or compensated.
Endangered Species	Endangered Species Act	16 U.S.C. §§ 1531 et seq.; 50 CFR §§ 17.11-17.12; 50 CFR Part 402	Applicable, if endangered species are encountered	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	No known endangered or threatened species have been identified in the vicinity of the Site. If such species or habitats in the remedial areas are identified, remedial activities would be designed and implemented to avoid effects endangered or threatened species or their habitats.
Historical/ Archeological Resources	National Historic Preservation Act	54 USC §§ 300101 et seq.; 36 CFR Part 800	Applicable, if subject historical resources are present	Pursuant to Section 106 of the NHPA, CERCLA response actions are required to take into account the effects of the response activities on any historic property (any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places, which would be significant in American history, architecture, archeology, engineering, and culture) and to resolve any adverse effects, including avoidance, minimization, or mitigation of the adverse effects.	No protected resources are known to exist in the East and South Ditch Stream areas and LNAPL area. If protected resources are identified in the remedial area, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to these protected resources.
Atlantic Flyway	Migratory Bird Treaty Act	16 USC § 703 et seq.	Applicable, if subject protected species are present	Protects migratory birds, their nests and eggs. A depredation permit issued by the U.S. Fish and Wildlife Service is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Remedial activities will be evaluated to protect migratory birds, their nests, and eggs. If migratory bird protected areas are identified within the remedial area, measures to avoid, minimize and/or mitigate any impacts to protected resource areas will be implemented in consultation with appropriate agencies.
State Standards					
Floodplains, Wetlands, Surface Waters	Massachusetts Wetland Protection Act and Regulations	MGL c. 131, § 40; 310 CMR 10.00	Applicable if alternative alters wetlands or floodplains	These regulations restrict dredging, filling, altering, or polluting inland wetland resource areas (defined as areas within the 100-year floodplain) and buffer zones (100 feet of a vegetated wetland or 200 feet from a perennial stream), and impose performance standards for work in such areas. Protected resource areas include: 10.54 (Bank); 10.55 (Bordering Vegetated Wetlands); 10.56 (Land under Water Bodies and Waterways); 10.57 (Land Subject to Flooding); and 10.58 (Riverfront Area).	Remedial activities will occur in/adjacent to wetlands and floodplains, and, if state regulated wetlands or floodplains will be altered, the remedial activities will comply with this ARAR through appropriate avoidance, minimization, mitigation, and restoration. Any remedial activity conducted within 100 feet of a state regulated wetland resource area or 200 feet from a perennial stream will comply with the substantive requirements of these regulations. Mitigation of impacts on state wetland resource areas will be addressed. All remedial work within any regulated floodplain will result in no net loss of flood storage capacity and no net increase in flood stage or velocities. Floodplain habitat will be restored, to the extent practicable.
Floodplains	Massachusetts Hazardous Waste Regulations, Location Standards for Land Subject to Flooding	310 CMR 30.701	Applicable, if hazardous waste is managed within a floodplain	This regulation sets forth criteria for siting hazardous waste facilities within land subject to flooding (as defined under the Massachusetts Wetland Protection Act standards). Any new or expanded hazardous waste storage or treatment facility (which only receives hazardous waste from on-site sources), the active portion of which is located within the boundary of land subject to flooding from the statistical 100-year frequency storm, shall be flood-proofed. Flood-proofing shall be designed, constructed, operated, and maintained to prevent floodwaters from coming into contact with hazardous waste.	To the extent any hazardous waste is generated during the remedial activities, the waste will be managed so that it will not impact floodplain resources.

Table D-4
Location-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL/SW-3
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Characteristic	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Wetlands, Aquatic Ecosystem	Massachusetts Clean Water Act; Massachusetts Water Quality Certification for Discharge of Dredged or Fill Material	MGL c. 21, §§ 26-53; 314 CMR 9.00	Applicable, if alternative involves filling of wetlands	For discharges of dredged or fill material, there must be no practicable alternative with less adverse impact on the aquatic ecosystem; appropriate and practicable steps must be taken to avoid and minimize potential adverse impacts to wetlands and land under water; stormwater discharges must be controlled with BMPs; and there must not be substantial adverse impacts to the physical, chemical, or biological integrity of surface waters. For dredging and dredged material management, there must be no practicable alternative with less adverse impact on the aquatic ecosystem; and if avoidance is not possible, then minimize, or if neither avoidance nor minimization are possible, then mitigate potential adverse impacts	The effects of remedial activities on the aquatic ecosystem will be evaluated and avoided, and/or minimized. Compensatory mitigation will need to be performed as necessary to comply with this ARAR through appropriate avoidance, minimization, mitigation and/or restoration. EPA has determined that the selected final LNAPL-SW action is the least environmentally damaging practicable alternative because (a) there is no practicable alternative method that will achieve cleanup objectives with less adverse impact and (b) all practicable measures would be taken to minimize and mitigate any adverse impacts from the work.
Endangered Species	Massachusetts Endangered Species Regulations	321 CMR 10.00	Applicable, if endangered species are encountered	Requires action to regulate the impact to state listed endangered or threatened species or their habitats. Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	No known endangered or threatened species or their habitats have been identified in the vicinity of the Site. If such species or habitats in the remedial areas are identified, remedial activities would be designed and implemented to avoid affects endangered or threatened species or their habitats.
Historical/ ArcheologicalResources	Massachusetts Antiquities Act; Massachusetts Historical Commission Regulations; Protection of Properties Included in the State Register of Historic Places	MGL c. 9, §§ 26-27C; 950 CMR 70.00 and 71.00	Applicable, if subject historical resources are present.	Projects must eliminate, limit, or mitigate adverse effects to properties listed in the State Register of Historic Places (historic and archaeological properties). Establishes coordination with the National Historic Preservation Act.	No protected resources are known to exist in the East and South Ditch Stream areas and LNAPL area. If protected resources are identified in the remedial area, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to these protected resources.
Area of Critical Environmental Concern	Massachusetts Areas of Critical Environmental Concern (ACECs) Regulations	301 CMR 12.00	Applicable, if ACEC is identified	An ACEC is of regional, state, or national importance or contains significant ecological systems with critical interrelationships among a number of components. An eligible area must contain features from four or more of the following groups: (1) fisheries, (2) coastal features, (3) estuarine wetlands, (4) inland wetlands, (5) inland surface waters, (6) water supply areas (e.g., aquifer recharge area); (7) natural hazard areas (e.g., floodplain); (8) agricultural areas; (9) historical/archeological resources; (10) habitat resources (e.g., for endangered wildlife); or (11) special use areas. After an area is designated as an ACEC, the aim is to preserve and restore these areas.	No known ACEC has been identified at the Site. If an ACEC is identified in the remediation area, remedial activities will be controlled to minimize impacts to affected species or resources.

Notes:
ACEC = Area of Critical Environmental Concern
ARAR = Applicable or Relevant and Appropriate Requirement
BMP = Best Management Practice
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
EPA = United States Environmental Protection Agency
FEMA = Federal Emergency Management Agency
MGL = Massachusetts General Law
PRB = Permeable Reactive Barrier
RCRA = Resource Conservation and Recovery Act
USC = United States Code
USFWS = United States Fish and Wildlife Service

Table D-5
Action-Specific ARARs, Criteria, Advisories, and Guidance for Soil/Sed-2
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Standards					
Municipal Solid Waste Landfills	RCRA Subtitle D; Criteria for Municipal Solid Waste Landfills	40 CFR Part 258, Subpart F	Relevant and Appropriate	Federal standards for non-hazardous solid waste landfills. Subpart F provides closure (including design requirements for a final cover system) and post-closure care requirements.	The Containment Area will be capped and closed in accordance with these requirements.
Hazardous Waste Treatment, Storage, Disposal	Resource Conservation and Recovery Act (RCRA) Subtitle C; Hazardous Waste Identification; Generator Requirements; Tracking Requirements; Treatment, Storage and Disposal Requirements; Groundwater Monitoring Requirements; Closure and Post Closure Requirements	42 USC § 6901 *et seq.*; 40 CFR Parts 260-262, Part 264	Applicable, if hazardous waste is generated	Federal standards used to identify, manage, and dispose of hazardous waste. Massachusetts has been delegated the authority to administer these RCRA standards through its state hazardous waste management regulations.	Any wastes generated during remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, will be analyzed under these standards to determine whether they are listed or characteristic hazardous waste. Non-hazardous wastes will be disposed of appropriately. Any generation, treatment, or storage of hazardous waste will comply with these regulations.
Hazardous Waste - Landfills	RCRA Subtitle C; Hazardous Waste Landfill Standards	40 CFR Part 264, Subpart N	Relevant and Appropriate, if hazardous waste is determined to have been disposed of in the Containment Area	Federal standards for hazardous waste landfills. Subpart N provides closure (including design requirements for a final cover system) and post-closure care requirements.	Based on available data, hazardous waste is not expected to be present in the Containment Area. If hazardous waste is determined to have been disposed of in the Containment Area, it will be capped and closed in accordance with these regulations.
Hazardous Waste - Surface Impoundments	RCRA Subtitle C; Hazardous Waste Surface Impoundment Standards	40 CFR Part 264, Subpart K	Relevant and Appropriate, if hazardous waste is determined to have been disposed of in the Containment Area	Federal standards for hazardous waste surface impoundments. Subpart K provides closure (including design requirements for a final cover system) and post-closure care requirements.	Based on available data, hazardous waste is not expected to be present in the Containment Area. If hazardous waste is determined to have been disposed of in the Containment Area, it will be capped and closed in accordance with these regulations.
Hazardous Waste - Air Emissions	RCRA, Air Emission Standards for Process Vents; Equipment Leaks; Tanks, Surface Impoundments, and Containers	40 CFR Part 264, Subparts AA, BB, and CC	Applicable, if hazardous wastes: with volatile organic concentrations of at least 10 parts per million by weight (ppmw) will be managed by process vents (Subpart AA); with organic concentrations of at least 10% by weight will be managed by equipment (Subpart BB); or with average VOC concentrations of 500 ppm or greater will be managed in tanks, surface impoundments, or containers, (Subpart CC). Relevant and Appropriate, if organics less than thresholds or for non-hazardous waste.	RCRA emissions standards not delegated to the State. Standards for process vents for systems that manage hazardous wastes that have organic concentrations of at least 10 ppmw. Standards for air equipment leaks for systems that manage hazardous wastes with organic concentrations of at least 10% by weight. Standards for tanks, surface impoundments, and containers that manage hazardous wastes with average VOC concentrations of 500 ppm or greater.	No hazardous waste generated by remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, is expected to have concentrations over the applicability thresholds. Management of VOCs in excavated soil and sediment and in any implemented building vapor mitigation measures will be in accordance with these air emission regulations.
Air Emissions	Clean Air Act (CAA), Hazardous Air Pollutants; National Emission Standards for Hazardous Air Pollutants (NESHAP)	42 USC § 112(b)(1); 40 CFR Part 61	Applicable	These regulations establish emissions standards for 189 hazardous air pollutants.	Remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, will be implemented in accordance with these rules. No air emissions from remedial activities will cause air quality standards to be exceeded. Dust standards will be complied with during remedial activities.

Table D-5
Action-Specific ARARs, Criteria, Advisories, and Guidance for Soil/Sed-2
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Discharges to Surface Water; Storm Water Controls	Clean Water Act; National Pollutant Discharge Elimination System (NPDES)	40 CFR Parts 122 and 125	Applicable (and if surface water discharge occurs, discharge standards are also applicable)	These requirements include storm water standards for construction activities disturbing more than one acre and requirements for stormwater discharges from hazardous waste treatment, storage, and disposal facilities. These requirements also specify the permissible concentration or level of contaminants in the discharge from any point source to waters of the United States.	Best management practices will be used to control and manage stormwater runoff during remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity. The discharge of treated effluent from remedial activities, including from dewatering, to a surface water will meet the substantive discharge standards (the Massachusetts Surface Water Discharge Permit Program [314 CMR 3.00] has similar requirements).
Discharge to a Publicly Owned Treatment Works (POTW)	General Pretreatment Regulations for Existing and New Sources of Pollution	40 CFR Part 403	Applicable, if discharge to a POTW occurs	Standards for discharge into a Publicly Owned Treatment Works (POTW).	The specifications for the most appropriate discharge method for effluent from remedial activities, including from dewatering, will be developed during remedial design. If effluent from remedial activities, including from dewatering, is discharged to a POTW, the discharge will be monitored and treated, if necessary, to comply with these regulations.
Underground Injection	SDWA Underground Injection Control (UIC) Program	40 CFR Parts 144, 146, and 147 (including Subpart W)	Applicable, if treated effluent is injected underground	These regulations outline minimum program and performance standards for the UIC program. Technical criteria and standards for siting, operating, closure, and post-closure are set forth in Part 146.	The specifications for the most appropriate discharge method for effluent from remedial activities, including from dewatering, will be developed during remedial design. If effluent from remedial activities, including from dewatering, is injected underground, the underground injection will be monitored and treated, if necessary, to comply with these regulations.
Sediment Remediation	Contaminated Sediment Remediation Guidance for Hazardous Waste Sites	EPA-540-R-05-012; OSWER 9355.0-85 (December 2005)	To Be Considered	Guidance for making remedy decisions for contaminated sediment sites. Some of the relevant sections of the guidance address Remedial Investigations (Ch. 2), FS Considerations (Ch. 3), Monitored Natural Recovery (Ch. 4), In-Situ Capping (Ch. 5), and Dredging and Excavation (Ch. 6).	Chromium- and/or BEHP-impacted wetland soil and sediments will be excavated in accordance with this guidance to a depth of approximately one foot below ground surface and disposed of off-site. Pre-design investigations will include sample analysis to confirm the limits in wetland soil and sediments that require remediation.
Investigation-Derived Waste (IDW)	Guide to Management of Investigation-Derived Wastes	USEPA OSWER Publication 9345.3-03FS, January 1992	To Be Considered	Guidance on management of IDW in a manner that ensures protection of human health and the environment.	IDW generated as part of remedial activities, including excavation of wetland soil and sediment, closure of the Containment Area equalization window, construction of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, and pre-design investigation, will be managed in accordance with guidance from this publication.
Vapor Intrusion	OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air	OSWER Publication 9200.2-154 (June 2015)	To Be Considered	This EPA guidance establishes a methodology for assessing potential indoor air risks to human health that may result from volatilization of contaminants from groundwater and soil vapor into an overlying building, using multiple lines of evidence.	Site-specific vapor intrusion performance standards derived considering this guidance will be used to ensure that the remedial activities, including any implementation of building vapor mitigation measures, prevent unacceptable risks due to vapor intrusion. Any implemented mitigation measures such as vapor barriers or SSDSs for new building construction or building alterations on the Property will be monitored to ensure their protectiveness. Institutional controls pertaining to vapor intrusion will be implemented and maintained utilizing these guidance standards until such time as it is determined they are no longer needed.
Vapor Intrusion	EPA Vapor Intrusion Screening Level (VISL) Calculator		To Be Considered	EPA developed the VISLs as numerical screening levels to identify areas or buildings that may warrant further investigation of the vapor intrusion pathway.	VISLs were compared to shallow groundwater data as screening tool for evaluating vapor intrusion risk.

Table D-5
Action-Specific ARARs, Criteria, Advisories, and Guidance for Soil/Sed-2
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
State Standards					
Hazardous Waste Identification	Massachusetts Hazardous Waste Management Rules for Identification and Listing of Hazardous Wastes	310 CMR 30.100	Applicable, if hazardous waste is generated	Massachusetts is delegated to administer RCRA through its state regulations. These regulations establish requirements for determining whether wastes are either listed or characteristic hazardous waste.	These Massachusetts regulations supplement federal RCRA requirements. Any wastes generated during remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, will be analyzed under these regulations to determine whether they are listed or characteristic hazardous wastes. Hazardous and nonhazardous wastes will be managed and disposed of appropriately.
Hazardous Waste - Generator Standards	Massachusetts Hazardous Waste Rules – Requirements for Generators	310 CMR 30.300	Applicable, if hazardous waste is generated	These regulations contain requirements for hazardous waste generators. The regulations apply to generators of sampling waste and also apply to the accumulation of waste prior to off-site disposal.	Any hazardous waste generated by remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, will be managed in accordance with these regulations.
Hazardous Waste - Management Facility Standards	Massachusetts Hazardous Waste Rules – Management Standards for All Hazardous Waste Facilities	310 CMR 30.500	Applicable, if hazardous waste is generated	General facility requirements for waste analysis, security measures, inspections, and training requirements. Section 30.580 addresses closure. Section 30.590 addresses post-closure of hazardous waste facilities. Section 30.513 requires a general waste analysis of any hazardous waste.	Any hazardous waste generated by remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, will be managed in accordance with these regulations.
Hazardous Waste - Technical Facility Standards	Massachusetts Hazardous Waste Rules – Technical Standards for All Hazardous Waste Facilities	310 CMR 30.600	Applicable, if hazardous waste is managed	Standards for the design, performance, operation, maintenance, and monitoring of hazardous waste facilities, including miscellaneous units.	Any hazardous waste generated by remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, will be managed in accordance with these regulations.
Hazardous Waste - Wastewater Treatment	Massachusetts Hazardous Waste Rules – Special Requirements for Wastewater Treatment Units	310 CMR 30.605	Applicable, if hazardous waste is managed in a WWTU	This regulation establishes standards for wastewater treatment units WWTUs) for the treatment of hazardous waste	If remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, generate hazardous waste that is managed in a WWTU, the WWTU will comply with these regulations.
Hazardous Waste - Surface Impoundments	Massachusetts Hazardous Waste Rules – Surface Impoundments	310 CMR 30.610	Relevant and Appropriate, if hazardous waste is determined to have been disposed of in the Containment Area	310 CMR 30.611 through 30.618 prescribe requirements for storage, treatment, and disposal of hazardous waste in surface impoundments. Provides specifications for inter alia design and operations, testing, monitoring and inspection, and closure and post-closure care.	Based on available data, hazardous waste is not expected to be present in the Containment Area. If hazardous waste is determined to have been disposed of in the Containment Area, it will be capped and closed in accordance with these regulations.

Table D-5
Action-Specific ARARs, Criteria, Advisories, and Guidance for Soil/Sed-2
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Hazardous Waste - Landfills	Massachusetts Hazardous Waste Rules – Landfills	310 CMR 30.620	Relevant and Appropriate, if hazardous waste is determined to have been disposed of in the Containment Area	310 CMR 30.621 through 30.633 prescribe requirements for disposal of hazardous waste in landfills. Provides specifications for inter alia design and operations, monitoring and inspection, and closure and post-closure care.	Based on available data, hazardous waste is not expected to be present in the Containment Area. If hazardous waste is present in the Containment Area, it will be capped and closed in accordance with these regulations.
Hazardous Waste - Waste Piles	Massachusetts Hazardous Waste Rules – Waste Piles	310 CMR 30.640	Applicable, if hazardous waste is managed in waste piles	310 CMR 30.641 through 30.649 prescribe requirements for storage and treatment of hazardous waste in waste piles. Provides specifications for inter alia design and operations, monitoring and inspection, and closure and post-closure care.	Any hazardous waste generated by remedial activities, including excavation of wetland soil and sediment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, and any implementation of building vapor mitigation measures, that is managed in a waste pile will comply with these regulations.
Hazardous Waste - Groundwater	Massachusetts Hazardous Waste Rules – Groundwater Protection	310 CMR 30.660	Applicable, if hazardous waste is managed in a regulated unit	310 CMR 30.661 through 30.673 prescribe requirements for regulated units that receive hazardous waste, except for certain waste piles, to protect groundwater.	Any hazardous waste generated by remedial activities, including excavation of wetland soil and sediment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, and any implementation of building vapor mitigation measures, will be managed to prevent contaminant migration to groundwater. Any management of hazardous waste in a subject waste pile will comply with these regulations.
Hazardous Waste - Containers	Massachusetts Hazardous Waste Rules – Use and Management of Containers	310 CMR 30.680	Applicable, if hazardous waste is containerized	310 CMR 30.681 through 30.689 prescribe requirements for the use of containers, such as drums, to store hazardous waste. Provides specifications for inter alia labelling and marking, management of containers, inspections, and closure.	Any hazardous waste generated by remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, that is managed in containers will comply with these regulations.
Hazardous Waste - Tanks	Massachusetts Hazardous Waste Rules – Storage and Treatment in Tanks	310 CMR 30.690	Applicable, if hazardous waste is stored and/or transported in tanks	310 CMR 30.691 through 30.699 prescribe requirements for the use of tanks to store and treat hazardous waste. Provides specifications for inter alia design and installation, containment and detection of leaks, general operating requirements, inspections, and closure and post-closure care.	Any hazardous waste generated by remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, that is managed in tanks will comply with these regulations.
Discharges to Surface Waters	Massachusetts Clean Water Act; Surface Water Discharge Permit Regulations	MGL c. 21, §§ 26-53; 314 CMR 3.00	Applicable, if surface water discharge occurs	These regulations require that discharges to waters of the Commonwealth shall not result in exceedances of Massachusetts Surface Water Quality Standards (MSWQS) (314 CMR 4.00).	Any water discharged to surface waters from remedial activities, including from dewatering, will be treated to meet the substantive discharge standards.
Discharges to Surface Water	Massachusetts Clean Water Act; MA Surface Water Quality Standards (MSWQS)	MGL c. 21, §§ 26-53; 314 CMR 4.00	Applicable, if surface water discharge occurs	These standards designate the most sensitive uses for which the various waters of the Commonwealth shall be enhanced, maintained, or protected. Minimum water quality criteria required to sustain the designated uses are established.	Any water discharged to surface waters from remedial activities, including from dewatering, will be treated to meet the substantive discharge standards.
Hazardous Waste - Facility Discharge Standards	Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities	MGL c. 21, §§ 26-53; 314 CMR 8.00	Applicable, if hazardous waste is generated and surface water discharge occurs	This regulation establishes additional requirements that must be satisfied for a RCRA facility (a wastewater treatment works which manages hazardous waste) that has a wastewater discharge permit.	Remedial activities, including excavation of wetland soil and sediment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, that involve management of hazardous waste prior to discharge will comply with these regulations.

Table D-5
Action-Specific ARARs, Criteria, Advisories, and Guidance for Soil/Sed-2
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Discharge to Publicly Owned Treatment Works (POTW)	Massachusetts Operation, Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Dischargers	314 CMR 12.00	Applicable, if discharges to a POTW occur	Standards for pretreatment requirements for sources to a POTW.	The most appropriate discharge method for the treated effluent from remedial activities, including from dewatering, will be developed during remedial design. If effluent from remedial activities, including from dewatering, is discharged to a POTW, the discharge will be monitored and treated, if necessary, to comply with these regulations.
Discharge of treated groundwater to groundwater	Massachusetts Groundwater Discharge Permit Program	314 CMR 5.10 and 5.11	Relevant and Appropriate, if treated effluent is injected underground	These regulations require MassDEP to control the discharge of pollutants to groundwaters of the Commonwealth to assure that groundwaters are protected for their actual and potential use as a source of potable water and surface waters are protected for their existing and designated uses.	The most appropriate discharge method for the treated effluent from remedial activities, including from dewatering, will be developed during remedial design. If effluent from remedial activities, including from dewatering, is discharged to groundwater, the discharge will be controlled so that groundwaters are protected for their actual and potential use as a source of potable water and surface waters are protected for their existing and designated uses in accordance with the substantive discharge standards.
Underground Injection	Massachusetts Underground Injection Control Regulations	310 CMR 27.00	Applicable, if treated effluent is injected underground	These regulations protect underground sources of drinking water by regulating the underground injection of hazardous wastes, fluids used for extraction of minerals, oil, and energy, and any other fluids having potential to contaminate groundwater.	The most appropriate discharge method for the treated effluent from remedial activities, including from dewatering, will be developed during remedial design. If effluent from remedial activities, including from dewatering, is injected underground or infiltrated, construction and operation of such re-injection or infiltration would comply with these regulations.
Solid Waste	Massachusetts Solid Waste Management Regulations	310 CMR 19.000	Applicable, if solid waste is generated	This regulation establishes requirements for the storage, transfer, processing, treatment, disposal, use and reuse of solid waste (including asbestos), including contracting for disposal or transport of solid waste.	Any wastes generated by remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, that are determined to not be hazardous wastes will be managed in accordance with these regulations.
Solid Waste	Massachusetts Solid Waste Management Regulations, Landfill design and operational standards	310 CMR 19.100	Relevant and Appropriate	Regulations establishing minimum performance and design standards; operation and maintenance standards; and closure/post-closure requirements for solid waste landfills.	The Containment Area will be capped and closed in accordance with these requirements.
Air Emissions	Massachusetts Ambient Air Quality Standards	310 CMR 6.00	Applicable	These regulations establish primary and secondary standards for emissions of sulfur dioxide, particulate matter, carbon monoxide, ozone, nitrogen dioxide, and lead.	Remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, and any building vapor mitigation measures, will be implemented in accordance with these regulations. Emission standards, including for dust, will be complied with during remedial activities
Air Emissions	Massachusetts Air Pollution Control Regulations	310 CMR 7.00	Applicable	These regulations set emission limits necessary to attain ambient air quality standards including standards for visible emissions (7.06); dust, odor, construction and demolition (7.09); noise (7.10); and asbestos (7.15).	Remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, and any building vapor mitigation measures, will be implemented in accordance with these regulations. Emission standards, including for dust, will be complied with during these remedial activities.

Table D-5
Action-Specific ARARs, Criteria, Advisories, and Guidance for Soil/Sed-2
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Sediment/Erosion Control; Stormwater Management	Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas	Prepared for Massachusetts Executive Office of Environmental Affairs (original print March 1997; reprint May 2003)	To Be Considered	Guidance on preventing erosion and sedimentation.	Design, construction, and operation of remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, and any building vapor mitigation measures, will be implemented in accordance with this guidance.
Monitoring Wells	Massachusetts Standard References for Monitoring Wells	WSC-310-91	To Be Considered	Guidance on locating, drilling, installing, sampling and decommissioning monitoring wells	Monitoring wells that are required as part of remedial activities will be installed, maintained, or decommissioned in accordance with this guidance.
Air Quality	Division of Air Quality Control (DAQC)	DAQC Policy 90-001, re: Noise Regulation,	To Be Considered	Guidance on sound emissions.	Remedial activities, including the excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, and any implemented building vapor mitigation measures, will comply with this guidance to assess whether any remedial measures exceed State noise guidance levels, and will follow the suggested noise limit to the extent possible in accordance with this guidance. Construction will be scheduled during daylight hours.

Notes:
ARAR = Applicable or Relevant and Appropriate Requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
DEP = Department of Environmental Protection
IDW = Investigation Derived Waste
MGL = Massachusetts General Law
NPDES = National Pollutant Discharge Elimination System
OSWER = Office of Solid Waste and Emergency Response
POTW = Publicly Owned Treatment Works
ppmw = parts per million by weight
RCRA = Resource Conservation and Recovery Act
USC = United States Code
EPA = United States Environmental Protection Agency

Table D-6
Location-Specific ARARs, Criteria, Advisories, and Guidance for Soil/Sed-2
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Characteristic	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Standards					
Floodplains and Wetlands	Floodplain Management and Protection of Wetlands	44 CFR Part 9 (implementing Executive Orders 11988 and 11990)	Relevant and Appropriate	Federal Emergency Management Agency (FEMA) regulations set forth the policy, procedure, and responsibilities to implement and enforce Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands). These regulations prohibit activities that adversely affect a federally-regulated wetland unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm to wetlands that may result from such use. These regulations require the avoidance of impacts associated with the occupancy and modification of federally-designated 100-year and 500-year floodplains and require the avoidance of development within a floodplain wherever there is a practicable alternative. An assessment of impacts to the 500-year floodplain is required for critical actions, which includes siting waste facilities in a floodplain. These regulations require public notice when proposing any action in or affecting floodplains or wetlands.	If there is no practicable alternative method to work in federal jurisdictional wetlands, or 100-year or 500-year floodplains, then all practicable measures will be taken to minimize and mitigate any adverse impacts. Erosion and sedimentation control measures will be adopted during remedial activities to protect these wetlands and floodplains. Remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, any implementation of building vapor mitigation measures, pre-design investigation, and monitoring activity, will comply with this ARAR through appropriate avoidance, minimization, mitigation and/or restoration. The Containment Area elevation (85 ft msl) is above the 500-year flood elevation (82 ft msl), which means that the infrastructure for the Containment Area cap would not result in the occupancy and modification of the 500-year floodplain on the Olin Property. If additional site preparation work is required to provide for adequate drainage and storage within the 100- or 500-year floodplain, this will be evaluated as part of design activities and implemented during the Remedial Action (RA) phase. After completion of work within the regulated 100- or 500-year floodplain, there will be no significant net loss of flood storage capacity and no significant net increase in flood stage or velocities. Floodplain habitat will be restored to the extent practicable. Federal jurisdictional wetlands altered by wetland soil and sediment excavation and soil covers installed adjacent to such wetlands will be restored in place.
Floodplains	RCRA Floodplain Restrictions for Hazardous Waste Facilities	42 USC § 6901 et seq.; 40 CFR § 264.18(b)	Applicable, if hazardous waste is managed within the 100-year floodplain	A hazardous waste treatment, storage, or disposal facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout or to result in no adverse effects on human health or the environment if washout were to occur.	To the extent any hazardous waste is generated during remedial activities, including the excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and monitoring activity, the waste will be managed so that it will not impact floodplain resources.
Floodplains	RCRA Floodplain Restrictions for Solid Waste Disposal Facilities and Practices	40 CFR § 257.3-1	Applicable, if solid waste is managed within the 100-year floodplain	Solid waste practices must not restrict the flow of a 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste, so as to pose a hazard to human life, wildlife, or land or water resources.	Any solid waste generated during remedial activities, including the excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and monitoring activity, will be managed so that it will not impact floodplain resources.

Table D-6
Location-Specific ARARs, Criteria, Advisories, and Guidance for Soil/Sed-2
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Characteristic	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Wetlands, Aquatic Ecosystem	Clean Water Act (CWA) Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material	33 USC § 1344(b)(1); 40 CFR Parts 230 & 231; and 33 CFR Parts 320-323	Applicable	For discharge of dredged or fill material into water bodies or wetlands, there must be no practicable alternative with less adverse impact on aquatic ecosystem; discharge cannot cause or contribute to violation of state water quality standards or toxic effluent standards or jeopardize threatened or endangered species; discharge cannot significantly degrade waters of U.S.; practicable steps must be taken to minimize and mitigate adverse impacts; and impacts on flood level, flood velocity, and flood storage capacity must be evaluated. Sets standards for restoration and mitigation required as a result of unavoidable impacts to aquatic resources. EPA must determine which alternative is the least environmentally damaging practicable alternative to protect wetland and aquatic resources.	Remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and monitoring activity, will comply with this ARAR through appropriate avoidance, minimization, mitigation and/or restoration. EPA has determined that the selected remedial alternative is the least environmentally damaging practicable alternative because (a) there is no practicable alternative method that will achieve cleanup objectives with less adverse impact and (b) all practicable measures would be taken to minimize and mitigate any adverse impacts from the work.
Wetlands	U.S. Army Corps of Engineers, New England District Compensatory Mitigation Guidance (09-07-2016)		To Be Considered	This guidance is to be considered when compensatory mitigation to address impacts to federal jurisdictional wetlands is appropriate for a particular remedial activity.	Remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and monitoring activity, may impact federal jurisdictional wetlands. Activities affecting federal jurisdictional wetlands will be conducted in accordance with these guidance standards for mitigation and restoration.
Surface Waters, Wetland/Waterway Habitat for Endangered Species, Migratory Species	Fish and Wildlife Coordination Act	16 USC § 661 et seq.; 40 CFR § 6.302(g)	Applicable	Requires that any federal agency proposing to modify a body of water must consult with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and other related state agencies to prevent, mitigate, or compensate for project-related losses of or damage to endangered species, fish, and wildlife resources.	Consultation with appropriate federal and state agencies will be maintained during planning and implementation of remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and monitoring activity to ensure that losses of or damage to habitat and wildlife will be prevented, mitigated, or compensated.
Endangered Species	Endangered Species Act	16 USC. §§ 1531 et seq.; 50 CFR §§ 17.11-17.12; 50 CFR Part 402	Applicable, if endangered species are encountered	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	No known endangered or threatend species have been identified in the vicinity of the Site. If such species or habitats in the remedial areas are identified, remedial activities will be designed and implemented to avoid effects to endangered or threatened species or their habitats.
Historical/ ArcheologicalResources	National Historic Preservation Act	54 USC §§ 300101 et seq.; 36 CFR Part 800	Applicable, if subject historical resources are present	Pursuant to Section 106 of the NHPA, CERCLA response actions are required to take into account the effects of the response activities on any historic property (any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places, which would be significant in American history, architecture, archeology, engineering, and culture) and to resolve any adverse effects, including avoidance, minimization, or mitigation of the adverse effects.	No protected resources are known to exist in the area impacted by remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and monitoring activity. If protected resource areas are identified, federal and state preservation officials will be consulted to address measures to avoid, minimize and/or mitigate any impacts to these protected resource areas.

Table D-6
Location-Specific ARARs, Criteria, Advisories, and Guidance for Soil/Sed-2
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Characteristic	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Atlantic Flyway	Migratory Bird Treaty Act	16 USC § 703 et seq.	Applicable, if subject protected species are present	Protects migratory birds, their nests, and eggs. A depredation permit issued by the U.S. Fish and Wildlife Service is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and monitoring activity, will be evaluated to protect migratory birds, their nests, and eggs. If migratory bird protected areas are identified in the area of remedial activities, measures to avoid, minimize and/or mitigate any impacts to protected resource areas will be implemented in consultation with appropriate agency officials.
State Standards					
Floodplains	Massachusetts Hazardous Waste Regulations, Location Standards for Land Subject to Flooding	310 CMR 30.701	Applicable, if hazardous waste is managed within a floodplain	This regulation sets forth criteria for siting hazardous waste facilities within land subject to flooding (as defined under the Massachusetts Wetland Protection Act standards). Any new or expanded hazardous waste storage or treatment facility (which only receives hazardous waste from on-site sources), the active portion of which is located within the boundary of land subject to flooding from the statistical 100-year frequency storm, shall be flood-proofed. Flood-proofing shall be designed, constructed, operated, and maintained to prevent floodwaters from coming into contact with hazardous waste.	To the extent any hazardous waste is generated during remedial activities, including the excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and monitoring activity, the waste will be managed so that it will not impact floodplain resources.
Floodplains, Wetlands, Surface Waters	Massachusetts Wetland Protection Act and Regulations	MGL c. 131, § 40; 310 CMR 10.00	Applicable if alternative alters wetlands or floodplains	These regulations restrict dredging, filling, altering, or polluting inland wetland resource areas (defined as areas within the 100-year floodplain) and buffer zones (100 feet of a vegetated wetland or 200 feet from a perennial stream), and impose performance standards for work in such areas. Protected resource areas include: 10.54 (Bank); 10.55 (Bordering Vegetated Wetlands); 10.56 (Land under Water Bodies and Waterways); 10.57 (Land Subject to Flooding); and 10.58 (Riverfront Area).	Remedial activities, including the excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and/or monitoring activity, will occur in/adjacent to wetlands and floodplains, and, if state regulated wetlands or floodplains will be altered, the remedial activities will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration. Any remedial activity described above conducted within 100 feet of a state regulated wetland resource area or 200 feet from a perennial stream will comply with the substantive requirements of these regulations. Mitigation of impacts on state wetland resource areas will be addressed. All remedial work within any regulated floodplain will result in no net loss of flood storage capacity and no net increase in flood stage or velocities. Floodplain habitat will be restored, to the extent practicable.
Wetlands, Aquatic Ecosystem	Massachusetts Clean Water Act; Massachusetts Water Quality Certification for Discharge of Dredged or Fill Material	MGL c. 21, §§ 26-53; 314 CMR 9.00	Applicable, if alternative involves filling of wetlands	For discharges of dredged or fill material, there must be no practicable alternative with less adverse impact on the aquatic ecosystem; appropriate and practicable steps must be taken to avoid and minimize potential adverse impacts to wetlands and land under water; stormwater discharges must be controlled with BMPs; and there must not be substantial adverse impacts to the physical, chemical, or biological integrity of surface waters. For dredging and dredged material management, there must be no practicable alternative with less adverse impact on the aquatic ecosystem; and if avoidance is not possible, then minimize, or if neither avoidance nor minimization are possible, then mitigate potential adverse impacts	Remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and monitoring activity, will comply with this ARAR through appropriate avoidance, minimization, mitigation and/or restoration. EPA has determined that the selected final soil-sediment action is the least environmentally damaging practicable alternative because (a) there is no practicable alternative method that will achieve cleanup objectives with less adverse impact and (b) all practicable measures would be taken to minimize and mitigate any adverse impacts from the work.

Table D-6
Location-Specific ARARs, Criteria, Advisories, and Guidance for Soil/Sed-2
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Characteristic	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Endangered Species	Massachusetts Endangered Species Regulations	321 CMR 10.00	Applicable, if endangered species are encountered	Requires action to regulate the impact to state listed endangered or threatened species or their habitats. Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	No known endangered or threatened species have been identified in the vicinity of the remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and monitoring activity. However, if state listed endangered or threatened species or their habitats in the area of remedial activities are identified, the remedial activities will be designed and implemented to avoid adverse effects to endangered or threatened species or their habitats.
Historical/ ArcheologicalResources	Massachusetts Antiquities Act; Massachusetts Historical Commission Regulations; Protection of Properties Included in the State Register of Historic Places	MGL c. 9, §§ 26-27C; 950 CMR 70.00 and 71.00	Applicable, if subject historical resources are present.	Projects must eliminate, limit, or mitigate adverse effects to properties listed in the State Register of Historic Places (historic and archaeological properties). Establishes coordination with the National Historic Preservation Act.	No protected resources are known to exist in the area impacted by remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and monitoring activity. If protected resource areas are identified in the area of remedial activities, federal and state preservation officials will be consulted to address measures to avoid, minimize and/or mitigate any impacts to these protected resources.
Area of Critical Environmental Concern	Massachusetts Areas of Critical Environmental Concern (ACECs) Regulations	301 CMR 12.00	Applicable, if ACEC is identified	An ACEC is of regional, state, or national importance or contains significant ecological systems with critical interrelationships among a number of components. An eligible area must contain features from four or more of the following groups: (1) fisheries, (2) coastal features, (3) estuarine wetlands, (4) inland wetlands, (5) inland surface waters, (6) water supply areas (e.g., aquifer recharge area); (7) natural hazard areas (e.g., floodplain); (8) agricultural areas; (9) historical/archeological resources; (10) habitat resources (e.g., for endangered wildlife); or (11) special use areas. After an area is designated as an ACEC, the aim is to preserve and restore these areas.	No known ACEC has been identified at the Site. If an ACEC is identified in the area of remedial activities, including excavation of wetland soil and sediment, dewatering and any related treatment, closure of the Containment Area equalization window, construction and O&M of the Containment Area cap and soil cover systems, implementation of any building vapor mitigation measures, pre-design investigation, and monitoring activity, activities will be controlled to minimize impacts to effected species or resources.

Notes:
ACEC = Area of Critical Environmental Concern
ARAR = Applicable or Relevant and Appropriate Requirement
BMP = Best Management Practice
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
FEMA = Federal Emergency Management Agency
MGL = Massachusetts General Law
RCRA = Resource Conservation and Recovery Act
USC = United States Code
EPA = United States Environmental Protection Agency
USFWS = United States Fish and Wildlife Service

Table D-7
Chemical-Specific ARARs, Criteria, Advisories, and Guidance for Soil/Sed-2
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Standards				
USEPA Risk Reference Doses (RfDs)	USEPA RfDs	To Be Considered	RfDs are considered to be the levels unlikely to cause significant adverse non-cancer health effects associated with a threshold mechanism of action in human exposure for a lifetime. Used in developing risk-based cleanup standards by computing human health hazard resulting from exposure to non-carcinogens at the Site.	Institutional controls (ICs) will prevent exposure to soil and sediment contaminants that contribute to a calculated non-carcinogenic risk, developed in consideration of this guidance. Long term monitoring and ICs will prevent residential development.
USEPA Carcinogenic Assessment Group, Cancer Slope Factors (CSFs)	USEPA CSFs	To Be Considered	CSFs are estimates of the upper-bound probability on the increased cancer risk from a lifetime exposure to contaminants. Used in developing risk-based cleanup standards by computing the incremental cancer risk from exposure to contaminants at the Site.	ICs will prevent exposure to soil and sediment contaminants that contribute to a calculated carcinogenic risk, developed in consideration of this guidance. Long term monitoring and ICs will prevent residential development.
Guidelines for Carcinogenic Risk Assessment	EPA/630/P-03/001F, March 2005	To Be Considered	These guidance values are to be used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	ICs will prevent exposure to soil and sediment contaminants that contribute to a calculated carcinogenic risk, developed in consideration of this guidance. Long term monitoring and ICs will prevent residential development.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens	EPA/630/R-03/003F, March 2005	To Be Considered	These guidance values are to be used to evaluate the potential carcinogenic hazard to children caused by exposure to contaminants.	ICs will prevent exposure to soil and sediment contaminants that contribute to a calculated carcinogenic risk, developed in consideration of this guidance. Long term monitoring and ICs will prevent residential development.
Regional Screening Levels for Chemical Contaminants at Superfund Sites	USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites	To Be Considered	Regional Screening Levels (RSLs) are risk based tools for screening contaminants at Superfund sites. RSLs are not intended to be cleanup standards.	ICs will prevent exposure to soil and sediment contaminants that contribute to a calculated residential risk based on standards developed in consideration of this guidance.
Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites	OSWER 9355.4-24 (2002)	To Be Considered	EPA guidance for evaluating soil contamination. Used to develop risk-based cleanup standards, including based on the leaching of soil contaminants to groundwater.	ICs will prevent exposure to soil and sediment contaminants that contribute to a calculated residential risk based on standards developed in consideration of this guidance.
Soil Screening Guidance: Technical Background Document	EPA/540/R95/128 (1996)	To Be Considered	EPA guidance for evaluating soil contamination. Used to develop risk-based cleanup standards.	ICs will prevent exposure to soil and sediment contaminants that contribute to a calculated residential risk based on standards developed in consideration of this guidance.
Ecological Risk Assessment Guidance for Superfund	EPA/540/R97/006	To Be Considered	EPA guidance used to develop site-specific ecological risk-based cleanup standards.	The remedial alternatives, including excavation of wetland soil and sediment and soil cover systems, will prevent ecological exposure to soil and sediment contaminants that contribute to a calculated risk developed in consideration of this guidance, by removing all contaminated wetland soil and sediment and covering or capping all upland soil that exceeds cleanup levels.
Ecological Soil Screening Levels (Eco-SSLs)	EPA, https://www.epa.gov/risk/ecological-soil-screening-level-eco-ssl-guidance-and-documents	To Be Considered	Provides nonregulatory soil screening criteria and toxicity reference values for the protection of ecological receptors.	The remedial alternatives, including excavation of wetland soil and sediment and soil cover systems, will prevent ecological exposure to soil contaminants that contribute to a calculated risk developed in consideration of this guidance, by removing all contaminated wetland soil and sediment and covering or capping all upland soil that exceeds cleanup levels.
Ontario Ministry of Environment and Energy (OMEE) Severe Effect Levels (SELs) for Freshwater Sediments	Persaud et al., 1993	To Be Considered	The SEL value is the concentration at which the majority of the sediment-dwelling organisms are affected. Used to develop risk-based cleanup standards.	The remedial alternatives, including excavation of wetland soil and sediment, will prevent ecological exposure to sediment contaminants that contribute to a calculated risk developed in consideration of this guidance, by removing all contaminated sediment that exceeds cleanup levels.
Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Probable Effects Concentrations (PECs)	MacDonald et al., 2000	To Be Considered	The PEC value is the concentration above which the adverse effects on sediment-dwelling organisms are likely to occur. Used to develop risk-based cleanup standards.	The remedial alternatives, including excavation of wetland soil and sediment, will prevent ecological exposure to sediment contaminants that contribute to a calculated risk developed in consideration of this guidance, by removing all contaminated sediment that exceeds cleanup levels.
European Regulation on Registration, Evaluation, Authorisation, and Restriction of Chemicals (REACH) Dossier	https://echa.europa.eu/regulations/reach/substance-registration/the-registration-dossier	To Be Considered	Source of ecological soil screening benchmarks used to develop site-specific ecological risk-based cleanup standards.	The remedial alternatives, including excavation of wetland soil and sediment and soil cover systems, will prevent ecological exposure to soil and sediment contaminants that contribute to a calculated ecological risk, by removing all contaminated wetland soil and sediment and covering and capping all upland contaminated soil that exceeds cleanup levels.

Table D-7
Chemical-Specific ARARs, Criteria, Advisories, and Guidance for Soil/Sed-2
Record of Decision
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-126/R2.)	Efroymson, Will & Suter, 1997http://www.hsrd.ornl.gov/ecorisk/tm126r21.pdf	To Be Considered	Source of ecological soil screening benchmarks used to develop site-specific ecological risk-based cleanup standards.	The remedial alternatives, including excavation of wetland soil and sediment and soil cover systems, will prevent ecological exposure to soil and sediment contaminants that contribute to a calculated risk, by removing all contaminated wetland soil and sediment and covering and capping all upland contaminated soil that exceeds cleanup levels.
Ontario Ministry of the Environment. 2011. Rationale for the Development of Generic Soil and Ground Water Standards for Use at Contaminated Sites in Ontario.	https://www.ontario.ca/page/soil-ground-water-and-sediment-standards-use-under-part-xv1-environmental-protection-act	To Be Considered	Source of ecological soil screening benchmarks used to develop site-specific ecological risk-based cleanup standards.	The remedial alternatives, including excavation of wetland soil and sediment and soil cover systems, will prevent ecological exposure to soil and sediment contaminants that contribute to a calculated risk, by removing all contaminated wetland soil and sediment and covering and capping all upland contaminated soil that exceeds cleanup levels.

Notes:
ARAR = Applicable or Relevant and Appropriate Requirement
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CSF = cancer slope factor
MCLGs = Maximum Contaminant Level Goals
MCLs = Maximum Contaminant Levels
RfD = reference dose

Appendix E

References

References

Agency for Toxic Substances and Disease Registry, 2017. Minimal Risk Levels. June. Accessed January 2018. https://www.atsdr.cdc.gov/mrls/index.html

AMEC, 2012a. Response Alternatives Evaluation Report, Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts. AMEC Environment & Infrastructure, Inc., August 3.

AMEC, 2012b. Final Operations, Maintenance & Performance Monitoring Plan, DAPL Extraction Pilot Test, Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts. AMEC Environment & Infrastructure, Inc.. October.

AMEC, 2014a. DAPL Extraction Pilot Study Performance Evaluation Report, Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts. AMEC Environment & Infrastructure, Inc. November.

AMEC, 2014b. OU3 Data Gap Analysis and Additional Field Studies Work Plan, Operable Unit 3, Olin Chemical Superfund Site, Wilmington, Massachusetts. AMEC Environment & Infrastructure, Inc. December 16.

AMEC, 2015a. Final Remedial Investigation Report, Operable Unit 1 & Operable Unit 2, Olin Chemical Superfund Site, Wilmington, Massachusetts. AMEC Environment & Infrastructure, Inc. July.

AMEC, 2015b. Final Data Gap Analysis and Additional Field Studies Work Plan, Operable Unit 3, Olin Chemical Superfund Site, Wilmington, Massachusetts. Amec Foster Wheeler Environment & Infrastructure, Inc. July 3.

AMEC, 2015c. Final Baseline Ecological Risk Assessment, Operable Unit 1 & Operable Unit 2, Olin Chemical Superfund Site. July 24.

AMEC, 2015d. Final Baseline Human Health Risk Assessment, Operable Unit 1 & Operable Unit 2, Olin Chemical Superfund Site. July 24.

AMEC, 2017. Draft Focused Remedial Investigation Report, Dense Aqueous Phase Liquid – Operable Unit 3, Olin Chemical Superfund Site, Wilmington, Massachusetts. Amec Foster Wheeler Environment & Infrastructure, Inc. October 5.

Bluestone, 2020. Residential Human Health Risk Evaluation – Olin OU1/OU2 Soils. Olin Chemical Superfund Site. Wilmington, Massachusetts. Bluestone Environmental Group. January 17.

Buchman, M. F., 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle WA, Office of Response and Restoration Division, National Oceanic and Atmospheric Administration.

California Office of Environmental Health Hazard Assessment, 2018. California Toxicity Criteria Database. Accessed 2018. https://data.ca.gov/dataset/toxicity-criteria-database

CRA, 1993. Comprehensive Site Assessment Phase II Field Investigation Report, Wilmington Facility, Wilmington, MA, Olin Corporation. Conestoga-Rovers & Associates. June.

Ecology, 1980. Field Investigations of Uncontrolled Hazardous Waste Sites, FIT Project, TDD # F1-8005-01F, Task Report to the Environmental Protection Agency, Contract No. 68-01-6056, Site Inspection Report of Olin Chemicals Group Plant, Eames Street, Wilmington, Massachusetts. Ecology and Environment, Inc., FIT Team, Region I. December 5.

Efroymson, R. A., Will, M. E. and Suter, G. W., II, 1997a. Efroymson, R.A., M.E., Will, and G.W. Suter II, 1997a. Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Processes: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, TN.

Efroymson, R. A., Will, M. E., Suter, G. W., II, and Wooten, A. C. 1997b. Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, TN.

European Chemicals Agency (ECHA), 2014. Registration, Evaluation, Authorisation and Restriction of Chemicals database. Accessed January 2014 at https://echa.europa.eu/web/guest/information-onchemicals/registered-substances); currently available at https://www.echemportal.org/echemportal/

GEI, 1998. Correspondence. From: M. Margret Hanley, LSP, Corporate Vice President/Environmental. To: Christopher Pyott, Environmental Analyst, Massachusetts Department of Environmental Protection, Northeast Regional Office, Bureau of Waste Site Cleanup. Transmitting *Report of Groundwater Sampling and Analysis in the Vicinity of the Calcium Sulfate Landfill, Olin Former Chemical Manufacturing Plant, 51 Eames Street, Wilmington, Massachusetts, RTN: 3-0471, Law Environmental Consultants, Inc., July 30, 1998*. July 31.

GEI, 1999. Correspondence. From: M. Margret Hanley, LSP, Corporate Vice President/Environmental. To: Christopher Pyott, Environmental Analyst, Department of Environmental Protection, Northeast Regional Office, Bureau of Waste Site Cleanup. Subject: Supplemental Phase II Comprehensive Site Assessment (CSA) Report, Geochemical Discrimination Between Groundwater Emanating from the Calcium Sulfate and Woburn Sanitary Landfills, Olin Corporation, Wilmington, Massachusetts, Release Tracking No. 3-0471. February 16.

GEI, 2000a. Part 2 Construction-Related RAM Plan, Olin Corporation Property, 51 Eames Street, Wilmington, MA, RTN. 3-0471. GEI Consultants, Inc. July 24.

GEI, 2000b. Status Report No. 1, Part 2 Construction Related Release Abatement Measure (RAM), Olin Wilmington Property, 51 Eames Street, Wilmington, MA, Release Tracking No. 3-0471. GEI Consultants, Inc. December 27.

GEI, 2004a. Field Activity Report, Former Lake Poly Area, Olin Corporation Site, Wilmington, MA, RTN 3-0471. GEI Consultants, Inc. February 10.

GEI, 2004b. Part 2 Construction-Related Release Abatement Measure Status Report No. 8, A Portion of the 51 Eames Street Site, Wilmington, MA. RTN 3-0471. September 7.

Geomega, 1999. Olin Wilmington Technical Series IV, Geochemical Discrimination Between Groundwater Emanating from the Calcium Sulfate and Woburn Sanitary Landfills. Prepared for: Olin Corporation, Wilmington, MA Facility. Geomega Inc. February 10.

Geomega, 2019. Data Gaps Work Plan. Geomega Inc. August 2.

Jones, D.S., Suter, G. W. II, and Hull, R. N., 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision; Oak Ridge National Laboratories (ES/ER/TM-95/R4). November.

MacDonald, D. D., Ingersoll, C.G and Berger, T. A., 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. *Archives of Environmental Contamination and Toxicology* 39:20-31.

MACTEC, 2007. Draft Focused Remedial Investigation Report, Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts. MACTEC Engineering and Consulting, Inc. October.

MACTEC, 2008. Final Interim Response Steps Work Plan, Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts. MACTEC Engineering and Consulting, Inc. August 8.

MACTEC, 2009. Final Remedial Investigation/Feasibility Study Work Plan, Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts. MACTEC Engineering and Consulting, Inc. August 14.

MACTEC, 2011. Preliminary Remedial Investigation Report, Operable Unit 1 for the Olin Property, Wilmington, Massachusetts, MACTEC Engineering and Consulting, Inc. August 22.

MassDEP, 1992. Notice of Responsibility Pursuant to M.G.L. c.21E and 310 CMR 40.000, Wilmington-ERB-N91-1628 Jewell Drive. Issued to: Olin Chemicals, P.O. Box 248, Lower River Road, Charlestow, TN 37310, Attn. Steve Morrow. Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Department of Environmental Protection, Metro Boston/Northeast Regional Office. May 28.

MassDEP, 2000. Administrative Consent Order, ACOP # NE-9009-4673, In the Matter of Clarence Spinazola, Solid Waste Landfill / 21E Site, Wilmington, Massachusetts. Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Department of Environmental Protection. July 24.

MassDEP, 2007. Sediment Toxicity of Petroleum Hydrocarbon Fractions. Office of Research and Standards. September.

MassDEP, 2009. Wilmington – Solid Waste/COR, Olin Gypsum Landfill, 51 Eames Street, Completion of Closure, FMF #131605. Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Department of Environmental Protection, Metro Boston/Northeast Regional Office. January 7.

MassDEP, 2010a. Groundwater Use and Value Determination, Olin Chemical Corporation Superfund Site. Commonwealth of Massachusetts, Department of Environmental Protection. September.

MassDEP, 2010b. Correspondence. From: David C. Adams, Environmental Engineer and John A. Carrigan, Section Chief, Solid Waste Management, Commonwealth of Massachusetts, Executive Office of Energy & Environmental Affairs, Department of Environmental Protection, Northeast Regional Office. To: Steve Morrow, Olin Corporation. Subject: WILMINGTON – Solid Waste/COR, Olin Gypsum Landfill, 51 Eames Street, Modification of Post Closure Monitoring Plan, Requirement for Application, FMF# 131605. December 14.

MassDEP, 2011. Correspondence. From: David C. Adams, Environmental Engineer and John A. Carrigan, Section Chief, Solid Waste Management, Commonwealth of Massachusetts, Executive Office of Energy & Environmental Affairs, Department of Environmental Protection. To: Steve Morrow, Olin

Corporation. Subject: WILMINGTON – Solid Waste/COR, Olin Gypsum Landfill, 51 Eames Street, Modification of Post Closure Monitoring Plan, Approval. March 3.

MassDEQE, 1987. Correspondence. From: Thomas C. McMahon, Director, Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Department of Environmental Quality Engineering, Division of Water Pollution Control. To: Michael J. Bellotti, Senior Environmental Technical Specialist, Olin Corporation. Subject: Sampling Parameters, Olin Chemical, Wilmington, MA.

Nobis, 2019. Memorandum. Olin – Plant B/East Ditch Risk Evaluation V2. Nobis Group. August 27.

Nobis, 2020. Transmittal of Residential Water Supply Results, Olin Chemical Superfund Site, Wilmington, Massachusetts, EPA Task Order No. 0021-RS-BD-01CH. Nobis Group. February 24.

Nobis, 2021. Memorandum. Olin: Cleanup Level for Ammonia in Surface Water. Nobis Group. March 12.

Oak Ridge National Laboratories, 2018. Provisional Peer-Reviewed Toxicity Values (PPRTVs) from the USEPA National Center for Environmental Assessment in Cincinnati, Ohio. https://hhpprtv.ornl.gov/ accessed in 2018.

Olin, 2002a. Correspondence. From: Thomas P. O'Brien, Manager Environmental Sites, Olin Corporation. To: Stephen M. Johnson, Chief, Site Management Section, Bureau of Waste Site Cleanup, Commonwealth of Massachusetts, Department of Environmental Protection. Subject: Request for Information; 51 Eames Street; DEP RTN 3-0471. November 27.

Olin, 2002b. Correspondence. From: Steve Morrow, Principle Environmental Specialist, Olin Corporation. To: Stephen M. Johnson, Chief, Site Management Section, Bureau of Waste Site Cleanup, Commonwealth of Massachusetts, Department of Environmental Protection. December 18.

Olin, 2015. Remedial Investigation Report, Operable Unit 1 & Operable Unit 2, Olin Superfund Site, Wilmington, Massachusetts. July 24.

Olin, 2020a. Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts, Volume I, Operable Unit 1 & Operable Unit 2, Feasibility Study. Olin Corporation. July 31.

Olin, 2020b. Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts, Volume 2, Interim Action Feasibility Study. Olin Corporation. August.

Olin, 2020c. Memorandum. Revised Human Health Risk Calculations for Potable Use of Private Residential Wells at Property 1 and Property 2 – Olin Chemical Superfund Site (OCSS) Operable Unit 3 (OU3). May 21.

Persaud, D., Jaagumagi, R., and Hayton, A., 1993. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario. Water Resources Branch, Ontario Ministry of Environment and Energy. August.

Sample et al., 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridg)e Reservation, U.S. Department of Energy, Oak Ridge National Laboratories. BJC/OR-112. August.

Shaw, 2005. IRA Status Report for Plant B Area Remediation Systems, 51 Eames Street Site, Wilmington, MA, MADEP RTN 3-0471. Shaw Environmental, Inc. August.

Smith, 1997. Supplemental Phase II Report, Wilmington, Massachusetts Site, Olin Corporation, MADEP RTN: 3-0471. Smith Technology Corporation, Plymouth Meeting, Pennsylvania, PTI Environmental Services, Boulder, Colorado, ABB Environmental Services, Inc., Wakefield, Massachusetts, Geomega, Boulder, Colorado. June.

Texas Natural Resource Conservation Commission, 2000. Texas Natural Resource Conservation Commission Surface Water Quality Standards. 30 TAC Chapter 307. Effective August 17.

USEPA, 1989. Risk Assessment Guidance for Superfund: Volume I. Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response. U.S. Environmental Protection Agency, Washington, D.C. EPA 540/1-89/002.

USEPA, 1993. Wildlife Exposure Factors Handbook. EPA/600/R-93/187. December.

USEPA, 1994. USEPA , Region I – New England Risk Updates, Number 2. August.

USEPA, 1995a. USEPA , Region I – New England Risk Updates, Number 3. August.

USEPA, 1995b. Memorandum. From: Elliott P. Laws, Assistant Administrator. Land Use in the CERCLA Remedy Selection Process. To: Director, Waste Management Division, Regions I, IV, V, VII, Director, Emergency and Remedial Response Division, Region II, Director, Hazardous Waste Management Division, Regions III, VI, VIII, IX, Director, Hazardous Waste Division, Region X, Director, Environmental Services Division, Regions I, VI, VII. OSWER Directive No. 9355.7-04. May 25.

USEPA, 1996a. Groundwater Use and Value Determination Guidance. EPA Region 1. Final Draft. April 3. Available at: https://archive.epa.gov/region1/brownfields/web/pdf/gwater.pdf (accessed December 7, 2020).

USEPA, 1996b. Assessment and Remediation of Contaminated Sediments (ARCS) Program: Calculation and Evaluation of Sediment Effect Concentrations for the Amphipod *Hyalella Azteca* and the Midge *Chironomus Riparius*. Great Lakes National Program Office. EPA/905/R96/08. September.

USEPA, 1997a. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final. EPA 540-R-97-006 / OSWER 9285.7-25. June.

USEPA, 1997b. Health Effects Assessment Summary Tables, FY 1997 Update. EPA 540-R-97-036. July.

USEPA, 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Facilities Peer Review Draft. November. Appendix C: Media to Receptor Bioconcentration Factors.

USEPA, 2001. Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment

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

USEPA, 2003a. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures. EPA/600/R-02/013. November.

USEPA, 2003b. Memorandum. From: Michael B. Cook, Director, Office of Superfund Remediation and Technology Innovation. To: Superfund National Policy Managers, Regions 1 – 10. Subject: Human Health Toxicity Values in Superfund Risk Assessments. OSWER Directive 9285.7-53. December 5.

USEPA, 2005a. Guidelines for Carcinogen Risk Assessment, Final, Risk Assessment Forum, PA/630/P-03/001F, Washington, D.C. March.

USEPA, 2005b. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, Risk Assessment Forum, EPA/630/R-03/003F, Washington, D.C. March.

USEPA, 2006. EPA Region III BTAG Freshwater Screening Benchmarks. July.

USEPA, 2008. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures. EPA/600/R-02/013. November.

USEPA, 2009a. Correspondence. From: James M. DiLorenzo, USEPA Region 1 – New England. To: Ken Finkelstein, NOAA/NOS/OR&R, Coastal Protection and Restoration Division. Subject: Transmittal of Final RI/FS Work Plan, Olin Chemical Superfund Site, Wilmington, Mass. November 12.

USEPA, 2009b. From: James M. DiLorenzo, USEPA Region 1 – New England. To: Andrew L. Raddant, Department of Interior, Office of Environmental Policy and Compliance. Subject: Transmittal of Final RI/FS Work Plan, Olin Chemical Superfund Site, Wilmington, Mass. November 12.

USEPA, 2009c. From: James M. DiLorenzo, USEPA Region 1 – New England. To: Ian A. Bowles, Secretary, Executive Office of Energy and Environmental Affairs, NRD Coordinator. Subject: Transmittal of Final RI/FS Work Plan, Olin Chemical Superfund Site, Wilmington, Mass. November 12.

USEPA, 2009d. "National Recommended Water Quality Criteria", Office of Water.

USEPA, 2010. Memorandum. NDMA in Private Wells – Recommendation to Discontinue Consumption, Olin Chemical Superfund Site, Wilmington, Mass. November 1.

USEPA, 2011. Memorandum. Olin Chemical Superfund Site – Approval to Perform an Engineering Evaluation/Cost Analysis for a Non-Time Critical Approval Action. May 25.

USEPA, 2012. Ecological Structure Activity Relationship Model. Microsoft Windows version 1.11. March.

USEPA, 2013a. Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013. EPA 822-R-18-002. April.

USEPA, 2013b. "Regional Screening Levels for Chemical Contaminants at Superfund Sites"; EPA Office of Superfund. November.

USEPA, 2015. From: Nancy Barmakian, Acting Director, Office of Site Remediation and Restoration, USEPA Region 1 – New England. To: Robert W. Jones, III, Managing Principal, New England Transrail, LLC. Subject: Comfort/Status and Reasonable Steps Letter, 51 Eames Street, Wilmington, Massachusetts, Olin Chemical Superfund Site. May 13.

USEPA, 2018a. Integrated Risk Information System on-line database search: www.epa.gov/iris

USEPA, 2018b. Regional Screening Levels (RSLs) – Generic Table. November. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables (accessed January 22, 2021).

USEPA, 2019. Regional Screening Levels (RSLs) – Generic Table. November. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables (accessed January 22, 2021).

USEPA, 2020a. Memorandum. Olin Chemical Superfund Site, Updates to OU1/OU2 RI Report Conclusions. August 5.

USEPA, 2020b. Memorandum. Olin Chemical Superfund Site, Updates to Draft 2019 OU3 RI Report Conclusions. August 5.

USEPA, 2020c. Memorandum. Volume III – Comparative Analyses, Feasibility Study Report, Olin Chemical Superfund Site, Wilmington, Massachusetts. August 5.

USEPA, 2020d. E-mail Correspondence. From: Melanie Morash, USEPA. To: Chinny Esakkiperumal, Olin Corporation. Subject: EPA Approval – Olin Chemical Superfund Site – Wilmington, MA – Data Gaps Work Plan – Phase 1A Proposal – Seismic Work. March 12.

USEPA, 2020e. Memorandum. From: Matthew Z. Leopold, General Counsel. To: Associate Deputy Administrator, Assistant Administrators, Regional Administrators. Subject: Virtual Public Hearings and Meetings. April 16.

Wehran, 1986. Phase I Site Inspection Report for the Olin Chemical Group, Wilmington, Massachusetts, Middlesex County, Massachusetts FIT Contract, MDEQE Project Number 86-01-086-093, WE Project Number 50086.10. Wehran Engineering Corp. September.

Wood, 2018. Revised Draft Baseline Human Health Risk Assessment, Operable Unit 3. Olin Chemical Superfund Site, Wilmington, MA. December 18.

Wood, 2019. Revised Draft Remedial Investigation Report, Operable Unit 3, Olin Chemical Superfund Site, Wilmington, Massachusetts. Wood Environment & Infrastructure Solutions. June.

Wood, 2020a. Memorandum, Supplemental Characterization of Containment Area Soil, November 2019, Olin Chemical Superfund Site, 51 Eames Street, Wilmington, MA. March 20.

Wood, 2020b. Technical Memorandum. Documentation of Preliminary Remediation Goals (PRGs) for Soils, Sediments, and Surface Water at the Olin Chemical Superfund Site. Wood Environment & Infrastructure Solutions, Inc. May 15.

Wood, 2020c. Technical Memorandum. Documentation of Preliminary Remediation Goals (PRGs) to Address Human Health Risks in Dense Aqueous-Phase Liquid (DAPL), Groundwater Hot Spots, Upland Soil (including Containment Area soil), and Surface Water at the Olin Chemical Superfund Site. Wood Environment & Infrastructure Solutions, Inc. July 1.

Appendix F

Acronyms and Abbreviations

Acronyms and Abbreviations

1,1-DCA	1,1-dichloroethane
5PT	5-phenyltetrazole
AOC	Administrative Settlement Agreement and Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
AS	Air Sparging
BAF	Bioaccumulation Factor
BEHP	bis-2-ethylhexylphthalate
BERA	Baseline Ecological Risk Assessment
BFPP	bona fide prospective purchaser
bgs	below ground surface
BHHRA	Baseline Human Health Risk Assessment
BRA	Baseline Risk Assessment
CCC	Criterion Continuous Concentration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
cf	cubic feet
CFR	Code of Federal Regulation
CMR	Code of Massachusetts Regulations
COC	Contaminant of Concern
COPC	Contaminants of Potential Concern
COPEC	Contaminants of Potential Ecological Concern
CSF	cancer slope factor
CSGWPP	Comprehensive State Groundwater Protection Program
CSL	Calcium Sulfate Landfill
CSM	Conceptual Site Model
CTE	Central Tendency Exposure
CWA	Clean Water Act
cy	cubic yard
DAPL	Dense Aqueous Phase Liquid
delta-BHC	delta-hexachlorocyclohexane
E-EA	Ecological Exposure Area
EA	Exposure Area
Eco-SSL	Ecological Soil Screening Level
EDI	Estimated Daily Intake
EE/CA	Engineering Evaluation/Cost Analysis
ELCR	excess lifetime cancer risk
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
EPH	extractable petroleum hydrocarbons
EPH/VPH	extractable petroleum hydrocarbon/volatile petroleum hydrocarbon
ESD	Explanation of Significant Difference
FEMA	Federal Emergency Management Agency
FS	Feasibility Study
ft	foot

GAC	granular activated carbon
GC/MS	gas chromatography/mass spectrometry
GERE	Grant of Environmental Restriction and Easement
gpm	gallons per minute
GWHS	Groundwater Hot Spots
g	grams
HDPE	high density polyethylene
HH-EA	Human Health Exposure Area
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
HRS	Hazard Ranking System
in	inch
IRA	Immediate Response Action
IUR	Inhalation Unit Risk
K	hydraulic conductivity
kg	Kilogram
LADD	lifetime average daily dose
LC/MS	liquid chromatography/mass spectrometry
LEDPA	Least Environmentally Damaging Practicable Alternative
LIF	Laser-Induced Fluorescence
LNAPL	Light Non-Aqueous Phase Liquid
LOAEL	Lowest Observed Adverse Effect Level
µg/L	micrograms per Liter
MassDEP	Massachusetts Department of Environmental Protection
MassDEQE	Massachusetts Department of Environmental Quality Engineering
MBTA	Massachusetts Bay Transportation Authority
MCL	Maximum Contaminant Level
MCP	Massachusetts Contingency Plan
MDC	Metropolitan District Commission
MEPA	Massachusetts Environmental Policy Act
mg/kg	milligrams per kilogram
mg/kg/day	milligrams per kilogram per day
mg/L	milligrams per Liter
µg/L	micrograms per Liter
MGL	Massachusetts General Laws
MMB	Maple Meadow Brook
MMH	monomethylhydrazine
µmhos/cm	microohms per centimeter
MOA	Mode of Action
MPE	multi-phase extraction
msl	mean sea level
MWRA	Massachusetts Water Resources Authority
NAUL	Notice of Activity and Use Limitation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDBA	n-nitrosodi-n-butylamine
NDEA	n-nitrosodiethylamine

NDMA	n-nitrosodimethylamine
NDPhA	n-nitrosodiphenylamine
NDPrA	n-nitrosodipropylamine
ng/L	nanograms per Liter
NIOSH	National Institute for Occupational Safety and Health
NMEA	n-nitrosomethylethylamine
NOAEL	No Observed Adverse Effect Level
NPI	National Polychemicals, Inc.
NPIP	n-nitrosopiperidine
NPL	National Priorities List
NPYR	n-nitrosopyrrolidine
NRWQC	National Recommended Water Quality Criteria
O&M	Operation and Maintenance
OBSC	4,4' oxybisbenzenesulfonylchloride
OBSH	4,4' oxybisbenzenesulfonylhydrazide
OU	Operable Unit
PA	Preliminary Assessment
PA/SI	Preliminary Assessment/Site Inspection
PAH	Polycyclic Aromatic Hydrocarbon
PCBs	polychlorinated biphenyls
PDI	Pre-design investigation
PIP	Potentially Interested Party
PPE	Personal Protective Equipment
PRB	Permeable Reactive Barrier
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
PVC	polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAGS	EPA Risk Assessment Guidance for Superfund
RAM	Release Abatement Measure
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RfC	Reference Concentration
RfD	Reference Dose
RGP	Remediation General Permit
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RPF	Relative Potency Factor
RSL	Regional Screening Level
s	second
SA	Site Assessment
SED	sediments
SEMD	Superfund and Emergency Management Division

sq. ft	square feet
SHPO	State Historic Preservation Officer
SI	Site Inspection
SMB	Sawmill Brook
SMP	Site Management Plan
SSDS	Sub-Slab Depressurization System
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compound
SW	surface water
SWPPP	Stormwater Pollution Prevention Plan
TBC	To-be-Considered
TCE	trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
THPO	Tribal Historic Preservation Officer
TM-1-P	2,4,4-trimethyl-1-pentene
TM-2-P	2,4,4-trimethyl-2-pentene
TMPs	trimethylpentenes
TSDF	treatment, storage, and disposal facility
TRV	Toxicity Reference Value
UCL	Upper Confidence Limit
UDMH	unsymmetrical dimethylhydrazine
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UV	ultra-violet
UVOST	ultra-violet optical screening tool
VI	Vapor Intrusion
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound
VPH	volatile petroleum hydrocarbons
WBV	Western Bedrock Valley
WERC	Wilmington Environmental Restoration Committee
WSL	Woburn Sanitary Landfill

Appendix G

Administrative Record Index and Guidance Documents

Olin Chemical
NPL Site Administrative Record
Record of Decision (ROD)
Final Action (Operable Units 1 & 2)
Interim Action (Operable Unit 3)

Index

ROD Dated: March 2021
Released: March 2021

Prepared by
EPA New England
Superfund & Emergency Management Division

Introduction to the Collection

This is the administrative record for the Olin Chemical Superfund Site, Wilmington, MA, Record of Decision (ROD), dated March 2021. The Record of Decision consists of a final remedial action for Operable Units (OUs) 1 & 2, and an interim remedial action for OU 3. The file contains site-specific documents and a list of guidance documents used by EPA staff in selecting a response action at the site.

This record replaces the administrative record file for the Olin Chemical Superfund Site, Wilmington, MA, Record of Decision (ROD) Proposed Plan, dated August 2020. Documents listed as bibliographic sources in individual reports might not be listed separately in the index.

The administrative record file is available for review at:

Online: https://go.usa.gov/xGb7a

Additional information about the site is also available at www.epa.gov/superfund/olin.

The EPA is temporarily suspending its Regional Records Centers for public visitors to reduce the risk of transmitting COVID-19. In addition, many site information repositories are closed and information in these repositories, including the administrative record file, has not been updated.

The EPA continues to carefully and continuously monitor information from the Centers for Disease Control and Prevention (CDC), local area health departments, and our Federal partners so that we can respond rapidly as conditions change regarding COVID-19.

For assistance with access or for questions, contact (note that because of government COVID-19 restrictions EPA's Offices may not be open to the public):

SEMS Records & Information Center
U.S. EPA Region 1 - New England
5 Post Office Square, Suite 100 (mail code: 02-3)
Boston, MA 02109-3912
(617) 918-1440 (phone)
R1.Records-SEMS@epa.gov (email)

An administrative record is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

Questions about this administrative record should be directed to the EPA New England site manager, Melanie Morash (617) 918-1292, morash.melanie@epa.gov.

AR 66513 & AR 66514 **Interim Record of Decision (ROD) - Operable Units (OU) 1, 2, & 3** **March 2021**

Document ID	Title	Document Date	Page Count	Author	Addressee	Resource Type	Program Information	Access Control	Region	URL
653925	RECORD OF DECISION (ROD)	3/30/2021	444	R1: (US EPA REGION 1)		RPT / Report	053-REMEDIAL/0531-Remedy Characterization/05.04-RECORD OF DECISION (ROD)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653925
653926	RESPONSIVENESS SUMMARY	3/30/2021	59	R1: (US EPA REGION 1)		RPT / Report	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653926
653927	LETTER REGARDING CONCURRENCE WITH RECORD OF DECISION (ROD)	3/25/2021	15	R01; Locke, Paul W (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Cianciarulo, Robert G (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/05.01-CORRESPONDENCE	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653927
653900	MEMO REGARDING CLEANUP LEVEL FOR AMMONIA IN SURFACE WATER	3/10/2021	10	R01: Brunelle, Jeffrey (NOBIS ENGINEERING), R01: Delong, T (NOBIS GROUP), R01: Lambert, J (NOBIS GROUP)		MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653900
100016500	LETTER REGARDING INITIATION OF SECTION 106 CONSULTATION WITH CONCURRENCE STAMP	2/22/2021	6	R01: Morash, Melanie (US EPA REGION 1)	R01: Simon, Brona (MA HISTORICAL COMMISSION), R01: Weeden, David (MASHPEE WAMPANOAG TRIBE)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/16.01-CORRESPONDENCE (NATURAL RESOURCE TRUSTEE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100016500
100016176	LETTER REGARDING INITIATION OF SECTION 106 CONSULTATION (CERTIFIED MAIL RECEIPTS ATTACHED)	1/19/2021	18	R01: Morash, Melanie (US EPA REGION 1)	R01: Simon, Brona (MA HISTORICAL COMMISSION), R01: Weeden, David (MASHPEE WAMPANOAG TRIBE)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/16.01-CORRESPONDENCE (NATURAL RESOURCE TRUSTEE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100016176
100002726	News Release: EPA Releases Tenth Update to the Administrator's Emphasis List, Continuing to Accelerate Progress in Cleaning Up the Nation's Land by Achieving Significant Milestones at 8 Sites Across the Country	1/15/2021	4	R11: (U.S. EPA)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/A4.6-Community Involvement Plan	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/100002726
652694	OEHHA TOXICITY CRITERIA DATABASE	12/9/2020	1	R01: (STATE OF CA OFFICE OF HEALTH HAZARD ASSESSMENT)		CHT / Chart/Table	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/652694
649997	NEWS RELEASE: EPA TO CONDUCT AERIAL SURVEY OF OLIN CHEMIAL SUPERFUND SITE IN WILMINGTON, MA WEEK OF 11/09/2020 OR 11/16/2020	11/9/2020	3	R01: (US EPA REGION 1)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.03-NEWS CLIPPINGS/PRESS RELEASES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649997
649954	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	1	R01: Pribyl, Lee (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649954
649957	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	1	R01: Feng, Haosheng (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649957
649960	EMAIL REGARDING COMMENTS ON PROPOSED PLAN (10/20/2020 COMMENT LETTER ATTACHED)	10/26/2020	4	R01: Beard, Jessica C (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649960
649962	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	1	R01: Brooks, Lee	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649962
649964	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	1	R01: Riedinger, Kristen (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649964
649965	LETTER REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	3	R01: Poitras, Brian A (WILMINGTON WOBURN INTERMODAL LLC)	R01: Morash, Melanie (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649965
649966	LETTER REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	5	R01: Stevenson, Martha (WERC)	R01: Jennings, Lynne (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649966
649968	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	2	R01: Baima, Stephanie (WILMINGTON (MA) RESIDENT OF)	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649968
649969	MEMO REGARDING TECHNICAL COMMENTS ON UPDATES TO OPERABLE UNIT (OU) 1 AND 2 REPORT, FEASIBILITY STUDY (FS) VOL.1, INTERIM ACTION FS VOL. 2, COMPRATIVE ANALYSIS VOL. 3, AND PROPOSED PLAN	10/26/2020	18	R01: (WILMINGTON ENVIRONMENTAL RESTORATION COMMITTEE)	R01: Jennings, Lynne (US EPA REGION 1), R01: Morash, Melanie (US EPA REGION 1), R01: Waldeck, Garry (MA DEPT OF ENVIRONMENTAL PROTECTION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649969
649972	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	1	R01: Baima, Jennifer (WILMINGTON (MA) RESIDENT OF)	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649972
649974	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	1	R01: Baima, Charles (WILMINGTON (MA) RESIDENT OF)	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649974

649975	SPECIFIC RECOMMENDATIONS AND PROPOSAL TO COLLABORATE FROM THE MIT SUPERFUND RESEARCH PROGRAM	10/26/2020	2	R01: Kay, Jennifer (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)), R01: Beard, Jessica C (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)), R01: Vandiver, Kathy (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)), R01: Swager, Timothy (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)), R01: Engelward, Bevin (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649975
649976	COMMENTS ON PROPOSED PLAN	10/26/2020	3	R01: Kay, Jennifer (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)), R01: Beard, Jessica C (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)), R01: Vandiver, Kathy (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)), R01: Swager, Timothy (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)), R01: Engelward, Bevin (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649976
649978	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	1	R01: Armijo, Amanda (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649978
649980	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	1	R01: Hrdina, Amy (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649980
649982	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	1	R01: Owiti, Norah A (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649982
649984	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/26/2020	1	R01: Moise, Aimee (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649984
649985	COMMENTS ON PROPOSED PLAN	10/26/2020	1	R01: Kelly, Jaime M (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649985
649931	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/23/2020	2	R01: Waldeck, Garry (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649931
649914	LETTER REGARDING COMMENTS ON PROPOSED PLAN	10/22/2020	3	R01: Eaton, Jonathan R (WILMINGTON (MA) TOWN OF)	R01: Morash, Melanie (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649914
649915	LETTER REGARDING COMMENTS ON PROPOSED PLAN	10/22/2020	5	R01: Reynolds, Robert C (GEOINSIGHT INC), R01: Trainer, Kevin D (GEOINSIGHT INC)	R01: Morash, Melanie (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649915
649917	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/22/2020	1	R01: Corless, Elliot (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649917
100015886	PRESENTATION - AERIAL ELECTROMAGNETIC (AEM) SURVEY	10/22/2020	3	R01: (OLIN CORP)		MTG / Meeting Document	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.04-PUBLIC MEETINGS/HEARINGS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100015886
100015887	TALKING POINTS FOR 10/22/2020 PRESENTATION TO THE TOWN OF WILLMINGTON'S BOARD OF SELECTMEN	10/22/2020	1	R01: Cashwell, James M (OLIN CORP)	R01: (WILMINGTON (MA) BOARD OF SELECTMEN)	MTG / Meeting Document	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.04-PUBLIC MEETINGS/HEARINGS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100015887
649910	EMAIL REGARDING COMMENTS ON PROPOSED PLAN	10/21/2020	3	R01: Kaushal, Simran (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649910
649599	LETTER REGARDING COMMENTS ON PROPOSED PLAN (TRANSMITTAL EMAIL ATTACHED)	10/20/2020	4	R01: Kay, Jennifer (MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT))	R01: Morash, Melanie (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649599
100015763	LETTER REGARDING UPCOMING AERIAL ELECTROMAGNETIC (AEM) SURVEY (FACT SHEET ATTACHED)	10/19/2020	4	R01: Cashwell, James M (OLIN CORP)	R01: Hull, Jeffrey M (WILMINGTON (MA) TOWN OF)	LTR / Letter	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.01-CORRESPONDENCE (COMMUNITY RELATIONS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100015763
100015428	LETTER REGARDING COMMENTS ON PROPOSED PLAN (COMMENTS ATTACHED)	10/2/2020	11	R01: Cashwell, James M (OLIN CORP)	R01: Morash, Melanie (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/05.03-RESPONSIVENESS SUMMARIES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100015428
649561	VIRTUAL PUBLIC HEARING CONFERENCE CALL TRANSCRIPT	9/22/2020	30	R01: Jennings, Lynne (US EPA REGION 1)		MTG / Meeting Document	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.04-PUBLIC MEETINGS/HEARINGS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/649561

649224	NEWS RELEASE: EPA EXTENDS PUBLIC COMMENT PERIOD FOR PROPOSED CLEANUP PLAN FOR OLIN CHEMICAL SUPERFUND SITE IN WILMINGTON, MA	9/15/2020		2	R01: (US EPA REGION 1)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.03-NEWS CLIPPINGS/PRESS RELEASES	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/649224
100015427	EMAIL REGARDING PRE-REGISTRATION FOR PROVIDING ORAL COMMENTS DURING 09/22/2020 PUBLIC HEARING	9/10/2020		2	R01: White, Sarah (US EPA REGION 1)		EML / Email	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.04-PUBLIC MEETINGS/HEARINGS	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/100015427
648692	EMAIL REPLYING TO REQUEST FOR EXTENSION OF 30-DAY COMMENT PERIOD (EMAIL HISTORY ATTACHED) [REDACTED]	9/9/2020		2	R01: Morash, Melanie (US EPA REGION 1)	R01: Dilorenzo, James M (US EPA REGION 1), R01: Pechulis, Kevin P (US EPA REGION 1), R01: Jennings, Lynne (US EPA REGION 1), R01: Shewack, Robert (US EPA REGION 1), R01: Stevenson, Martha (WERC)	EML / Email	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.01-CORRESPONDENCE (COMMUNITY RELATIONS)	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/648692
648686	EMAIL REQUESTING EXTENSION OF 30-DAY COMMENT PERIOD [REDACTED]	9/8/2020		1	R01: Stevenson, Martha (WERC)	R01: Dilorenzo, James M (US EPA REGION 1), R01: Pechulis, Kevin P (US EPA REGION 1), R01: Jennings, Lynne (US EPA REGION 1), R01: Morash, Melanie (US EPA REGION 1), R01: Shewack, Robert (US EPA REGION 1)	EML / Email	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.01-CORRESPONDENCE (COMMUNITY RELATIONS)	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/648686
100014400	PUBLIC MEETING PRESENTATION (PDF VERSION)	8/25/2020		33	R01: (US EPA REGION 1)		MTG / Meeting Document	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.04-PUBLIC MEETINGS/HEARINGS	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/100014400
647840	PUBLIC NOTICE: EPA ANNOUNCES PROPOSED PLAN TO CLEAN UP THE OLIN CHEMICAL SUPERFUND SITE IN WILMINGTON, MA	8/12/2020		1	R01: (US EPA REGION 1)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.03-NEWS CLIPPINGS/PRESS RELEASES	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/647840
100014355	PRESS RELEASE: EPA ANNOUNCES PROPOSED PLAN TO BEGIN CLEAN UP OF THE OLIN CHEMICAL SUPERFUND SITE IN WILMINGTON, MA	8/12/2020		3	R01: (US EPA REGION 1)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.03-NEWS CLIPPINGS/PRESS RELEASES	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/100014355
100014373	NOTIFICATION TO POTENTIALLY INTERESTED PARTY (PIP) OF FORTHCOMING PROPOSED CLEANUP PLAN - BAYER CORP	8/12/2020		12	R01: Jennings, Lynne (US EPA REGION 1)	R01: Partridge, Scott (BAYER CORP)	LTR / Letter	052-ENFORCEMENT/0522-Negotiations/10.01-CORRESPONDENCE (ENFORCEMENT/NEGOTIATION)	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/100014373
100014374	NOTIFICATION TO POTENTIALLY INTERESTED PARTY (PIP) OF FORTHCOMING PROPOSED CLEANUP PLAN - SANOFI US SERVICES INC	8/12/2020		12	R01: Jennings, Lynne (US EPA REGION 1)	R01: Lee, Chan (SANOFI US SERVICES INC)	LTR / Letter	052-ENFORCEMENT/0522-Negotiations/10.01-CORRESPONDENCE (ENFORCEMENT/NEGOTIATION)	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/100014374
100014426	PUBLIC NOTICE AS APPEARING IN WILMINGTON TOWN CRIER: EPA ANNOUNCES PROPOSED PLAN TO CLEAN UP THE OLIN CHEMICAL SUPERFUND SITE IN WILMINGTON, MA	8/12/2020		1	R01: (US EPA REGION 1), R01: (WILMINGTON TOWN CRIER)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.03-NEWS CLIPPINGS/PRESS RELEASES	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/100014426
100014368	EMAIL REGARDING UPCOMING PUBLIC INFORMATIONAL MEETING (PROPOSED PLAN AND SAVE THE DATE POSTCARD ATTACHED)	8/11/2020		55	R01: Pechulis, Kevin (US EPA REGION 1)	R01: Cashwell, James M (OLIN CORP), R01: Funderberg, Lisa A (OLIN CORP), R01: Share, David M (OLIN CORPORATION)	EML / Email	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.01-CORRESPONDENCE (COMMUNITY RELATIONS)	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/100014368
100014369	EMAIL REGARDING UPCOMING PUBLIC INFORMATIONAL MEETING (PROPOSED PLAN AND SAVE THE DATE POSTCARD ATTACHED)	8/11/2020		55	R01: Pechulis, Kevin (US EPA REGION 1)	R01: Feist, S	EML / Email	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.01-CORRESPONDENCE (COMMUNITY RELATIONS)	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/100014369
100014370	EMAIL REGARDING UPCOMING PUBLIC INFORMATIONAL MEETING (PROPOSED PLAN AND SAVE THE DATE POSTCARD ATTACHED)	8/11/2020		55	R01: Pechulis, Kevin (US EPA REGION 1)	R01: Guilliani, V	EML / Email	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.01-CORRESPONDENCE (COMMUNITY RELATIONS)	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/100014370
100014371	EMAIL REGARDING UPCOMING PUBLIC INFORMATIONAL MEETING (PROPOSED PLAN AND SAVE THE DATE POSTCARD ATTACHED)	8/11/2020		55	R01: Pechulis, Kevin (US EPA REGION 1)	R01: Amidon, David M (BURNS & LEVINSON LLP)	EML / Email	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.01-CORRESPONDENCE (COMMUNITY RELATIONS)	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/100014371
647859	MEMO REGARDING UPDATES TO REMEDIAL INVESTIGATION (RI) REPORT CONCLUSIONS	8/5/2020		20	R01: Dilorenzo, James (US EPA REGION 1)		MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/647859
647860	MEMO REGARDING FEASIBILITY STUDY (FS) REPORT, VOLUME 3 OF 3 - COMPARATIVE ANALYSES	8/5/2020		48	R01: Jennings, Lynne (US EPA REGION 1)		MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.06-FEASIBILITY STUDY REPORTS	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/647860
647882	MEMO REGARDING UPDATES TO DRAFT 2019 REMEDIAL INVESTIGATION (RI) REPORT CONCLUSIONS	8/5/2020		25	R01: Dilorenzo, James (US EPA REGION 1)		MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/647882
647851	MEMO REGARDING PROPOSED PLAN PUBLIC COMMENT PERIOD - VIRTUAL PUBLIC MEETING MEASURES	8/3/2020		2	R01: Pechulis, Kevin (US EPA REGION 1)		MEMO / Memorandum	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.01-CORRESPONDENCE (COMMUNITY RELATIONS)	UCTL(Uncontrolled)	1 https://semspub.epa.gov/src/document/01/647851

647828	SAVE THE DATE POSTCARD, VIRTUAL MEETING AND HEARING 08/25/2020 AND 09/22/2020	8/1/2020	2	R01: (US EPA REGION 1)		MTG / Meeting Document	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.04-PUBLIC MEETINGS/HEARINGS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647828
647858	INTERIM ACTION FEASIBILITY STUDY (FS), VOLUME 2 OF 3 (08/03/2020 TRANSMITTAL LETTER ATTACHED)	8/1/2020	864	R01: (OLIN CORPORATION)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/04.06-FEASIBILITY STUDY REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647858
647883	PROPOSED PLAN	8/1/2020	52	R01: (US EPA REGION 1)		RPT / Report	053-REMEDIAL/0531-Remedy Characterization/04.09-PROPOSED PLANS FOR SELECTED REMEDIAL ACTION	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647883
647850	FEASIBILITY STUDY (FS), VOLUME 1 OF 3 (TRANSMITTAL LETTER ATTACHED)	7/31/2020	276	R01: (OLIN CORPORATION)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/04.06-FEASIBILITY STUDY REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647850
647843	ADDRESS LISTS FOR SAVE THE DATE POSTCARD, VIRTUAL MEETING AND HEARING 08/25/2020 AND 09/22/2020	7/30/2020	1	R01: (US EPA REGION 1)		LST / List/Index	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.06-MAILING LISTS	PRVY / Controlled/Privacy	1	N/A
647583	MEMO REGARDING BENZO(A)PYRENE DISTRIBUTION AND SURFACE WATER IMPACTS	7/20/2020	8	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)	R01: Morash, Melanie (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.02-SAMPLING & ANALYSIS DATA (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647583
647282	TECHNICAL MEMORANDUM REGARDING DOCUMENTATION OF PRELIMINARY REMEDIATION GOALS (PRGS) TO ADDRESS HUMAN HEALTH RISKS IN DENSE AQUEOUS-PHASE LIQUID (DAPL), GROUNDWATER HOT SPOTS, UPLAND SOIL (INCLUDING CONTAINMENT AREA SOIL), AND SURFACE WATER	7/1/2020	102	R01: Murphy, Michael, J (WOOD)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.09-HEALTH ASSESSMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647282
647201	REDACTED EMAIL REGARDING QUESTION ON PRELIMINARY REMEDIATION GOAL (PRG) FOR AMMONIA IN SURFACE WATER (EMAIL HISTORY ATTACHED)	6/17/2020	3	R01: Mercer, Gary (WILMINGTON ENVIRONMENTAL RESTORATION COMMITTEE)	R01: Morash, Melanie (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/03.10-ENDANGERMENT/BASELINE RISK ASSESSMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647201
647006	TECHNICAL MEMO REGARDING PRELIMINARY EVALUATION OF FLOODPLAIN IMPACTS (TRANSMITTAL LETTER ATTACHED)	6/4/2020	5	R01: Walter, Nelson (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC)	R01: Cashwell, James M (OLIN CORP), R01: Esakkiperumal, Chinny (OLIN CORPORATION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647006
646183	REVISED MEMO REGARDING REVISED HUMAN HEALTH RISK CALCULATIONS FOR POTABLE USE OF PRIVATE RESIDENTIAL WELLS AT PROPERTY 1 AND PROPERTY 2 (TRANSMITTAL LETTER ATTACHED)	5/21/2020	164	R01: Thompson, Peter (OLIN CORP), R01: Murphy, Michael (OLIN CORP)	R01: Cashwell, James M (OLIN CORP)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.09-HEALTH ASSESSMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/646183
646169	MEMO REGARDING DOCUMENTATION OF PRELIMINARY REMEDIATION GOALS (PRGS) FOR SOILS, SEDIMENTS, AND SURFACE WATER (TRANSMITTAL LETTER ATTACHED)	5/15/2020	55	R01: Murphy, Michael, J (WOOD)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/646169
100002469	For Regional Superfund Site Teams: CERCLA Interim Guidance on Public Engagement During COVID-19	4/28/2020	2	R11: (U.S. EPA)		LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.4-Directives and Policy Guidance Documents	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/100002469
100002476	Memorandum on Virtual Public Hearings and Meetings	4/16/2020	2	R11: (Office of General Counsel)		LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.4-Directives and Policy Guidance Documents	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/100002476
646107	EMAIL APPROVING PROPOSAL TO APPEND THE ONGOING QUARTERLY MONITORING PROGRAM (EMAIL HISTORY ATTACHED)	4/10/2020	7	R01: Morash, Melanie (US EPA REGION 1)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	EML / Email	053-REMEDIAL/0534-Post Construction/08.01-CORRESPONDENCE (POST REMEDIAL ACTION)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/646107
644595	MEMO REGARDING HEXAVALENT CHROMIUM IN GROUNDWATER, SURFACE WATER, SEDIMENT, AND SOIL (TRANSMITTAL LETTER ATTACHED)	4/2/2020	128	R01: Murphy, Michael, J (WOOD), R01: Kullman, Jane (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.02-SAMPLING & ANALYSIS DATA (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644595
644569	MEMO REGARDING SUPPLEMENTAL CHARACTERIZATION OF CONTAINMENT AREA SOIL (TRANSMITTAL LETTER ATTACHED)	3/20/2020	445	R01: Bowen, Elizabeth T (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC), R01: Tull, Kerry (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC)	R01: Cashwell, James M (OLIN CORP), R01: Esakkiperumal, Chinny (OLIN CORPORATION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644569
644544	EMAIL REGARDING EPA APPROVAL OF DATA GAPS WORK PLAN - PHASE 1A PROPOSAL - SEISMIC WORK (EMAIL HISTORY ATTACHED)	3/12/2020	6	R01: Morash, Melanie (US EPA REGION 1)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/04.07-WORK PLANS & PROGRESS REPORTS (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644544
644516	LETTER REGARDING PROPOSAL TO APPEND THE ONGOING QUARTERLY MONITORING PROGRAM	3/6/2020	4	R01: Cashwell, James M (OLIN CORP)	R01: Morash, Melanie (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0534-Post Construction/08.01-CORRESPONDENCE (POST REMEDIAL ACTION)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644516
644517	MEMO RESPONDING TO COMMENTS AND CONDITIONAL APPROVAL OF COMPREHENSIVE DATA GAPS WORK PLAN - PHASE 1	3/6/2020	7	R01: Cashwell, James M (OLIN CORP)	R01: Jennings, Lynne (US EPA REGION 1), R01: Morash, Melanie (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/04.07-WORK PLANS & PROGRESS REPORTS (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644517

644066	EMAIL RESUBMITTING CSM TRANSECT FIGURES (FIGURES ATTACHED)	2/28/2020	5	R01: Lambert, Jennifer (NOBIS GROUP)	R01: Dilorenzo, James (US EPA REGION 1), R01: Pechulis, Kevin P (US EPA REGION 1), R01: Jennings, Lynne (US EPA REGION 1), R01: Ng, Manchak (US EPA REGION 1), R01: Morash, Melanie (US EPA REGION 1), R01: Brandon, William C (US EPA REGION 1), R01: Waldeck, Garry (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: Carroll, Courtney (US EPA REGION 1), R01: Kelly, Christopher, J (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/04.06-FEASIBILITY STUDY REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644066
644082	EMAIL REGARDING CONTAINMENT SOIL DATA (RESULTS MEMO AND DATA SHEETS ATTACHED)	2/28/2020	175	R01: Lambert, Jennifer (NOBIS GROUP)	R01: Dilorenzo, James (US EPA REGION 1), R01: Pechulis, Kevin P (US EPA REGION 1), R01: Jennings, Lynne (US EPA REGION 1), R01: Ng, Manchak (US EPA REGION 1), R01: Morash, Melanie (US EPA REGION 1), R01: Brandon, William C (US EPA REGION 1), R01: Waldeck, Garry (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: Carroll, Courtney (US EPA REGION 1), R01: Kelly, Christopher, J (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/04.06-FEASIBILITY STUDY REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644082
644084	LETTER TRANSMITTING RESIDENTIAL WATER SUPPLY RESULTS	2/24/2020	41	R01: Lambert, Jennifer (NOBIS GROUP)	R01: Morash, Melanie (US EPA REGION 1)	ADD / Analytical Data Document	053-REMEDIAL/0531-Remedy Characterization/04.02-SAMPLING & ANALYSIS DATA (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644084
644086	EMAIL REGARDING EPA COMMENTS ON PROPOSAL TO AMEND THE QUARTERLY GROUNDWATER MONITORING PROGRAM (EMAIL HISTORY AND FIGURES OF MONITORING WELLS PROPOSED FOR REMOVAL ATTACHED)	2/24/2020	10	R01: Lambert, Jennifer (NOBIS GROUP)	R01: Dilorenzo, James (US EPA REGION 1), R01: Pechulis, Kevin P (US EPA REGION 1), R01: Jennings, Lynne (US EPA REGION 1), R01: Ng, Manchak (US EPA REGION 1), R01: Morash, Melanie (US EPA REGION 1), R01: Brandon, William C (US EPA REGION 1), R01: Waldeck, Garry (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: Carroll, Courtney (US EPA REGION 1), R01: Kelly, Christopher, J (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644086
644089	MEMO REGARDING DENSE AQUEOUS PHASE LIQUID (DAPL) ALTERNATIVE DETAILED ANALYSIS R6	2/21/2020	117	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, Jennifer (NOBIS GROUP)	R01: (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.06-FEASIBILITY STUDY REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644089
647261	EMAIL REGARDING DATA GAPS WORK PLAN - PHASE 1A PROPOSAL - SEISMIC WORK (EMAIL HISTORY ATTACHED)	2/18/2020	4	R01: Morash, Melanie (US EPA REGION 1)	R01: Cashwell, James M (OLIN CORP)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647261
643525	EMAIL REGARDING EPA COMMENTS ON DATA GAPS WORK PLAN - PHASE 1 (REVIEW MEMOS AND EMAIL HISTORY ATTACHED)	1/31/2020	30	R01: Morash, Melanie (US EPA REGION 1)	R01: Cashwell, James M (OLIN CORP)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/643525
643505	MEMO REGARDING RESIDENTIAL HUMAN HEALTH RISK EVALUATION - OPERABLE UNIT (OU) 1 AND 2 SOILS	1/17/2020	16	R01: Woods, C (BLUESTONE ENVIRONMENTAL GROUP)	R01: Dilorenzo, James (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.10-ENDANGERMENT/BASELINE RISK ASSESSMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/643505
643161	EMAIL REGARDING COMMENTS ON PROPOSAL TO AMEND THE QUARTERLY GROUNDWATER MONITORING PROGRAM (EMAIL HISTORY ATTACHED)	1/4/2020	4	R01: Morash, Melanie (US EPA REGION 1)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/643161
644083	MEMO REGARDING DENSE AQUEOUS PHASE LIQUID (DAPL) VOLUME AND NDMA MASS CALCULATIONS (01/15/2020 TRANSMITTAL LETTER ATTACHED)	1/3/2020	68	R01: Davis, Andy (GEOMEGA INC), R01: Humphrey, S (GEOMEGA INC)	R01: Cashwell, James (OLIN CORP), R01: Esakkiperumal, Chinny (OLIN CORPORATION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.06-FEASIBILITY STUDY REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644083
650490	SEMI-ANNUAL STATUS REPORT NO. 25	12/18/2019	262	R01: (WOOD)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650490
646123	MEMO RESPONDING TO PLANT B / EAST DITCH RISK EVALUATION V2 (TRANSMITTAL LETTER ATTACHED)	12/13/2019	12	R01: Murphy, Michael, J (WOOD)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.10-ENDANGERMENT/BASELINE RISK ASSESSMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/646123
642199	MEMO REGARDING SITE-SPECIFIC AMBIENT WATER QUALITY CRITERION (AWQC) FOR AMMONIA (11/26/2019 TRANSMITTAL LETTER ATTACHED)	11/25/2019	14	R01: Murphy, Michael, J (WOOD)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.02-SAMPLING & ANALYSIS DATA (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/642199
641674	MEMO REGARDING RECOMMENDATION OF LOCATIONS FOR MULTI-PORT WELL INSTALLATIONS, CONTAINMENT AREA	11/5/2019	3	R01: Brandon, William C (US EPA REGION 1)	R01: Morash, Melanie (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/641674
646113	MEMO REGARDING OPERABLE UNIT (OU) 1 / OU 2 REMEDIAL INVESTIGATION (RI) APPENDIX J REVIEW	11/5/2019	5	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)	R01: (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/646113
652662	REGIONAL SCREENING LEVELS (RSL) FOR CHEMICAL CONTAMINANTS AT SUPERFUND SITES, THQ 0.1	11/1/2019	1	R01: (US EPA REGION 1)		CHT / Chart/Table	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/652662
652663	REGIONAL SCREENING LEVELS (RSL) FOR CHEMICAL CONTAMINANTS AT SUPERFUND SITES, THQ 1.0	11/1/2019	1	R01: (US EPA REGION 1)		CHT / Chart/Table	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/652663

643135	LETTER REGARDING PROPOSAL TO APPEND THE ONGOING QUARTERLY MONITORING PROGRAM	10/23/2019	4	R01: Cashwell, James M (OLIN CORP)	R01: Morash, Melanie (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0534-Post Construction/08.01-CORRESPONDENCE (POST REMEDIAL ACTION)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/643135
643155	MEMO REGARDING EVALUATION OF POTENTIAL CONTAMINANTS OF CONCERN: EAST DITCH SURFACE WATER, SOUTH DITCH SURFACE WATER, AND GROUNDWATER	10/23/2019	561	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)	R01: (US EPA)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.02-SAMPLING & ANALYSIS DATA (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/643155
641683	PRESENTATION: COMMUNITY MEETING	10/22/2019	49	R01: (US EPA REGION 1)		MTG / Meeting Document	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.04-PUBLIC MEETINGS/HEARINGS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/641683
642182	SAVE THE DATE POSTCARD ANNOUNCING OPEN HOUSE / PUBLIC MEETING	10/22/2019	2	R01: (US EPA REGION 1)		MTG / Meeting Document	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.04-PUBLIC MEETINGS/HEARINGS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/642182
199603	Overview of the Olin Chemical Superfund Site Fact Sheet	10/21/2019	7			PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/A4.6-Community Involvement Plan	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/199603
641673	MEDIA ADVISORY: INFORMATIONAL MEETING TO BE HELD ON THE OLIN CHEMICAL SUPERFUND SITE IN WILMINGTON, MA	10/16/2019	2	R01: (US EPA REGION 1)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.03-NEWS CLIPPINGS/PRESS RELEASES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/641673
643156	MEMO REGARDING GROUNDWATER TREND EVALUATION FOR WELLS ASSOCIATED WITH EAST DITCH AND SOUTH DITCH	10/1/2019	70	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)	R01: (US EPA)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.02-SAMPLING & ANALYSIS DATA (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/643156
100012999	FACT SHEET - TECHNICAL ASSISTANCE SERVICES FOR COMMUNITIES (TASC) - 2019	10/1/2019	7	R01: (US EPA REGION 1)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.05-FACT SHEETS/INFORMATION UPDATES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100012999
643158	LETTER REGARDING PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) SAMPLING RESULTS	9/27/2019	93	R01: Bowen, Elizabeth T (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC), R01: Andolsek, Hank (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/04.02-SAMPLING & ANALYSIS DATA (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/643158
100002231	Superfund Task Force Final Report	9/9/2019	80	R11: (SUPERFUND TASK FORCE), R11: (Office Of Land & Emergency Management (OLEM))		RPT / Report	058-PROGRAM SUPPORT/0587-Public Affairs/B7.2-Public Information & Outreach	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/100002231
640101	MEMO REGARDING PLANT B / EAST DITCH RISK EVALUATION V2	8/27/2019	51	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP), R01: Woods, C (NOBIS GROUP), R01: Delong, T (NOBIS GROUP)	R01: (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.10-ENDANGERMENT/BASELINE RISK ASSESSMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640101
640109	EMAIL TRANSMITTING MEMOS REGARDING DENSE AQUEOUS PHASE LIQUID (DAPL) TREATMENT OPTIONS AND REVIEW FAILURE OF DAPL EXTRACTION PILOT TEST AND ALTERNATIVE WELL DESIGN FOR DAPL EXTRACTION (EMAIL HISTORY ATTACHED)	8/15/2019	2	R01: Morash, Melanie (US EPA REGION 1)	R01: Jennings, Lynne (US EPA REGION 1), R01: Cashwell, James M (OLIN CORP)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640109
640104	MEMO REGARDING DENSE AQUEOUS PHASE LIQUID (DAPL) TREATMENT OPTIONS	8/12/2019	7	R01: Huling, Scott G (US EPA)	R01: Dilorenzo, James M (US EPA REGION 1), R01: Morash, Melanie (US EPA REGION 1), R01: Smith, Christopher (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640104
640111	EMAIL REGARDING EPA COMMENTS ON 07/25/2019 PROPOSED STREAM GAUGE LOCATIONS (08/06/2019 REVIEW MEMO AND EMAIL HISTORY ATTACHED)	8/12/2019	7	R01: Morash, Melanie (US EPA REGION 1)	R01: Cashwell, James M (OLIN CORP)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640111
640113	EMAIL REGARDING EPA / NOBIS REVIEW OF CONTAINMENT AREA SOIL PROPOSAL (08/06/2019 REVIEW MEMO ATTACHED)	8/8/2019	5	R01: Dilorenzo, James (US EPA REGION 1)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640113
640137	MEMO REVIEWING SUPPLEMENTAL CHARACTERIZATION OF SOIL WITHIN THE CONTAINMENT AREA V3	8/6/2019	4	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)	R01: (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640137
643129	DATA GAPS WORK PLAN (TRANSMITTAL LETTER ATTACHED)	8/2/2019	74	R01: (GEOMEGA INC)	R01: (OLIN CORPORATION)	WP / Work Plan	053-REMEDIAL/0531-Remedy Characterization/04.07-WORK PLANS & PROGRESS REPORTS (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/643129
640115	EMAIL TRANSMITTING MEMOS REGARDING COMMENTS ON SEISMIC REFRACTION INFORMATION AND SURFACE WATER STREAM GAUGES (07/29/2019 STREAM GAUGE LOCATION COMMENT MEMO, 07/30/2019 GEOPHYSICAL ALIGNMENTS MEMO, AND EMAIL HISTORY ATTACHED)	7/31/2019	5	R01: Jennings, Lynne (US EPA REGION 1)	R01: Cashwell, James M (OLIN CORP)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640115
640117	EMAIL REGARDING ADDITIONAL FEEDBACK ON SEISMIC LINES (FIGURE OF PROPOSED LINES EAST OF OLIN AND EMAIL HISTORY ATTACHED)	7/31/2019	3	R01: Jennings, Lynne (US EPA REGION 1)	R01: Cashwell, James M (OLIN CORP)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640117

647039	MEMO REGARDING REVISED REMEDIAL INVESTIGATION (RI) REPORT REVIEW COMMENTS	7/31/2019	12	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)		MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/647039
640136	MEMO REGARDING PROPOSED STREAM GAUGE LOCATION REVIEW COMMENTS	7/29/2019	2	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)	R01: (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/640136
647040	MEMO REGARDING SUPPLEMENTAL CHARACTERIZATION OF SOIL WITHIN THE CONTAINMENT AREA (07/26/2019 TRANSMITTAL LETTER ATTACHED)	7/25/2019	7	R01: Bowen, Libby (WOOD), R01: Andolsek, Hank (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC), R01: Thompson, Peter (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC)	R01: Cashwell, James M (OLIN CORP), R01: Esakkiperumal, Chinny (OLIN CORPORATION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.03-SCOPES OF WORK (RI)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/647040
640135	MEMO REVIEW COMMENTS REGARDING REVISED DRAFT OPERABLE UNIT (OU) 1 AND OU2 FEASIBILITY STUDY (FS)	7/24/2019	9	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)	R01: (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.06-FEASIBILITY STUDY REPORTS	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/640135
647014	MEMO REGARDING CONTAINMENT AREA SOIL EVALUATION	7/22/2019	128	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)		MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.02-SAMPLING & ANALYSIS DATA (FS)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/647014
640102	MEMO REGARDING REVISED EVALUATION OF DENSE AQUEOUS PHASE LIQUID (DAPL) AND NDMA TO SUPPORT FEASIBILITY STUDY (FS) REVIEW AND DEVELOPMENT OF DAPL AND GROUNDWATER ALTERNATIVES V5	7/19/2019	60	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)	R01: (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/640102
640103	MEMO REGARDING DENSE AQUEOUS PHASE LIQUID (DAPL) EXTRACTION ALTERNATIVES V2.2	7/19/2019	29	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)	R01: (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/640103
640134	MEMO REGARDING GROUNDWATER HOTSPOT / DOWNGRADIENT CONTROL CONCEPTUAL MODEL MEMORANDUM	7/19/2019	7	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)	R01: (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/640134
100012144	PRESENTATION: OLIN'S RECOMMENDED MODIFICATIONS TO PROPOSED OCSS SEISMIC LINES FOLLOWING 07/12/2019 CONFERENCE CALL	7/19/2019	18	R01: (OLIN CORP)	R01: (US EPA REGION 1)	MTG / Meeting Document	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/100012144
100012145	MEMO REGARDING MODIFICATION TO SEISMIC LINES TO ACCOMMODATE USEPA'S PROPOSAL AND THE EXISTING DATA IN THE EAST-OF-OLIN AREA	7/18/2019	4	R01: Davis, Andy (GEOMEGA INC)	R01: Cashwell, James M (OLIN CORP), R01: Esakkiperumal, Chinny (OLIN CORPORATION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/100012145
647205	SEMI-ANNUAL STATUS REPORT NO. 24 (TRANSMITTAL LETTER ATTACHED)	7/3/2019	2005	R01: (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/647205
640133	DRAFT MEMO REGARDING GROUNDWATER EXTRACTION ALTERNATIVES - FEASIBILITY, EXTRACTION OF NDMA-CONTAINING GROUNDWATER WITHIN MAPLE MEADOW BROOK WETLANDS USING SWAMP MAT APPROACH	6/27/2019	25	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC), R01: Lambert, J (NOBIS GROUP)	R01: (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/640133
642184	LETTER REGARDING NOTICE OF DISAPPROVAL, FINAL INTERIM RESPONSE STEPS WORK PLAN (IRSWP) ADDENDUM - PLANT B CONTINUED OPERATIONS MAINTENANCE AND MONITORING (OM&M) PLAN	6/12/2019	2	R01: Dilorenzo, James M (US EPA REGION 1)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/642184
647016	REVISED REMEDIAL INVESTIGATION (RI) REPORT	6/1/2019	6056	R01: (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/647016
640854	FEASIBILITY STUDY (FS) REPORT, OPERABLE UNIT (OU) 1 AND OU2, REVISED DRAFT	5/1/2019	276	R01: (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/04.06-FEASIBILITY STUDY REPORTS	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/640854
640853	FEASIBILITY STUDY (FS) REPORT, INTERIM ACTION, DRAFT	4/1/2019	138	R01: (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/04.06-FEASIBILITY STUDY REPORTS	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/640853
652637	NEWS RELEASE: ADMINISTRATOR WHEELER RECOGNIZES ACCOMPLISHMENTS AT TWO SUPERFUND SITES MOVING OFF THE ADMINISTRATOR'S EMPHASIS LIST	4/1/2019	3	R01: (US EPA REGION 10		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.03-NEWS CLIPPINGS/PRESS RELEASES	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/652637
647258	PRESENTATION: WILMINGTON MEETING	3/26/2019	24	R01: (OLIN CORPORATION)		MTG / Meeting Document	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.04-PUBLIC MEETINGS/HEARINGS	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/647258
642120	LETTER REGARDING EPA RESPONSES TO 01/02/2019 RESPONSE TO EPA'S COMMENTS ON DRAFT REMEDIAL INVESTIGATION (RI) AND FEASIBILITY STUDY (FS) REPORTS	3/8/2019	172	R01: Dilorenzo, James M (US EPA REGION 1)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/642120
653915	CALCIUM SULFATE LANDFILL BIENNIAL REPORT (2017-2018)	2/22/2019	193	R01: (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC)	R01: (OLIN CORPORATION)	RPT / Report	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/653915
650489	SEMI-ANNUAL STATUS REPORT NO. 23	1/3/2019	241	R01: (WOOD)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/650489

647262	MEMO RESPONDING TO 11/29/2019 MEMO - RESOLUTION OF CONCEPTUAL SITE MODEL (CSM)	12/21/2018	36	R01: (US EPA REGION 1)	R01: (OLIN CORPORATION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647262
647842	MEMO REGARDING IMPROVING RESOLUTION AND TECHNICAL BASIS FOR CONCEPTUAL SITE MODEL (CSM) RELATIVE TO MAIN STREET AND JEWEL DRIVE DENSE AQUEOUS PHASE LIQUID (DAPL) POOLS	11/29/2018	21	R01: Brandon, Bill (US EPA REGION 1)	R01: Dilorenzo, James M (US EPA REGION 1), R01: Jennings, Lynne (US EPA REGION 1), R01: Lambert, Jennifer (NOBIS GROUP), R01: Smith, Christopher (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647842
640105	MEMO REGARDING REVIEW FAILURE OF DENSE AQUEOUS PHASE LIQUID (DAPL) EXTRACTION PILOT TEST AND ALTERNATIVE WELL DESIGN FOR DAPL EXTRACTION	11/16/2018	4	R01: Huling, Scott G (US EPA)	R01: Dilorenzo, James M (US EPA REGION 1), R01: Smith, Christopher (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640105
641688	LETTER RESPONDING TO NOTIFICATIONS REGARDING PLANT B	11/15/2018	3	R01: Dilorenzo, James (US EPA REGION 1)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/641688
643157	LETTER RESPONDING TO 5 SUBMITTALS FROM OLIN: 2 IRSWP MONITORING PROGRAM OPTIMIZATION PROPOSALS, GROUNDWATER OPTIMIZATION PROPOSAL, REQUEST FOR APPROVAL OF ADDITIONAL INVESTIGATION TASK, AND VERIFICATION OF DNAPL AT SELECT MONITORING LOCATIONS	11/15/2018	23	R01: Smith, Christopher (US EPA REGION 1)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/04.01-CORRESPONDENCE (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/643157
647841	MEMO REGARDING FOLLOW-UP TO MEETING OF 10/25/2018: REEVALUATION OF TECHNICAL BASIS FOR MAIN STREET SADDLE AND RELATED CONCEPTUAL SITE MODEL (CSM) ELEMENTS, INITIAL RESPONSE	11/15/2018	3	R01: Brandon, Bill (US EPA REGION 1)	R01: Dilorenzo, James M (US EPA REGION 1), R01: Jennings, Lynne (US EPA REGION 1), R01: Lambert, Jennifer (NOBIS GROUP), R01: Smith, Christopher (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647841
100010328	LETTER REGARDING DISAPPROVAL OF MARCH 2018 REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS) DELIVERABLES	9/25/2018	275	R01: Dilorenzo, James M (US EPA REGION 1)	R01: Esakkiperumal, Chinny (OLIN CORPORATION)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100010328
647015	MEMO REGARDING REVIEW COMMENTS ON REVISED ROCK MATRIX SAMPLING WORK PLAN	8/3/2018	3	R01: Lambert, J (NOBIS GROUP)		MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.02-SAMPLING & ANALYSIS DATA (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647015
650715	SEMI-ANNUAL STATUS REPORT NO. 22	7/26/2018	2069	R01: (WOOD)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650715
647041	ROCK MATRIX SAMPLING WORK PLAN (TRANSMITTAL LETTER ATTACHED)	7/6/2018	82	R01: (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC)	R01: (OLIN CORPORATION)	WP / Work Plan	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647041
647209	TECHNICAL REVIEW MEMO - DRAFT REMEDIAL INVESTIGATION (RI)	5/16/2018	27	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC)	R01: Dilorenzo, James M (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647209
647259	TECHNICAL MEMO - CONTAINMENT AREA BEDROCK BORING RESULTS (TRANSMITTAL LETTER ATTACHED)	5/10/2018	44	R01: Murphy, Michael, J (WOOD), R01: Thompson, Peter (WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS INC)	R01: Cashwell, James M (OLIN CORP), R01: Esakkiperumal, Chinny (OLIN CORPORATION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.02-SAMPLING & ANALYSIS DATA (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647259
642599	LETTER REGARDING EPA REVIEW AND PARTIAL CONDITIONAL APPROVAL OF GW-413 AREA SUPPLEMENTAL INVESTIGATION	3/29/2018	4	R01: Dilorenzo, James M (US EPA REGION 1)	R01: Cashwell, James M (OLIN CORP)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/642599
650714	SEMI-ANNUAL STATUS REPORT NO. 21 (TRANSMITTAL LETTER ATTACHED)	1/11/2018	3025	R01: (AMEC FOSTER WHEELER ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650714
647235	MEMO REGARDING COMMENTS ON DENSE AQUEOUS PHASE LIQUID (DAPL) FOCUSED FEASIBILITY STUDY (FS)	11/27/2017	2	R01: (WILMINGTON ENVIRONMENTAL RESTORATION COMMITTEE)	R01: Dilorenzo, James (US EPA REGION 1), R01: Waldeck, Garry (MA DEPT OF ENVIRONMENTAL PROTECTION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.06-FEASIBILITY STUDY REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647235
647237	MEMO REGARDING COMMENTS ON FOCUSED REMEDIAL INVESTIGATION (RI) REPORT, DENSE AQUEOUS PHASE LIQUID (DAPL)	11/27/2017	3	R01: (WILMINGTON ENVIRONMENTAL RESTORATION COMMITTEE)	R01: Dilorenzo, James (US EPA REGION 1), R01: Waldeck, Garry (MA DEPT OF ENVIRONMENTAL PROTECTION)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647237
647236	DRAFT FOCUSED REMEDIAL INVESTIGATION (RI) REPORT, DENSE AQUEOUS PHASE LIQUID (DAPL) (TRANSMITTAL LETTER ATTACHED)	10/5/2017	235	R01: (AMEC FOSTER WHEELER ENVIRONMENT & INFRASTRUCTURE, INC.)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647236
650713	SEMI-ANNUAL STATUS REPORT NO. 20	7/13/2017	2723	R01: (AMEC FOSTER WHEELER ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650713
647255	LETTER REGARDING EVALUATION OF EARLY ACTION TO ADDRESS PRINCIPAL THREATS IN GROUNDWATER	2/24/2017	24	R01: Dilorenzo, James M (US EPA REGION 1)	R01: Cashwell, James M (OLIN CORP)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647255
650712	SEMI-ANNUAL STATUS REPORT NO. 19	1/3/2017	2477	R01: (AMEC FOSTER WHEELER ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650712
647830	LETTER REGARDING REVIEW AND CONDITIONAL APPROVAL OF GW-413 AREA SUPPLEMENTAL INVESTIGATION PROPOSAL	8/4/2016	2	R01: Dilorenzo, James M (US EPA REGION 1)	R01: Cashwell, James M (OLIN CORP)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647830
650711	SEMI-ANNUAL STATUS REPORT NO. 18 (06/29/2016 TRANSMITTAL LETTER ATTACHED)	7/1/2016	2498	R01: (AMEC FOSTER WHEELER ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650711

642597	LETTER REGARDING GW-413 AREA SUPPLEMENTAL INVESTIGATION PROPOSAL	6/14/2016	35	R01: Murphy, Michael (AMEC FOSTER WHEELER), R01: Thompson, Peter (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: Dilorenzo, James M (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/642597
650710	SEMI-ANNUAL STATUS REPORT NO. 17	1/7/2016	1947	R01: (AMEC FOSTER WHEELER ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650710
627393	FINAL REMEDIAL INVESTIGATION (RI) REPORT - APPENDIX A - D	7/24/2015	1242	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/627393
627394	FINAL REMEDIAL INVESTIGATION (RI) REPORT - APPENDIX E	7/24/2015	25503	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/627394
627395	FINAL REMEDIAL INVESTIGATION (RI) REPORT - APPENDIX F - J	7/24/2015	978	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/627395
627396	FINAL REMEDIAL INVESTIGATION (RI) REPORT - APPENDIX K - L	7/24/2015	682	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/627396
627397	FINAL REMEDIAL INVESTIGATION (RI) REPORT - APPENDIX M	7/24/2015	11970	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/627397
627398	FINAL REMEDIAL INVESTIGATION (RI) REPORT - APPENDIX N	7/24/2015	1640	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/627398
627399	FINAL REMEDIAL INVESTIGATION (RI) REPORT - APPENDIX O	7/24/2015	11432	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/627399
641414	FINAL REMEDIAL INVESTIGATION (RI) REPORT	7/24/2015	517	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/641414
642000	FINAL REMEDIAL INVESTIGATION (RI) REPORT - ATTACHMENTS A - E	7/24/2015	500	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/642000
650709	SEMI-ANNUAL STATUS REPORT NO. 16 (TRANSMITTAL LETTER ATTACHED)	7/7/2015	1703	R01: (AMEC FOSTER WHEELER ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650709
647208	FINAL DATA GAP ANALYSIS AND ADDITIONAL FIELD STUDIES WORK PLAN	7/3/2015	464	R01: (AMEC FOSTER WHEELER ENVIRONMENT & INFRASTRUCTURE, INC.)	R01: (OLIN CORPORATION)	WP / Work Plan	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647208
640862	LETTER REGARDING REVIEW AND CONDITIONAL APPROVAL, DRAFT FINAL REMEDIAL INVESTIGATION (RI) AND RISK ASSESSMENT REPORT AND RELATED DOCUMENTS	7/2/2015	2	R01: Dilorenzo, James M (US EPA REGION 1)	R01: Cashwell, James M (OLIN CORP)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640862
576599	COMFORT/STATUS LETTER - 51 EAMES STREET, WILMINGTON, MA	5/13/2015	8	R01: Barmakian, Nancy (US EPA REGION 1)	R01: Jones, Robert (NEW ENGLAND TRANSRAIL LLC)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/576599
642595	LETTER REGARDING CONDITIONAL APPROVAL OF REVISED OPERABLE UNIT (OU) 3 DATA GAP ANALYSIS AND ADDITIONAL FIELD STUDIES WORK PLAN	5/13/2015	7	R01: Dilorenzo, James M (US EPA REGION 1)	R01: Cashwell, James M (OLIN CORP)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/04.07-WORK PLANS & PROGRESS REPORTS (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/642595
644093	LETTER REGARDING COMMENTS ON DATA GAP ANALYSIS AND ADDITIONAL FIELD STUDIES WORK PLAN	4/3/2015	4	R01: Trifilo, Joel J (GEOINSIGHT INC), R01: Trainer, Kevin D (GEOINSIGHT INC), R01: Webster, Michael J (GEOINSIGHT INC)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644093
644091	COMMENTS ON DATA GAP ANALYSIS AND SUPPLEMENTAL WORK PLAN REVISED (12/16/2014)	3/17/2015	5	R01: (WILMINGTON ENVIRONMENTAL RESTORATION COMMITTEE)	R01: Dilorenzo, James (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644091
643159	MEMO REGARDING SUPPLEMENTAL WATER LEVEL AND HYDRAULIC ANALYSIS, DENSE NON-AQUEOUS PHASE LIQUID (DNAPL) EXTRACTION PILOT STUDY PERFORMANCE EVALUATION REPORT	2/5/2015	19	R01: Rand, John B (AMEC ENVIRONMENT AND INFRASTRUCTURE INC), R01: Thompson, Peter (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: Cashwell, James M (OLIN CORP)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/04.02-SAMPLING & ANALYSIS DATA (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/643159
644092	REVIEW OF DATA GAP ANALYSIS AND ADDITIONAL FIELD STUDIES WORK PLAN (TRANSMITTAL LETTER ATTACHED)	1/23/2015	6	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644092
650708	SEMI-ANNUAL STATUS REPORT NO. 15 (TRANSMITTAL LETTER ATTACHED)	12/31/2014	1972	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650708
647263	DATA GAP ANALYSIS AND ADDITIONAL FIELD STUDIES WORK PLAN	12/16/2014	429	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: (OLIN CORPORATION)	WP / Work Plan	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647263
576492	DENSE AQUEOUS PHASE LIQUID (DAPL) EXTRACTION PILOT STUDY PERFORMANCE EVALUATION REPORT	11/7/2014	101	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/576492
650707	SEMI-ANNUAL STATUS REPORT NO. 14 (TRANSMITTAL LETTER ATTACHED)	7/2/2014	2212	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650707

644090	REVIEW OF DRAFT FINAL REMEDIAL INVESTIGATION (RI) REPORT (TRANSMITTAL LETTER ATTACHED)	5/19/2014	78	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/644090
640859	LETTER REGARDING RESPONSE TO COMMENTS CONCERNING SECOND INTERIM DELIVERABLE - BASELINE ECOLOGICAL RISK ASSESSMENT (ERA)	3/21/2014	27	R01: Murphy, Michael (AMEC ENVIRONMENT AND INFRASTRUCTURE INC), R01: Thompson, Peter (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: Dilorenzo, James M (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/03.10-ENDANGERMENT/BASELINE RISK ASSESSMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640859
640860	RESPONSE TO COMMENTS CONCERNING REMEDIAL INVESTIGATION (RI) SECTION 1-5 INCLUDING STAKEHOLDER COMMENTS (TRANSMITTAL LETTER ATTACHED)	3/21/2014	70	R01: Murphy, Michael (AMEC ENVIRONMENT AND INFRASTRUCTURE INC), R01: Thompson, Peter (AMEC ENVIRONMENT AND INFRASTRUCTURE INC)	R01: Dilorenzo, James M (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640860
650499	SEMI-ANNUAL STATUS REPORT NO. 13	1/29/2014	7291	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650499
652661	REGIONAL SCREENING LEVELS (RSL) FOR CHEMICAL CONTAMINANTS AT SUPERFUND SITES	11/1/2013	17	R01: (US EPA REGION 1)		CHT / Chart/Table	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/652661
650498	SEMI-ANNUAL STATUS REPORT NO. 12	7/1/2013	9598	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650498
100002732	Aquatic Life Ambient Water Quality Criteria for Ammonia - Freshwater - 2013 - EPA 822-R-18-002	4/1/2013	255	R11: (US ENVIRONMENTAL PROTECTION AGENCY)		LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.4-Directives and Policy Guidance Documents	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/11/100001732
640861	REVIEW OF PRELIMINARY REMEDIAL INVESTIGATION (RI) REPORT, REMAINING ISSUES (TRANSMITTAL LETTER ATTACHED)	1/31/2013	13	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James M (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640861
650497	SEMI-ANNUAL STATUS REPORT NO. 11	1/2/2013	23905	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650497
647004	FINAL OPERATIONS, MAINTENANCE AND PERFORMANCE MONITORING (O&M) PLAN, DENSE NON-AQUEOUS PHASE LIQUID (DNAPL) EXTRACTION PILOT TEST	10/1/2012	688	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORPORATION)	R01: (US EPA REGION 1)	WP / Work Plan	053-REMEDIAL/0534-Post Construction/08.05-WORK PLANS & PROGRESS REPORTS (POST REMEDIAL)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647004
643123	RESPONSE ALTERNATIVES EVALUATION REPORT	8/3/2012	104	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORPORATION)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/04.04-INTERIM DELIVERABLES (FS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/643123
650496	SEMI-ANNUAL STATUS REPORT NO. 10	7/2/2012	1375	R01: (AMEC ENVIRONMENT AND INFRASTRUCTURE INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650496
650495	SEMI-ANNUAL STATUS REPORT NO. 9	12/30/2011	4822	R01: (MACTEC ENGINEERING AND CONSULTING INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650495
647590	PRELIMINARY REMEDIAL INVESTIGATION (RI) REPORT	8/22/2011	8527	R01: (MACTEC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647590
174480	FACT SHEET: GROUNDWATER ROAD MAP DETAILING THE RECOMMENDED PROCESS FOR RESTORING CONTAMINATED GROUNDWATER AT SUPERFUND SITES OSWER 9283.1-34	7/1/2011	31			LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.1-Regulations, Standards & Guidelines	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/174480
650494	SEMI-ANNUAL STATUS REPORT NO. 8	7/1/2011	5037	R01: (MACTEC ENGINEERING AND CONSULTING INC), R01: OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650494
485654	[REDACTED] ENGINEERING EVALUATION / COST ANALYSIS (EE/CA) APPROVAL MEMORANDUM FOR NON-TIME CRITICAL REMOVAL ACTION (NTCRA), OPERABLE UNIT 3 (OU3)	5/26/2011	25	R01: Owens Iii, James T (US EPA REGION 1)		MEMO / Memorandum	054-REMOVAL/0541-Removal Responses/02.02-REMOVAL RESPONSE REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485654
484768	REVIEW OF GROUNDWATER FROM WELL (MAP 24/LOT 54) REGARDING N-NITROSODIMETHYLAMINE (NDMA)	5/12/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: Stanley, Lisa (WILMINGTON (MA) RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484768
484771	[REDACTED] REVIEW OF GROUNDWATER FROM WELL (MAP 27/LOT 14C) REGARDING N-NITROSODIMETHYLAMINE (NDMA)	5/12/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484771
484772	[REDACTED] REVIEW OF GROUNDWATER FROM WELL (MAP 24/LOT 63) REGARDING N-NITROSODIMETHYLAMINE (NDMA)	5/12/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484772
484773	[REDACTED] REVIEW OF GROUNDWATER FROM WELL (MAP 24/LOT 94) REGARDING N-NITROSODIMETHYLAMINE (NDMA)	5/12/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484773

484774	[REDACTED] REVIEW OF GROUNDWATER FROM WELL (MAP 02/LOT 07E) REGARDING N-NITROSODIMETHYLAMINE (NDMA)	5/12/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484774
484775	[REDACTED] REVIEW OF GROUNDWATER FROM WELL (MAP 15/LOT 2C) REGARDING N-NITROSODIMETHYLAMINE (NDMA)	5/12/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484775
484776	[REDACTED] REVIEW OF GROUNDWATER FROM WELL (MAP 24/LOT 54) REGARDING N-NITROSODIMETHYLAMINE (NDMA)	5/12/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484776
484777	[REDACTED] REVIEW OF GROUNDWATER FROM WELL (MAP 24/LOT 64) REGARDING N-NITROSODIMETHYLAMINE (NDMA)	5/12/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484777
485558	[REDACTED] LETTER REGARDING RESIDENCE WELL SAMPLING	4/29/2011	2	R01: Murphy, Michael (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter H (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485558
485561	[REDACTED] LETTER REGARDING RESIDENCE WELL SAMPLING	4/29/2011	2	R01: Murphy, Michael (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485561
483572	[REDACTED] EMAIL REGARDING UPDATE ON POTENTIAL WATER SOLUTION OPTION (WITH EMAIL HISTORY)	4/25/2011	2	R01: (WILMINGTON (MA) - RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483572
70001450	EMAIL REGARDING SCHEDULING OF BRIEFING FOR WILMINGTON TOWN OFFICIALS ON OLIN PRIVATE WELL SAMPLING (EMAIL HISTORY ATTACHED)	4/25/2011	3	R01: (WILMINGTON (MA) TOWN OF)	R01: White, Sarah (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001450
483571	[REDACTED] EMAIL REGARDING UPDATE OF WATER SOLUTION	4/21/2011	1	R01: (WILMINGTON (MA) - RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483571
70001449	EMAIL REGARDING OLIN LETTER OF SUPPORT FOR NON-TIME CRITICAL REMOVAL ACTION (NTCRA)	4/21/2011	1	R01: Coyne, Joseph (MA DEP)	R01: Dilorenzo, James (US EPA REGION 1), R01: Brill, Larry (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001449
483576	[REDACTED] EMAIL REGARDING PRIVATE WELL UPDATE	4/20/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	EML / Email	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483576
485613	MADEP SUPPORT LETTER FOR NON-TIME CRITICAL REMOVAL ACTION (NTCRA) ACTION MEMORANDUM	4/20/2011	2	R01: Naparstek, Jay (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Brill, Larry (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485613
70001484	MA DEP SUPPORT LETTER FOR NON-TIME CRITICAL REMOVAL ACTION (NTCRA)	4/20/2011	2	R01: Naparstek, Jay (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Brill, Larry (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001484
70001447	EMAIL REGARDING RECENT PRIVATE WELL RESULTS	4/12/2011	2	R01: Webster, Michael J (GEOINSIGHT INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001447
483570	[REDACTED] EMAIL REGARDING RESIDENTIAL WELL SAMPLING CONDUCTED ON 03/30/2011 AND 03/31/2011	4/11/2011	2	R01: Brunelle, Jeffrey (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483570
483575	[REDACTED] EMAIL REGARDING N-NITROSODIMETHYLAMINE (NDMA) IN PRIVATE WELLS DATA CONFIRMATION	4/11/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) TOWN OF)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483575
484735	[REDACTED] EMAIL REGARDING OLIN CORRESPONDENCE DATED 04/07/2011	4/11/2011	1	R01: (WILMINGTON (MA) - RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484735
70001442	EMAIL REGARDING HOME OWNER LETTERS	4/8/2011	1	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001442
484789	MAP: FIGURE 1 N-NITROSODIMETHYLAMINE (NDMA) CONCENTRATIONS IN RESIDENTIAL WELLS, REVISION 03 - 2010	4/6/2011	1	R01: (NOBIS ENGINEERING INC)		FIG / Figure/Map/ Drawing	056-SITE SUPPORT/0561-Administrative Support/17.04-NON-PRINT MATERIALS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484789

70001473	MAP: N-NITROSODIMETHYLAMINE (NDMA) CONCENTRATIONS IN RESIDENTIAL WELLS - 2010	4/6/2011	1	R01: (NOBIS ENGINEERING INC)		FIG / Figure/Map/ Drawing	056-SITE SUPPORT/0561-Administrative Support/17.04-NON-PRINT MATERIALS	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/70001473
483568	[REDACTED] EMAIL REGARDING COMMENTS ON REVISED PRIVATE WELL FIGURE (EMAIL HISTORY ATTACHED)	4/5/2011	7	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483568
70001452	SUMMARY OF 2010 PRIVATE WELL DATA M-14/L-02B	4/5/2011	11			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/70001452
70001454	SUMMARY OF 2010 PRIVATE WELL DATA M-27M-27/L-14C	4/5/2011	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/70001454
483567	[REDACTED] EMAIL REGARDING COMMENTS ON REVISED PRIVATE WELL FIGURE	4/4/2011	4	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483567
70001444	EMAIL REGARDING FIGURE 1 - N-NITROSODIMETHYLAMINE (NDMA) CONCENTRATION IN RESIDENTIAL WELLS - 2010 (EMAIL HISTORY ATTACHED)	4/1/2011	2	R01: Bouvier, Marc (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/70001444
70001470	EMAIL TRANSMITTING REVISED PRIVATE WELL FIGURE	4/1/2011	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: Morrow, Stephen (OLIN CORP)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/70001470
485564	[REDACTED] MAP: FIGURE 1 N-NITROSODIMETHYLAMINE (NDMA) CONCENTRATIONS IN RESIDENTIAL WELLS - 2010	3/31/2011	1	R01: (NOBIS ENGINEERING INC)		FIG / Figure/Map/ Drawing	056-SITE SUPPORT/0561-Administrative Support/17.04-NON-PRINT MATERIALS	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485564
70001475	FIGURE 1: N-NITROSODIMETHYLAMINE (NDMA) CONCENTRATIONS IN RESIDENTIAL WELLS - 2010	3/31/2011	1	R01: (NOBIS ENGINEERING INC)		FIG / Figure/Map/ Drawing	056-SITE SUPPORT/0561-Administrative Support/17.04-NON-PRINT MATERIALS	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/70001475
485658	[REDACTED] RESIDENTIAL WELLS FOR SAMPLING 2011	3/30/2011	2			LST / List/Index	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485658
70001439	EMAIL REGARDING UPDATED RESIDENTIAL SCHEDULE	3/30/2011	2	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/70001439
483574	[REDACTED] EMAIL REGARDING PRIVATE WELL LETTERS	3/29/2011	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: Morrow, Stephen (OLIN CORP)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483574
483565	[REDACTED] EMAIL REGARDING DRAFT REVIEW FOR PRIVATE WELL RESULTS QUARTER 3 AND 4	3/28/2011	2	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483565
483566	[REDACTED] EMAIL REGARDING PRIVATE WELL QUARTER 3 AND 4, INTERNAL DRAFT	3/28/2011	2	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483566
483569	[REDACTED] EMAIL REGARDING PRIVATE WELL SAMPLING 2011, 1ST QUARTER (EMAIL HISTORY ATTACHED)	3/28/2011	3	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483569
483494	[REDACTED] SUMMARY OF PRIVATE WELL RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL AND MASSACHUSETTS DRINKING WATER STANDARDS/GUIDELINES	3/25/2011	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483494
483495	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING	3/25/2011	2	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Stephen (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483495
483496	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING	3/25/2011	2	R01: Morrow, Stephen (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483496
483497	[REDACTED] SUMMARY OF PRIVATE WELL RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL AND MASSACHUSETTS DRINKING WATER STANDARDS/GUIDELINES	3/25/2011	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483497

483498	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING	3/25/2011	2	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter H (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483498
483499	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING	3/25/2011	1	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483499
483564	[REDACTED] EMAIL REGARDING PRIVATE WELL SAMPLING 2011 - 1ST QUARTER	3/24/2011	2	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483564
485000	[REDACTED] ADDITIONAL PRIVATE WELLS LOCATION - MARCH 2011	3/24/2011	2			LST / List/Index	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485000
485657	[REDACTED] 2011 QUARTER 1 PRIVATE WELL DATA	3/24/2011	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485657
70001468	EMAIL TRANSMITTING ADDITIONAL PRIVATE WELL LOCATIONS	3/24/2011	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: Morrow, Stephen (OLIN CORP)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001468
70001478	ADDITIONAL WELL LOCATIONS FIGURE	3/24/2011	1	R01: (GOOGLE)		FIG / Figure/Map/ Drawing	056-SITE SUPPORT/0561-Administrative Support/17.04-NON-PRINT MATERIALS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001478
483573	[REDACTED] EMAIL REGARDING LATEST PRIVATE WELL RESULTS	3/21/2011	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: Morrow, Stephen (OLIN CORP)	EML / Email	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483573
70001435	EMAIL REGARDING WILMINGTON RESIDENTIAL WELLS 2010 DATA	3/21/2011	2	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001435
70001461	SUMMARY OF 2010 PRIVATE WELL DATA M-14/L-02B	3/21/2011	11			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001461
70001482	SUMMARY OF 2010 PRIVATE WELL DATA	3/18/2011	11			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001482
70001463	EMAIL REGRADING OLIN DRINKING WATER RISKS (EMAIL HISTORY ATTACHED)	3/10/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001463
70001515	EMAIL REGARDING OLIN DRINKING WATER RISKS	3/10/2011	1	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001515
70001525	RESIDENTIAL DRINKING WATER INGESTION CANCER RISK 70 YEAR EXPOSURE	3/10/2011	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001525
653797	LETTER REGARDING APPROVAL OF MODIFICATION OF POST CLOSURE MONITORING PLAN, OLIN GYPSUM LANDFILL, 51 EAMES STREET	3/3/2011	2	R01: Adams, David C (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: Carrigan, John A (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653797
485603	EMAIL REGARDING OLIN PRIVATE WELL INFORMATION	2/15/2011	1	R01: Newhouse, Shelly (WILMINGTON (MA) BOARD OF HEALTH)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485603
70001521	EMAIL REGARDING OLIN PRIVATE WELL INFORMATION	2/15/2011	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: Newhouse, Shelly (WILMINGTON (MA) BOARD OF HEALTH)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001521
485535	[REDACTED] LIST OF WELLS SORTED BY ADDRESSES (MAPS ATTACHED) [HARD COPY IMAGE SKEWED]	2/11/2011	9			LST / List/Index	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485535
483590	[REDACTED] EMAIL REGARDING UNVALIDATED N-NITROSODIMETHYLAMINE (NDMA) DATA FOR DECEMBER SAMPLING (EMAIL HISTORY ATTACHED)	2/7/2011	3	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483590

484770	[REDACTED] FIGURE 1 N-NITROSODIMETHYLAMINE (NDMA) CONCENTRATIONS IN RESIDENTIAL WELLS - DECEMBER 2010	2/7/2011	1	R01: (NOBIS ENGINEERING INC)		FIG / Figure/Map/ Drawing	056-SITE SUPPORT/0561-Administrative Support/17.04-NON-PRINT MATERIALS	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/484770
70001514	EMAIL REGARDING OLIN N-NITROSODIMETHYLAMINE (NDMA) RESIDENTIAL FIGURE	2/7/2011	1	R01: Bouvier, Marc (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/70001514
483589	[REDACTED] EMAIL REGARDING RESIDENTIAL WELLS SUMMARY REPORT (EMAIL HISTORY ATTACHED)	2/4/2011	7	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483589
483580	[REDACTED] EMAIL REGARDING WELL RESULTS	1/31/2011	2	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483580
483588	[REDACTED] EMAIL REGARDING LOW-LEVEL PAHS DETECTED IN PRIVATE WELLS (EMAIL HISTORY ATTACHED)	1/26/2011	3	R01: Sugatt, Richard (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483588
483586	[REDACTED] EMAIL REGARDING LOW-LEVEL PAHS DETECTED IN PRIVATE WELLS (EMAIL HISTORY ATTACHED)	1/25/2011	2	R01: Sugatt, Richard (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483586
483587	[REDACTED] EMAIL REGARDING LOW-LEVEL PAHS DETECTED IN PRIVATE WELLS (EMAIL HISTORY ATTACHED)	1/25/2011	4	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483587
483594	[REDACTED] EMAIL REGARDING OLIN SUMMER 2010 DRINKING WATER WELLS - PAHS	1/25/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	EML / Email	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483594
484739	LETTER REGARDING TRITES RESIDENCE WELL SAMPLING	1/24/2011	2	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/484739
485043	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING	1/24/2011	2	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485043
485504	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING CONDUCTED IN AUGUST 2010	1/24/2011	2	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485504
485507	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING CONDUCTED IN AUGUST 2010	1/24/2011	2	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485507
485676	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING	1/24/2011	2	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485676
484738	[REDACTED] EMAIL REGARDING WELL WATER APPOINTMENT CANCELLATION (EMAIL HISTORY ATTACHED)	1/18/2011	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/484738
485508	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING CONDUCTED IN AUGUST 2010	1/18/2011	1	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485508
485512	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING CONDUCTED IN AUGUST 2010	1/18/2011	1	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485512
485520	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING CONDUCTED IN AUGUST 2010	1/18/2011	1	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485520
485538	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN AUGUST 2010	1/18/2011	1	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485538
485539	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN AUGUST 2010	1/18/2011	1	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485539

485540	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN AUGUST 2010	1/18/2011	1	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485540
483585	[REDACTED] EMAIL REGARDING WELL WATER APPOINTMENT CANCELLATION	1/17/2011	1	R01: (WILMINGTON (MA) - RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483585
485042	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN JULY AND AUGUST 2010 (CERTIFIED MAIL RECEIPTS AND SUPPORTING DOCUMENTATION ATTACHED)	1/17/2011	46	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485042
650493	SEMI-ANNUAL STATUS REPORT NO. 7	1/14/2011	27759	R01: (MACTEC ENGINEERING AND CONSULTING INC), R01: OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/650493
483577	[REDACTED] EMAIL REGARDING QUARTERS 1 AND 2 RESULT LETTERS (EMAIL HISTORY ATTACHED)	1/13/2011	2	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483577
483578	[REDACTED] EMAIL REGARDING QUARTER 2 RESULT LETTERS (EMAIL HISTORY ATTACHED)	1/13/2011	2	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483578
483579	[REDACTED] EMAIL REGARDING QUARTER 2 RESULTS LETTERS (EMAIL HISTORY ATTACHED)	1/13/2011	2	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483579
483584	[REDACTED] EMAIL REGARDING WELL WATER APPOINTMENT (EMAIL HISTORY ATTACHED)	1/13/2011	8	R01: (WILMINGTON (MA) - RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483584
485659	[REDACTED] TRANSMITTAL LETTER FOR DATA VALIDATION SUMMARY AND LABORATORY ANALYTICAL DATA	1/13/2011	1	R01: Morrow, Stephen (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485659
485667	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING	1/13/2011	1	R01: Morrow, Stephen (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485667
485001	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING	1/11/2011	1	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485001
485002	[REDACTED] TRANSMITTAL LETTER FOR DATA VALIDATION SUMMARY AND LABORATORY ANALYTICAL DATA	1/11/2011	1	R01: Morrow, Stephen (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485002
485004	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING	1/11/2011	1	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485004
485549	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING	1/11/2011	1	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485549
483582	[REDACTED] EMAIL CORRESPONDENCE REGARDING WELL WATER (EMAIL HISTORY ATTACHED)	1/5/2011	3	R01: (WILMINGTON (MA) - RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483582
483583	[REDACTED] EMAIL REGARDING WELL WATER APPOINTMENT (EMAIL HISTORY ATTACHED)	1/5/2011	5	R01: (WILMINGTON (MA) - RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483583
483592	[REDACTED] EMAIL REGARDING WELL WATER APPOINTMENT (EMAIL HISTORY ATTACHED)	1/5/2011	4	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483592
483593	[REDACTED] EMAIL REGARDING WELL WATER APPOINTMENT (EMAIL HISTORY ATTACHED)	1/5/2011	6	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483593
483581	[REDACTED] EMAIL REGARDING BOTTLED WATER	12/27/2010	2	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Guichard, Brian (OLIN CHEMICAL)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483581

483591	[REDACTED] EMAIL REGARDING WELL WATER (EMAIL HISTORY ATTACHED)	12/27/2010	3	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483591
484736	[REDACTED] EMAIL CORRESPONDENCE REGARDING WELL WATER	12/24/2010	2	R01: (WILMINGTON (MA) - RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484736
485668	[REDACTED] PRIVATE RESIDENTIAL WELLS SAMPLED	12/15/2010	2			RPT / Report	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485668
70001491	EMAIL REGARDING FOURTH QUARTER PRIVATE WELL SAMPLING	12/15/2010	2	R01: Morrow, Stephen (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001491
653930	LETTER REGARDING MODIFICATION OF POST CLOSURE MONITORING PLAN, REQUIREMENT FOR APPLIATION, OLIN GYPSUM LANDFILL	12/14/2010	2	R01: Adams, David C (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: Carrigan, John A (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Morrow, Stephen (OLIN CORP)	LTR / Letter	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653930
484758	[REDACTED] PRIVATE RESIDENTIAL WELLS SAMPLED DECEMBER 2010	12/1/2010	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484758
485038	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN JULY, AUGUST AND SEPTEMBER 2010 (SUPPORTING DOCUMENTATION ATTACHED) [MARGINALIA]	11/29/2010	36	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485038
484706	[REDACTED] EMAIL REGARDING N-NITROSODIMETHYLAMINE (NDMA) WELLS	11/12/2010	2	R01: (TOWN OF WILMINGTON)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484706
484712	[REDACTED] EMAIL REGARDING N-NITROSODIMETHYLAMINE (NDMA) IN WELLS	11/12/2010	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: (TOWN OF WILMINGTON)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484712
484713	[REDACTED] EMAIL REGARDING N-NITROSODIMETHYLAMINE (NDMA) IN WELLS AND ASKING FOR POSIBILITY TO GET IN TOUCH WITH OWNERS (EMAIL HISTORY ATTACHED)	11/12/2010	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (TOWN OF WILMINGTON)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484713
484714	[REDACTED] EMAIL REGARDING RECOMMENDATION THAT WELL WATER NO LONGER BE USED FOR DRINKING OR COOKING PURPOSES DUE TO CONTINUED DETECTION OF NDMA	11/12/2010	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484714
485003	[REDACTED] SUMMARY OF PRIVATE RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL AND MASSACHUSETTS DRINKING WATER STANDARDS/GUIDELINES (12/03/2010 DATA VALIDATION SUMMARY ATTACHED)	11/12/2010	44			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485003
485006	[REDACTED] SUMMARY OF PRIVATE RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL AND MASSACHUSETTS DRINKING WATER STANDARDS/GUIDELINES (12/03/2010 DATA VALIDATION SUMMARY ATTACHED)	11/12/2010	50			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485006
485505	[REDACTED] SUMMARY OF PRIVATE RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL AND MASSACHUSETTS DRINKING WATER STANDARDS/GUIDELINES (12/03/2010 DATA VALIDATION SUMMARY ATTACHED)	11/12/2010	60			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485505
485506	[REDACTED] SUMMARY OF PRIVATE RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL AND MASSACHUSETTS DRINKING WATER STANDARDS/GUIDELINES (12/03/2010 DATA VALIDATION SUMMARY ATTACHED) [MARGINALIA]	11/12/2010	60			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485506
485509	[REDACTED] SUMMARY OF PRIVATE RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL AND MASSACHUSETTS DRINKING WATER STANDARDS/GUIDELINES (12/03/2010 DATA VALIDATION SUMMARY ATTACHED)	11/12/2010	60			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485509
485513	[REDACTED] SUMMARY OF PRIVATE RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL AND MASSACHUSETTS DRINKING WATER STANDARDS/GUIDELINES (12/03/2010 DATA VALIDATION SUMMARY ATTACHED) [MARGINALIA]	11/12/2010	60			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485513

485521	[REDACTED] SUMMARY OF PRIVATE RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL AND MASSACHUSETTS DRINKING WATER STANDARDS/GUIDELINES (12/03/2010 DATA VALIDATION SUMMARY ATTACHED) [MARGINALIA]	11/12/2010	60			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485521
485522	[REDACTED] SUMMARY OF PRIVATE RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL AND MASSACHUSETTS DRINKING WATER STANDARDS/GUIDELINES (12/03/2010 DATA VALIDATION SUMMARY ATTACHED) [MARGINALIA]	11/12/2010	76			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485522
485005	[REDACTED] SUMMARY OF PRIVATE RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL AND MASSACHUSETTS DRINKING WATER STANDARDS/GUIDELINES (12/03/2010 DATA VALIDATION SUMMARY ATTACHED)	11/11/2010	60			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485005
485516	[REDACTED] LETTER REGARDING US EPA REQUEST TO PROVIDE BOTTLED WATER (SUPPORTING DOCUMENTATION ATTACHED)	11/8/2010	83	R01: Hilliard, Garland (OLIN CORP)	R01: Owens, James T (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485516
484701	[REDACTED] EMAIL TRANSMITTING RISK CALCULATIONS FOR ALL DETECTED COMPOUNDS (EMAIL HISTORY ATTACHED)	11/1/2010	3	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484701
485082	MEMO CONCERNING NDMA IN PRIVATE WELLS AND RECOMMENDATION TO DISCONTINUE CONSUMPTION	11/1/2010	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: Owens, James T (US EPA REGION 1)	MEMO / Memorandum	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485082
485502	[REDACTED] REQUEST TO REDUCE EXPOSURE TO NDMA (ROUTING AND TRANSMITTAL SLIP ATTACHED) (WITH CONCURRENCES)	11/1/2010	4	R01: Owens, James T (US EPA REGION 1)	R01: Hilliard, Garland (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485502
485666	[REDACTED] REQUEST TO REDUCE EXPOSURE TO NDMA [UNSIGNED]	11/1/2010	3	R01: Owens, James T (US EPA REGION 1)	R01: Hilliard, Garland (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485666
70001543	EMAIL TRANSMITTING N-NITROSODIMETHYLAMINE (NDMA) 1E-04 RISK SPREADSHEET	10/28/2010	1	R01: Sugatt, Richard (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001543
484711	[REDACTED] EMAIL REGARDING JEFF AVAILABILITY OF PRIVATE WELL SAMPLING	10/25/2010	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: Ford, Heather M (NOBIS ENGINEERING INC)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484711
484700	[REDACTED] EMAIL REGARDING OLIN WELL WATER SAMPLING SCHEDULE	10/22/2010	2	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484700
485009	[REDACTED] SUMMARY OF ALL AVAILABLE DATA FOR PRIVATE WELL M-24/L-94 - DETECTED PARAMETERS ONLY (SUPPORTING DOCUMENTATION ATTACHED)	10/22/2010	21			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485009
485526	[REDACTED] LETTER REGARDING DETECTION OF NDMA IN PRIVATE WELLS AND DISCONTINUATION OF THEIR USE AS SOURCE OF DRINKING WATER (ENVELOPE ATTACHED)	10/22/2010	2	R01: Caira, Michael (WILMINGTON (MA) TOWN OF)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485526
484710	[REDACTED] EMAIL TRANSMITTING PRIVATE WELL FACTORS	10/21/2010	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: Ford, Heather M (NOBIS ENGINEERING INC)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484710
484705	[REDACTED] EMAIL REGARDING LETTER TO RESIDENT TRANSMITTING SUGGESTED REVISIONS	10/19/2010	2	R01: Sugatt, Richard (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484705
485015	[REDACTED] LETTER PROVIDING EXPLANATION OF GROUNDWATER RESULTS FOR RESIDENTIAL WELL	10/19/2010	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485015
485542	[REDACTED] LETTER PROVIDING FURTHER EXPLANATION OF GROUNDWATER RESULTS FOR RESIDENTIAL WELL	10/19/2010	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485542
483599	[REDACTED] EMAIL TRANSMITTING WELL ANALYTICAL RESULTS	10/18/2010	2	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483599

484704	[REDACTED] EMAIL REGARDING APPOINTMENT FOR OLIN SAMPLING (EMAIL HISTORY ATTACHED)	10/18/2010	3	R01: Newhouse, Shelly (METCALF & EDDY)	R01: Webster, Michael J (GEOINSIGHT INC), R01: Woods, Michael (WILMINGTON (MA) WATER & SEWER DIVISION), R01: (TOWN OF WILMINGTON)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484704
70001569	ANALYTICAL REPORT, SDG NO. 360-30382-1	10/18/2010	302	R01: Mason, Becky C (TEST AMERICA), R01: Wickham, James T (TEST AMERICA)	R01: (OLIN CORP)	RPT / Report	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001569
485031	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN MARCH AND JULY 2010 (10/15/2010 LETTER AND 07/08/2008 DATA VALIDATION SUMMARY TEST AMERICA DATA SETS 360-27496-1 AND 360-27496-2 ATTACHED) [MARGINALIA]	10/15/2010	84	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485031
484702	[REDACTED] EMAIL REGARDING PRIVATE WELLS	10/7/2010	2	R01: Sugatt, Richard (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484702
484703	[REDACTED] EMAIL REGARDING COMMENTS ON DATA PACKAGE OF PRIVATE WELL	10/7/2010	5	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484703
483596	[REDACTED] EMAIL TRANSMITTING RISK CALCULATION SPREADSHEETS REGARDING WELL	10/5/2010	2	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483596
483597	[REDACTED] EMAIL TRANSMITTING DATA VALIDATION PACKAGE	10/5/2010	1	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483597
483598	[REDACTED] EMAIL TRANSMITTING JULY AND AUGUST 2010 RESIDENTIAL WELL DATA VALIDATION REPORT	10/5/2010	1	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483598
484709	[REDACTED] EMAIL REGARDING PRIVATE WELLS	10/5/2010	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: Sugatt, Richard (US EPA REGION 1), R01: Ford, Heather M (NOBIS ENGINEERING INC)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484709
70001531	EMAIL TRANSMITTING DATA VALIDATION PACKAGE	10/5/2010	1	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001531
483595	[REDACTED] EMAIL REGARDING EVALUATION OF WELL RESULTS (EMAIL HISTORY ATTACHED)	10/4/2010	3	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483595
484734	[REDACTED] EMAIL REGARDING DRAFT LETTER	10/4/2010	1	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484734
485008	[REDACTED] CALCULATIONS OF EXCESS LIFETIME CANCER RISKS BASED ON CHILDHOOD AND ADULT EXPOSURE FOR AVERAGE AND MOST RECENT GROUNDWATER CONCENTRATION	10/1/2010	4			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485008
485098	[REDACTED] TABLES 1 THROUGH 4: CALCULATION OF EXCESS LIFE CANCER RISK BASED ON CHILDHOOD AND ADULT EXPOSURE BASED ON MOST RECENT GROUNDWATER CONCENTRATION	10/1/2010	4			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485098
70001548	RESIDENTIAL DRINKING WATER INGESTION CANCER RISK	10/1/2010	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001548
485013	{REDACTED] DATA VALIDATION SUMMARY, TEST AMERICA DATA SETS 360-29118 AND 360-29259	9/30/2010	17	R01: Ricardi, Chris (MACTEC ENGINEERING AND CONSULTING INC), R01: Murphy, Michael (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485013
485007	[REDACTED]LETTER CONCERNING RESULTS OF RESIDENTIAL WELL SAMPLING PERFORMED IN MARCH AND JULY 2010 (SUPPORTING DOCUMENTATION ATTACHED)	9/23/2010	4	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485007
485636	[REDACTED] RESIDENTIAL WELL SAMPLING PROGRAM (VALIDATION SUMMARY AND ANALYTICAL DATA ATTACHED)	9/23/2010	4	R01: Morrow, Stephen (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485636

485637	[REDACTED] EMAIL REGARDING OLIN-REVIEW OF PRIVATE WELL DATA [MARGINALIA]	9/23/2010	1	R01: Sugatt, Richard (US EPA REGION 1)	R01: Dilorenzo, Jim (US EPA)	CORR / Correspondence	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485637
485638	[REDACTED] EMAIL REGARDING SCANNED EPA FILES FOR WHITNEY BARREL (EMAIL HISTORY AND SAMPLING RESULTS ATTACHED) [MARGINALIA]	9/23/2010	12		R01: Dilorenzo, Jim (US EPA)	CORR / Correspondence	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485638
485648	[REDACTED] UPDATE ON PRIVATE WELL SAMPLING EFFORT	9/23/2010	7	R01: Dilorenzo, James (US EPA REGION 1)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485648
484708	[REDACTED] EMAIL REGARDING OLIN RESIDENTIAL WELLS SUMMARY	9/16/2010	4	R01: Dilorenzo, James (US EPA REGION 1)	R01: Cosio, Julie (MA DEPT OF PUBLIC HEALTH)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484708
484707	[REDACTED] EMAIL REGARDING SAMPLING OF AREA RESIDENTIAL WELLS AT SITE (EMAIL HISTORY ATTACHED)	9/3/2010	3	R01: Dilorenzo, James (US EPA REGION 1)	R01: Trifilo, Joel J (GEOINSIGHT INC)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484707
526084	GROUNDWATER USE AND VALUE DETERMINATION (09/21/2010 COVER LETTER ATTACHED)	9/1/2010	6	R01: (MA DEPARTMENT OF ENVIRONMENTAL PROTECTION - COMMISSIONER)		EML / Email	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/526084
70001527	EMAIL TRANSMITING PRIVATE WELLS SAMPLES	8/30/2010	1	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001527
484716	[REDACTED] EMAIL TRANSMITTING SUMMARY DATA TABLE REGARDING RESIDENTIAL WELL SAMPLING	8/20/2010	1	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484716
484737	[REDACTED] EMAIL SUMMARIZING PRIVATE WELL SAMPLING EFFORT	8/20/2010	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: Cosio, Julie (MA DEPT OF PUBLIC HEALTH)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484737
70001576	EMAIL REQUESTING LOCATION AND DATA FOR RESIDENTIAL WELLS	8/18/2010	1	R01: Cosio, Julie (MA DEPT OF PUBLIC HEALTH)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001576
70001575	EMAIL REGARDING RISK CALCULATION FOR RESIDENTIAL DRINKING WATER SAMPLE WITH BEHP DATA HIT	8/17/2010	3	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001575
70001578	EMAIL ASKING CONCURRENCE OR POSITION REGARDING RISK CALCULATION FOR RESIDENTIAL DRINKING WATER SAMPLE WITH BEHP DATA	8/17/2010	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: Sugatt, Richard (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001578
485645	[REDACTED] HYDRAZINE DETECTED AT RESIDENTIAL WELL	8/10/2010	2	R01: Sugatt, Richard (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485645
485646	[REDACTED] EMAIL REGARDING MARCH 2010 RISK CALCULATION (WITH ATTACHMENTS)	8/10/2010	4	R01: Sugatt, Richard (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485646
485022	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN MARCH 2010 (07/23/2010 LETTER AND 07/08/2008 DATA VALIDATION SUMMARY TEST AMERICA DATA SETS 360-27496-1 AND 360-27496-2 ATTACHED) [MARGINALIA]	8/4/2010	58	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485022
485023	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN MARCH 2010 (07/23/2010 LETTER AND 07/08/2008 DATA VALIDATION SUMMARY, TEST AMERICA DATA SETS 360-27496-1 AND 360-27496-2 ATTACHED)	8/4/2010	58	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485023
485024	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN MARCH 2010 (07/23/2010 LETTER AND 07/08/2008 DATA VALIDATION SUMMARY TEST AMERICA DATA SETS 360-27496-1 AND 360-27496-2 ATTACHED) [MARGINALIA]	8/4/2010	58	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485024

485025	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN MARCH 2010 (07/23/2010 LETTER AND 07/08/2008 DATA VALIDATION SUMMARY TEST AMERICA DATA SETS 360-27496-1 AND 360-27496-2 ATTACHED) [MARGINALIA]	8/4/2010	58	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485025
485026	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN MARCH 2010 (07/23/2010 LETTER AND 07/08/2008 DATA VALIDATION SUMMARY TEST AMERICA DATA SETS 360-27496-1 AND 360-27496-2 ATTACHED) [MARGINALIA]	8/4/2010	58	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485026
485027	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN MARCH 2010 (07/23/2010 LETTER AND 07/08/2008 DATA VALIDATION SUMMARY TEST AMERICA DATA SETS 360-27496-1 AND 360-27496-2 ATTACHED) [MARGINALIA]	8/4/2010	58	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485027
485028	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN MARCH 2010 (07/23/2010 LETTER AND 07/08/2008 DATA VALIDATION SUMMARY TEST AMERICA DATA SETS 360-27496-1 AND 360-27496-2 ATTACHED) [MARGINALIA]	8/3/2010	46	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485028
484780	TABLE 3: CALCULATION OF EXCESS LIFE CANCER RISK BASED ON CHILDHOOD AND ADULT EXPOSURE BASED ON MOST RECENT GROUNDWATER CONCENTRATION	8/1/2010	5			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484780
485097	[REDACTED] TABLE 4: CALCULATION OF EXCESS LIFE CANCER RISK BASED ON CHILDHOOD AND ADULT EXPOSURE BASED ON MOST RECENT GROUNDWATER CONCENTRATION	8/1/2010	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485097
485010	[REDACTED] DATA VALIDATION SUMMARY, TEST AMERICA DATA SETS 360-27496-1 AND 360-27496-2 (09/30/2010 DATA VALIDATION SUMMARY, TEST AMERICA DATA SET 360-29439 ATTACHED) [MARGINALIA]	7/8/2010	80	R01: Smith, Deborah L (KESTREL ENVIRONMENTAL TECHNOLOGIES INC)	R01: Ricardi, Christian (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485010
650488	SEMI-ANNUAL STATUS REPORT NO. 6	7/2/2010	1125	R01: (MACTEC ENGINEERING AND CONSULTING INC), R01: OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650488
485019	[REDACTED] MARCH 2010 SAMPLING (SUPPORTING DOCUMENTATION ATTACHED) [MARGINALIA]	5/25/2010	4			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485019
485500	[REDACTED] SPREADSHEET WITH MARCH 2010 SAMPLING, RESIDENTIAL DRINKING WATER INGESTION CANCER RISK OF 24 NG/L OF N-NITROSODIPROPYLAMINE, ASSUMING MUTAGENIC MODE OF CARCINOGENESIS	3/1/2010	4			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485500
485551	[REDACTED] ANALYTICAL RESULTS FOR PRIVATE WELLS - OCTOBER 2008 - MARCH 2010	3/1/2010	8			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485551
485565	[REDACTED] ANALYTICAL RESULTS FOR PRIVATE WELLS - OCTOBER 2008 - MARCH 2010	3/1/2010	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485565
70001616	EMAIL TRANSMITTING OLIN DRINKING WATER WELL DATA TABLE (EMAIL HISTORY ATTACHED)	3/1/2010	2	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001616
484731	[REDACTED] EMAIL REGARDING WILMINGTON HOME OWNER SAMPLING PROGRAM (EMAIL HISTORY ATTACHED)	2/23/2010	3	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484731
485545	[REDACTED] LETTER REGARDING ANALYSIS OF GROUNDWATER FROM RESIDENTIAL WELL	2/18/2010	4	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485545
485548	[REDACTED] LETTER REGARDING ANALYSIS OF GROUNDWATER FROM RESIDENTIAL WELL	2/18/2010	4	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485548
70001607	EMAIL TRANSMITTING OLIN RESIDENTIAL SAMPLING SUMMARY TABLE	2/18/2010	2	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001607

485035	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN NOVEMBER 2009 (02/08/2010 LETTER AND 12/22/2009 DATA VALIDATION SUMMARY TEST AMERICA DATA SETS 360-25526-1 AND 360-25526-2 ATTACHED) [MARGINALIA]	2/10/2010	44	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485035
485037	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN NOVEMBER 2009 (02/08/2010 LETTER AND 12/22/2009 DATA VALIDATION SUMMARY TEST AMERICA DATA SETS 360-25526-1 AND 360-25526-2 ATTACHED) [MARGINALIA]	2/10/2010	33	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485037
483561	PROPOSED DRINKING WATER ANALYTES, REVISION 2	2/8/2010	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483561
484730	[REDACTED] EMAIL TRANSMITTING SUPPORTING SPREADSHEETS FOR DRINKING WATER WELL RISK BASED ON NOVEMBER 2009 SAMPLING (EMAIL HISTORY ATTACHED)	2/1/2010	2	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484730
100016232	LETTER REGARDING APPROVAL OF CLOSURE OF SPINAZOLA LANDFILL AKA MAPLE MEADOW LANDFILL NEAR SITE PROPERTY	1/21/2010	6	R01: Lipman, Steven G (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Spinazola, Clarence (ESTATE OF CLARENCE SPINAZOLA), R01: Toomey, Michael (BOSTON ENVIRONMENTAL AND TRUCKING), R01: (RIEMER & BRAUNSTEIN LLP)	LTR / Letter	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100016232
485039	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN NOVEMBER 2009 (SUPPORTING DOCUMENTATION ATTACHED) [MARGINALIA]	1/14/2010	34	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485039
485040	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN NOVEMBER 2009 (SUPPORTING DOCUMENTATION ATTACHED) [MARGINALIA]	1/14/2010	45	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485040
484715	[REDACTED] EMAIL TRANSMITTING OLIN RISK ASSESSMENT OF PRIVATE WELLS (EMAIL HISTORY ATTACHED)	1/12/2010	2	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484715
484759	[REDACTED] PROPOSED DRINKING WATER ANALYTES	1/1/2010	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484759
650492	SEMI-ANNUAL STATUS REPORT NO. 5	12/22/2009	1736	R01: (MACTEC ENGINEERING AND CONSULTING INC), R01: OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650492
484756	[REDACTED] TIER 2 DATA VALIDATION REPORT, SDG NO. D00273	12/15/2009	68	R01: Quigley, Diane (WESTON SOLUTIONS INC), R01: Deruzzo, Gail (NOBIS ENGINEERING INC)	R01: Clark, Christine (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484756
484752	[REDACTED] TOTAL RECOVERABLE METALS IN WATER (CHAIN OF CUSTODY ATTACHED)	12/11/2009	10	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484752
484746	[REDACTED] SPLIT ANALYSIS AMMONIA (CHAIN OF CUSTODY ATTACHED)	11/17/2009	17	R01: (ALPHA ANALYTICAL LABORATORIES)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484746
484748	[REDACTED] SPLIT ANALYSIS BNAS IN WATER (CHAIN OF CUSTODY ATTACHED)	11/17/2009	19	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484748
484754	[REDACTED] SPLIT ANALYSIS VOAS IN DRINKING WATER (CHAIN OF CUSTODY ATTACHED)	11/13/2009	21	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484754
650437	LETTER TRANSMITTING FINAL REMEDIAL INVESTIGATION / FEASBILITY STUDY (RI/FS) WORK PLAN	11/12/2009	2	R01: Finkelstein, Kenneth (US NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/16.01-CORRESPONDENCE (NATURAL RESOURCE TRUSTEE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650437
650438	LETTER TRANSMITTING FINAL REMEDIAL INVESTIGATION / FEASBILITY STUDY (RI/FS) WORK PLAN	11/12/2009	2	R01: Raddant, Andrew (US DEPT OF INTERIOR)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/16.01-CORRESPONDENCE (NATURAL RESOURCE TRUSTEE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650438
650439	LETTER TRANSMITTING FINAL REMEDIAL INVESTIGATION / FEASBILITY STUDY (RI/FS) WORK PLAN	11/12/2009	2	R01: Bowles, Ian (MA EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/16.01-CORRESPONDENCE (NATURAL RESOURCE TRUSTEE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650439

653702	REVISIONS TO SECTION 307 - TEXAS SURFACE WATER QUALITY STANDARDS	11/12/2009	144	R01: (TX NATURAL RESOURCE CONSERVATION COMMISSION)		LAWS / Laws/Regulations/Guidance	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653702
485625	[REDACTED] EPA SPLITS SPECIALTY CHEMS DAS 0043S-403099 VALIDATED	11/10/2009	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485625
484729	[REDACTED] EMAIL REGARDING OLIN DRIKING WATER SAMPLING SCHEDULE (EMAIL HISTORY ATTACHED)	11/9/2009	2	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484729
484786	SAMPLE RECEIPT MEMORANDUM	11/9/2009	1	R01: Boudreau, Dan (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	MEMO / Memorandum	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484786
484785	PROPOSED DRINKING WATER ANALYTES ROUND 3, REVISED 11/02/2009	11/3/2009	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484785
70001604	EMAIL REGARDING WILMINGTON FINAL RESIDENTIAL WELL PROGRAM TABLE	11/3/2009	2	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001604
484728	[REDACTED] EMAIL REGARDING OLIN DRINKING WATER SAMPLING SCHEDULE	11/2/2009	2	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484728
485553	[REDACTED] ANALYTICAL RESULTS FOR PRIVATE WELLS - OCTOBER 2008 - NOVEMBER 2009	11/1/2009	8			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485553
485554	[REDACTED] ANALYTICAL RESULTS FOR PRIVATE WELLS - OCTOBER 2008 - NOVEMBER 2009	11/1/2009	8			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485554
70001602	EMAIL REGARDING RESIDENTIAL WELL TABLE	10/22/2009	2	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001602
485541	[REDACTED] REQUEST TO SAMPLE RESIDENTIAL WELL WATER	10/5/2009	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485541
485544	[REDACTED] LETTER REGARDING ANALYSIS OF GROUNDWATER FROM RESIDENTIAL WELL (SUPPORTING DOCUMENTATION ATTACHED) [MARGINALIA]	10/5/2009	36	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485544
485547	[REDACTED] LETTER REGARDING ANALYSIS OF GROUNDWATER FROM RESIDENTIAL WELL (SUPPORTING DOCUMENTATION ATTACHED) [MARGINALIA]	10/5/2009	34	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485547
484727	[REDACTED] EMAIL REGARDING WILMINGTON HOME OWNER WELL LETTERS	9/22/2009	1	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484727
485033	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN MARCH 2009	9/22/2009	1	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485033
485036	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN MARCH 2009 (09/21/2009 LETTER AND 06/02/2009 DATA VALIDATION SUMMARY TEST AMERICA DATA SET 360-21622 ATTACHED) [MARGINALIA]	9/22/2009	16	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485036
485034	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN MARCH 2009 (06/02/2009 DATA VALIDATION SUMMARY TEST AMERICA DATA SET 360-21622 ATTACHED) [MARGINALIA]	9/21/2009	15	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485034
483523	FACT SHEET: EMERGING CONTAMINENT N-NITROSODIMETHYLAMINE (NDMA)	9/1/2009	4	R01: (US EPA REGION 1)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.05-FACT SHEETS/INFORMATION UPDATES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483523

640138	HISTORICAL AERIAL PHOTOGRAPHIC ANALYSIS, LAND USE/LAND COVER ANALYSIS, SITE DISCOVERY INVENTORY ANALYSIS, WETLANDS/DRAINAGE ANALYSIS, AND FRACTURE TRACE ANALYSIS, VOLUME 1 OF 2	9/1/2009	49	R01: (US EPA - ENVIRONMENTAL PHOTOGRAPHIC INTERPRETATION CTR (EPIC))		PHT / Photograph	056-SITE SUPPORT/0561-Administrative Support/17.04-NON-PRINT MATERIALS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640138
640139	HISTORICAL AERIAL PHOTOGRAPHIC ANALYSIS, LAND USE/LAND COVER ANALYSIS, SITE DISCOVERY INVENTORY ANALYSIS, WETLANDS/DRAINAGE ANALYSIS, AND FRACTURE TRACE ANALYSIS, VOLUME 2 OF 2	9/1/2009	49	R01: (US EPA - ENVIRONMENTAL PHOTOGRAPHIC INTERPRETATION CTR (EPIC))		PHT / Photograph	056-SITE SUPPORT/0561-Administrative Support/17.04-NON-PRINT MATERIALS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/640139
485623	[REDACTED] RESPONSE TO OLIN REGARDING EVALUATION OF FORMALDEHYDE DATA (CHRONOLOGY OF FORMALDEHYDE ATTACHED)	8/27/2009	3	R01: Dilorenzo, James (US EPA REGION 1)	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485623
485639	[REDACTED] RESPONSE TO OLIN REGARDING EVALUATION OF FORMALDEHYDE DATA (CHRONOLOGY OF FORMALDEHYDE ATTACHED)	8/27/2009	3	R01: Dilorenzo, James (US EPA REGION 1)	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485639
458068	FINAL REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS) WORK PLAN, VOLUME 1 OF 4, PROJECT OVERVIEW (TRANSMITTAL, RESPONSE TO EPA CONDITIONAL APPROVAL AND COMMENTS, AND ADDENDUM 1 - NORTH POND INVESTIGATION ATTACHED)	8/14/2009	180	R01: (OLIN CORP), R01: (MACTEC ENGINEERING AND CONSULTING INC)	R01: (US EPA REGION 1)	WP / Work Plan	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/458068
458069	FINAL REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS) WORK PLAN, VOLUME 2 OF 4, PROJECT OPERATIONS PLAN, SITE MANAGEMENT PLAN AND COMMUNITY RELATIONS SUPPORT PLAN	8/14/2009	51	R01: (OLIN CORP), R01: (MACTEC ENGINEERING AND CONSULTING INC)	R01: (US EPA REGION 1)	WP / Work Plan	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/458069
458070	FINAL REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS) WORK PLAN, VOLUME 3-A OF 4, PROJECT OPERATIONS PLAN, FIELD SAMPLING PLAN	8/14/2009	449	R01: (OLIN CORP), R01: (MACTEC ENGINEERING AND CONSULTING INC)	R01: (US EPA REGION 1)	WP / Work Plan	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/458070
458071	FINAL REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS) WORK PLAN, VOLUME 3-B OF 4, PROJECT OPERATIONS PLAN, QUALITY ASSURANCE PROJECT PLAN (QAPP)	8/14/2009	2552	R01: (OLIN CORP), R01: (MACTEC ENGINEERING AND CONSULTING INC)	R01: (US EPA REGION 1)	WP / Work Plan	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/458071
458072	FINAL REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS) WORK PLAN, VOLUME 4 OF 4, PROJECT OPERATIONS PLAN, HEALTH AND SAFETY PLAN	8/14/2009	323	R01: (OLIN CORP), R01: (MACTEC ENGINEERING AND CONSULTING INC)	R01: (US EPA REGION 1)	WP / Work Plan	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/458072
485621	[REDACTED] EVALUATION OF FORMALDEHYDE DATA	7/29/2009	4	R01: Morrow, Steve (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485621
485622	[REDACTED] RESPONSE TO MACTEC'S DATA VALIDATION COMMENTS ON FORMALDEHYDE DATED JUNE 24, 2009 (WITH ATTACHMENT)	7/10/2009	15	R01: Deruzzo, Gail (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485622
650487	SEMI-ANNUAL STATUS REPORT NO. 4	6/29/2009	853	R01: (MACTEC ENGINEERING AND CONSULTING INC), R01: OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650487
175202	MEMO REGARDING SUMMARY OF KEY EXISTING EPA CERCLA POLICIES FOR GROUNDWATER RESTORATION	6/26/2009	12			CORR / Correspondence	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.1-Regulations, Standards & Guidelines	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/175202
483519	REVIEW OF NOBIS ENGINEERING DATA VALIDATION REPORT AND METHOD 8315 FORMALDEHYDE DATA REPORTED BY SOUTHWEST RESEARCH INSTITUTE	6/24/2009	4	R01: Ricardi, Christian (MACTEC ENGINEERING AND CONSULTING INC), R01: Murphy, Michael (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483519
483522	LETTER REGARDING DATA REVIEW OF FORMALDEHYDE DATA FROM MARCH 2009 RESIDENTIAL SAMPLING EVENT (SUPPORTING DOCUMENTATION ATTACHED) [MARGINALIA]	6/22/2009	5	R01: Deruzzo, Gail (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483522
70001600	EMAIL REGARDING N-NITROSODIMETHYLAMINE (NDMA)	6/18/2009	1		R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001600
484726	[REDACTED] EMAIL REGARDING WILMINGTON HOME OWNER SAMPLING PROGRAM	6/10/2009	2	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484726
485518	[REDACTED] RESIDENTIAL WELL SAMPLING UPDATE	6/10/2009	2	R01: (NOBIS ENGINEERING INC)		LST / List/Index	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485518

484725	[REDACTED] EMAIL REQUESTING COMPLETE LABORATORY DATA PACKAGE	6/8/2009		3	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484725
485080	DATA VALIDATION SUMMARY, TEST AMERICA DATA SET 360-21622 (06/05/2009 TRANSMITTAL LETTER ATTACHED) [MARGINALIA]	6/2/2009		483	R01: Ricardi, Chris (MACTEC ENGINEERING AND CONSULTING INC), R01: Murphy, Michael (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485080
484724	[REDACTED] EMAIL TRANSMITTING LATEST CALCULATIONS OF CANCER RISK OF DRINKING WATER OF PRIVATE WELLS (EMAIL HISTORY ATTACHED)	5/14/2009		5	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484724
484755	[REDACTED] TIER 2 DATA VALIDATION REPORT, SDG NO. D00232	5/11/2009		7	R01: Quigley, Diane (WESTON SOLUTIONS INC), R01: Deruzzo, Gail (NOBIS ENGINEERING INC)	R01: Clark, Christine (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484755
484757	[REDACTED] TIER 2 DATA VALIDATION REPORT, SDG NO. D00083	5/11/2009		7	R01: Deruzzo, Gail (NOBIS ENGINEERING INC)	R01: Clark, Christine (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484757
485032	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN JANUARY 2009 (04/16/2009 LETTER AND LABORATORY ANALYSIS REPORT ATTACHED) [MARGINALIA]	4/21/2009		24	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485032
484744	[REDACTED] TOTAL RECOVERABLE METALS IN WATER (CHAIN OF CUSTODY ATTACHED)	4/14/2009		9	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484744
484742	[REDACTED] SPLIT ANALYSIS BNAS IN WATER (CHAIN OF CUSTODY ATTACHED)	4/2/2009		18	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484742
484743	[REDACTED] SPLIT ANALYSIS ION CHROMATOGRAPHY ANION (CHAIN OF CUSTODY ATTACHED)	3/30/2009		11	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484743
483552	HRGC/HRMS AND N-NITROSODIMETHYLAMINE (NDMA) ANALYSIS DATA SHEET	3/28/2009		6	R01: (SOUTHWEST RESEARCH INSTITUTE)		RPT / Report	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483552
485624	[REDACTED] DATA SUMMARY TABLE TIER 2 VALIDATED DATA AQUEOUS ANALYSES DAS NO. 0022S, SDG NO. DOO232/368405	3/28/2009		2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485624
484741	[REDACTED] SPLIT ANALYSIS AMMONIA (CHAIN OF CUSTODY ATTACHED)	3/25/2009		12	R01: (ALPHA ANALYTICAL LABORATORIES)	R01: Boudreau, Dan (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484741
484745	[REDACTED] SPLIT ANALYSIS VOAS IN DRINKING WATER (CHAIN OF CUSTODY ATTACHED)	3/19/2009		21	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484745
484723	[REDACTED] EMAIL REGARDING DRAFT RESPONSE TO RESIDENTIAL WELL LETTER (EMAIL HISTORY ATTACHED)	3/4/2009		2	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484723
485029	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN DECEMBER 2008 (03/04/2009 LETTER AND LABORATORY ANALYSIS REPORT ATTACHED)	3/4/2009		21	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485029
485030	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN DECEMBER 2008 (03/04/2009 LETTER AND LABORATORY ANALYSIS REPORT ATTACHED)	3/4/2009		21	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485030
485546	[REDACTED] LETTER REGARDING DETECTION OF NDMA IN RESIDENTIAL WELL WATER	3/4/2009		2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485546
484722	[REDACTED] EMAIL TRANSMITTING PRIVATE WELL SAMPLE RESULT COMMUNICATIONS	3/2/2009		1	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484722

485525	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING (SUPPORTING DOCUMENTATION ATTACHED)	3/2/2009	21	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485525
484796	SAMPLE DISPOSITION DOCUMENT- PROJECT NUMBER 07110022	3/1/2009	1	R01: Germansderfer, Inna (US EPA REGION 1), R01: Dilorenzo, James (US EPA REGION 1)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484796
484719	[REDACTED] EMAIL REGARDING RESPONSE TO WATER TEST	2/27/2009	4	R01: (WILMINGTON (MA) - RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484719
484720	[REDACTED] EMAIL REGARDING WILMINGTON SAMPLING (EMAIL HISTORY ATTACHED)	2/27/2009	2	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484720
484721	[REDACTED] EMAIL REGARDING WATER TEST (EMAIL HISTORY ATTACHED)	2/27/2009	5	R01: (WILMINGTON (MA) - RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484721
485628	[REDACTED] ANALYSIS OF GROUNDWATER (MAP 24/LOT 63) SPLIT RESULTS	2/27/2009	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485628
484718	[REDACTED] EMAIL CONCERNING WATER TEST RESULTS	2/23/2009	2	R01: (WILMINGTON (MA) - RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484718
485020	[REDACTED] LETTER REGARDING RESULTS OF WELL SAMPLING CONDUCTED IN DECEMBER 2008 (SUPPORTING DOCUMENTATION ATTACHED)	2/20/2009	21	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485020
484717	[REDACTED] EMAIL REGARDING RESAMPLE OF HOME OWNER WELL MAP 24 LOT 54	2/19/2009	1	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484717
485543	[REDACTED] LETTER REGARDING DETECTION OF NDMA IN RESIDENTIAL WELL WATER (07/1999 FACT SHEET ATTACHED)	2/19/2009	4	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485543
485626	[REDACTED] ANALYSIS OF GROUNDWATER (MAP 27/LOT 14C) SPLIT RESULTS	2/19/2009	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485626
485627	[REDACTED] ANALYSIS OF GROUNDWATER (MAP 24/LOT 87) SPLIT RESULTS	2/19/2009	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485627
485629	[REDACTED] ANALYSIS OF GROUNDWATER (MAP 15/LOT 2C) SPLIT RESULTS	2/19/2009	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485629
485630	[REDACTED] ANALYSIS OF GROUNDWATER (MAP 14/LOT 2B) SPLIT RESULTS	2/19/2009	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485630
485041	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENTIAL WELL SAMPLING CONDUCTED IN OCTOBER 2008 (SUPPORTING DOCUMENTATION ATTACHED) [MARGINALIA]	2/18/2009	23	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485041
485528	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING (SUPPORTING DOCUMENTATION ATTACHED)	2/18/2009	26	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485528
485530	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING (SUPPORTING DOCUMENTATION ATTACHED)	2/18/2009	23	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485530
485531	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING (SUPPORTING DOCUMENTATION ATTACHED)	2/18/2009	23	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485531
485532	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING (SUPPORTING DOCUMENTATION ATTACHED)	2/18/2009	23	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485532

485533	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING (SUPPORTING DOCUMENTATION ATTACHED)	2/18/2009	23	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485533
485534	[REDACTED] LETTER REGARDING RESIDENTIAL WELL SAMPLING (SUPPORTING DOCUMENTATION ATTACHED)	2/18/2009	23	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485534
485021	[REDACTED] DRAFT, LETTER REGARDING DETECTION OF NDMA IN WELL WATER	2/13/2009	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485021
485673	[REDACTED] HOME OWNER WELL SAMPLING PROGRAM	2/13/2009	2	R01: Morrow, Steve (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	LST / List/Index	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485673
484733	[REDACTED] EMAIL REGARDING PRIVATE WELL COMMUNICATIONS	2/10/2009	2	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484733
485503	[REDACTED] DETECTED CONCENTRATIONS 2008 TO 2009 PRIVATE WELL RESULTS	2/1/2009	2	R01: Owens, James T (US EPA REGION 1)		RPT / Report	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485503
485559	[REDACTED] LETTER TRANSMITTING RESULTS OF RESIDENCE WELL SAMPLING	2/1/2009	1	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485559
485562	[REDACTED] LETTER TRANSMITTING RESULTS OF WELL SAMPLING	2/1/2009	2	R01: Morrow, Steve (OLIN CORP)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485562
70001640	EMAIL TRANSMITTING OLIN PROPOSED ADDITIONAL DRINKING WELL ANALYTES	1/30/2009	2	R01: Deruzzo, Gail (NOBIS ENGINEERING INC)	R01: Boudreau, Dan (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001640
485557	[REDACTED] SUMMARY OF RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL DRINKING WATER STANDARDS/GUIDELINES	1/29/2009	2	R01: Morrow, Steve (OLIN CORP)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485557
485096	EMAIL REGARDING ADDITIONAL CONTAMINANTS LIST (EMAIL HISTORY AND TABLE OF PROPOSED ADDITIONAL DRINKING WELL ANALYTES ATTACHED) [MARGINALIA]	1/26/2009	3	R01: Sugatt, Richard (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485096
483553	ATSDR TECHNICAL ASSISTANCE FORM	1/21/2009	3	R01: Sweet, William (US AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR))	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483553
70001639	EMAIL REGARDING N-NITROSODIMETHYLAMINE (NDMA) GROUNDWATER RISK	1/20/2009	1	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Dilorenzo, James (US EPA REGION 1), R01: Sugatt, Richard (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001639
653914	LETTER REGARDING COMPLETION OF CLOSURE, OLIN GYPSUM LANDFILL, 51 EAMES STREET	1/17/2009	10	R01: Adams, David C (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: Carrigan, John A (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653914
485560	[REDACTED] SUMMARY OF RESIDENCE WELL MONITORING DATA AND COMPARISON TO FEDERAL DRINKING WATER STANDARDS/GUIDELINES	1/8/2009	2	R01: Morrow, Steve (OLIN CORP)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485560
646184	LETTER REGARDING COMPLETION OF CLOSURE, OLIN GYPSUM LANDFILL	1/7/2009	5	R01: Adams, David C (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: Carrigan, John A (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Morrow, Steve (OLIN CORP)	LTR / Letter	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/646184
646186	FACT SHEET: OLIN GYPSUM LANDFILL CLOSURE CERTIFICATION	1/6/2009	5	R01: (MA DEPT OF ENVIRONMENTAL PROTECTION)		RPT / Report	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/646186
485563	[REDACTED] DRAFT, LETTER REGARDING DETECTION OF N-NITROSODIMETHYLAMINE (NDMA) IN WELL WATER, MAP 24/LOT 54	1/2/2009	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485563
196796	National Recommended Water Quality Criteria	1/1/2009	22	R11: (US ENVIRONMENTAL PROTECTION AGENCY)		PUB / Publication	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.1-Regulations, Standards & Guidelines	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/196796

458077	SEMI-ANNUAL STATUS REPORT NO. 3 (12/31/2008 TRANSMITTAL LETTER ATTACHED)	12/29/2008	595	R01: (MACTEC ENGINEERING AND CONSULTING INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0532-Remedial Design/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/458077
483556	DATA VALIDATION SUMMARY, TEST AMERICA DATA SETS 360-19275-1 AND 360-19248-1	12/19/2008	75	R01: Ricardi, Chris (MACTEC ENGINEERING AND CONSULTING INC), R01: Murphy, Michael (MACTEC ENGINEERING AND CONSULTING INC)	R01: Morrow, Steve (OLIN CORP)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483556
484790	RESIDENTIAL WELL SAMPLING RESULTS (FINAL RESULTS SUMMARY ATTACHED)	12/19/2008	7	R01: Morrow, Steve (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/484790
485656	[REDACTED] RESIDENTIAL WELL SAMPLING RESULTS (FINAL RESULTS SUMMARY ATTACHED) [MARGINALIA]	12/19/2008	7	R01: Morrow, Steve (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485656
485556	[REDACTED] HOME OWNER WELL SAMPLING PROGRAM	12/12/2008	2	R01: Morrow, Steve (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	LST / List/Index	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485556
70001638	EMAIL REGARDING HOME OWNERS SAMPLING UPDATE	12/12/2008	1	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/7000138
484751	[REDACTED] TOTAL RECOVERABLE METALS IN WATER (CHAIN OF CUSTODY ATTACHED), DRAFT RESULTS	12/3/2008	9	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/484751
485642	[REDACTED] TECHNICAL OVERSIGHT REPORT, POTENTIALLY RESPONSIBLE PARTY (PRP) SAMPLING OF RESIDENTIAL WELLS (12/16/2008 TRANSMITTAL LETTER ATTACHED)	12/1/2008	14	R01: (NOBIS ENGINEERING INC)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485642
485640	[REDACTED] ANALYTICAL SCREENING DATA REPORT WATER SAMPLES (11/17/2008 AND 01/10/2000 TRANSMITTALS ATTACHED)	11/17/2008	8	R01: (MA DEP)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485640
484791	SAMPLE RECEIPT MEMORANDUM	11/12/2008	2	R01: Boudreau, Dan (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	MEMO / Memorandum	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/484791
70001637	EMAIL REGARDING HOME WELL OWNER UPDATE	11/4/2008	1	R01: Morrow, Steven G (OLIN CHEMICAL CORP)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/70001637
485675	[REDACTED] HOME OWNER WELL SAMPLING PROGRAM	10/31/2008	3	R01: Morrow, Steve (OLIN CORP)	R01: Dilorenzo, James (US EPA REGION 1)	LST / List/Index	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485675
484732	[REDACTED] EMAIL REGARDING PENDING PRIVATE WELL SAMPLES	10/29/2008	2	R01: (WILMINGTON (MA) - RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/484732
484747	[REDACTED] SPLIT ANALYSIS BNAS IN WATER (CHAIN OF CUSTODY ATTACHED)	10/24/2008	29	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/484747
485510	[REDACTED] HOME OWNER WELL SAMPLING PROGRAM (MAP ATTACHED) [MARGINALIA]	10/24/2008	2			LST / List/Index	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485510
485519	[REDACTED] HOME OWNER WELL SAMPLING PROGRAM	10/24/2008	2			LST / List/Index	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/485519
483542	SPLIT ANALYSIS AMMONIA (CHAIN OF CUSTODY ATTACHED)	10/15/2008	12	R01: (ALPHA ANALYTICAL LABORATORIES)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/483542
484750	[REDACTED] SPLIT ANALYSIS ION CHROMATOGRAPHY ANION (CHAIN OF CUSTODY ATTACHED)	10/15/2008	12	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/484750
484753	[REDACTED] SPLIT ANALYSIS VOAS IN DRINKING WATER (CHAIN OF CUSTODY ATTACHED)	10/14/2008	27	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)		1	https://semspub.epa.gov/src/document/01/484753

484749	[REDACTED] SPLITS CHAIN OF CUSTODY RECORD	10/8/2008	1	R01: (US EPA REGION 1)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484749
485631	[REDACTED] SPLIT COMPARISON OF PRIVATE WELL RESULTS 2008	10/1/2008	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485631
647003	DENSE NON-AQUEOUS PHASE LIQUID (DNAPL) PILOT DESIGN REPORT	9/9/2008	16	R01: Thompson, Peter H (MACTEC ENGINEERING AND CONSULTING INC), R01: Oulton, Ralph E (MACTEC ENGINEERING AND CONSULTING INC)	R01: Dilorenzo, James M (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0532-Remedial Design/06.04-REMEDIAL DESIGN REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647003
485045	RESIDENTIAL WELL SAMPLING	8/27/2008	5			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485045
485650	[REDACTED] EMAIL REGARDING WELL SAMPLING FOR METHYL TERTIARY BUTYL ETHER (MTBE) (EMAIL HISTORY ATTACHED)	8/27/2008	3	R01: Dilorenzo, James (US EPA REGION 1)	R01: Coyne, Joseph (MA DEP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485650
70001635	EMAIL REGARDING PRIVATE WELL ANALYTICAL LIST	8/18/2008	3	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001635
293559	FINAL INTERIM RESPONSE STEPS WORK PLAN	8/8/2008	433	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: (US EPA REGION 1)	WP / Work Plan	054-REMOVAL/0541-Removal Responses/02.06-WORK PLANS & PROGRESS REPORTS (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/293559
485514	[REDACTED] ADDITIONAL COMMENTS ON PRIVATE WELL SUMMARY	8/6/2008	2	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485514
485641	[REDACTED] ADDITIONAL COMMENTS ON PRIVATE WELL SUMMARY [MARGINALIA]	8/6/2008	2	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485641
485644	[REDACTED] EMAIL REGARDING OLIN'S PROPOSED PRIVATE WELL LIST	8/1/2008	2	R01: Dilorenzo, James (US EPA REGION 1)	R01: Ford, Heather M (NOBIS ENGINEERING INC)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485644
293558	SEMI-ANNUAL STATUS REPORT NO. 2 (06/27/2008 COVER LETTER ATTACHED)	6/27/2008	970	R01: (MACTEC ENGINEERING AND CONSULTING INC), R01: (OLIN CORP)	R01: (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0532-Remedial Design/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/293558
484760	[REDACTED] REVIEW SUMMARY OF PRIVATE WELL INVENTORY AND SAMPLING ACTIVITIES DURING IMMEDIATE RESPONSE ACTIONS 2003/2004	6/1/2008	8	R01: (NOBIS ENGINEERING INC)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484760
485643	[REDACTED] GROUNDWATER USE AND VALUE DETERMINATION (05/30/2008 MAP ATTACHED) [MARGINALIA]	6/1/2008	3			RPT / Report	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485643
485647	[REDACTED] REVIEW SUMMARY OF PRIVATE WELL INVENTORY AND SAMPLING ACTIVITIES DURING IMMEDIATE RESPONSE ACTIONS 2003/2004 (06/18/2008 TRANSMITTAL LETTER AND TABLES ATTACHED) [MARGINALIA]	6/1/2008	13	R01: (NOBIS ENGINEERING INC)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485647
485651	[REDACTED] REVIEW SUMMARY OF PRIVATE WELL INVENTORY AND SAMPLING ACTIVITIES DURING IMMEDIATE RESPONSE ACTIONS 2003/2004 (06/09/2008 TRANSMITTAL LETTER AND TABLES ATTACHED) [MARGINALIA]	6/1/2008	11	R01: (NOBIS ENGINEERING INC)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485651
484793	FACT SHEET: EMERGING CONTAMINANT N-NITROSODIMETHYLAMINE (NDMA)	4/1/2008	4	R01: (US EPA REGION 1)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.05-FACT SHEETS/INFORMATION UPDATES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484793
135714	Procedures for the Derivation of Equilibrium Partitioning Sediments Benchmarks (ESBs) for the Protection of Benthic Organisms: Compendium of Tier 2 Values for Nonionic Organics, EPA/600/R-02/016	3/1/2008	75			LAWS / Laws/Regulations/Guidance	053-REMEDIAL/053-REMEDIAL/0531-Remedy Characterization/A4.2-Record of Decision/Remedy Selection	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/135714
484798	DRINKING WATER CONTAMINANTS	2/15/2008	13	R01: (US EPA)		RPT / Report	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484798
484799	2008 STANDARDS AND GUIDELINES FOR CONTAMINANTS IN MASSACHUSETTS DRINKING WATER	2/15/2008	7	R01: (MA DEP)		RPT / Report	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484799

485600	CURRENT REGULATORY LIMIT: N NITROSODIMETHYLAMINE (NDMA)	2/15/2008	3	R01: (MA DEP)		RPT / Report	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485600
485601	FACT SHEET: CURRENT REGULATORY LIMIT - N NITROSODIMETHYLAMINE (NDMA)	2/15/2008	20	R01: (AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR))		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.05-FACT SHEETS/INFORMATION UPDATES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485601
280865	REVIEW OF DRAFT FOCUSED REMEDIAL INVESTIGATION (RI) REPORT [MARGINALIA]	1/15/2008	22	R01: Dilorenzo, James M (US EPA REGION 1)	R01: Morrow, Stephen (OLIN CORP)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280865
280857	SPLIT DATA FOR GROUNDWATER LETTER REPORT	1/10/2008	1	R01: Dilorenzo, James M (US EPA REGION 1)	R01: Morrow, Stephen (OLIN CORP)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.02-SAMPLING & ANALYSIS DATA (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280857
650486	SEMI-ANNUAL STATUS REPORT NO. 1	1/2/2008	1082	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: (US EPA REGION 1)	RPT / Report	054-REMOVAL/0541-Removal Responses/02.06-WORK PLANS & PROGRESS REPORTS (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/650486
484740	[REDACTED] DATA SUMMARY TABLE: TIER 2 DATA VALIDATION N-NITROSODIMETHYLAMINE (NDMA) ANALYSIS	1/1/2008	7	R01: (NOBIS ENGINEERING INC)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484740
280845	LETTER REGARDING POSTPONEMENT OF REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS) WORK PLAN	12/17/2007	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: Morrow, Stephen (OLIN CORP)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280245
280859	SAMPLE RECEIPT MEMORANDUM	12/12/2007	1	R01: Boudreau, Dan (US EPA REGION 1)	R01: Dilorenzo, James M (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280859
280860	SPLIT DATA FOR GROUNDWATER LETTER REPORT [MARGINALIA]	12/4/2007	11	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James M (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.02-SAMPLING & ANALYSIS DATA (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280860
280864	SPLIT DATA FOR GROUNDWATER LETTER REPORT [MARGINALIA]	12/4/2007	11	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James M (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.02-SAMPLING & ANALYSIS DATA (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280864
280862	SPLIT DATA FOR GROUNDWATER LETTER REPORT [MARGINALIA]	11/29/2007	26	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James M (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.02-SAMPLING & ANALYSIS DATA (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280862
280861	SPLIT DATA FOR GROUNDWATER LETTER REPORT [MARGINALIA]	11/28/2007	26	R01: Boudreau, Daniel N (US EPA REGION 1)	R01: Dilorenzo, James M (US EPA REGION 1)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.02-SAMPLING & ANALYSIS DATA (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280861
280863	SAMPLING & ANALYSIS SPLIT DATA FOR GROUNDWATER REPORT [MARGINALIA]	11/20/2007	12	R01: (ALPHA ANALYTICAL LABORATORIES)	R01: Boudreau, Daniel N (US EPA REGION 1)	ADD / Analytical Data Document	053-REMEDIAL/0531-Remedy Characterization/03.02-SAMPLING & ANALYSIS DATA (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280863
647012	REDACTED EMAIL REGARDING REVIEW OF INTERIM RESPONSE STEPS WORK PLAN (11/02/2007-11/09/2007 SUPPORTING EMAILS ATTACHED)	11/19/2007	2	R01: Duggan, Deborah L (WILMINGTON (MA) TOWN OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647012
484795	SAMPLE DISPOSITION DOCUMENT- PROJECT NUMBER 07110022	11/14/2007	4	R01: Dilorenzo, James (US EPA REGION 1), R01: Montanaro, Joseph (US EPA REGION 1)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484795
280858	EMAIL REGARDING PLANNED SPLIT SAMPLING (WITH 11/08/2007 EMAIL ATTACHED)	11/9/2007	6	R01: Thompson, Peter H (MACTEC ENGINEERING AND CONSULTING INC)	R01: Dilorenzo, James M (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280858
280821	REVIEW OF DRAFT INTERIM RESPONSE STEPS WORK PLAN	11/2/2007	12	R01: Dilorenzo, James (US EPA REGION 1)	R01: Morrow, Stephen (OLIN CORP)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.06-WORK PLANS & PROGRESS REPORTS (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280821
280409	COMMENTS ON THE INTERIM RESPONSE STEPS WORK PLAN (IRSWP)	10/16/2007	2	R01: Ford, Heather M (US EPA REGION 1)	R01: Bouvier, Marc (NOBIS ENGINEERING INC)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280409
275079	REFERENCES, PART 2, FOR DRAFT, FOCUSED REMEDIAL INVESTIGATION (RI)	10/10/2007	6765	R01: (US EPA REGION 1), R01: (MACTEC)		RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/275079
280397	MEETING ATTENDANCE LIST: FOCUSED REMEDIAL INVESTIGATION (RI) REPORT	10/10/2007	1	R01: (US EPA REGION 1)		MTG / Meeting Document	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.04-PUBLIC MEETINGS/HEARINGS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280397
280401	OVERVIEW MEETING PRESENTATION: DRAFT FOCUSED REMEDIAL INVESTIGATION (RI) REPORT	10/10/2007	29	R01: (MACTEC)		MTG / Meeting Document	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280401
280425	MEETING AGENDA FOR FOCUSED REMEDIAL INVESTIGATION (RI) REPORT	10/10/2007	1	R01: (US EPA REGION 1)		MTG / Meeting Document	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280425

280419	MEMO ON DRAFT FOCUSED REMEDIAL INVESTIGATION (RI) REPORT	10/5/2007	1	R01: Dilorenzo, James (US EPA REGION 1)		MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280419
485529	[REDACTED] LETTER REGARDING PRIVATE WELL SAMPLING RESULTS (SUPPORTING DOCUMENTATION ATTACHED)	10/4/2007	18	R01: Pyott, Christopher (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: Fagan, Joanne (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: (WILMINGTON (MA) - RESIDENT OF)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485529
275077	DRAFT, FOCUSED REMEDIAL INVESTIGATION (RI)	10/1/2007	9661	R01: (US EPA REGION 1), R01: (MACTEC)		RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.06-REMEDIAL INVESTIGATION REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/275077
280434	MEMO WITH COMMENTS ON THE DRAFT INTERIM RESPONSE STEPS WORKPLAN ADDITIONAL INFORMATION	9/21/2007	2	R01: Sullivan, Suzanne M (METCALF & EDDY)	R01: Dilorenzo, James (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280434
280839	LETTER REGARDING COMMENTS ON DRAFT INTERIM RESPONSE STEPS WORK PLAN	9/21/2007	2	R01: Sullivan, Suzanne M (METCALF & EDDY)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.06-WORK PLANS & PROGRESS REPORTS (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280239
647008	REDACTED EMAIL REGARDING ADDITIONAL COMMENT ON DRAFT INTERIM RESPONSE STEPS WORK PLAN (IRSWP) ADDITIONAL INFORMATION	9/21/2007	1	R01: Duggan, Deborah L (WILMINGTON (MA) TOWN OF)	R01: Dilorenzo, James (US EPA REGION 1)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647008
647009	REDACTED EMAIL REGARDING WERC'S COMMENTS ON REVIEW PROCESS	9/21/2007	1	R01: Dilorenzo, James (US EPA REGION 1)	R01: Coyne, Joseph (MA DEP)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647009
647010	REDACTED EMAIL COMMENTS ON PROCESS (RESPONSE ATTACHED)	9/21/2007	4	R01: Dilorenzo, James (US EPA REGION 1)	R01: Coyne, Joseph (MA DEP)	EML / Email	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647010
647011	REDACTED EMAIL WITH THE COMMENTS ON THE DRAFT INTERIM RESPONSE STEPS WORK PLAN AND SUPPLEMENTAL MATERIALS	9/21/2007	3	R01: Mercer, Gary (METCALF & EDDY)	R01: Dilorenzo, James (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647011
280408	EMAIL REGARDING COMMENT PERIOD AND NEW MATERIAL (EMAIL HISTORY ATTACHED)	9/10/2007	2	R01: Dilorenzo, James (US EPA REGION 1)		EML / Email	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280408
280395	ANNOUNCEMENT OF A PUBLIC INFORMATION MEETING ON 09/05/2007	9/5/2007	2	R01: (US EPA REGION 1)		MTG / Meeting Document	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.04-PUBLIC MEETINGS/HEARINGS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280395
653700	SEDIMENT TOXICITY OF PETROLEUM HYDROCARBON FRACTIONS	9/1/2007	89	R01: (BATTELLE)	R01: (MA DEPT OF ENVIRONMENTAL PROTECTION)	RPT / Report	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653700
280433	MEMO WITH COMMENTS ON THE DRAFT INTERIM RESPONSE STEPS WORK PLAN	8/28/2007	4	R01: Sullivan, Suzanne M (WILMINGTON (MA) RESIDENT OF)	R01: Dilorenzo, James (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280433
280828	LETTER REGARDING COMMENTS ON DRAFT INTERIM RESPONSE STEPS WORK PLAN [MARGINALIA]	8/28/2007	7	R01: Trifilo, Joel J (GEOINSIGHT INC), R01: Gilbert, John (GEOINSIGHT INC)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.06-WORK PLANS & PROGRESS REPORTS (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280828
485536	[REDACTED] MAP: SITE LOCATION [MARGINALIA]	8/28/2007	1	R01: (MACTEC ENGINEERING AND CONSULTING INC)		FIG / Figure/Map/ Drawing	056-SITE SUPPORT/0561-Administrative Support/17.04-NON-PRINT MATERIALS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485536
280431	MEMO ON THE REVIEW OF THE 07/25/2007 DRAFT INTERIM RESPONSE STEPS WORK PLAN	8/27/2007	1	R01: Sugatt, Richard (US EPA REGION 1)	R01: Dilorenzo, James (US EPA REGION 1)	MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280431
485511	[REDACTED] TABLE 2.1-18: RESIDENTIAL WELL SAMPLE LOCATIONS	8/24/2007	1	R01: (MACTEC ENGINEERING AND CONSULTING INC)		FIG / Figure/Map/ Drawing	056-SITE SUPPORT/0561-Administrative Support/17.04-NON-PRINT MATERIALS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485511
485523	[REDACTED] TABLE C.2-1: GROUNDWATER ANALYTICAL RESULTS DRAFT REMEDIAL INVESTIGATION (RI) REPORT	8/14/2007	4			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485523
280418	MEMO ON DRAFT INTERIM RESPONSE STEPS WORK PLAN	8/8/2007	1	R01: Dilorenzo, James (US EPA REGION 1)		MEMO / Memorandum	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280418
274545	DRAFT INTERIM RESPONSE STEPS WORK PLAN (07/30/2007 TRANSMITTAL LETTER ATTACHED)	7/25/2007	332	R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSULTING INC)	R01: (US EPA REGION 1)	WP / Work Plan	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/274545
280396	NEWS RELEASE: THE US EPA ANNOUNCES THE AVAILABILITY OF A TECHNICAL ASSISTANCE GRANT (TAG) FOR THE OLIN CHEMICAL SUPERFUND SITE	7/1/2007	1	R01: Shewack, Robert (US EPA REGION 1)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.07-TECHNICAL ASSISTANCE GRANTS (TAGS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280396
273456	ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT (AOC) WITH STATEMENT OF WORK (SOW) FOR RI/FS	6/28/2007	115	R01: Owens Iii, James T (US EPA REGION 1)		LGL / Legal Instrument	052-ENFORCEMENT/0522-Negotiations/10.07-EPA ADMINISTRATIVE ORDERS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/273456

280402	NEWS RELEASE: US EPA ANNOUNCES A SETTLEMENT AGREEMENT FOR INVESTIGATION OF THE OLIN CHEMICAL SUPERFUND SITE	6/1/2007	3	R01: (US EPA REGION 1)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.03-NEWS CLIPPINGS/PRESS RELEASES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280402
280393	LETTER ON WILMINGTON ENVIRONMENTAL RESTORATION COMMITTEE APPLYING FOR A TECHNICAL ASSISTANCE GRANT (TAG)	5/9/2007	1	R01: Brazell, Mary (WILMINGTON ENVIRONMENTAL RESTORATION COMMITTEE)	R01: Shewack, Robert (US EPA REGION 1)	LTR / Letter	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.07-TECHNICAL ASSISTANCE GRANTS (TAGS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280393
280435	MEETING NOTES REGARDING SUPERFUND PROCESS	3/13/2007	2	R01: (US EPA REGION 1), R01: (WILMINGTON (MA) TOWN OF)		MTG / Meeting Document	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280435
653912	CLOSURE CERTIFIATION LETTER, CALCIUM SULFATE LANDFILL, 51 EAMES STREET	12/13/2006	40	R01: Peters, Mark (MACTEC ENGINEERING AND CONSULTING INC), R01: Thompson, Peter (MACTEC ENGINEERING AND CONSUTING INC)	R01: Adams, David C (MA DEPT OF ENVIRONMENTAL PROTCTION)	LTR / Letter	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653912
653913	DRAFT CALCIUM SULFATE LANDFILL POST CLOSURE MONITORING PLAN, 51 EAMES STREET (12/15/2006 TRANSMITTAL LETTER ATTACHED)	12/1/2006	48	R01: (MACTEC ENGINEERING AND CONSULTING INC)		WP / Work Plan	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653913
652698	FRESHWATER SCREENING BENCHMARKS, EPA REGION 3 BIOLOGICAL TECHNICAL ASSISTANCE GROUP (BTAG)	7/1/2006	8	R01: (US EPA REGION 3)		CHT / Chart/Table	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/652698
251674	SPECIAL NOTICE LETTER (SNL) - AMERICAN BILTRITE INC	6/19/2006	6	R01: Studlien, Susan (US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION)	R01: Winkleman, Henry W (AMERICAN BILTRITE INC)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/25674
251675	SPECIAL NOTICE LETTER (SNL) - STEPAN COMPANY	6/19/2006	6	R01: Studlien, Susan (US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION)	R01: Olian, Robert M (SIDLEY & AUSTIN), R01: (STEPAN COMPANY)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/251675
251676	SPECIAL NOTICE LETTER (SNL) - NOR-AM AGRO LLC	6/19/2006	6	R01: Studlien, Susan (US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION)	R01: Threadgold, Eric (NOR-AM AGRO LLC)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/251676
251677	SPECIAL NOTICE LETTER (SNL) - FISONS LIMITED	6/19/2006	6	R01: Studlien, Susan (US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION)	R01: Polinsky, Laurie H (FISONS LIMITED)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/251677
251678	SPECIAL NOTICE LETTER (SNL) - BILTRITE CORP	6/19/2006	6	R01: Studlien, Susan (US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION)	R01: Amidon, David M (BURNS & LEVINSON LLP), R01: (BILTRITE CORP)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/251678
251679	SPECIAL NOTICE LETTER (SNL) - OLIN CORP	6/19/2006	5	R01: Studlien, Susan (US EPA REGION 1 - OFFICE OF SITE REMEDIATION & RESTORATION)	R01: Hilliard, Garland (OLIN CORP), R01: Morrow, Stephen (OLIN CORP)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/251679
252319	GENERAL NOTICE LETTER (GNL) - NOR-AM AGRO LLC (INFORMATION SHEET ATTACHED)	5/24/2006	8	R01: Studlien, Susan (US EPA REGION 1)	R01: Threadgold, Eric (NOR-AM AGRO LLC)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/252319
252320	GENERAL NOTICE LETTER (GNL) - FISONS LIMITED (INFORMATION SHEET ATTACHED)	5/24/2006	8	R01: Studlien, Susan (US EPA REGION 1)	R01: Polinsky, Laurie H (FISONS LIMITED)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/252320
280394	NEWS RELEASE: OLIN CHEMICAL SITE ADDED TO NATIONAL SUPERFUND LIST	4/18/2006	2	R01: (US EPA REGION 1)		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.03-NEWS CLIPPINGS/PRESS RELEASES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280394
280430	LETTER ABOUT PROPOSED DENSE AQUEOUS PHASE LIQUID (DAPL) EXTRACTION WELL LOCATION	3/9/2006	2	R01: Johnson, Stephen (US EPA), R01: Pyott, Christopher (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Dilorenzo, James (US EPA REGION 1)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280430
275083	LETTER REGARDING TRUCKS-TO-RAIL WASTE TRANSFER FACILITY	3/1/2006	2	R01: Varney, Robert W (US EPA REGION 1)	R01: Kerry, John F (US SENATE)	LTR / Letter	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/14.01-CORRESPONDENCE (CONGRESSIONAL RELATIONS)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/275083
280400	AGENDA AND NOTES FROM A MEETING ON 02/08/2006 [MARGINALIA]	2/8/2006	14	R01: (MA DEPT OF ENVIRONMENTAL PROTECTION)		MTG / Meeting Document	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280400
485609	ASSESSMENT GUIDANCE FOR PERCHLORATE	1/26/2006	3	R01: Bodine, Susan Parker (US EPA)	R01: (REGIONAL ADMINISTRATORS-REGIONS I-X)	RPT / Report	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485609
241252	GENERAL NOTICE LETTER (GNL) - OLIN CORPORATION	1/12/2006	8	R01: Studlien, Susan (US EPA REGION 1)	R01: Pain, George H (OLIN CORP)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/241252
241253	GENERAL NOTICE LETTER (GNL) - BILTRITE CORPORATION	1/12/2006	8	R01: Studlien, Susan (US EPA REGION 1)	R01: Fine, Stephen A (BILTRITE CORP)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/241253
241254	GENERAL NOTICE LETTER (GNL) - AMERICAN BILTRITE INC	1/12/2006	8	R01: Studlien, Susan (US EPA REGION 1)	R01: Winkelman, Henry W (AMERICAN BILTRITE INC)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/241254

241255	GENERAL NOTICE LETTER (GNL) - STEPAN COMPANY	1/12/2006	8	R01: Studlien, Susan (US EPA REGION 1)	R01: Brennan, Richard S (STEPAN COMPANY)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/241255
647586	IMMEDIATE RESPONSE ACTION (IRA) STATUS REPORT FOR PLANT B AREA REMEDIATION SYSTEMS (08/30/2005 TRANSMITTAL MEMO ATTACHED)	8/1/2005	414	R01: (SHAW ENVIRONMENTAL INC)	R01: (OLIN CORPORATION)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.07-WORK PLANS & PROGRESS REPORTS (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/647586
280429	LETTER ABOUT DENSE AQUEOUS PHASE LIQUID (DAPL) RECOVERY PILOT TEST OFF-PROPERTY WEST DITCH STUDY AREA LAB COLUMN TEST AND PERFORMANCE MONITORING PROGRAM	3/21/2005	5	R01: Pyott, Christopher (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: Johnson, Stephen M (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Morrow, Stephen (OLIN CORP)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280429
190690	GUIDELINES FOR CARCINOGEN RISK ASSESSMENT	3/1/2005	166			LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.1-Regulations, Standards & Guidelines	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/190690
100002728	Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens - EPA/630/R-03-003F	3/1/2005	126			LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.4-Directives and Policy Guidance Documents	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/100002728
280428	LETTER ABOUT OLIN PROPERTY WEST DITCH DAPL RECOVERY PROVE-OUT	2/1/2005	6	R01: Pyott, Christopher (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: Johnson, Stephen M (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Morrow, Stephen (OLIN CORP)	LTR / Letter	053-REMEDIAL/0531-Remedy Characterization/03.01-CORRESPONDENCE (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/280428
248296	PART 2 CONSTRUCTION RELATED RELEASE ABATEMENT MEASURE - STATUS REPORT #8 (RELEASE ABATEMENT MEASURE (RAM) TRANSMITTAL FORM AND TRANSMITTAL LETTER ATTACHED)	9/7/2004	344	R01: Hanley, Margret (GEI CONSULTANTS INC)	R01: Pyott, Christopher (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: (OLIN CORP)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.04-INTERIM DELIVERABLES (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/248296
485524	[REDACTED] TABLE 1: ANALYTICAL DATA FOR PRIVATE WELL SAMPLING	8/5/2004	6			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485524
247370	FIELD ACTIVITY REPORT - FORMER LAKE POLY AREA (COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM AND 02/10/2004 TRANSMITTAL LETTER ATTACHED)	2/9/2004	156	R01: Hanley, Margret (GEI CONSULTANTS INC), R01: Axelrod, Eric M (MACTEC ENGINEERING AND CONSULTING INC), R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC)	R01: Pyott, Christopher (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: Morrow, Stephen (OLIN CORP)	RPT / Report	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/247370
485649	[REDACTED] MAP: FIGURE 1 PRIVATE WELL INVESTIGATION SURVEY	1/20/2004	1	R01: (MACTEC)		FIG / Figure/Map/ Drawing	056-SITE SUPPORT/0561-Administrative Support/17.04-NON-PRINT MATERIALS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485649
485537	[REDACTED] UPDATE ON INVENTORY AND TESTING OF PRIVATE WELLS (TABLES AND MAPS ATTACHED) [MARGINALIA AND HIGHLIGHTS]	1/8/2004	18	R01: Axelrod, Eric M (MACTEC ENGINEERING AND CONSULTING INC), R01: Murphy, Michael J (MACTEC ENGINEERING AND CONSULTING INC)	R01: Pyott, Christopher (MA DEPT OF ENVIRONMENTAL PROTECTION)	LTR / Letter	054-REMOVAL/0541-Removal Responses/02.02-REMOVAL RESPONSE REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485537
136	MEMO REGARDING REVISIONS TO HUMAN HEALTH TOXICITY VALUES IN SUPERFUND RISK ASSESSMENTS	12/5/2003	4	R11: (US ENVIRONMENTAL PROTECTION AGENCY)		LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.1-Regulations, Standards & Guidelines, 058-PROGRAM SUPPORT/0583-Regulatory Development/B8.4-Directives and Policy Guidance Documents	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/136
100002731	Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures - EPA-600-R-02-013	11/1/2003	175	R11: (US ENVIRONMENTAL PROTECTION AGENCY)		LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.4-Directives and Policy Guidance Documents	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/100002731
100016398	SUPPLEMENTAL STATE INFORMATION REQUEST RESPONSE - OLIN CORP	12/18/2002	20	R01: Morrow, Steve (OLIN CORP)	R01: Johnson, Stephen M (MA DEPT OF ENVIRONMENAL PROTECTION)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100016398
190669	CALCULATING UPPER CONFIDENCE LIMITS FOR EXPOSURE POINT CONCENTRATIONS AT HAZARDOUS WASTE SITES	12/1/2002	32			LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.1-Regulations, Standards & Guidelines	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/190669
247317	STATE INFORMATION REQUEST RESPONSE - OLIN CORP	11/27/2002	91	R01: Obrien, Thomas P (OLIN CORP)	R01: Johnson, Stephen M (MA DEPT OF ENVIRONMENAL PROTECTION)	LTR / Letter	052-ENFORCEMENT/0521-PRP Search/11.09-PRP-SPECIFIC DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/247317
248308	PART 2 CONSTRUCTION RELATED RELEASE ABATEMENT MEASURE STATUS REPORT NO 1 (RELEASE AND UTILITY RELATED ABATEMENT MEASURE (RAM) TRANSMITTAL FORM AND TRANSMITTAL LETTER ATTACHED)	12/27/2000	291	R01: Hanley, Margret (GEI CONSULTANTS INC)	R01: Pyott, Christopher (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: (OLIN CORP)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.04-INTERIM DELIVERABLES (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/248308
100015929	ADMINISTRATIVE CONSENT ORDER FOR CLOSURE OF SPINAZOLA LANDFILL - MA DEP DOCKET NO. ACOP NO. NE-9009-4673	7/24/2000	13	R01: (MA DEPT OF ENVIRONMENTAL PROTECTION)		LGL / Legal Instrument	052-ENFORCEMENT/0522-Negotiations/10.03-STATE AND LOCAL ENFORCEMENT RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100015929

652699	ARTICLE IN ARCHIVES OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY: DEVELOPMENT AND EVALUATION OF CONSENSUS-BASED SEDIMENT QUALITY GUIDELINES FOR FRESHWATER ECOSYSTEMS	1/13/2000	13	R01: Berger, T A, R01: Ingersoll, C G (COLUMBIA ENVIRONMENTAL RESEARCH CENTER), R01: Macdonald, Donald D (MACDONALD ENVIRONMENTAL SCIENCES LTD)		PUB / Publication	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	COPY(Controlled/Copyright)	1	DOI: 10.1007/s002440010075
190616	PEER REVIEW DRAFT - SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT PROTOCOL FOR HAZARDOUS WASTE COMBUSTION FACILITIES, VOLUME ONE	8/1/1999	1362			LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.1-Regulations, Standards & Guidelines	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/190616
70001483	ATSDR FACT SHEET: N-NITROSODIMETHYLAMINE (NDMA)	7/1/1999	2	R01: (AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR))		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.05-FACT SHEETS/INFORMATION UPDATES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001483
70001618	FACT SHEET: N-NITROSO-DIMETHYLAMINE (NDMA) CAS #62-75-9	7/1/1999	2	R01: (AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR))		PUB / Publication	051-COMMUNITY INVOLVEMENT/0511-Community Involvement Activities/13.05-FACT SHEETS/INFORMATION UPDATES	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001618
247373	TRANSMITTAL LETTER FOR SUPPLEMENTAL PHASE 2 COMPREHENSIVE SITE ASSESSMENT (CSA) - GEOCHEMICAL DISCRIMINATION BETWEEN GROUNDWATER EMANATING FROM CALCIUM SULFATE AND WOBURN LANDFILL (COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM ATTACHED)	2/16/1999	4	R01: Hanley, Margret (GEI CONSULTANTS INC)	R01: Pyott, Christopher (MA DEPT OF ENVIRONMENTAL PROTECTION)	LTR / Letter	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/247373
247379	TECHNICAL SERIES 4 - GEOCHEMICAL DISCRIMINATION BETWEEN GROUNDWATER EMANATING FROM THE CALCIUM SULFATE ADN WOBURN SANITARY LANDFILLS	2/10/1999	58	R01: (GEOMEGA INC)	R01: (OLIN CORP)	RPT / Report	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/247379
247328	TECHNICAL SERIES 3 - RESULTS OF AUGUST 1998 MULTILEVEL PIEZOMENTER SAMPLING EVENT AND DAPL/DIFFUSE LAYER DISCRIMINATION ANALYSIS (COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM AND 01/22/99 TRANSMITTAL LETTER ATTACHED)	1/8/1999	48	R01: (GEOMEGA INC)	R01: Pyott, Christopher (MA DEPT OF ENVIRONMENTAL PROTECTION)	RPT / Report	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/247328
247374	REPORT OF GROUNDWATER SAMPLING AND ANALYSIS IN THE VICINITY OF THE CALCIUM SULFATE LANDFILL (COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM AND 07/31/98 TRANSMITTAL LETTER ATTACHED)	7/30/1998	23	R01: Hanley, Margret (GEI CONSULTANTS INC), R01: (LAW ENGINEERING AND ENVIRONMENTALSERVICES)	R01: Pyott, Christopher (MA DEPT OF ENVIRONMENTAL PROTECTION), R01: (OLIN CORP)	RPT / Report	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/247374
652695	TOXICOLOGICAL BENCHMARKS FOR SCREENING CONTAMINANTS OF POTENTIAL CONCERN FOR EFFECTS ON TERRESTRIAL PLANTS: 1997 REVISION	11/1/1997	123	R01: Efroymson, R A (LOCKHEED MARTIN ENERGY SYSEMS INC), R01: Suter II, G W (LOCKHEED MARTIN ENERGY SYSEMS INC), R01: Will, M E (LOCKHEED MARTIN ENERGY SYSEMS INC), R01: Wooten, A C (LOCKHEED MARTIN ENERGY SYSEMS INC)	R01: (US DEPT OF ENERGY)	RPT / Report	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/652695
652696	TOXICOLOGICAL BENCHMARKS FOR CONTAMINANTS OF POTENTIAL CONCERN FOR EFFECTS ON SOIL AND LITTER, INVERTEBRATES AND HETEROTROPHIC PROCESS: 1997 REVISION	11/1/1997	151	R01: Efroymson, R A (LOCKHEED MARTIN ENERGY SYSEMS INC), R01: Suter II, G W (LOCKHEED MARTIN ENERGY SYSEMS INC), R01: Will, M E (LOCKHEED MARTIN ENERGY SYSEMS INC)	R01: (US DEPT OF ENERGY)	RPT / Report	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/652696
157968	EPA RULES OF THUMB FOR SUPERFUND REMEDY SELECTION	8/1/1997	26				053-REMEDIAL/0531-Remedy Characterization/A4.2-Record of Decision/Remedy Selection	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/157968
158350	EPA Health Effects Assessment Summary Tables FY 1997 Update	7/1/1997	403				053-REMEDIAL/053-REMEDIAL/0531-Remedy Characterization/A4.2-Record of Decision/Remedy Selection	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/158350
157941	ECOLOGICAL RISK ASSESSMENT GUIDANCE FOR SUPERFUND: PROCESS FOR DESIGNING AND CONDUCTING ECOLOGICAL RISK ASSESSMENTS - INTERIM FINAL	6/1/1997	239			LAWS / Laws/Regulations/Guidance	053-REMEDIAL/053-REMEDIAL/0531-Remedy Characterization/A4.2-Record of Decision/Remedy Selection, 058-PROGRAM SUPPORT/0583-Regulatory Development/B8.1-Regulations, Standards & Guidelines	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/11/157941
248913	SUPPLEMENTAL PHASE 2 REPORT [PART 1 OF 2] (COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM AND PHASE 1 COMPLETION STATEMENT ATTACHED) [MARGINALIA]	6/1/1997	387	R01: (ABB ENVIRONMENTAL SERVICES INC), R01: (GEOMEGA INC), R01: (PTI ENVIRONMENTAL SERVICES), R01: (SMITH TECHNOLOGY CORP)		RPT / Report	055-SITE EVALUATION/0551-Pre-Remedial Site Evaluation/01.03-SITE INSPECTION/INVESTIGATION	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/248913
248914	SUPPLEMENTAL PHASE 2 REPORT - TABLES AND FIGURES [PART 2 OF 2]	6/1/1997	690	R01: (ABB ENVIRONMENTAL SERVICES INC), R01: (GEOMEGA INC), R01: (PTI ENVIRONMENTAL SERVICES), R01: (SMITH TECHNOLOGY CORP)		RPT / Report	055-SITE EVALUATION/0551-Pre-Remedial Site Evaluation/01.03-SITE INSPECTION/INVESTIGATION	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/248914

173	Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Groundwater at CERCLA Sites [EPA # 540/R-96/023; OSWER # 9283.1-12]	10/1/1996	86			LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.4-Directives and Policy Guidance Documents	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/173
652697	TOXICOLOGICAL BENCHMARKS FOR SCREENING CONTAMINANTS OF POTENTIAL CONCERN FOR EFFECTS ON SEDIMENT-ASSOCIATED BIOTA: 1996 REVISION	6/1/1996	52	R01: Hull, R N (LOCKHEED MARTIN ENERGY SYSEMS INC), R01: Jones, D S (LOCKHEED MARTIN ENERGY SYSEMS INC), R01: Suter II, G W (LOCKHEED MARTIN ENERGY SYSEMS INC)	R01: (US DEPT OF ENERGY)	RPT / Report	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/652697
66493	FINAL DRAFT GROUNDWATER USE AND VALUE DETERMINATION GUIDANCE	4/3/1996	28	R01: (US EPA REGION 1)		RPT / Report	056-SITE SUPPORT/0561-Administrative Support/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/66493
652660	RISK UPDATES, NUMBER 3	8/1/1995	6	R01: (US EPA REGION 1)		PUB / Publication	053-REMEDIAL/0531-Remedy Characterization/03.10-ENDANGERMENT/BASELINE RISK ASSESSMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/652660
147	Land Use in the CERCLA remedy Selection Process	5/25/1995	11			LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.4-Directives and Policy Guidance Documents	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/147
50978	RISK UPDATES, NUMBER 2	8/1/1994	23	R01: (US EPA REGION 1)		PUB / Publication	053-REMEDIAL/0531-Remedy Characterization/03.10-ENDANGERMENT/BASELINE RISK ASSESSMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/50978
190664	WILDLIFE EXPOSURE FACTORS HANDBOOK, APPENDIX: LITERATURE REVIEW DATABASE, VOLUME Ii OF II	12/1/1993	481			PUB / Publication	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.1-Regulations, Standards & Guidelines	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/190664
190663	WILDLIFE EXPOSURE FACTORS HANDBOOK, VOLUME I OF II	12/1/1993	84			PUB / Publication	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.1-Regulations, Standards & Guidelines	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/190663
653701	GUIDELINES FOR THE PROTECTION AND MANAGEMENT OF AQUATIC SEDIMENT QUALITY IN ONTARIO	8/1/1993	39	R01: (ONTARIO MINISTRY OF ENVIRONMENT AND ENERGY)		RPT / Report	056-SITE SUPPORT/0561-Administrative Suport/17.07-REFERENCE DOCUMENTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653701
248902	COMPREHENSIVE SITE ASSESSMENT (SI) - PHASE 2 FIELD INVESTIGATION REPORT, VOLUME 1 OF 3	6/1/1993	302	R01: (CONESTOGA-ROVERS & ASSOCIATES)	R01: (OLIN CORPORATION)	RPT / Report	055-SITE EVALUATION/0551-Pre-Remedial Site Evaluation/01.03-SITE INSPECTION/INVESTIGATION	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/248902
248903	COMPREHENSIVE SITE ASSESSMENT (SI) - PHASE 2 FIELD INVESTIGATION REPORT, VOLUME 2 OF 3	6/1/1993	672	R01: (CONESTOGA-ROVERS & ASSOCIATES)	R01: (OLIN CORPORATION)	RPT / Report	055-SITE EVALUATION/0551-Pre-Remedial Site Evaluation/01.03-SITE INSPECTION/INVESTIGATION	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/248903
248904	COMPREHENSIVE SITE ASSESSMENT (SI) - PHASE 2 FIELD INVESTIGATION REPORT, VOLUME 3 OF 3	6/1/1993	666	R01: (CONESTOGA-ROVERS & ASSOCIATES)	R01: (OLIN CORPORATION)	RPT / Report	055-SITE EVALUATION/0551-Pre-Remedial Site Evaluation/01.03-SITE INSPECTION/INVESTIGATION	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/248904
249005	NOTICE OF RESPONSIBIILTY LETTER REGARDING 02/04/92 INVESTIGATION OF RELEASE OF ALUMINUM HYDROXIDE AND CHROMIUM (CERTIFIED MAIL RECEIPT ATTACHED)	5/28/1992	5	R01: Boyle, Timothy J (MA DEPT OF ENVIRONMENTAL PROTECTION)	R01: Morrow, Stephen (OLIN CORP)	LTR / Letter	052-ENFORCEMENT/0522-Negotiations/10.03-STATE AND LOCAL ENFORCEMENT RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/249005
174509	MEMO REGARDING CONSIDERATIONS IN GROUND-WATER REMEDIATION AT SUPERFUND SITES AND RCRA FACILITIES - UPDATE OSWER No. 9283.1-06	5/27/1992	13			MEMO / Memorandum	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.1-Regulations, Standards & Guidelines	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/174509
156748	A Guide to Principal Threat and Low Level Threat Wastes Office	11/1/1991	4				053-REMEDIAL/0531-Remedy Characterization/A4.2-Record of Decision/Remedy Selection	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/156748
191	RISK ASSESSMENT GUIDANCE FOR SUPERFUND (RAGS), VOLUME I-HUMAN HEALTH EVALUATION MANUAL, PART A	12/1/1989	288			LAWS / Laws/Regulations/Guidance	058-PROGRAM SUPPORT/0583-Regulatory Development/B8.1-Regulations, Standards & Guidelines, 058-PROGRAM SUPPORT/0583-Regulatory Development/B8.4-Directives and Policy Guidance Documents	UCTL(Uncontrolled)	11	https://semspub.epa.gov/src/document/11/191
653911	LETTER REGARDING COMPLETION OF CLOSURE, GYPSUM LANDFILL (STATEMENT OF COMPLIANCE ATTACHED)	2/1/1988	16	R01: Cameron, Donald (OLIN CORP)	R01: Chalpin, Richard J (MA DEPT OF ENVIRONMENTAL QUALITY ENGINEERING)	LTR / Letter	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653911
646185	LETTER REGARDING TELEPHONE CONVERSATION ABOUT SAMPLING PARAMETERS	12/30/1987	1	R01: Mcmahon, Thomas C (MA DEPT OF ENVIRONMENTAL QUALITY ENGINEERING)	R01: Bellotti, Michael J (OLIN CORP)	LTR / Letter	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/646185
653910	LETTER REGARDING SULFATE SETTLING PONDS CLOSURE	6/18/1987	1	R01: Norwood, Verrill M (OLIN CORP)	R01: Dore, Peter (MA DIVISION OF ATER POLLUTION CONTROL)	LTR / Letter	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653910

100012146	NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT NO. MA0005304	3/9/1987	7	R01: (MA DEPT OF ENVIRONMENTAL QUALITY ENGINEERING), R01: (US EPA REGION 1)		LGL / Legal Instrument	052-ENFORCEMENT/0522-Negotiations/10.03-STATE AND LOCAL ENFORCEMENT RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100012146
100012147	DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT NO. MA0005304 FACT SHEET	10/8/1986	13	R01: (US EPA REGION 1)		PUB / Publication	052-ENFORCEMENT/0522-Negotiations/10.03-STATE AND LOCAL ENFORCEMENT RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/100012147
653909	LETTER REGARDING GYPSUM WASTE LANDFILL, SUMMARY OF WORK FOR PLACEMENT OF CALCIUM SULFATE	10/7/1986	6	R01: Mcbrien, Ronald J (OLIN CORP)	R01: Adams, David (MA DEPT OF ENVIRONMENTAL QUALITY ENGINEERING)	LTR / Letter	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653909
248870	PHASE 1 SITE INSPECTION (SI) REPORT [MARGINALIA AND HIGHLIGHTS]	9/1/1986	321	R01: (WEHRAN ENGINEERING CORP)		RPT / Report	055-SITE EVALUATION/0551-Pre-Remedial Site Evaluation/01.03-SITE INSPECTION/INVESTIGATION	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/248870
646153	HYDROGEOLOGIC INVESTIGATION (02/25/1982 TRANSMITTAL LETTER ATTACHED)	2/1/1982	149	R01: (MALCOM PIRNIE INC)	R01: (OLIN CHEMICAL CORP)	RPT / Report	053-REMEDIAL/0531-Remedy Characterization/03.04-INTERIM DELIVERABLES (RI)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/646153
476282	SITE INSPECTION (SI) REPORT	12/5/1980	72	R01: Cook, David K (ECOLOGY & ENVIRONMENT INC)	R01: Hackler, John F (US EPA REGION 1 - OFFICE OF UNCONTROLLED WASTE SITES)	RPT / Report	055-SITE EVALUATION/0551-Pre-Remedial Site Evaluation/01.03-SITE INSPECTION/INVESTIGATION	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/476282
653908	SITE PLAN, PROPOSED DEWATERED CAKE LANDFILL, NATIONAL POLYCHEMICALS INC	8/31/1973	6	R01: (DANA PERKINS AND SONS INCORPORATED)		FIG / Figure/Map/Drawing	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/653908
646187	POLLUTION CONTROL STUDY FOR NATIONAL POLYCHEMICALS INC	8/21/1969	19	R01: (BADGER CO)		RPT / Report	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/646187
475926	SCREENING QUICK REFERENCE TABLES (SQUIRTS)	Undated	34	R01: (NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA))		NOTE / Notes	055-SITE EVALUATION/0551-Pre-Remedial Site Evaluation/01.18-SITE ASSESSMENT SUPPORT DOCUMENTATION	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/475926
483478	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 30 YEAR EXPOSURE BASED ON 11/2009 EPA SAMPLING RESULTS	Undated	3	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483478
483479	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 30 YEAR EXPOSURE BASED ON 11/2009 EPA SAMPLING RESULTS	Undated	3	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483479
483480	[REDACTED] SPREADSHEET FOR RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 70 YEAR EXPOSURE BASED ON 11/2009 EPA SAMPLING RESULTS	Undated	3	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483480
483481	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 70 YEAR EXPOSURE BASED ON 11/2009 EPA SAMPLING RESULTS	Undated	3	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483481
483482	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 30 YEAR EXPOSURE	Undated	6	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483482
483483	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 30 YEAR EXPOSURE	Undated	3	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483483
483484	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 70 YEAR EXPOSURE	Undated	6	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483484
483485	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 70 YEAR EXPOSURE	Undated	3	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483485
483486	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 30 YEAR EXPOSURE BASED ON EPA SAMPLING RESULTS	Undated	3	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483486
483487	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 30 YEAR EXPOSURE BASED ON OLIN COPR SAMPLING RESULTS	Undated	3	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483487
483488	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 30 YEAR EXPOSURE BASED ON OLIN COPR SAMPLING RESULTS	Undated	3	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483488

483489	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 30 YEAR EXPOSURE BASED ON EPA SAMPLING RESULTS	Undated	3	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483489
483490	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 70 YEAR EXPOSURE BASED ON EPA SAMPLING RESULTS	Undated	3	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483490
483491	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 70 YEAR EXPOSURE BASED ON OLIN CORP SAMPLING RESULTS	Undated	3	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483491
483492	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 70 YEAR EXPOSURE BASED ON OLIN CORP SAMPLING RESULTS	Undated	3	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483492
483493	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 70 YEAR EXPOSURE BASED ON EPA SAMPLING RESULTS	Undated	3	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483493
483524	HEALTH EFFECTS REGARDING N-NITROSODIMETHYLAMINE (NDMA)	Undated	50			RPT / Report	054-REMOVAL/0541-Removal Responses/02.02-REMOVAL RESPONSE REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483524
483525	POTENTIAL HUMAN EXPOSURE REGARDING N-NITROSODIMETHYLAMINE (NDMA)	Undated	12			RPT / Report	054-REMOVAL/0541-Removal Responses/02.02-REMOVAL RESPONSE REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483525
483526	PUBLIC HEALTH STATEMENT REGARDING N-NITROSODIMETHYLAMINE (NDMA)	Undated	7			RPT / Report	054-REMOVAL/0541-Removal Responses/02.02-REMOVAL RESPONSE REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483526
483527	REGULATIONS AND ADVISORIES REGARDING N-NITROSODIMETHYLAMINE (NDMA)	Undated	3			RPT / Report	054-REMOVAL/0541-Removal Responses/02.02-REMOVAL RESPONSE REPORTS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483527
483558	RESIDENTIAL DRINKING WATER INGESTION CANCER RISK BASED CONCENTRATION FOR 1E-04 CANCER RISK AND 70 YEAR EXPOSURE	Undated	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483558
483559	RESIDENTIAL DERMAL CONTACT NON CANCER RISK CHILD EXPOSURE	Undated	10			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/483559
484778	RESIDENTIAL DRINKING WATER INGESTION CANCER RISK OF 9.4 NG/L OF N-NITROSODIMETHYLAMINE (NDMA) ASSUMING MUTAGENIC MODE OF CARCINOGENESIS 70 YEAR EXPOSURE	Undated	3			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484778
484782	RESIDENTIAL DRINKING WATER INGESTION CANCER RISK OF 14 NG/L OF N-NITROSODIMETHYLAMINE (NDMA) ASSUMING MUTAGENIC MODE OF CARCINOGENESIS 70 YEAR EXPOSURE	Undated	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484782
484783	PROPOSED DRINKING WATER ANALYTES [HIGHLIGHTS]	Undated	3			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484783
484784	PROPOSED DRINKING WATER ANALYTES [HIGHLIGHTS]	Undated	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484784
484787	TAP SAMPLING OF RESIDENTIAL WELLS PROCEDURE	Undated	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/484787
485014	[REDACTED] EXCERPT REGARDING SAMPLING OF PRIVATE WELLS	Undated	1			RPT / Report	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485014
485016	[REDACTED] RESIDENTIAL PROPERTIES WITH PRIVATE WELLS PROPOSED FOR SAMPLING (SUPPORTING DOCUMENTATION ATTACHED)	Undated	4			LST / List/Index	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485016
485017	[REDACTED] TABLE C-20: USABLE EXISTING GROUNDWATER DATA SUMMARY - PRIVATE WELLS [MARGINALIA]	Undated	10			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485017
485018	[REDACTED] TABLE C-20: USABLE EXISTING GROUNDWATER DATA SUMMARY - PRIVATE WELLS	Undated	70			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485018

485046	PROPOSED DRINKING WELL ANALYTES	Undated	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485046
485048	LETTER REGARDING PRIVATE DRINKING WATER WELL [BEST AVAILABLE COPY]	Undated	1	R01: Newhouse, Shelly (WILMINGTON (MA) BOARD OF HEALTH)		LTR / Letter	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485048
485064	PROPOSED ADDITIONAL DRINKING WELL ANALYTES [REVISED]	Undated	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485064
485067	PROPOSED ADDITIONAL DRINKING WELL ANALYTES	Undated	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485067
485075	PRIVATE WELL SURVEY QUESTIONS	Undated	2	R01: (US EPA REGION 1)		FRM / Form	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485075
485093	PROPOSED ADDITIONAL DRINKING WELL ANALYTES [MARGINALIA]	Undated	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485093
485095	MAP: EXTENT OF GROUNDWATER IMPACT [MARGINALIA]	Undated	1	R01: (MACTEC ENGINEERING AND CONSULTING INC)		FIG / Figure/Map/ Drawing	056-SITE SUPPORT/0561-Administrative Support/17.04-NON-PRINT MATERIALS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485095
485099	[REDACTED] RESIDENTIAL PROPERTIES WITH PRIVATE WELLS PROPOSED FOR SAMPLING [MARGINALIA]	Undated	1			LST / List/Index	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485099
485501	[REDACTED] PROPOSED DRINKING WELL ANALYTES [MARGINALIA]	Undated	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485501
485515	[REDACTED] RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISKS	Undated	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485515
485517	[REDACTED] TABLE 3: SUMMARY OF RECOMMENDED PRIVATE WELL SAMPLING	Undated	4			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485517
485527	[REDACTED] RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISKS [HIGHLIGHTS]	Undated	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485527
485550	[REDACTED] SPREADSHEET WITH COMPARISON OF WELL MONITORING DATA (AUGUST 2010) WITH EPA REGIONAL SCREENING LEVELS OF TAPWATER	Undated	3			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485550
485632	[REDACTED] GIS PRIVATE WELLS	Undated	2			LST / List/Index	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485632
485669	[REDACTED] SECOND SAMPLING EVENT OF WILMINGTON RESIDENTIAL WELLS - 07/29/2010 - 08/23/2010	Undated	2			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485669
485670	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISK 30 YEAR EXPOSURE BASED ON 11/2009 EPA SAMPLING RESULTS	Undated	3	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485670
485671	[REDACTED] SPREADSHEET WITH RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISKS	Undated	2	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485671
485672	[REDACTED] LIST OF PROPERTIES WITH RESIDENTIAL WELLS	Undated	2			LST / List/Index	054-REMOVAL/0541-Removal Responses/02.01-CORRESPONDENCE (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485672
485674	[REDACTED] RESIDENTIAL DRINKING WATER/HOUSEHOLD WATER USE CANCER RISKS	Undated	2	R01: Woods, Cynthia (AVATAR ENVIRONMENTAL)	R01: Sugatt, Richard (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/485674

646166	NOTES ON HISTORIC WASTE DISPOSAL AT SITE	Undated	30	R01: (MA DEPT OF ENVIRONMENTAL PROTECTION)		RPT / Report	056-SITE SUPPORT/0563-State/Tribal Involvement/09.10-STATE TECHNICAL AND HISTORICAL RECORDS	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/646166
70001573	RESIDENTIAL DRINKING WATER INGESTION CANCER RISK-BASED CONCENTRATION FOR 1E-04 CANCER RISK AND 70 YEAR EXPOSURE	Undated	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001573
70001583	RESIDENTIAL DERMAL CONTACT NON-CANCER RISK RESIDENTIAL CHILD EXPOSURE (NATIVE FILE ATTACHED)	Undated	1	R01: Ford, Heather M (NOBIS ENGINEERING INC)	R01: Dilorenzo, James (US EPA REGION 1)	ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001583
70001585	RESIDENTIAL INGESTION NON-CANCER RISK RESIDENTIAL CHILD EXPOSURE (NATIVE FILE ATTACHED)	Undated	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001585
70001620	PROPOSED DRINKING WELL ANALYTES (NATIVE FILE ATTACHED)	Undated	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001620
70001633	PROPOSED DRINKING WELL ANALYTES (NATIVE FILE ATTACHED)	Undated	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001633
70001652	PROPOSED ADDITIONAL DRINKING WELL ANALYTES (NATIVE FILE ATTACHED)	Undated	1			ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001652
70001653	FIELD AND QUALITY CONTROL SAMPLE SUMMARY (TABLE ON SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIME ATTACHED)	Undated	2	R01: (NOBIS ENGINEERING INC)		ADD / Analytical Data Document	054-REMOVAL/0541-Removal Responses/02.03-SAMPLING & ANALYSIS DATA (REMOVAL RESPONSE)	UCTL(Uncontrolled)	1	https://semspub.epa.gov/src/document/01/70001653