Environmental Remediation Group

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August 3, 2020

Ms. Lynne Jennings and Ms. Melanie Morash
U. S. Environmental Protection Agency (USEPA), Region 1
5 Post Office Square, Suite 100,
Mail Stop OSRR07-4, Boston, MA 02109-3912

RE: Interim Action Feasibility Study (Volume II)
Olin Chemical Superfund Site
51 Eames Street, Wilmington, MA

Dear Ms. Jennings and Ms. Morash:

The Interim Action Feasibility Study (IAFS) for the Olin Chemical Superfund Site (OCSS) located at 51 Eames Street in Wilmington, Massachusetts is attached hereto. A draft IAFS, prepared in collaboration with the USEPA and the Massachusetts Department of Environmental Protection (MADEP), was previously submitted to USEPA on April 30, 2020. The attached version of the IAFS has been revised to incorporate USEPA and MADEP comments and subsequent discussions.

A separate FS, referred to as the operable unit (OU)1/OU2 FS, was submitted to the USEPA under separate cover on July 31, 2020. The OU1/OU2 FS and IAFS are companion documents with the OU1/OU2 FS referred to as Volume I, and the IAFS referred to as Volume II. USEPA will complete the comparative analyses, which will be added to the OU1/OU2 and IAFS reports as Volume III.

We appreciate the input that you and your team provided during this significant effort and look forward to continuing to work together on this project. Please contact me at (423) 336-4012 if you have any questions.

Sincerely,
OLIN CORPORATION

James M. Cashwell
Director, Environmental Remediation

Enclosure:
Interim Action Feasibility Study (Volume II)

SEMS Doc ID 647858

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OLIN CHEMICAL SUPERFUND SITE
51 Eames Street
Wilmington, Massachusetts

Volume 2
Interim Action Feasibility Study

Prepared for:

United States Environmental Protection Agency
Region 1
5 Post Office Square, Suite 100
Boston, MA 02109

August 2020

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LIST OF ACRONYMS

1,2-DCA	1,2-dichloroethane
ACECs	Areas of Critical Environmental Concern
AMEC	AMEC Environment & Infrastructure, Inc.
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
BEHP	Bis-2-ethylhexyl phthalate
BHHRA	Baseline Human Health Risk Assessment
bgs	Below ground surface
BMPs	Best Management Practices
CA	Containment Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-dichloroethene
cm/sec	centimeters per second
CMR	Code of Massachusetts Regulations
COC	Chemical of Concern
CSL	Calcium Sulfate Landfill
CSM	Conceptual Site Model
cy	cubic yard
DAPL	Dense Aqueous Phase Liquid
DGWP	Data Gaps Work Plan
FS	Feasibility Study
ft	foot or feet
ft msl	feet above mean sea level
g	gram
GCL	geosynthetic clay liner
GEI	Geotechnical Engineers, Inc.
gpm	gallons per minute
HDPE	High density polyethylene
HI	Hazard Index

LIST OF ACRONYMS (cont.)

HQ	Hazard Quotient
IAFS	Interim Action Feasibility Study
LIF	laser-induced fluorescence
LNAPL	Light Non-Aqueous Phase Liquid
MACTEC	MACTEC Engineering and Consulting, Inc.
MassDEP	Massachusetts Department of Environmental Protection
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MCP	Massachusetts Contingency Plan
µg/L	Micrograms per liter
µmhos/cm	Micro-ohms per centimeter
mg/L	Milligrams per liter
MPE	Multi-phase extraction
msl	mean sea level
MWRA	Massachusetts Water Resource Authority
MWSW	Municipal Water Supply Well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDMA	N-nitrosodimethylamine
NDPA	N-nitrosodiphenylamine
ng/L	Nanograms per Liter
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OCSS	Olin Chemical Superfund Site
off-PWD	Off-Property West Ditch
Olin	Olin Corporation
O&M	Operations and maintenance
off-PWD	Off-Property West Ditch
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit

LIST OF ACRONYMS (cont.)

PCMP	Post-Construction Monitoring Plan
PDI	pre-design investigation
POTW	publicly owned treatment works
PPE	personal protective equipment
PRG	Preliminary Remediation Goal
Property	Olin Property
PVC	Polyvinyl chloride
RA	Remedial Action
RAM	Release Abatement Measure
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RGP	Remediation General Permit
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RSL	Regional Screening Level
SDWA	Safe Drinking Water Act
SCADA	supervisory control and data aquisition
Sf	square feet
the Site	Olin Chemical Superfund Site
SOW	Statement of Work
SVOC	semivolatile organic compound
TCE	trichloroethene
TMP	trimethylpentenes
TSDF	treatment, storage and disposal facility
UCL	Upper Concentration Limit
UIC	underground injection control
USEPA	United States Environmental Protection Agency
UV	Ultraviolet
UVOST	ultraviolet optical screening tool

LIST OF ACRONYMS (cont.)

VC	vinyl chloride
VI	vapor intrusion
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbon
WBV	Western Bedrock Valley
Wood	Wood Environment & Infrastructure Solutions, Inc.

1.0 INTRODUCTION

This Interim Action Feasibility Study (IAFS) Report has been developed to provide a range and evaluation of remedial alternatives that will address mass removal and source control to reduce future impacts to groundwater and other media by contaminants related to the Olin Chemical Superfund Site (OCSS, or the Site) in Wilmington, MA. This IAFS Report is a result of significant discussion between the United States Environmental Protection Agency (USEPA) and Olin and represents a cooperative approach to addressing environmental concerns at the Site. This IAFS Report also follows submittal of several significant documents as described below. The IAFS Report is Volume II of a larger Feasibility Study (FS) report for the Site that is intended to evaluate alternatives for not only mass removal and source control, but also for soils, sediments, and surface water Site-wide. Volume I (the operable unit [OU]1/OU2 FS Report), has been prepared to evaluate remedial alternatives for soil (except for Containment Area soils), sediments, and surface water.[1] Volume III provides the comparative analysis of the remedial alternatives presented in Volumes I and II.

The remedial alternatives developed in the FS report are also supported by two memoranda prepared by EPA, which update the conclusions and findings presented in the OU1/OU2 Remedial Investigation (RI) Report (AMEC Environment & Infrastructure, Inc. (AMEC), 2015b; 2015 OU1/OU2 RI Report)[2] and Revised RI Report OU3 (Wood Environment & Infrastructure Solutions, 2019a; Draft 2019 OU3 RI Report).[3] Additional supporting documents for the FS report include memoranda documenting the development of Preliminary Remediation Goals (PRGs) for soil, sediments, and surface water[4] and the development of PRGs to address human health risks in Dense Aqueous-Phase Liquid (DAPL), groundwater hot spots, upland soil (including Containment Area soil), and surface water.[5]

[1] Olin Chemical Superfund Site, OU1/OU2 Feasibility Study, July 2020.
[2] Memorandum, *Olin Chemical Superfund Site, Updates to OU1/OU2 RI Report Conclusions, EPA, August 2020.*
[3] Memorandum, *Olin Chemical Superfund Site, Updates to OU3 RI Report Conclusions, EPA, August 2020.*
[4] Technical Memorandum, *Documentation of Preliminary Remediation Goals (PRGs) for Soil, Sediment and Surface Water, Olin Chemical Superfund Site – Wilmington, MA,* Olin Corporation, May 15, 2020.
[5] 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. (Wood), July 1, 2020a).

A Final Remedial Investigation (RI) Report (Amec Foster Wheeler, 2015b) was developed by Olin Corporation (Olin) and approved by the United States Environmental Protection Agency (USEPA) (USEPA, 2015) for Operable Units 1 and 2 (OU1 and OU2) at the Site. OU1 and OU2 are composed of all soil, sediment, and Site-wide surface water.

In March 2018, the following documents associated with OU1, OU2, and OU3 (Site-wide groundwater) were submitted to the USEPA:

- Draft OU1/OU2 Feasibility Study (FS)
- Draft OU3 RI Report
- Draft OU3 Baseline Human Health Risk Assessment (BHHRA)
- Draft OU3 FS

The USEPA provided comments on these documents in a September 25, 2018 letter. The USEPA met with Olin on December 10, 2018 to discuss comments and concerns raised by the USEPA on aspects of the conceptual site model (CSM) and data gaps. As a result of the December 10, 2018 meeting and the subsequent meetings and communications between USEPA and Olin throughout 2019 and early 2020, this IAFS Report was prepared to evaluate potential interim remedial action alternatives to address sources of contamination at the Site.

1.1 Purpose, Scope and Report Organization

1.1.1 Purpose and Scope

The purpose of this document is to develop and evaluate interim remedial action alternatives[6], specifically:

- to enhance recovery of light non-aqueous phase liquid (LNAPL) at the Plant B area,
- to reduce the volume and mass of dense aqueous phase liquid (DAPL) in the overburden aquifer,

[6] The IAFS Report presents the range of alternatives to address DAPL, groundwater hot spots, LNAPL, and Containment Area soil. While the latter two cleanup components were originally grouped with the DAPL and groundwater hot spot evaluations due to their connection to groundwater (in the case of LNAPL, which, together with dissolved-phase constituents in groundwater, is captured by Plant B prior to impacting East Ditch Stream, and in the case of Containment Area soil, for its relationship to the Containment Area DAPL pool and hot spot groundwater), the alternatives developed for LNAPL and Containment Area soil would not be interim, but final remedial action alternatives.

- to extract groundwater hot spots with the highest concentrations of N-nitrosodimethylamine (NDMA) for mass reduction and source control from the overburden aquifer, and
- to address impacted soils within the Containment Area.

Interim Action is appropriate to address remaining sources in groundwater while site studies continue to close data gaps. A range of remedial alternatives to address potential risks associated with groundwater, as appropriate, will be developed in a future OU3 Groundwater FS following the closure of data gaps and the expected implementation of the remedies described in this IAFS Report.

This IAFS Report develops and presents interim/final action alternatives in a manner consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CPR Part 300), and Guidance for Conducting Remedial Investigations and Feasibility Studies under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Office of Solid Waste and Emergency Response [OSWER] Directive 9355.3-01; USEPA, 1988b). The alternatives presented in this document are developed by assembling combinations of technologies into alternatives that address source control.

The scope of this IAFS Report is commensurate with the approach outlined in the USEPA Guide to developing Superfund No Action, Interim Action, and Contingency Remedy Records of Decision (RODs) (USEPA, 1991a).

1.1.2 Report Organization

The remainder of Section 1 presents background information concerning LNAPL recovery at the Plant B Area, the three DAPL pools, groundwater hot spot contamination, and the Containment Area, including a brief summary of past response actions. This is followed by summaries of the nature and extent of contamination, contaminant fate and transport processes for OU3, the CSM, and the risk assessments that have been completed, as they relate to the interim actions developed and evaluated in this IAFS Report.

Section 2 discusses the remedial action objectives (RAOs) and the identification and screening of technologies. This section also discusses the groundwater chemicals of concern (COCs) for future potable use of groundwater and presents applicable or relevant and appropriate requirements (ARARs) as they relate to implementation of the interim actions. Section 2 then develops the general response actions to meet the RAOs and identifies technologies specific to LNAPL, DAPL, NDMA-containing groundwater hot spots, and Containment Area soils.

Section 3 presents the screening of each technology based on effectiveness, implementability, and cost as well as the development of remedial alternatives. Candidate technologies that meet screening criteria are retained for alternative development.

Section 4 provides an evaluation of the interim/final action alternatives for each of the four source areas. Each alternative is evaluated against seven of the nine CERCLA evaluation criteria. Recommended interim/final actions are not included in this IAFS Report but will be presented by the USEPA in a Proposed Plan that describes the selected interim/final actions.

Section 5 contains references.

1.2 Background Information

The OCSS is comprised of the Olin Property (Property), an approximate 50-acre parcel located at 51 Eames Street in Wilmington, Massachusetts (**Figure 1.2-1**), and adjoining off-Property areas that have been impacted by contaminant releases from the Property (see, for example, Figure 1.2-2, Figure 1.2-3, Figure 1.3-1, Figure 1.4-1, and figures from the Draft 2019 OU3 RI Report that show the distribution of NDMA and other primary COCs in groundwater, which are provided in Appendix C). A chemical manufacturing facility ("facility") was formerly located within the northern 30-acre portion of the Property.

Manufacturing activities were conducted at the OCSS from 1953 until 1986, when all manufacturing operations ceased. Olin purchased the Property in 1980 and operated the facility 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. The facility produced chemical products for use in the rubber and plastics industry. Additional information regarding the history of the OCSS, including Massachusetts Contingency Plan (MCP) and CERCLA response actions, is presented in the 2015 OU1/OU2 RI Report (Amec Foster Wheeler Environment & Infrastructure, Inc. [Amec Foster Wheeler], 2015b).

The OCSS was listed on the National Priorities List (NPL) pursuant to CERCLA Section 105, 42 U.S.C. § 9605 on April 19, 2006 (71 FR 20,016). The OCSS was listed primarily due to the presence of NDMA in groundwater within the Maple Meadow Brook aquifer near five of the Town of Wilmington's Municipal Water Supply Wells (MWSW). These supply wells were taken out of active service in 2003 when NDMA was first detected in groundwater samples collected from four of the five MWSWs. Although the wells have not been used as a potable water source since that time, they are serviced annually to maintain their status as active wells. Olin and the other respondents provided funding to connect the Town of Wilmington to the Massachusetts Water

Resource Authority (MWRA) to replace the potable water historically provided by the MWSWs. The Town of Wilmington draws their current water supply from four supply wells located beyond the groundwater impacts from the OCSS. The MWRA connection remains intact and is used as necessary based on demand.

Prior to the NPL listing, the OCSS had been the subject of many years of investigations and response activities carried out by Olin and supervised by Massachusetts Department of Environmental Protection (MassDEP) under Chapter 21E of the General Laws of Massachusetts and the MCP. The OCSS was classified as a priority disposal site under the MCP in 1993 and as a Tier I site in 1994. The Site is no longer an MCP Tier 1 site, as it is now being regulated by USEPA.

Olin Corporation, American Biltrite Inc. (and The Biltrite Corporation), and Stepan Company, as owners and Co-Respondents, voluntarily entered into an Administrative Settlement Agreement and Order on Consent (AOC) with the USEPA to conduct an RI/FS for the OCSS (USEPA, 2007a) on July 3, 2007. The scope of the RI/FS is described in the Statement of Work (SOW) as prepared by the USEPA Region I – New England and dated June 28, 2007 (USEPA, 2007b).

USEPA has subdivided the OCSS into three OUs, as defined in the AOC/SOW, and are described as follows:

OU1: Approximately 50-acre Olin Property including the former facility area, the established conservation area, the on-Property ditch system, the Calcium Sulfate Landfill (CSL), and the Slurry Wall/Containment Area. The RI/FS, beginning in 2007, evaluated soil (including vadose zone soil), surface water, sediment and potential vapor intrusion into OU1 buildings. Soils located within the water table will be evaluated in the groundwater RI/FS for OU3.

OU2: Off-Property surface water and sediment areas, including the off-Property East Ditch, a small portion of the South Ditch, the off-Property West Ditch (off-PWD), and portions of the Maple Meadow Brook Wetland. (Note: In recent documents, USEPA refers to East Ditch and South Ditch as East Ditch Stream and South Ditch Stream. Consistent with historical documentation for the site, "stream" is not used to reference these water bodies in this report, however, at the request of USEPA, this terminology will be used in the future when appropriate.) North Pond and Landfill Brook were investigated as part of OU2 and were found not to be part of the OCSS (MACTEC Engineering and Consulting, Inc. [MACTEC], 2007).

OU3: On- and off-Property groundwater areas including groundwater beneath the Olin Property, the Maple Meadow Brook aquifer, and groundwater located south and east of the Olin Property. A revised draft RI for OU3 groundwater was submitted to USEPA on June 28, 2019

(Wood, 2019a; Draft 2019 OU3 RI Report). Soils located within the water table will also be evaluated under OU3 (Wood, 2019a).

Figure 1.2-2 identifies the Ipswich and Aberjona Watersheds and the locations of the Plant B treatment building, the three DAPL pools, the Containment Area, and other relevant site features. **Figure 1.2-3** provides additional detail of the current and historic site features.

1.3 Site Description

The OCSS encompasses the Property and surrounding areas where contaminants have migrated via surface water, sediment, DAPL, and/or groundwater transport. The Property is bounded on the east by the Massachusetts Bay Transit Authority tracks, on the south by the Woburn/Wilmington Town Line, on the west by an inactive Boston and Maine Railroad spur, and on the north by Eames Street. These site boundaries, as well as OCSS features, are shown on **Figure 1.2-2**. The Property is located in an industrialized area of Wilmington within a general industrial zone. Intensive industrial land use occurs on the eastern, northern and western sides of the Property. The southern side of the Property is bounded by the Woburn Sanitary Landfill, a former municipal solid waste landfill that has been closed. The study area includes residential properties, some with private groundwater supply wells, that are located along Main Street and Cook Avenue located to the west of the Property[7] and along Eames Street before it intersects with Woburn Street. Additional detailed information about the Olin Property is presented in the 2015 OU1/OU2 RI Report (Amec Foster Wheeler, 2015b), Draft 2017 Remedial Investigation Report – Dense Aqueous Phase Liquid (Amec Foster Wheeler, 2017), and in the Draft 2019 OU3 RI Report (Wood, 2019a).

The former facility was located on the northern half of the Property (north of the South Ditch), which is currently 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, for Site maintenance and management purposes, Olin installed a 40-foot office trailer and two metal storage trailers in the northeastern portion of the Property, near the Plant B groundwater recovery/treatment system.

[7] NDMA has also been sporadically detected in private wells on Border Avenue, Burnham Street, Butters Row, Chestnut Street, Mill Road, Hillside Way and Sachem Circle at concentrations which are primarily below the tap water screening level of 11 ng/L for NDMA.

Site features relevant to the interim actions addressed in this IAFS Report are described below.

1.3.1 Plant B Groundwater Recovery/Treatment System

The Plant B groundwater recovery/treatment system has been in operation since 1981 with continued operation from 1997 to 2006 as an Immediate Response Action under the MCP and from 2008 to date in accordance with the Interim Response Steps Measure Work Plan (MACTEC, 2008) under the AOC. The system is located at the northeast corner of the 51 Eames Street property as shown on **Figures 1.2-2 and 1.2-3** and described in more detail below**.**

The system was installed to prevent seepage of a LNAPL into the East Ditch, which is located along the eastern perimeter of the former facility. The LNAPL is a mixture of process oil and other raw materials historically stored and used at the Facility, including bis-2-ethylhexyl phthalate (BEHP), trimethylpentenes (TMPs), and N-nitrosodiphenylamine (NDPA), and was released during operations of former Property owners prior to Olin's ownership. The Plant B system's primary purpose is to control the migration of LNAPL by maintaining a cone of depression in groundwater. Currently, on average, approximately 1 to 2 gallons of LNAPL is removed annually. 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). The most current RGP was issued on June 26, 2018.

The LNAPL is considered a potential source of dissolved phase contaminants to groundwater which could discharge to East Ditch. Plant B also provides hydraulic containment of the dissolved phase contaminants. Alternatives included in this IAFS Report were developed to prevent LNAPL from contributing to groundwater impacts which could discharge to East Ditch.

During operation of the Plant B treatment system, additional measures including air sparging with soil vapor extraction and nutrient addition for biological stimulation were implemented to reduce the mass of TMPs and BEHP. Plant B falls within a Zone II public water supply area. While there are not currently any off-Property public water supply wells near Plant B that could be impacted by contaminated groundwater emanating from the Plant B area, there are no controls currently in place to prohibit installation of such a well on a neighboring property.

1.3.2 DAPL Pools

DAPL is a highly concentrated brine that is typically dark green (almost black) in color, with a low pH and a density slightly greater than water. The general definition of DAPL is based on having a specific gravity greater than 1.025, which can be measured in a laboratory setting and estimated

by an empirical formula based on its primary constituents. In general, DAPL at the OCSS exhibits the following concentrations of major constituents. Concentrations of these constituents alone do not define DAPL, they are indicators which can be used for a density prediction:

- Ammonia concentration greater than 1,250 milligrams per liter (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; and
- Specific conductance greater than 20,600 micro-ohms per centimeter (µmhos/cm).

DAPL also generally contains the highest concentrations of NDMA and other COCs. In the absence of specific gravity data, specific conductance has been used historically as an indicator to discriminate DAPL samples from overlying groundwater. Olin has committed to re-evaluating this empirical formula to predict density following receipt of groundwater data collected during quarterly groundwater sampling events. Olin has also committed to collecting groundwater and DAPL samples for measurement of specific gravity during quarterly groundwater sampling events at an off-Site laboratory.

The primary transfer of constituents from DAPL to overlying groundwater occurs via chemical diffusion. This diffusion results in the presence of a "diffuse layer," which is an approximately three- to five-foot layer of groundwater overlying the DAPL. The diffuse layer is defined by specific conductance between 3,000 and 20,600 µmhos/cm. The diffuse layer also contains elevated concentrations of NDMA and other COCs. The current flux of contaminants from DAPL through the diffuse layer and into groundwater is likely small in comparison to the initial releases that resulted in convective mixing.

Above the diffuse layer, overlying shallow groundwater generally contains relatively low concentrations of NDMA and other COCs.

In accordance with various USEPA guidance documents (USEPA, 1991b and 1999), "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, to surface water, or to air, or acts as a source for direct exposure. In the case of the OCSS, DAPL is considered a source material. Therefore, in this IAFS Report, source control interim actions are evaluated for the three DAPL pools. In addition, as discussed in Section 1.3.3, this IAFS Report includes an evaluation of alternatives for remediation of areas of groundwater with the highest concentrations of the primary COC, NDMA (i.e., groundwater hot spots).

DAPL has been identified in pools residing in bedrock depressions within the overburden aquifer beneath the Olin Property (the on-Property DAPL pool located beneath the Containment Area), immediately west of the Olin Property (off-PWD DAPL pool), and further to the west near Main Street (Main Street DAPL pool). The areal extent of the three DAPL pools is shown on **Figure 1.3-1**.

A DAPL Extraction Pilot Test (Pilot Test) was conducted from 2012 – 2014 to evaluate the feasibility of DAPL extraction in the off-PWD DAPL pool area. The Pilot Test results and data evaluation are presented in the DAPL Extraction Pilot Study Performance Evaluation Report (AMEC, 2014), which concluded that DAPL extraction in the off-PWD DAPL pool is feasible if the pumping rate does not exceed the gravity drainage rate of the DAPL (less than 0.5 gallons per minute [gpm]). Olin has continued to extract DAPL from a single extraction well (EW-1) from the off-PWD DAPL pool area since the completion of the Pilot Test. It is notable that after two years of additional continued extraction, the extraction rate of 0.5 gpm was determined to be unsustainable. The extraction rate was reduced to 0.25 gpm, which has remained sustainable over a longer time frequency. It should be noted that because DAPL is drawn down below the extraction well screen even at a pumping rate of 0.25 gpm, the system is currently operated on an intermittent basis. To date, approximately one million gallons have been extracted and disposed off-site.

1.3.3 Impacted Groundwater in the Ipswich Watershed

Investigations to date have documented Site-related impacts to overburden and bedrock groundwater at the Olin Property and primarily in areas to the west and north of the Property in the Ipswich Watershed. The Ipswich Watershed includes the zone of contribution for five inactive Town of Wilmington MWSWs, and numerous private residential bedrock drinking water wells. The MWSWs, located adjacent to Butters Row, Chestnut Street, and Town Park have been inactive since March of 2003 due to the detection of NDMA at concentrations above the MassDEP Office of Research and Standards Drinking Water Guideline of 10 nanograms per liter (ng/L).

Overburden and bedrock groundwater plume cores are located to the northwest of the Olin Property. Monitoring wells representative of the overburden groundwater plume cores include GW-84S, M, and D; GW-85D; GW-86D, and GW-87D and GW-61BR, GW-62Br and BRD, MP-5 (Port 3), GW-103BR, and GW-65BR, BRDS, and BRDD. The distribution of NDMA impacted to groundwater is described further in Section 1.4.3.

The overburden groundwater beneath the Maple Meadow Brook wetland flows to the north along a bedrock valley. Surface water from the Maple Meadow Brook wetland also flows to the north and subsequently flows into the Ipswich River.

NDMA was used in this IAFS Report as an indicator to depict the extent of the overburden and bedrock groundwater plumes and in the development of alternatives for remediation of groundwater hot spots. The groundwater hot spots are defined by presence/absence of NDMA, which appears to be the most mobile of the groundwater contaminants. The NDMA is also the most substantial contributor to health risk for the potential future potable use of groundwater from the core of the overburden and bedrock plumes.

Impacts to groundwater also exist in the Aberjona Watershed and are discussed in Section 1.4.3.

This IAFS Report evaluates alternatives for removal of groundwater with elevated concentrations of NDMA, along with management of the DAPL source areas. An OU3 FS, to be developed following expected implementation of remedies discussed in this IAFS Report, will evaluate alternatives for remediating impacted groundwater.

1.3.4 Containment Area

The Containment Area is located in the western portion of the Property, southwest of the former manufacturing buildings. As part of the closure activities initiated in 1986, Olin ceased operations and completed closure of two lined lagoons in accordance with closure plans approved by MassDEP (MACTEC, 2007). The sludge in the lagoons and the lagoon liners were removed and placed in the CSL. The CSL was then covered with a low permeability cap in 1988, and received final closure certification in accordance with the Massachusetts Solid Waste Management Regulations (310 Code of Massachusetts Regulations [CMR] 19.000). The location of the former lined lagoons is shown on **Figure 1.2-3**.

A Slurry Wall/Containment Area was constructed in 2000/2001 in the area of the lagoons as a Release Abatement Measure (RAM), while the OCSS was regulated under the MCP. The location of the Slurry Wall and extent of the Containment Area are shown on **Figure 1.2-3**. The purpose of the Slurry Wall/Containment Area was to reduce the potential for the on-Property DAPL pool to continue to be a source of dissolved constituents to groundwater by containing the DAPL and impacted groundwater overlying the DAPL. The 3-foot wide soil-clay perimeter slurry wall surrounding the Containment Area was installed into the bedrock surface to a practical extent. The Containment Structure is currently covered by a temporary cap of 8-mil polyethylene sheeting designed to reduce infiltration by directing precipitation away from the Containment

Area through an internal drain leading to a storm water retention basin. A voluntary deed restriction was placed on the Property that prohibits disturbing the soils within the Containment Area.

A water table equalization window within the slurry wall allows the groundwater surface within and outside the slurry wall to equilibrate. The window, approximately 50 feet long and 8 feet deep, was installed on the west side of the slurry wall and consists of crushed stone backfill that extends about 3 feet below the groundwater table.

In 2000, a Post-Construction Monitoring Plan (PCMP) was prepared and approved by MassDEP, and monitoring was initiated to assess: (1) the performance of the subsurface containment structure in encompassing the DAPL and diffuse groundwater, and (2) the performance of the temporary cap in minimizing the influx of precipitation and storm water into the containment structure. Semi-annual status reports have been prepared since 2001 to document PCMP monitoring. Conclusions and observations of the PCMP monitoring to date indicate that the horizonal and vertical gradients are relatively flat within the Containment Area and that the equalization window is functioning as designed to relieve any buildup of hydraulic pressure inside the slurry wall.

Historically, prior to construction of the Slurry Wall/Containment Area structure, a RAM was conducted to investigate and remediate three areas within the Containment Area. Those three areas, Drum Area A, Drum Area B, and the Buried Debris Area (**Figure 1.2-3**), were excavated and the drums and debris were disposed off-site primarily as non-hazardous solid waste (some material was disposed as hazardous waste). Contaminated soils were segregated using field screening and visual observations and the more highly contaminated soils were disposed off-site. The remainder of the soils were stockpiled and sampled, and the stockpiled soils that met re-use criteria (MCP Upper Concentration Limits (UCLs) and/or the MCP S-3 soil standards) were used as backfill.

Confirmation soil sample results obtained from the final excavation limits exhibited concentrations of OCSS-related constituents well below the MCP UCLs, and, in most cases, below the MCP S-3 soil standards. The performance of the RAM for Former Drum Areas A and B is documented in the RAM Status Report No. 1 (Geotechnical Engineers, Inc. [GEI], 2000) and the Drum Removal RAM Status Report No. 2 and Completion Statement (GEI, 2001).

Additional detail of the RAM for Drum Area A and B and the Buried Debris Area is provided in **Appendix A** along with other soil data. The remediated drum areas and the Buried Debris Area represent a small fraction of the total extent of the Containment Area. For the remainder of the

Containment Area, where no subsurface anomalies were identified, analytical data are available for more than 30 soil borings. The data set for subsurface samples (1-10 ft below ground surface [bgs]) collected from soils within the Containment Area includes more than 100 data points for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, and chromium, lead, and cadmium and 19 or more data points for other metals/inorganics. Surface soils within the Containment Area were sampled as part of the OU1/OU2 RI.

An additional Containment Area soil investigation was conducted in November 2019 to characterize the top 10 feet (ft) of the Containment Area soil to evaluate if fill materials met the definition of a Resource Conservation and Recovery Act (RCRA) characteristic hazardous waste, and to provide additional soil characterization. Soil samples were also collected below the depth of fill (deeper than 10 ft below ground surface) and at the bedrock interface. During the drilling program additional soil samples, based on appearance, were collected and analyzed. Based on the data collected during this effort, the soil samples were found to not contain RCRA hazardous waste. The Supplemental Characterization of Containment Area Soil memorandum (**Appendix B**) summarizes the associated analytical results as well as a limited assessment of bedrock type and structure beneath the Containment Area (CA) (Wood, 2020b).

1.4 Nature and Extent of Contamination

The nature and extent of contamination across OU1 and OU2 are discussed in detail in the 2015 OU1/OU2 RI Report (Amec Foster Wheeler, 2015b). The nature and extent of impact in groundwater, as well as DAPL and the effects of DAPL on groundwater conditions in the vicinity of the OCSS, have been evaluated in the Draft 2019 OU3 RI Report (Wood, 2019a). As discussed previously, additional site investigations and revisions to the Draft 2019 OU3 RI Report are being conducted on a parallel track with this IAFS Report. Therefore, this section summarizes information from the 2015 OU1/OU2 RI Report and the Draft 2019 OU3 RI Report as it relates to the interim actions evaluated in the IAFS Report.

This section also summarizes information about DAPL and the effects of DAPL on groundwater conditions in the vicinity of the OCSS as presented in the Focused Remedial Investigation Report (MACTEC, 2007), Final Data Gap Analysis and Additional Field Studies Work Plan (Amec Foster Wheeler, 2015a), 2015 OU1/OU2 RI Report (Amec Foster Wheeler, 2015b), and Draft 2017 Focused DAPL RI Report (Amec Foster Wheeler, 2017).

1.4.1 Plant B LNAPL

Based on data collected during regular operations, maintenance, and monitoring and summarized in semi-annual status reports submitted to USEPA, recent monitoring results indicate that wells GW-23, IW-11, and P5 are the only wells that regularly contain a significant amount of LNAPL. During the third quarter of 2019 and first quarter of 2020, LNAPL thickness in these wells ranged from non-detect to 0.30 feet, while LNAPL was infrequently detected in the other wells near Plant B at thicknesses of no more than 0.05 feet. Therefore, the residual LNAPL appears to be limited to an isolated area near the northeast corner of the Plant B building.

The LNAPL at Plant B consists of a mixture of process oil and dissolved organic contaminants including BEHP, TMPs and NDPA. Additionally, groundwater that is extracted in the vicinity of Plant B is also contaminated with iron and ammonia. Based on the Draft 2019 OU3 BHHRA (Appendix K of Wood, 2019a), the COCs in shallow overburden groundwater in the vicinity of Plant B include TMPs, naphthalene, biphenyl ether, diphenyl ether, and various aromatics and aliphatics.[8]

1.4.2 Dense Aqueous Phase Liquid

The definition of DAPL has been discussed at length in the Draft 2019 OU3 RI Report (Wood, 2019a). The physical appearance, density, and major constituents and associated concentrations in DAPL are presented in Section 1.3.2. The nature of DAPL is primarily associated with inorganics (various anions, cations, and ammonia as described above), although it also contains NDMA and low concentrations of other volatile and semivolatile organics.

Based on DAPL characterization data collected to date, the metal/inorganic constituents detected in DAPL include, in order of decreasing concentration: sulfate; sodium; chloride; ammonia; chromium; iron; aluminum; and manganese. Organic compounds detected in DAPL include, in order of decreasing concentration: phenol; acetone; 2-hexanone; bromoform; 2-butanone (methyl ethyl ketone); BEHP; toluene; TMPs; 4-bromophenyl-phenylether; naphthalene; benzoic acid; NDMA; and 2-nitrodiphenylamine. A detailed discussion of the chemistry of DAPL was provided in the Draft 2017 Focused DAPL RI Report (Amec Foster Wheeler, 2017) and is also summarized in the Draft 2019 OU3 RI Report (Wood, 2019a).

[8] COCs in shallow overburden groundwater near Plant B are listed in Table 5.3-3 of Wood (2019a).

The main COC associated with DAPL is NDMA, although dissolution of other organics and inorganics from DAPL adversely impacts groundwater quality. The highest concentrations of NDMA associated with the Site have been detected in DAPL samples.

DAPL present at the OCSS is a result of historic disposal practices that ceased around 1972, and DAPL is no longer being formed or released. The DAPL formed ex-situ as a result of acid process waste waters with high dissolved total solids content (i.e., higher density liquids) being released to unlined ponds on the Property including Lake Poly, the East and West Acid Pits, and the three Acid Pits south of the East and West Warehouses. Once formed, DAPL migrated vertically by gravity, penetrating overburden groundwater under the disposal pits and accumulating along the bedrock surface. During infiltration of these dense fluids through the water column, convective mixing with groundwater dispersed the site-related compounds within the local aquifer.

DAPL then flowed by gravity along the bedrock surface, collecting in a series of cascading (progressively lower) bedrock depressions. These are referred to as DAPL pools. DAPL in pools becomes more concentrated vertically as dissolved constituent concentrations and fluid density increase with depth. These properties of DAPL cause it to move by gravity rather than with the groundwater gradient, allowing it to accumulate and remain within bedrock depressions. DAPL has been identified in pools residing in bedrock depressions beneath the Olin Property (on-Property DAPL pool), immediately west of the Olin Property (off-PWD DAPL pool), and further to the west near Main Street (Main Street DAPL pool). The extent of DAPL in bedrock will be further evaluated during the upcoming data gaps investigation efforts. The elevations of the DAPL surface in these pools have remained fairly consistent over the last decade based on DAPL elevations measured in the available multiport monitoring wells. Additional investigations, including the planned Data Gap Investigation (Geomega, 2019), will reduce uncertainty and help refine the understanding of DAPL distribution. The areal extent of the three DAPL pools, as is currently understood, is shown on **Figure 1.3-1**.

1.4.3 OU3 Groundwater

The remedial alternatives described in this IAFS Report are designed to address source removal, remediate groundwater hot spots, and minimize further migration of contaminants in groundwater; it is anticipated that a separate OU3 FS will be prepared at a later date to address long term remediation of groundwater impacts associated with the Site. Groundwater impacts are associated with the industrial process water disposal practices that led to the formation and migration of DAPL. These process waters were disposed of at former Lake Poly and other unlined impoundments including the East and West Acid pits as well as three smaller acid pits as

discussed in the Draft 2019 OU3 RI Report (Wood, 2019a). The COCs for OU3 groundwater are described in the Draft 2019 OU3 BHHRA and include metals, VOCs, and SVOCs (Tables 5.3-1 and 5.3-2 of Appendix K of Wood, 2019a).

During initial movement of DAPL by gravity flow, extensive convective mixing with groundwater occurred, expanding the extent of dissolved constituents in groundwater. These dissolved constituents subsequently migrated advectively with groundwater. Once the DAPL migrated by gravity past the groundwater divide and into the Ipswich Watershed, advective movement of dissolved constituents in groundwater advanced the extent of contamination farther down the Western Bedrock Valley (WBV) (see discussion in Section 3.2.3.1, Figures 3.2-7, and Figures 3.2-1 through 3.2-5 of the Draft 2019 OU3 RI Report, Wood, 2019a) and into the Maple Meadow Brook aquifer. The most significant groundwater impacts in the Maple Meadow Brook aquifer (Ipswich Watershed) are primarily deep, occurring in the deep overburden and underlying bedrock. On the eastern and southern side of the groundwater divide, diffuse contamination in groundwater that originated in DAPL has migrated to the east along South Ditch, and dissolved constituents have migrated off the Property. The extent of off-Property migration to the east and southeast in the Aberjona Watershed is significant but limited compared to the extent of migration that occurred within the Maple Meadow Brook aquifer in the Ipswich Watershed.

Distribution of Contaminants of Concern

NDMA is considered an indicator parameter for the purposes of this FS and is a targeted compound for interim action as discussed above. The March 2019 distribution of NDMA in the deep overburden groundwater, which is representative of NDMA distribution in the subsurface, is presented on **Figure 1.4-1**. Additional distribution figures for NDMA and the other groundwater COCs are provided in Appendix C.

The core of the overburden groundwater plume in the Ipswich Watershed is represented by the extent of diffuse groundwater in deep overburden wells. The core of the overburden plume in the Aberjona Watershed is represented by the region of diffuse groundwater surrounding the DAPL pools and along the water course of South Ditch. The extent of groundwater impacts within the Aberjona Watershed has remained relatively consistent based on data collected during the OU3 RI and the most recent comprehensive groundwater sampling effort; however, this interpretation will be re-evaluated as additional groundwater monitoring data are generated. Some downgradient migration of NDMA has occurred in the deep overburden groundwater and bedrock groundwater systems within the Ipswich Watershed since shut-down of the Town wells.

The distribution figures for NDMA and the other primary risk contributors related to the OCSS (arsenic, cobalt, iron and manganese) as developed from historical data and as presented in the Draft 2019 OU3 RI Report are provided in **Appendix C**. The distribution of cobalt in deep overburden groundwater is similar to the distribution of NDMA. 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 from diffuse to overlying groundwater. While these metals are highest in DAPL and diffuse groundwater in the core of the Ipswich Watershed plume, they remain at or above Regional Screening Levels (RSL) (for Hazard Index [HI] =1) in groundwater downgradient of the DAPL pools. The RSLs for iron, manganese, and cobalt are 1,400, 430, and 6 micrograms per liter (µg/L), respectively.

Arsenic concentrations are elevated in groundwater, likely the result of mobilization of naturally-occurring arsenic bound to iron hydroxides in the aquifer matrix. As reported in Table 4.3-1 of the Draft 2019 OU3 RI Report, arsenic is present at concentrations of up to 200 µg/L which exceeds the maximum contaminant level (MCL) of 10 µg/L in several areas. Within the Ipswich Watershed, the highest arsenic concentrations are associated with DAPL in the Main Street DAPL pool (260 µg/L) and with groundwater at the Spinazzola Trust landfill at MW-208D (110 µg/L) and MW-208BR (58 µg/L). Elevated arsenic also occurs within the diffuse groundwater in the core of the Ipswich plume and in bedrock underlying that corresponding portion of the WBV. Slightly down gradient in the Ipswich Watershed, arsenic concentrations are below the MCL.

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. Thus, this IAFS Report focuses on NDMA as the primary indicator of impacted groundwater for the remedial alternatives that are evaluated in Section 4.0.

1.4.4 OU1 Slurry Wall/Containment Area

Investigations of soil in the Containment Area are summarized in Section 1.3.4. **Appendix A** includes a presentation and summary of the historical analytical data available for soil within the Containment Area, and **Appendix B** presents information from the November 2019 Supplemental Characterization of Containment Area Soil. Confirmatory soil sampling was conducted in the excavations, and stockpiled soils were sampled for waste characterization purposes and to determine if they met re-use criteria. The 2015 OU1/OU2 BHHRA (Appendix M of Amec Foster Wheeler, 2015b) did not identify any soil areas with unacceptable direct exposure risks to human receptors (trespassers, construction workers, and outdoor workers), including surface soils within the Containment Area. The calculated cancer risks for the future

outdoor worker and future trespasser in the 2015 OU1/OU2 BHHRA were $5x10^{-6}$ and $2x10^{-6}$, respectively, which are within the USEPA acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$. The corresponding non-cancer hazard indices were 0.05 and 0.02, respectively, which are below the CERCLA limit of 1.0. The 2015 OU1/OU2 BHHRA concluded that the Property, including the Containment Area, is suitable for industrial/commercial use. Additional sampling of soils within the Containment Area was conducted in November 2019 to confirm whether materials within the Containment Area meet the criteria for classification as a hazardous waste. Based on the data collected during this effort, the soil samples were found to not contain RCRA hazardous waste. Results of this additional sampling are presented in the Supplemental Characterization of Containment Area Soil Technical Memorandum (Wood, 2020b; included as **Appendix B**). A human health risk evaluation for industrial/commercial workers and future construction workers was conducted using these data (Wood, 2020a). Based on this evaluation, soil exposure cancer risk and HIs for industrial/commercial workers, trespassers, and future construction workers meet CERCLA risk limits.

1.4.5 DAPL and Groundwater Interaction

The primary transfer of constituents from DAPL to overlying groundwater occurs via chemical diffusion. As described in Section 1.3.2, contaminants are transferred via diffusion from DAPL to the diffuse layer and into groundwater.

When the DAPL pools were originally formed 50 to 60 years ago and DAPL was actively moving through the overburden to its present location, a larger volume of diffuse material was also created by these more dynamic transport processes.

1.4.6 OU3 Aquifers and Watersheds

OU3 groundwater consists of two distinct groundwater systems flowing within two watersheds separated by a groundwater divide. An overburden groundwater divide is located primarily west and north of the Olin Property, near the Main Street DAPL pool. The position of the divide corresponds approximately with Eames Street, then extends south, parallel to Main Street (**Figure 1.2-2**). The location of the divide is sensitive to relatively small changes in groundwater elevation. Gradients are generally flat in the area where the divide occurs. The divide fluctuates seasonally in response to changing precipitation patterns, groundwater recharge, and groundwater elevation conditions.

North and west of the groundwater divide, groundwater flows in the Ipswich Watershed towards the Maple Meadow Brook aquifer. South of the groundwater divide, groundwater flows and

mixes with overlying groundwater in the Aberjona Watershed. The shallower portion of this groundwater discharges to surface water in South Ditch. Deeper overburden groundwater to the south and east of South Ditch yields detectable levels of NDMA.

1.5 Conceptual Site Model / Contaminant Fate and Transport

For current conditions at OU1 and OU2, there are few complete migration pathways. There is no evidence of erosional transport of impacted soils due to storm water runoff. Areas are well grassed, and permanent erosion controls are in place. The volatiles (primarily TMPs) that have been reported in subsurface soils are not located below occupied structures, and therefore are not currently part of a complete vapor intrusion pathway.

The distribution of COCs in environmental media at OU1 and OU2 is consistent with the physical and chemical fate and transport characteristics of those chemicals. In general, BEHP, chromium, and TMPs are not highly water soluble and have been retained in soils and sediments. In contrast, ammonia is highly water soluble and may be transferred to surface water where groundwater is discharged to the ditches. TMPs are highly volatile, and could result in a potential vapor intrusion pathway if buildings were constructed and occupied in the future in areas with elevated TMPs concentrations.

Most of the OCSS chemicals of interest are persistent chemicals, with little or no biotic or abiotic degradation in the natural environment. NDMA is an exception in that it is naturally degraded in surface water by the ultraviolet (UV) light in sunlight.

The CSM for DAPL (contaminant sources, migration pathways, and transport) was described in the Draft 2017 Focused DAPL RI Report (Amec Foster Wheeler, 2017) and in the Draft 2019 OU3 RI Report (Wood, 2019a), yet the CSM for DAPL continues to be refined to address uncertainties. Additional information about the DAPL pools, the underlying bedrock, and the potential for ongoing DAPL migration will be gained during the upcoming implementation of the Data Gaps Work Plan (Geomega, 2019).

Sources of contamination at the Property were related to former manufacturing operations and disposal practices. Former contaminant sources in unsaturated soils in OU1 (Amec Foster Wheeler, 2015b) have been investigated and addressed through response actions under the MCP. These sources include the Former Lake Poly, East and West Pits, and the three Acid Pits. Each of these unlined pits received liquids from the manufacturing operation at some time between 1953 and approximately 1972. The liquids contained sulfuric acid, sodium chloride, sodium sulfate, ammonium chloride, ammonium sulfate, chromium sulfate, and other

constituents. The liquids included dense fluids that stratified according to density within the ponds and then penetrated the groundwater column below the ponds to the bedrock surface, becoming DAPL. The DAPL then moved by gravity along the bedrock surface to its current location in the DAPL pools. The amount of DAPL seepage into bedrock fractures will be studied as part of the OU3 Data Gaps Work Plan (DGWP). These former sources were addressed under the MCP such that only residual impacts have been identified (Amec Foster Wheeler, 2015b).

In addition to the vadose zone sources, liquid disposal practices resulted in the formation of DAPL pools located below the groundwater table and within bedrock depressions. These include the Main Street DAPL pool and the upper DAPL pool, which is divided into an on-Property and off-PWD portion. The on-Property portion is largely within the Containment Area and the off-Property portion lies between the Containment Area and Jewel Drive. The Main Street DAPL pool is farther to the northwest. The DAPL pools are depicted on **Figure 1.3-1**. It appears likely that DAPL spilled over from the Main Street DAPL pool into the MMB aquifer, and likely seeped into large bedrock fractures mapped in that area. The extent of residual DAPL and dissolved-phase chemicals in the MMB bedrock will be a subject of study in the OU3 data gaps field work.

As summarized in the Draft 2019 OU3 RI Report (Wood, 2019a), extensive investigations were completed at the liquid disposal areas, and soil removal actions were conducted under the MCP. Surface soils under the temporary cap were characterized under OU1 remedial investigations and were further characterized during a soils investigation in November 2019. Results of the November 2019 investigation are presented in the Technical Memorandum: Supplemental Characterization of Containment Area Soil (**Appendix B**).

A release of BEHP, TMPs and an LNAPL processing oil occurred decades ago in the vicinity of Plant B. The release of LNAPL and the capture of groundwater to address dissolved COCs is being addressed by ongoing actions at Plant B.

1.5.1 Migration Pathways

As previously mentioned, most of the original sources (e.g., former pits; Lake Poly) on-Property have been fully or partially remediated. There is no longer a direct migration pathway from former source areas (disposal features) to current DAPL pools and DAPL is no longer being formed. DAPL formation ceased when disposal of process liquids into Lake Poly and other unlined lagoons was terminated. Dissolved constituents in groundwater are mobile to varying degrees in the context that they diffuse from DAPL to the diffuse layer and then may migrate via advection and dispersion within groundwater.

The primary transport mechanism of DAPL constituents is through diffusion and advective transport in groundwater. Diffuse groundwater is also transported advectively with groundwater according to local gradients, with some component of gravity flow. The dissolved constituents are subject to sorption, diffusion into fine grained soil material, precipitation within the aquifer matrix (aluminum, iron, chromium oxides and oxy-hydroxides, and acid sulfate minerals), and attenuation through dispersion and dilution.

The soluble constituents in DAPL diffuse vertically and form a diffuse layer several feet thick above the DAPL. The diffuse layer is subject to further vertical mixing and advective transport with groundwater. The diffuse layer represents a geochemical gradient-driven continuum between the DAPL and overlying groundwater.

1.5.2 Receptors

The Draft 2019 OU3 BHHRA concluded that the calculated cancer risk for the hypothetical exposure scenario of future potable use of DAPL is above the upper end of the NCP and USEPA cancer risk range. The calculated non-cancer HI is above the CERCLA limit of 1, and the estimated blood lead levels for a child are below the USEPA target blood lead level of 10 µg/dL and the Center for Disease Control "reference level" of 5 µg/dL for hypothetical potable use of DAPL residual waste material.

The Draft 2019 OU3 BHHRA identified a hypothetical future risk for potable use of groundwater from the core of the plume within the Ipswich Watershed. This groundwater is within the zone of influence of the Town of Wilmington's inactive MWSWs. The primary risk contributors include NDMA, arsenic, cobalt, iron, and manganese.

1.5.3 Environmental Fate and Transport

The focus of this IAFS Report is evaluation of potential remedial actions to (1) enhance recovery of LNAPL and prevent the discharge of LNAPL and groundwater containing Site contaminants into East Ditch; (2) reduce volume and mass of NDMA and other COCs within DAPL, reduce migration of DAPL, and prevent human exposure to DAPL containing Site contaminants; (3) reduce volume and mass of NDMA and other COCs in highly contaminated groundwater (groundwater hot spots) prevent unacceptable human exposure to groundwater containing Site contaminants; and (4) prevent leaching of Site contaminants from Containment Area soil. These actions will also help control exposure of current and future receptors to contaminants in the environment under reasonably foreseeable scenarios. Therefore, the following summary of

environmental fate and transport considers the physical fate and transport of both DAPL and dissolved constituents associated with DAPL that are primary risk contributors.

1.5.3.1. DAPL Pools

Elevation of the DAPL surface within the three DAPL pools was documented by induction logging and multilevel piezometer sampling from 2001 through 2005. These investigations were conducted to define the area of the DAPL pools (to the extent possible given geologic variability) and determine the elevation of potential outlets represented by low spots in the bedrock surface (saddles). These low spots are the locations where DAPL is presumed to have overflown into the next bedrock pool. The surface elevations of the DAPL pools are, within measurable certainty, close to the interpreted elevations of the saddles that contain them. This observation will be verified during forthcoming OU3 data gaps investigation.

The location of the DAPL pools are well established and known to an extent that permits an evaluation in this IAFS Report. Additional information regarding the extent and elevation of the DAPL surface and potential pathways for transmission of DAPL from on- to off-site DAPL pools will be obtained during the OU3 data gaps investigation.

1.5.3.2. Dissolved Constituents

The dissolved constituents from the Property that are significant risk contributors for potable use of groundwater include NDMA, cobalt, arsenic, iron, and manganese. Several other constituents that are not associated with releases from the OCSS are also risk contributors; these include: 1,2-dichloroethane (1,2-DCA), benzene, cis-1,2-dichlorothene (cis-1,2-DCE), naphthalene, trichloroethene (TCE) and vinyl chloride (VC). The Town of Wilmington's Butters Row Treatment Plant was specifically designed to remove TCE and other VOCs encountered in the town MWSWs. The historical sources of these VOCs have not been investigated under OU3.

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 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.

Cobalt remains slightly elevated around the plume core within and immediately surrounding the diffuse groundwater within Maple Meadow Brook aquifer in the WBV. Cobalt, like aluminum in

clay minerals, appears to have been solubilized from clay minerals within the aquifer matrix as the result of lower than neutral pH in DAPL and diffuse groundwater within the WBV. As the diffuse groundwater migrates downgradient and mixes with higher pH groundwater, pH increases to near-neutral and the cobalt, again like the aluminum, precipitates and is re-incorporated into the aquifer matrix.

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 solubilizes with decreasing pH, those metals are also released. Metals released in this manner will re-sorb or re-complex as groundwater moves downgradient and geochemical conditions return to those of ambient groundwater.

The distribution of chromium, which is an anthropogenic component of DAPL, attenuates rapidly in groundwater downgradient from the DAPL pools due to precipitation with sulfate and with aluminum hydroxides on ferric iron nucleation sites on the aquifer matrix. Downgradient from the core of the plume, chromium is below detection limits with few exceptions (see Figures 4.4.6-4a, 4.4.6-4b, 4.4.6-4c, 4.4.6-5a, 4.4.6-5b, and 4.4.6-5c in the Draft 2019 OU3 RI Report, Wood, 2019a).

The other major mechanism affecting the long-term fate and transport of NDMA and other constituents is matrix diffusion, particularly where bedrock is impacted by DAPL and diffuse groundwater. This topic requires additional study and is not further discussed here.

1.6 Baseline Risk Assessments

The BHHRA included in the 2015 OU1/OU2 RI Report (Amec Foster Wheeler, 2015b) and the Draft 2019 OU3 BHHRA (Appendix K of Wood, 2019a) provided health risk information relevant to the interim actions identified and evaluated in this IAFS Report. The 2015 OU1/OU2 BHHRA evaluated risks associated with surface soil currently located beneath the temporary cap at the Containment Area. The Draft OU3 BHHRA (Appendix K of Wood, 2019a) evaluated risks for current, future, and hypothetical exposures to groundwater (potable use and non-potable irrigation use) in the Ipswich and Aberjona Watersheds as well as hypothetical long-term potable use of DAPL. The results/conclusions of these BHHRAs concerning media and receptor

scenarios that are relevant to the interim actions that are the focus of the IAFS Report are summarized below.

1.6.1 OU1/OU2 BHHRA

The 2015 OU1/OU2 BHHRA (Amec Foster Wheeler, 2015b) evaluated hypothetical potential trespasser and outdoor worker exposures and risks associated with surface soil (0-1 ft bgs) beneath the current temporary cap at the Containment Area.

Calculated cancer risks for a future outdoor worker and future trespasser were 5×10^{-6} and 2×10^{-6}, respectively, which are within the USEPA acceptable risk range of 1×10^{-4} to 1×10^{-6}. The corresponding non-cancer hazard indices were 0.05 and 0.02, respectively, which are below the CERCLA limit of 1.0. The 2015 OU1/OU2 BHHRA did not evaluate potential exposure to deeper soils within the Containment Area. However, additional soil sampling was conducted in November 2019 and the results of that investigation are presented in the *Technical Memorandum: Supplemental Characterization of Containment Area Soil* (**Appendix B**).

Human health risk calculations for the Containment Area have been conducted using the analytical data from the 2019 surface and subsurface soil investigation and the surface soil data for soils within the Containment Area. The risk calculations are documented in Appendix A of the 2020 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*, July 2020 (Wood, 2020a). The cancer risks and HIs for the industrial/commercial worker exposed to soil 0-2 ft bgs and 2-10 ft bgs and the future construction worker exposed to soil 0-10 ft bgs were within the CERCLA cancer risk range and below an HI of 1.0, respectively. Based on the 2015 BHHRA results for upland soil and the 2020 human health risk evaluation for soils within the Containment Area, cancer risk and HIs for soil exposure for industrial/commercial workers, trespassers, and future construction workers meet CERCLA risk limits. Therefore, human health risk-based PRGs for direct exposure to soils (ingestion, dermal contact, and inhalation of dust) for current and future industrial/commercial land use is not necessary to support the FS.

1.6.2 Draft OU3 BHHRA

The Draft 2019 OU3 BHHRA was included as Appendix K of the Draft 2019 OU3 RI Report (Wood, 2019a). The conclusions of the Draft 2019 OU3 BHHRA for relevant media and receptor scenarios are summarized in the following paragraphs.

1.6.2.1. Current Exposure Scenarios

Calculated cancer risks for the current human health exposure scenarios are below the upper end of the NCP and USEPA cancer risk range and the calculated non-cancer HIs are below the CERCLA limit of 1 for the following exposure scenarios:

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

Based on the calculations in the Draft 2019 OU3 BHHRA, the risks due to NDMA in groundwater at these locations are within acceptable ranges. Two of the fifteen residential wells have shown consistently higher levels of NDMA over time than other residential wells, with detections generally less than 15 ng/L and less than the risk criteria of 47 ng/L. In 2017, two residential wells exhibited NDMA results of 56 ng/L and 57 ng/L; however, these wells were resampled upon review of data, and NDMA concentrations in the resamples were below detection limits or well below the risk criteria. All previous and subsequent sampling results for these two locations have been well below the NDMA risk range of 47 ng/L. Olin is in the process of working with the Town of Wilmington to voluntarily extend a waterline to the two households with consistent detections referenced above.

1.6.2.2. Future Exposure Scenarios

Estimated cancer risks for the potential future exposure scenarios are below the upper end of the NCP and USEPA cancer risk range and the calculated non-cancer HIs meet the CERCLA limit of 1 for:

- Future irrigation use of two inactive industrial/commercial wells at One Jewel Drive;
- Future Construction Worker exposure to shallow groundwater – on-Property (excluding Plant B Area);
- Future Construction Worker exposure to shallow groundwater – off-Property;

Calculated cancer risks for the future exposure scenarios are above the upper end of the NCP and USEPA cancer risk range and the calculated non-cancer HIs are above the CERCLA limit of 1 for:

- Future potable use of groundwater from the Ipswich Watershed overburden aquifer (Reasonable Maximum Exposure (RME) scenario) – potential future installation of private or public wells or resumption of operation of currently inactive MWSWs;

- Future potable use of groundwater from the Ipswich Watershed bedrock aquifer (RME scenario) – potential future installation of private or public wells or resumption of operation of currently inactive MWSWs;

Calculated cancer risks for the future exposure scenario are below the upper end of the NCP and USEPA cancer risk range and the calculated non-cancer HI is above the CERCLA limit of 1 for:

- Future Construction Worker exposure to shallow groundwater – on Property (Plant B Area). A groundwater remedial system is currently operating in this area of the Property; thus, potential exposure concentrations are expected to decrease over time.

1.6.2.3. Hypothetical Future Exposure Scenarios

Calculated cancer risks for the hypothetical future exposure scenarios are above the upper end of the NCP and USEPA cancer risk range and the calculated non-cancer HIs are above the CERCLA limit of 1 for:

- Hypothetical future potable use of groundwater from the Aberjona Watershed overburden aquifer (RME scenario); and
- Hypothetical future potable use of groundwater from the Aberjona Watershed bedrock aquifer (RME scenario).

Calculated cancer risk for the hypothetical future exposure scenario is above the upper end of the NCP and USEPA cancer risk range, the calculated non-cancer HI is above the CERCLA limit of 1, and the estimated blood lead levels for a child are below the USEPA target blood lead level of 10 µg/dL and the CDC "reference level" of 5 µg/dL for:

- Hypothetical potable use of DAPL.

1.7 Site Characterization Summary

The nature and extent of contamination for OU1/OU2 soil, surface water, and sediment and OU3 groundwater and DAPL pools have been well characterized and defined, and additional refinements will be made to the CSM with the data collected during implementation of the Data Gaps Work Plan (Geomega, 2019). Existing data are adequate to support risk characterization and risk management decisions.

2.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

Using the process outlined in the NCP and USEPA RI/FS guidance (USEPA, 1988b), this section presents the RAOs, identifies appropriate general response actions, and identifies and screens technologies and process options. The identification and screening of technologies incorporates a streamlined approach to identify most appropriate technologies and alternatives to meet the objectives of the interim actions. The simplicity of this approach is consistent with the intent of interim actions as compared to the intent of final remedial actions. In some cases, the interim actions could become final remedies or important components of the same.

The process begins with the development of RAOs, followed by identification of ARARs. Chemical-specific numerical cleanup goals are typically then established. Estimates are made of the areas and volumes of media that exceed numerical cleanup goals. Potential cleanup technologies are then identified and screened to produce a list of suitable technologies that can be assembled into remedial alternatives capable of mitigating actual or potential risks at the OCSS.

2.1 Remedial Action Objectives

RAOs are media-specific goals for protecting human health and the environment. These RAOs frame the remainder of the identification and screening of remedial technologies. The RAOs for each Site component considered in this IAFS Report are as follows:

Light Non-Aqueous Phase Liquid (LNAPL)

- Prevent migration of LNAPL to East Ditch to prevent exposure by current and future ecological receptors to LNAPL containing Site contaminants that would result in potential adverse impacts.
- Remove, to the extent practicable, LNAPL that represents a source of Site contaminants to groundwater and a source of TMPs to indoor air vapors, via a vapor intrusion pathway, that could pose an unacceptable risk to workers of occupants of future buildings.

Dense Aqueous Phase Liquid (DAPL)

- Reduce, to the extent practicable, the volume of DAPL and mass of Site contaminants in DAPL that represent a source to groundwater, surface water, and sediments.
- Reduce, to the extent practicable, the horizontal and vertical migration of DAPL acting as a source of Site contaminants, including penetration into bedrock.

- Prevent potential human exposure by a future resident to DAPL containing Site contaminants at levels that pose an unacceptable risk.

Groundwater Hot Spots

- Reduce, to the extent practicable, the mass of Site contaminants in highly contaminated groundwater (groundwater hot spots).
- Reduce, to the extent practicable, the further horizontal and vertical migration of Site contaminants in groundwater hot spots, including penetration into bedrock.
- Prevent potential human exposure by a future resident to groundwater containing Site contaminants at levels that pose an unacceptable risk.

Containment Area

- Prevent potential human exposure by a future indoor worker or building occupant to indoor air vapors, via a vapor intrusion pathway, containing Site contaminants at levels that pose an unacceptable risk.
- Prevent exposure by current and future ecological receptors to soil containing Site contaminants that would result in potential adverse impacts.
- 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.

In the text below, RAOs are further evaluated to support the identification and screening of appropriate technologies. For the interim remedial actions evaluated in this IAFS Report, not all of the components of a typical FS are important or applicable and therefore are not discussed in detail. With respect to ARARs for these interim actions, the focus is on the ARARs that are specifically related to the proposed actions, as opposed to the ARARs that apply to specific environmental media. For example, with respect to removal of DAPL and hot spot groundwater as source material, the purpose is to reduce volume and mass and there is not a specific ARAR related to a numerical cleanup goal, so the most relevant ARARs are those that address the handling, transport, and off-site treatment and disposal or discharge of the extracted material. The enhanced LNAPL recovery is a similar situation, with no numerical cleanup requirements.

2.1.1 Applicable or Relevant and Appropriate Requirements (ARARs)

CERCLA and the NCP require that on-site Superfund remedial actions must attain federal standards, requirements, limitations, or more stringent state standards determined to be legally

applicable or relevant and appropriate to the circumstances at a given site. ARARs are federal environmental and state environmental and facility siting requirements used to: (1) evaluate the appropriate extent of site cleanup; (2) define and formulate remedial action alternatives; and (3) govern implementation and operation of the selected action. Inherent in the interpretation of ARARs is the assumption that protection of human health and the environment is ensured.

To properly consider ARARs and to clarify their function in the remedy selection process, the NCP defines two ARAR components: (1) applicable requirements; and (2) relevant and appropriate requirements. These definitions are discussed in the following paragraphs.

Applicable Requirements. Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site (40 Code of Federal Regulations [CFR] 300.400(g)). To be applicable, a requirement must directly and fully address a CERCLA activity.

Relevant and Appropriate Requirements. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the site that their use is well-suited to the particular site (40 CFR 300.400(g)(2)).

There is another category of information that is often considered in the ARARs analysis but that are not actually ARARs. Those are non-promulgated guidance, recommendations, and other information that may be used in the absence of ARARs, where ARARs are not sufficiently protective to develop cleanup goals, or when necessary to ensure protectiveness. These items are referred to as "To Be Considered" items or "TBCs." For the purpose of this FS, the term "ARARs" includes TBCs.

ARARs are divided into the three categories described in the following paragraphs.

Location-specific ARARs set restrictions upon the concentration of hazardous substances or the conduct of activities solely because they are in special locations. In determining the use of location-specific ARARs for selected remedial actions at CERCLA sites, one must investigate the jurisdictional prerequisites of each of the regulations. Basic definitions and exemptions must be analyzed on a site-specific basis to confirm the correct application of the requirements.

Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies that establish the acceptable amount or concentration of a chemical that may remain in, or be discharged to, the environment (USEPA, 1988a). They govern the extent of site remediation by providing either actual cleanup levels, or the basis for calculating such levels. For example, groundwater MCLs provide federally enforceable standards used in development of cleanup goals for contaminated groundwater. Chemical-specific ARARs associated with LNAPL, DAPL and hot spot groundwater have not been identified for this interim action.

Action-specific ARARs are usually technology- or activity-based requirements or limitations on remedial actions taken (USEPA, 1988a). Selection of a particular response action at a site will invoke the appropriate action-specific ARARs that may specify particular performance standards or technologies, as well as specific environmental levels for discharged or residual chemicals. If treated groundwater is discharged to a surface water body, the treated effluent would need to meet federal and state surface water discharge requirements. Action-specific ARARs may also be used to indicate acceptable levels of discharge in determining treatment and disposal requirements, and to assess the effectiveness of future remedial alternatives.

Many regulations can fall into more than one category. For example, many location-specific ARARs are also action-specific because they are triggered if response activities affect site features. Likewise, many chemical-specific ARARs are also location-specific.

The Occupational Safety and Health Administration (OSHA) has promulgated standards for protection of workers who may be exposed to hazardous substances at Resource Conservation and Recovery Act (RCRA) or CERCLA sites. USEPA requires compliance with the OSHA standards in the NCP, not through the ARAR process. Therefore, the OSHA standards are not considered as ARARs. Although the requirements, standards, and regulations of OSHA are not ARARs, they will be complied with during response activities.

Preliminary Identification of ARARs. The location-, chemical-, and potential action-specific ARARs that have been preliminarily identified in support of this IAFS Report are presented in Tables 2.1-1 through 2.1-13.

In Tables 2.1-1 through 2.1-13, the column(s) at the right of the ARAR tables denote applicability to each of the identified alternatives, as discussed in Section 4.

2.1.2 Chemicals of Concern

This section describes COCs that have been identified for each area addressed in this IAFS Report.

2.1.2.1. LNAPL

The LNAPL near Plant B consists of a mixture of process oil and dissolved organic contaminants including BEHP, TMPs and NDPA. The COCs associated the shallow overburden groundwater in the vicinity of Plant B include TMPs, naphthalene, biphenyl, diphenyl ether, and various aromatics and aliphatics (Table 5.3-3 in Appendix K of Wood, 2019a).

2.1.2.2. DAPL

The composition of DAPL is discussed in Sections 1.3.2 and 1.4.2. Specific COCs have not been identified for DAPL, but for purposes of this IAFS Report, the DAPL constituents (particularly NDMA) that diffuse from DAPL to groundwater are the primary contaminants of interest.

2.1.2.3. Groundwater Hot Spots

For purposes of this IAFS Report, NDMA is the primary indicator contaminant for the groundwater hot spots. The complete COC listings for the plume cores are presented in Tables 5.3-1 and 5.3-2, respectively of the Draft 2019 OU3 BHHRA (Appendix K of Wood, 2019a), and were addressed briefly above in Section 1.4.3.

For future potable use of groundwater, those chemicals with exposure point concentrations greater than applicable drinking water standards are identified as ARARs-based COCs. Arsenic is the primary ARARs-based COC within the core of the plume in the Ipswich Watershed. The term primary is used to identify the COCs that contribute the largest amount of risk (risk drivers). Other infrequently detected constituents contribute much less risk (e.g., chlorinated solvents).

The primary human health risk-based COCs were identified for future potable use of Ipswich Watershed groundwater in the Draft 2019 OU3 BHHRA (Appendix K of Wood, 2019a) and included NDMA, cobalt, iron, manganese, and arsenic. The other OU3 contaminants that are important to consider for groundwater treatment include:

- Aluminum
- Ammonia
- Calcium
- Chloride
- Chromium
- Sodium
- Sulfate
- Nitrate

The ARARs-based and human health risk-based COCs are considered primarily for groundwater treatment.

2.1.2.4. Containment Area

The soil COCs in the Containment Area include chromium, BEHP, and TMPs.

2.1.3 Development of Preliminary Remediation Goals

Preliminary remediation goals (PRGs) are medium-specific concentrations used during analysis and selection of interim action alternatives. PRGs should comply with ARARs and result in residual risks consistent with NCP requirements for protection of human health and the environment. Therefore, there are both ARAR-based PRGs and risk-based PRGs. Eventually, PRGs may be modified and/or potentially become the basis for final remediation levels for the selected remedy.

ARAR-based PRGs for the OCSS include MCLs for groundwater. Risk-based PRGs were developed and presented in Tables 5.3-4 and 5.3-5 of the Draft 2019 OU3 BHHRA (Appendix K of Wood, 2019a). The risk-based PRG ranges for COCs are listed below.

- NDMA: 16 to 160 ng/L (Hazard Quotient [HQ] = 0.1, 1.0) and 0.47 ng/L to 47 ng/L (cancer risk of $1x10^{-6}$ and $1x10^{-4}$)
- Cobalt: 0.6 to 6 µg/L (HQ = 0.1, 1.0)
- Iron: 1.4 mg/L to 14 mg/L (HQ = 0.1, 1.0)
- Manganese: 43 to 430 µg/L (HQ = 0.1, 1.0)
- Arsenic: 0.6 to 6 µg/L (HQ = 0.1, 1.0) and 0.052 µg/L to 5.2 µg/L (cancer risk of $1x10^{-6}$ and $1x10^{-4}$)

2.1.4 Volumes and Areas of Media to be Addressed

This subsection presents the most recent estimated volumes of media, as applicable, associated with LNAPL near Plant B, and the DAPL pools.

The extent of LNAPL volume under the Plant B foundation is unknown. Estimates of residual LNAPL present in the vicinity of Plant B are based on the measured thickness of LNAPL in relevant wells (<0.10 feet) and estimates of adsorbed LNAPL within a 2-foot thick smear zone over approximately 310 square feet. The estimate of LNAPL within the area of Plant B is less than 40 gallons.

For the purposes of remedy development and costing, the approximate volume[9] of DAPL present in the three DAPL pools is:

- on-Property DAPL pool 240,000 gallons
- off-PWD DAPL pool 1,300,000 gallons
- Main Street DAPL pool 13,300,000 gallons

These volumes are based on currently available data and will be further refined through implementation of the Data Gaps Work Plan and subsequent pre-design investigations.

The volume of NDMA-contaminated groundwater within various contour intervals, as well as the estimated mass of NDMA, in the groundwater hot spots are as follows (calculations are explained further in Section 4.4):

- NDMA 11,000 ng/L contour intervals: 17.1 million gallons of groundwater with 1,715 grams (g) of NDMA.
- NDMA 5,000 ng/L contour intervals: 68.4 million gallons of groundwater with 4,440 g of NDMA.
- NDMA 1,100 ng/L contour intervals: 110.3 million gallons of groundwater with 4,747 g of NDMA.

For the Containment Area soils, the excavation areas for this IAFS Report were assumed based on the available analytical data and the PRGs of 3 mg/kg for BEHP and 1,000 mg/kg for chromium. Estimated volumes of soil to be excavated are as follows (**Section 4.5.2**):

- Depth of 0 – 1 ft bgs: 347 cubic yards (cy) over 9.362 square feet (sf)
- Depth of 0 – 10 ft bgs: 44,261 cy over 119,506 sf

2.2 General Response Actions

General response actions are categories of remedial actions that may be used to satisfy RAOs by either reducing the contaminant concentration in each medium below the PRG or by preventing receptor exposure to the contaminated medium. General response actions describe categories

[9] EPA's consultant has calculated higher volume estimates. Both parties agree that the approximate volume range is 15 to 20 million gallons of DAPL. More precise volume estimates will be developed during pre-design investigations.

of remedial actions that may be employed to satisfy RAOs and provide the basis for identifying specific remedial technologies.

Potential general response actions for LNAPL are:

- No Action
- Institutional Controls
- Treatment
- Removal
- Disposal

Potential general response actions for DAPL are:

- No Action
- Institutional Controls
- Containment
- Treatment
- Removal
- Disposal

Potential general response actions for Groundwater Hot Spots are:

- No Action
- Institutional Controls
- Natural Recovery
- Treatment
- Containment/Removal
- Disposal

Potential general response actions for the Containment Area soils are:

- No Action
- Institutional Controls
- Capping
- Removal
- Disposal

2.3 Identification and Screening of Technologies and Process Options

This section identifies and screens remedial technologies for the following sources: LNAPL near Plant B, the DAPL pools, groundwater with NDMA hot spots, and the Containment Area. The identification and screening of remedial technologies follows the process outlined in the NCP and USEPA RI/FS guidance (USEPA, 1988b and 1990). Technologies with potential to attain the RAOs established in Subsection 2.1 and corresponding to the categories of general response actions described in Subsection 2.2 are identified. Demonstrated performance of each technology for site contaminants and conditions is considered during technology identification. The result is a list of potential remedial technologies that are then screened based on their applicability to site- and waste-limiting characteristics. The purpose of the screening is to produce a list of suitable technologies that can then be assembled into remedial alternatives capable of mitigating actual or potential risks at the site and meeting RAOs.

2.3.1 Identification and Screening of Technologies

Categories of remedial technologies and specific process options were identified based on a review of literature, vendor information, performance data, and experience in developing other FSs under CERCLA. Process options with potential to attain the RAOs were retained during the screening.

The technology screening process reduces the number of potentially applicable technologies and process options by evaluating factors that may influence process-option effectiveness and implementability and is consistent with CERCLA guidance for performing an FS (USEPA, 1988b).

The screening process assesses each technology or process option for its effectiveness and implementability with regard to site-specific conditions, known and suspected contaminants, and affected environmental media. The effectiveness evaluation focuses on: (1) whether the technology is capable of handling the estimated areas or volumes of media and meeting the contaminant reduction goals identified in the RAOs; (2) the effectiveness of the technology in protecting human health and the environment during the construction and implementation phase; and (3) how proven and reliable the technology is with respect to contaminants and conditions at the site. Implementability encompasses both the technical and administrative feasibility of implementing a technology.

Waste-limiting characteristics primarily establish the effectiveness and performance of a technology; site-limiting characteristics affect implementability of a technology. Waste-limiting characteristics consider the suitability of a technology based on contaminant types, individual

compound properties (e.g., volatility, solubility, specific gravity, adsorption potential, and biodegradability), and interactions that may occur between mixtures of compounds (e.g., chemical reactions or increased solubility). Site-limiting characteristics consider the effect of site-specific physical features on the implementability of a technology, including topography, buildings, underground utilities, available space, and proximity to sensitive operations. Technology screening based on waste- and site-limiting characteristics serves a two-fold purpose of screening out technologies whose applicability is limited by site-specific waste or site considerations, while retaining as many potentially applicable technologies as possible. At this stage in the process, relative costs are considered to eliminate technologies that are substantially less cost-effective.

2.3.2 Evaluation of Technologies and Selection of Representative Technologies

2.3.2.1. Removal of LNAPL and Associated Dissolved-Phase Contaminants

Table 2.3-1 presents the technology screening for free LNAPL and residual LNAPL within the smear zone. Technologies and process options judged ineffective or not implementable were not retained. The retained technologies and process options are those considered most suitable for remediation of free phase and smear zone LNAPL and associated dissolved-phase contaminants at the OCSS. The retained technologies/process options may be used alone or integrated with other technologies to develop remedial alternatives.

The following paragraphs summarize the results of technology screening for LNAPL near Plant B:

Institutional Controls. Institutional Controls are non-engineered instruments, such as administrative and legal controls, that help to minimize the potential for exposure to contamination and/or protect the integrity of a response action.

Treatment. Biodegradation and air sparging/soil vapor extraction are not retained because they have previously proven ineffective or been used to diminishing effectiveness on LNAPL near Plant B. In-situ chemical oxidation, co-solvent flushing, steam/hot air injection, and radio-frequency heating are not retained because they would be ineffective on LNAPL of such a minimal thickness, would have limited implementability at the site, or would potentially cause impacts to the East Ditch.

Removal. Multi-phase extraction, LNAPL skimming, excavation, and removal of LNAPL-impacted soil are retained.

Disposal. Discharge (after treatment) and off-site disposal are retained for combination with other technologies.

Based on the screening of technologies, the following are retained for assembling into remedial alternatives for LNAPL near Plant B:

- No Action
- Institutional Controls
- Sampling and Analysis
- Multi-phase Extraction
- LNAPL Skimming
- Excavation
- Off-site LNAPL Disposal

2.3.2.2. Reduction of DAPL Volume and Mass of DAPL Constituents

Table 2.3-2 presents the technology screening for reduction of DAPL volume and DAPL constituent mass. Technologies and process options judged ineffective or not implementable were not retained. The retained technologies and process options are those considered most suitable for remediation of DAPL. The retained technologies/process options may be used alone or integrated with other technologies to develop remedial alternatives.

The following paragraphs summarize the results of technology screening for DAPL:

Institutional Controls. Institutional Controls are non-engineered instruments, such as administrative and legal controls, that help to minimize the potential for exposure to contamination and/or protect the integrity of a response action.

Containment. Containment technologies were not retained because of their implementation difficulty given the industrial nature of the areas above the DAPL pools. The high density of structures, including buildings, subsurface utilities, private properties, and transportation infrastructure would render the installation of containment structures infeasible. There is also a mixture of property types, including private property and Town property. These circumstances are quite different from the already-constructed Slurry Wall/Containment Area around the on-Property DAPL pool, where these types of physical obstructions were not present. These circumstances would also complicate efforts to verify the competent installation of containment structures.

Containment of the off-PWD and Main Street DAPL pools would not enhance extraction or alleviate impacts to bedrock groundwater that have already occurred but could presumably be used to prevent future migration in bedrock fractures. Horizontal grouting and targeted grouting of fracture systems was not retained as a containment method due to implementability constraints and the need for extensive investigations to ensure effectiveness. Hydraulic containment was not retained because the DAPL is mostly contained from migration by its own gravimetric properties and the natural subsurface geology.

Treatment. In-situ treatment technologies for DAPL are not retained at this time; many of these have the potential to increase toxicity, mobilize COCs from DAPL, increase groundwater impacts, or cause adverse geochemical impacts. Olin however is in the process of evaluating on-site treatment of extracted DAPL as an option to current off-site disposal. Although many treatment technologies would be ineffective on the complicated mix of DAPL-related COCs, a potential treatment train for extracted DAPL has been considered. The proposed treatment train for extracted DAPL includes lime precipitation of metals; air stripping of VOCs and ammonia; UV oxidation of NDMA; and evaporation of the remaining water. This approach is discussed in more detail in Section 3.

Due to the contained nature of the DAPL pools, DAPL would not be expected to move through a permeable reactive barrier for treatment. Adsorption is not retained due to the potential for iron fouling and its inability to affect the mass of some DAPL-related COCs, and break-point chlorination for ammonia treatment is not retained as a standalone technology because it requires low turbidity and low dissolved solids, it may result in unwanted chlorinated byproducts, and would be ineffective for some DAPL-related constituents making it unsuitable for a DAPL source control technology.

Removal. DAPL extraction is retained. Based on the Pilot Test and on-going DAPL extraction of the off-PWD DAPL pool, extraction of DAPL appears to be feasible and implementable, at least in the short term. As discussed previously, limited lateral migration of DAPL and diffuse groundwater also appears to have occurred within the shallow weathered bedrock, where present, adjacent to and down slope of the DAPL pools. While physical extraction is a viable way to remove DAPL from the overburden, it is highly unlikely that all DAPL can be removed. Some amount of DAPL will remain in both the alluvial overburden soils and the weathered bedrock, and it is likely that a certain amount of residual DAPL will also remain on the bedrock surface in the depressions where DAPL pools have formed. In addition, not all the DAPL present in overburden porosity will freely drain by gravity. Therefore, DAPL extraction is not likely to remove all DAPL. The nature and extent of DAPL in fractured bedrock, and the relationship

between DAPL and bedrock including potential matrix diffusion will be investigated under the OU3 Data Gaps Work Plan.

Disposal. Discharge (after treatment) and off-site disposal are retained for combination with other technologies. The DAPL that has been extracted from the off-PWD DAPL pool has been shipped off-site for disposal historically at two permitted commercial hazardous waste facilities: (1) a wastewater treatment facility (in Indiana) where waste streams are treated and blended prior to permitted discharge, and (2) a deep well injection facility (in Ohio). Currently, the DAPL is only disposed at a permitted wastewater treatment facility. DAPL is extremely complex to treat chemically, and a commercially viable on-site treatment option that would not include some measure of off-site disposal has not yet been developed.

Based on the screening of technologies, the following are retained for assembling into interim action alternatives for DAPL:

- No Action
- Institutional Controls
- Sampling and Analysis
- DAPL Extraction
- DAPL treatment processes, to be assembled in a treatment train for extracted DAPL
- Discharge (after treatment) via deep well injection
- Concentration (On-site DAPL Evaporation)
- Off-site Disposal

2.3.2.3. Remediation of Groundwater Hot Spots

For the purposes of this IAFS Report, Groundwater Hot Spots are defined as groundwater containing a large portion of the overall mass of contaminants relative to the overall plume, the removal of which would facilitate remediation of the entire plume by reducing the extent and further migration of the plume. Groundwater Hot Spots contain significantly elevated concentrations of NDMA and other Olin Site-related contaminants (Site contaminants). Remedies for the Groundwater Hot Spots were developed based on targeting NDMA concentrations based on contours of 11,000 ng/L, 5,000 ng/L and 1,100 ng/L.

Table 2.3-3 presents the technology screening for mass removal and source control for NDMA-containing groundwater hot spots. Technologies and process options judged ineffective or not implementable were not retained. The retained technologies and process options are those considered most suitable. The retained technologies/process options may be used alone or integrated with other technologies to develop interim action alternatives.

The following paragraphs summarize the results of technology screening for groundwater:

Institutional Controls. Institutional Controls are non-engineered instruments, such as administrative and legal controls, that help to minimize the potential for exposure to contamination and/or protect the integrity of a response action.

Monitored Natural Attenuation. Monitored Natural Attenuation was not retained as an interim action, source control technology for groundwater hot spots.

Treatment. Table 2.3-3 includes various in-situ and ex-situ treatment technologies that were evaluated for groundwater. Enhanced biodegradation is retained for the potential to oxidize NDMA through co-metabolic biodegradation, a technology that is still in the laboratory development phase and is not yet proven at field scale. Air sparging/soil vapor extraction, chemical reduction/oxidation permeable reactive barrier, and break-point chlorination were not retained because they were either ineffective for the OCSS COCs and/or could increase toxicity and mobility of OCSS COCs (of note, enhanced biodegradation also has the potential to oxidize trivalent chromium to hexavalent chromium). UV oxidation was retained for its effectiveness in treating NDMA. Adsorption is retained due to being somewhat effective for ammonia and chromium. Air stripping was retained as a potential unit operation for removal of volatile COCs from extracted groundwater.

Containment/Removal. Groundwater extraction and treatment are retained.

Disposal. Discharge (after treatment) is retained for combination with other technologies.

Based on the screening of technologies, the following are retained for assembling into remedial alternatives for groundwater:

- No Action
- Institutional Controls
- Sampling and Analysis
- Enhanced Biodegradation
- Adsorption
- UV Oxidation
- Groundwater Extraction
- Groundwater Treatment
- Discharge (after treatment)

2.3.2.4. Containment Area Soils

Table 2.3-4 presents the technology screening for the Containment Area. These technologies were screened for their ability to meet the RAOs of preventing leaching of soil contaminants and preventing human exposure of soil contaminants. Technologies and process options identified that were judged ineffective or not implementable were not retained. The retained technologies and process options are those considered most suitable to address Containment Area soils. The retained technologies/process options may be used alone or integrated with other technologies to develop remedial alternatives. Based on the screening of technologies, the following are retained for assembling into remedial alternatives for the Containment Area.

The following paragraphs summarize the results of technology screening for the Containment Area.

Institutional Controls. Institutional Controls are non-engineered instruments, such as administrative and legal controls, that help to minimize the potential for exposure to contamination and/or protect the integrity of a response action.

Containment. Four types of capping scenarios were identified for the containment general response action. Based on screening of their ability to prevent or minimize the potential for leaching of contaminants, only the RCRA Subtitle C and Subtitle D options were retained for development into remedial alternatives.

In addition to capping, two stabilization methods were considered under the containment general response action: ex-situ stabilization of excavated soil before off-site disposal, and in-situ stabilization. Ex-situ stabilization was retained as a possible technology for treating excavated soil, if necessary, prior to off-site disposal.

Removal. Mechanical excavation was identified as the removal technology to be retained for development of remedial alternatives.

Disposal. Both on-site and off-site disposal were identified as common disposal options. Removing soil from the Containment Area and disposing elsewhere on-site is not considered a viable approach to site remediation. Therefore, only off-site disposal was retained for development into remedial alternatives.

Based on the screening of technologies, the following are retained for assembling into remedial alternatives for the Containment Area:

- No Action
- Institutional Controls
- Sampling and Analysis
- Containment via Capping
- Ex-situ soil stabilization
- Mechanical Excavation
- Off-Site Disposal

3.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

In this section, remedial alternatives are developed to meet the RAOs presented in Subsection 2.1, using the general response actions identified in Subsection 2.2 either individually or in combination. Remedial alternatives are then screened with respect to the criteria of effectiveness, implementability, and cost to meet the requirements of CERCLA and the NCP (40 CFR 300.430(e)(7)). An interim action FS is typically a streamlined and focused evaluation, wherein a narrower range of technologies and alternatives should be tailored to the specific scope and purpose of the interim action. This document in general follows the screening process for a normal FS that includes a more detailed evaluation process for developing final remedies.

3.1 Alternative Screening Criteria

The objective of the alternative screening step is to eliminate impractical alternatives or higher cost alternatives (i.e., order of magnitude cost differences) that provide little or no increase in effectiveness or implementability over their lower-cost counterparts. The effectiveness and implementability criteria used for screening the alternatives are discussed in the following paragraphs.

Effectiveness. This criterion focuses on the degree to which an alternative reduces toxicity, mobility, and/or volume through treatment, minimizes residual risks and affords long-term protection, complies with ARARs and minimizes short-term impacts. The NCP indicates that both short- and long-term aspects of effectiveness should be considered. Short-term is considered to be during the construction and implementation period, while long-term begins once the interim remedial action is complete and RAOs have been met. Short-term effectiveness considerations include the effects of the alternatives during the construction and implementation period, the alternative's ability to meet RAOs, and the relative time frame required to achieve RAOs. Long-term effectiveness considers the magnitude of the remaining residual risk because of residual contaminant sources, and the adequacy and reliability of specific technical components and control measures to maintain compliance with RAOs over the life of the remediation. Alternatives that do not meet the RAOs are eliminated from further consideration.

Implementability. Each alternative is also evaluated in terms of technical and administrative implementability. In the assessment of short-term technical implementability, the availability of a technology for construction or mobilization and operation, as well as compliance with action-specific ARARs during the remedial action, are considered. Long-term technical implementability considers the ease of operation and maintenance, technical reliability, the ease of undertaking

additional remedial actions, and the degree of monitoring or controls for residuals and untreated wastes. Administrative feasibility for implementing a given technology addresses the ability to obtain approvals from pertinent offices and agencies for off-site activities; the availability of treatment, storage, and disposal services; and the commercial availability of required services and trained specialists or operators. Alternatives that are not technically or administratively implementable or that would require equipment, specialists, or facilities that are not available within a reasonable time period may be eliminated from further consideration (NCP, 40 CFR 300.430(e)(7)).

Costs. This criterion considers the costs of construction and long-term costs to operate and maintain the alternatives. As noted in USEPA guidance, the overall goal of the remedy selection process is to remediate contaminated sites to the maximum extent practicable, which requires a co-equal mandate for remedies to be cost-effective (USEPA, 1988b). Costs that are grossly excessive compared to the overall effectiveness of alternatives may be considered as one of several factors used to eliminate alternatives. Alternatives providing effectiveness and implementability similar to that of another alternative by employing a similar method of treatment or engineering control, but at greater cost, may also be eliminated (NCP, 40 CFR 300.430(e)(7)).

This screening section does not formally evaluate costs. Rather, based on knowledge of relative costs, professional judgment is used to identify the relative cost-effectiveness of each alternative. Detailed cost evaluations will be performed in Section 4, as part of the detailed evaluation of those alternatives that are retained after this section's screening.

The No Action Alternative is not evaluated according to the screening criteria; it will pass through screening to be evaluated during the detailed analysis as a baseline for other retained alternatives (USEPA, 1988b).

3.2 Identification and Development of Alternatives

Based on the screening of technologies and process options presented in Subsection 2.3 and **Table 2.3-1 through Table 2.3-4**, the following interim action alternatives have been assembled for DAPL and groundwater hot spots, and final remedy alternatives have been assembled for LNAPL and the Containment Area.

<u>LNAPL</u>

- Alternative LNAPL 1: No Action
- Alternative LNAPL 2: Manual Recovery

- Alternative LNAPL 3: Continual Mechanical Recovery
- Alternative LNAPL 4: Multi-Phase Extraction (MPE)
- Alternative LNAPL 5: Continued Operation of Plant B and Expanded Multi-Phase Extraction
- Alternative LNAPL 6: Continued Operation of Plant B Followed by Demolition and Excavation

DAPL

- Alternative DAPL 1: No Action
- Alternative DAPL 2: DAPL Extraction from Off-PWD DAPL Pool
  - DAPL 2A: 1 Extraction Well (0.25 gpm)
  - DAPL 2B: 4 Extraction Wells (0.25 gpm per well)
- Alternative DAPL 3: DAPL Extraction from Containment Area DAPL Pool
  - DAPL 3A: 1 Extraction Well (0.25 gpm)
  - DAPL 3B: 4 Extraction Wells (0.25 gpm per well)
- Alternative DAPL 4: DAPL Extraction from Main Street DAPL Pool
  - DAPL 4A: 3 Extraction Wells (0.5 gpm per well)
  - DAPL 4B: 12 Extraction Wells (0.5 gpm per well)

Groundwater Hot Spots

- Alternative GW 1: No Action
- Alternative GW 2: Groundwater Hot Spot Extraction from Two New Extraction Well Within the 11,000 ng/L NDMA Contours
- Alternative GW 3: Groundwater Hot Spot Extraction from Three New Extraction Wells Within the 11,000 ng/L NDMA Contours
- Alternative GW 4: Groundwater Hot Spot Extraction from Six New Extraction Wells Within the 5,000 ng/L NDMA Contours
- Alternative GW 5: Groundwater Hot Spot Extraction from Twelve New Extraction Wells Within the 1,100 ng/L NDMA Contours

Containment Area

- Alternative CA 1: No Action
- Alternative CA 2: Capping, Equalization Window Closure, and Institutional Controls
- Alternative CA 3: Targeted Soil Removal

3.2.1 LNAPL Remedial Alternatives

This section summarizes the remedial alternatives for removal of LNAPL.

3.2.1.1. Alternative LNAPL 1: No Action

In the No Action LNAPL alternative, institutional controls would be implemented, and the current efforts to recover LNAPL would continue. The No Action LNAPL alternative would not include additional remedial actions to enhance recovery of LNAPL. The No Action alternative provides a baseline for comparison with the other developed LNAPL alternatives as required by CERCLA and the NCP.

3.2.1.2. Alternative LNAPL 2: Manual Recovery

Alternative LNAPL 2 consists of implementing institutional controls and manual recovery of LNAPL from the existing extraction well IW-11 at Plant B. LNAPL is currently recovered via a skimmer bucket on a monthly basis, and total annual LNAPL removal is less than one gallon per year. This alternative would include additional recovery efforts using absorbent socks in two wells where measurable LNAPL is observed (GW-23 and P5). The recovered LNAPL would be stored on-site until being disposed of in accordance with RCRA regulations.

3.2.1.3. Alternative LNAPL 3: Continual Mechanical Recovery

Alternative LNAPL 3 consists of implementing institutional controls that prevent excavation and use of groundwater near Plant B and continual mechanical recovery of LNAPL from three new recovery wells at Plant B. The recovery wells would be in the area in which LNAPL is most frequently observed between the foundation of Plant B and IW-11. Each of the recovery wells would be fitted with an automated skimmer containing a hydrophobic/oleophilic filter to collect LNAPL inside the skimmer without also entraining water. Pumps in the skimmers are actuated periodically by a centralized controller to pump the collected LNAPL to a drum or other central collection point for storage. The skimmers fluctuate with the water table to keep the collection port at the product/water interface. The recovered LNAPL would be stored on-site until being disposed in accordance with RCRA regulations. Quarterly groundwater monitoring would continue to be performed until determined to be unnecessary via five-year review.

3.2.1.4. Alternative LNAPL 4: Multi-Phase Extraction

Alternative LNAPL 4 consists of implementing institutional controls and installing one MPE well to remove LNAPL from under the foundation of Plant B. The new MPE recovery well would be

located just outside the northeast corner of the Plant B Treatment Building where the thickest accumulation of LNAPL is observed (near GW-23). The MPE treatment system would be skid-mounted and rented from an environmental contractor. The skid mounted MPE treatment system includes the extraction blower, knockout tank to separate the streams, and vapor treatment, if necessary. Extracted LNAPL would be stored at the Site and disposed of in accordance with ARARs. Extracted groundwater would be treated at the existing Plant B.

3.2.1.5. Alternative LNAPL 5: Continued Operation of Plant B and Expanded Multi-Phase Extraction

Plant B would continue to operate until the Groundwater Hot Spot treatment system has been constructed and is operational. Effluent from the current Plant B extraction wells would be rerouted to the new groundwater treatment system, and then Plant B would be decommissioned and demolished. A pre-design investigation to delineate LNAPL extent, including beneath the Plant B building foundation, would be performed, and based on the results, MPE wells would then be installed within the footprint of the residual LNAPL plume (currently estimated at 3-5 wells).

Groundwater, LNAPL, and soil vapor would be extracted through MPE wells with groundwater being treated at the new Groundwater Hot Spot treatment system. A skid-mounted treatment system would include an oil/water separator to remove the LNAPL and vapor-phase GAC to treat the soil vapor. Demolition of Plant B and installation of the MPE wells, piping, and skid-mounted treatment system is estimated to be completed in 6 months, following which the MPE component of this alternative is expected to operate for 6 to 12 months. It is assumed the existing Plant B extraction wells would continue operating through the first five-year review following MPE completion.

3.2.1.6. Alternative LNAPL 6: Continued Operation of Plant B Followed by Demolition and Excavation

Plant B would continue to operate until the new Groundwater Hot Spot treatment system has been constructed and is operational. Current Plant B extraction wells would then be rerouted to the new groundwater treatment system, and Plant B would be decommissioned and demolished. A pre-design investigation would be performed to determine the areal extent of LNAPL and the depth of the smear zone. Based on the results of the investigation, LNAPL-impacted soil would be excavated to the bottom of the smear zone. The limits of excavation would be based on the pre-design investigation as well as the observed extent of LNAPL. If

additional LNAPL-impacted soil is encountered during excavation, additional soil would be removed to the extent feasible.

3.2.2 DAPL Remedial Alternatives

DAPL extraction at the Off-Property West Ditch (OPWD) DAPL pool, also known as the Jewel Drive DAPL pool, has been demonstrated under the DAPL Extraction Pilot Test to be successful when lower DAPL extraction rates are used (less than 0.5 gallons per minute [gpm]) to minimize entrainment of groundwater and groundwater mixing. Therefore, the active remedial alternatives proposed for all three DAPL pools is DAPL extraction and ex-situ treatment. For each DAPL pool, a pair of remedial alternatives are proposed with a presumed minimum and maximum number of wells to evaluate relative timeframe and cost sensitivities.

For comparative purposes, the extracted DAPL is proposed to be treated on-site. Feasibility of DAPL treatment and details of the required treatment trains will be evaluated as part of pre-design investigations (PDIs).

3.2.2.1. Alternative DAPL 1: No Further Action

Alternative DAPL 1 does not include any additional remedial action components to reduce DAPL volume or to control or eliminate potential risks from exposure to DAPL. The No Further Action alternative provides a baseline for comparison with the other alternatives as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP).

3.2.2.2. Alternative DAPL 2: DAPL Extraction from Off-PWD DAPL Pool

Alternative DAPL 2 addresses the off-PWD DAPL pool. It includes institutional controls for properties above the footprint of the DAPL pools to prevent groundwater use, optimization of the current DAPL extraction system, operations and maintenance (O&M), monitoring, and Five-Year Reviews.

For comparative and initial costing purposes, an estimated DAPL pool volume of 1.3 million gallons was used (Table 4 of Geomega, 2020). This estimate was based on the most recent (2019) sampling results.

Alternative DAPL 2 includes one alternative with a minimum number of extraction wells (DAPL 2A) and one with an anticipated maximum number of extraction wells (DAPL 2B). The number of extraction wells described in the alternatives below are intended to provide a range. The actual

number of extraction wells will be based on future data collection activities and observations during remedy design and implementation.

3.2.2.2.1. Alternative DAPL 2A

Alternative DAPL 2A includes installation of a new extraction well to replace the existing extraction well (EW-1). The new well will be installed adjacent to EW-1 and construction will include a two-foot screen. The shorter screen may allow slightly improved pumping rates without dilution.

Current subsurface data collected at the Site indicates that the central portion of the DAPL pool is located beneath an existing building within an east-west sloping bedrock depression. The alternative will include installing borings to bedrock on the northeast and southeast side of the building to confirm bedrock elevations and current geophysical data. The topography of the bedrock will determine long-term sustainable recovery rates. These may be greater than 0.25 gpm, depending on the geometry of the pool. Locations of potential DAPL extraction wells for comparative and initial costing purposes are discussed in Section 4.

If the general slope of bedrock is confirmed to be east to west, then the current extraction well is located properly for removing DAPL via gravity drainage long-term. Alternative DAPL 2A may not be effective if geophysical data indicates that bedrock conditions do not align with the current bedrock model.

The analysis of alternatives and cost estimate for Alternative DAPL 2A assumes that 95% of the accessible DAPL present in the off-PWD DAPL pool (1.235 million gallons) will be recovered and treated on-site.

3.2.2.2.2. Alternative DAPL 2B

Alternative DAPL 2B includes the components in Alternative DAPL 2A, plus extraction from the lowest point in the basin (assumed to be beneath the center of the building). In addition, Alternative DAPL 2B includes a provision for auxiliary DAPL extraction wells to minimize drawdown, provide flexibility with pumping rates, and target any bedrock low spots identified during system design. Locations of potential DAPL extraction wells for comparative and initial costing purposes are discussed in Section 4.

Due to the more extensive extraction network, the analysis of alternatives and cost estimate for Alternative DAPL 2B assumes that 100% of the accessible DAPL present in the off-PWD DAPL pool (1.3 million gallons) will be recovered and treated on-site.

3.2.2.3. Alternative DAPL 3: DAPL Extraction from Containment Area DAPL Pool

Alternative DAPL 3 addresses the On-Property (Containment Area) DAPL pool. It includes institutional controls for properties above the footprint of the DAPL pools to prevent groundwater use, installation of a DAPL extraction and treatment system, O&M, monitoring, and Five-Year Reviews.

For comparative and initial costing purposes, an estimated DAPL pool volume of 240,000 gallons was used (Table 4 of Geomega, 2020). This estimate was based on the most recent (2019) sampling results.

Alternative DAPL 3 includes two alternatives to provide a range of extraction wells, one with minimal additional infrastructure (DAPL 3A) and one with increased DAPL removal capability (DAPL 3B) as described in the subsections below. The number of extraction wells described below are intended to provide a reasonable range for treatment. The final number of wells will be based on future data collection activities and observations during design and implementation.

3.2.2.3.1. Alternative DAPL 3A

Alternative DAPL 3A includes installation of a single, centrally located extraction well at the lowest point of the bedrock depression within the Containment Area. Current data indicate that the bedrock surface slopes gently beneath the DAPL area; therefore, sustainable gravity-driven extraction rates are expected to be like those of the off-PWD Pool. If the bedrock surface is more complex (multiple low areas), the DAPL pool may not be fully captured by a single extraction well. Actual extraction rates and the extraction well location would be evaluated as part of the system design and O&M. Locations of potential DAPL extraction wells for comparative and initial costing purposes are discussed in Section 4.

The analysis of alternatives and cost estimate for Alternative DAPL 3A assumes that 95% of the accessible DAPL present in the Containment Area DAPL pool (228,000 gallons) will be recovered and treated on-site.

3.2.2.3.2. Alternative DAPL 3B

Alternative DAPL 3B includes the extraction well included in DAPL 3A plus one or more auxiliary extraction points to allow for relatively slow DAPL extraction at each point, provides flexibility with pumping rates, and targets any bedrock low spots identified during system design. Locations of

potential DAPL extraction wells for comparative and initial costing purposes are discussed in Section 4.

Due to the more extensive extraction network, the analysis of alternatives and cost estimate for Alternative DAPL 3B assumes that 100% of the accessible DAPL present in the Containment Area DAPL pool (0.24 million gallons) will be recovered and treated on-site.

3.2.2.4. Alternative DAPL 4: DAPL Extraction from Main Street DAPL Pool

Alternative DAPL 4 addresses the Main Street DAPL pool. It includes institutional controls for properties above the footprint of the DAPL pool to prevent groundwater use, installation of a DAPL extraction and treatment system, O&M, monitoring, and Five-Year Reviews.

For comparative and initial costing purposes, an estimated DAPL pool volume of 13.3 million gallons was used (Table 4 of Geomega, 2020). This estimate was based on the most recent (2019) sampling results.

Alternative DAPL 4 includes one alternative with a minimum number of extraction wells (DAPL 4A) and one with an anticipated maximum number of extraction wells (DAPL 4B). The number of extraction wells described in the alternatives below are intended to provide a range. The actual number of extraction wells will be based on future data collection activities and observations during remedy design and implementation.

3.2.2.4.1. Alternative DAPL 4A

Alternative 4A includes three extraction wells at bedrock low points identified using available data and assumes that each extraction well could be pumped at 0.5 gpm based on the more steeply-dipping bedrock slopes at the Main Street DAPL pool. Actual extraction rates would be evaluated as part of the system design and O&M. Locations of potential DAPL extraction wells for comparative and initial costing purposes are discussed in Section 4.

The analysis of alternatives and cost estimate for Alternative DAPL 4A assumes that 95% of the accessible DAPL present in the Main Street DAPL pool (12.635 million gallons) will be recovered and treated on-site.

3.2.2.4.2. Alternative DAPL 4B

Alternative 4B includes a total of 12 extraction wells, each pumping at an average rate of 0.5 gpm to maintain an overall removal rate of 6 gpm and target bedrock variability in this much larger

area. Locations of potential DAPL extraction wells for comparative and initial costing purposes are discussed in Section 4.

Due to the more extensive extraction network, the analysis of alternatives and cost estimate for Alternative DAPL 4B assumes that 100% of the accessible DAPL present in the Main Street DAPL pool (13.3 million gallons) will be recovered and treated on-site.

3.2.3 Groundwater Hot Spots Alternatives

This section summarizes the remedial alternatives that have been developed for remediation of groundwater hot spots. These alternatives incorporate extraction wells to remove groundwater from the areas with the highest concentrations of site-related COCs, as indicated by the presence of NDMA. These alternatives consider extraction of groundwater containing NDMA within the 11,000 ng/L, 5,000 ng/L, and 1,100 ng/L contour intervals. Groundwater with lower concentrations of NDMA and other site COCs will be considered in a future OU3 FS.

3.2.3.1. Alternative GW 1: No Action

The No Action alternative does not include remedial action components to reduce volume or mass of contaminants or to control migration or eliminate potential risks from exposure to groundwater. The No Action alternative provides a baseline for comparison with the other developed alternatives as required by CERCLA and the NCP.

3.2.3.2. Alternative GW 2: Groundwater Hot Spot Extraction from Two New Extraction Wells at GW-58D and GW-83D from Within the 11,000 ng/L NDMA Contour

Alternative GW 2 includes installation of two new deep overburden groundwater extraction wells placed near existing monitoring wells GW-58D and GW-83D to extract groundwater containing NDMA within the 11,000 ng/L contour intervals. The two new extraction wells would be installed downgradient of the Main Street DAPL pool, which is the most downgradient of the three DAPL pools. Extracted groundwater would be conveyed to a new groundwater treatment plant to be constructed on the Olin Property (on-Property construction used for cost development purposes – final treatment plant location will be determined during system design); treated to meet discharge standards by removing Site-specific COCs, including NDMA; and discharged appropriately to surface water. Alternative GW 2 would also include implementation of institutional controls to prevent use of contaminated groundwater as a potable water source.

3.2.3.3. Alternative GW 3: Groundwater Hot Spot Extraction from Three New Extraction Wells from Within the 11,000 ng/L NDMA Contour

Alternative GW 3 includes installation of three new deep overburden groundwater extraction wells placed near existing monitoring wells GW-58D, GW-83D, and GW-84D to extract groundwater containing NDMA within the 11,000 ng/L contour intervals. The three new extraction wells would be installed downgradient of the Main Street DAPL pool. Extracted groundwater would be conveyed to a new groundwater treatment plant to be constructed on the Olin Property; treated to meet discharge standards by removing Site-specific COCs, including NDMA; and discharged appropriately to surface water. Alternative GW 3 would also include implementation of institutional controls to prevent use of contaminated groundwater as a potable water source.

3.2.3.4. Alternative GW 4: Groundwater Hot Spot Extraction from Within the 5,000 ng/L NDMA Contour

Alternative GW 4 includes installation of six new deep overburden groundwater extraction wells to extract groundwater containing NDMA within the 5,000 ng/L contour intervals. The six new extraction wells would include the three wells described in Alternative GW 3; one extraction well installed adjacent to GW-85D; and two extraction wells installed over the Main Street DAPL pool, to be screened in the diffuse layer over the DAPL surface. These wells would extract groundwater within the NDMA 5,000 ng/L contour intervals, including the toe of the 5,000 ng/L plume extending around GW-85D. As with Alternatives GW 2 and GW3, extracted groundwater would be conveyed to a new groundwater treatment plant; treated to reduce concentrations of Site-specific COCs; and discharged appropriately to surface water. Alternative GW 4 would also include implementation of institutional controls to prevent use of contaminated groundwater as a potable water source.

3.2.3.5. Alternative GW 5: Groundwater Hot Spot Extraction from Within the 1,100 ng/L NDMA Contour

Alternative GW 5 includes installation of 12 new deep overburden groundwater extraction wells to extract groundwater containing NDMA within the 1,100 ng/L contour intervals. This alternative includes the six new extraction wells described above for Alternative GW 4; two wells between the Off-Property West Ditch (off-PWD) and Main Street DAPL pool; one well in the GW-413D area; two wells in the Main Street DAPL pool screened in the diffuse layer over the DAPL surface; and one well on-site near GW-55D. These proposed extraction wells locations would extract groundwater within the NDMA 1,100 ng/L contour intervals. As with Alternatives

GW 2, GW 3, and GW 4, extracted groundwater would be conveyed to a new groundwater treatment plant; treated to reduce concentrations of Site-specific COCs; and discharged appropriately to surface water. Alternative GW 5 would also include implementation of institutional controls to prevent use of contaminated groundwater as a potable water source.

3.2.4 Containment Area Alternatives

Based on USEPA review of the draft 2018 OU1/OU2 FS report and the draft 2018 OU3 FS report (Amec Foster Wheeler, 2018b and c), the USEPA requested that this IAFS Report include alternatives for soils within the Containment Area. Capping and excavation are the technologies that have been retained to fulfill this request. The purpose of capping is to improve hydraulic isolation by minimizing infiltration and elimination of hydraulic communication through the equalization window. Capping would also reduce the potential for leaching of constituents from unsaturated soil to groundwater.

3.2.4.1. Alternative CA 1: No Action

The No Action alternative does not include capping or removal of soil that might reduce infiltration or leaching to groundwater or control or eliminate potential risks from exposure to soil within the Containment Area (beyond existing restrictions). The No Action alternative provides a baseline for comparison with the other developed alternatives as required by CERCLA and the NCP.

3.2.4.2. Alternative CA 2: Capping, Equalization Window Closure, and Institutional Controls

Alternative CA 2 consists of institutional controls, closure of the equalization window in the Containment Area's slurry wall, and construction of a permanent cap over the Containment Area to replace the existing temporary cap. This alternative would also include long-term O&M and Five-Year Reviews.

This alternative provides a composite barrier, conceptualized as a Subtitle D cap with a geosynthetic clay liner (GCL) as the infiltration barrier, that improves the hydraulic performance of that cap design by adding an overlying geomembrane on the GCL. Leakage through imperfections in the geomembrane is minimized by hydration of the bentonite clay in the underlying GCL. The GCL is not subject to desiccation problems due to freeze/thaw cycles common to clay soil liners in composite caps. The proposed cap would minimize infiltration levels and have a hydraulic conductivity comparable to the Containment Area's slurry wall. The

longevity of the material used in the proposed cap would long outlast any other future development components constructed over it.

3.2.4.3. Alternative CA 3: Targeted Soil Removal

Alternative CA 3 would consist of identification and removal of soil within the Containment Area that have high potential for leaching of constituents to groundwater. Targeted areas of soil would be excavated; dewatered and stabilized as necessary; and transported off-site for disposal. Post-excavation verification sampling would be conducted to document soil impact limits and to confirm achievement of RAOs and PRGs. Upon confirmation that impacted soils have been removed, excavated areas would be backfilled and the excavated areas would be restored. Because potentially contaminated soil would be removed, long-term monitoring and Five-Year Site Reviews would not be required. The slurry wall and equalization window would remain in place and continue to function as intended.

3.3 Initial Screening of Alternatives

During this step of the FS process, the alternatives that have been developed in Section 3.2 are screened against the effectiveness, implementability, and cost criteria as defined in Subsection 3.1. The objective of the alternative screening step is to eliminate impractical or economically infeasible alternatives (i.e., order of magnitude cost differences when compared to return on investments) that provide little or no increase in effectiveness or implementability over their lower-cost counterparts. The alternatives retained during this screening step are then carried through a detailed evaluation (Section 4).

3.3.1 LNAPL Alternatives

This section provides the initial screening of LNAPL alternatives.

3.3.1.1. Alternative LNAPL 1: No Action

Alternative LNAPL 1 is the no action alternative, which is required to be retained and is typically used only as a baseline for comparison to other remedial alternatives. Alternative LNAPL 1 is not effective: it does not reduce toxicity, mobility, or volume of contaminants, and will not meet the RAO to enhance recovery of LNAPL. Alternative LNAPL 1 can readily be implemented and is retained for detailed analysis.

3.3.1.2. Alternative LNAPL 2: Manual Recovery

Alternative LNAPL 2 includes institutional controls, manual recovery of LNAPL enhanced by installation of absorbent socks in wells that contain measurable product, monitoring, and Five-Year Reviews. This alternative is somewhat effective: it reduces toxicity, mobility, and volume, through removal of LNAPL and meets the RAO to enhance recovery of LNAPL. The alternative is readily implementable, and has a low relative cost. Alternative LNAPL 2 is retained for detailed analysis.

3.3.1.3. Alternative LNAPL 3: Continual Mechanical Recovery

Alternative LNAPL 3 includes institutional controls, continual mechanical recovery of LNAPL, monitoring, and Five-Year Reviews. Alternative LNAPL 3 is somewhat effective: it reduces toxicity, mobility, and volume, and also meets the RAO to enhance LNAPL recovery during implementation. The components for mechanical recovery are well-proven remedial technologies and are readily implemented, and has a relatively low cost. Alternative LNAPL 3 is retained for detailed analysis.

3.3.1.4. Alternative LNAPL 4: MPE

Alternative LNAPL 4 includes institutional controls, MPE of LNAPL at the northeast corner of the Plant B building, monitoring, and Five-Year Reviews. This Alternative is effective: it reduces toxicity, mobility, and volume, and also meets the RAO to enhance LNAPL recovery during implementation.[10] The alternative is expected have a short duration (several months to a year) and the components for MPE are well-proven remedial technologies that are readily implemented and has a relatively low cost. Alternative LNAPL 4 is retained for detailed analysis.

3.3.1.5. Alternative LNAPL 5: Continued Operation of Plant B Followed by Plant B Demolition and Expanded Multi-Phase Extraction

Alternative 5 includes continued operation of Plant B until completion of the Groundwater Hot Spot treatment system. Plant B would then be decommissioned and demolished, and 3 to 5 new MPE wells would be installed within the footprint of the residual LNAPL plume. Groundwater,

[10] In Volume III of the FS report, Alternative LNAPL-4 will be consolidated with Alternative SW-3 from the OU1/OU2 FS. Alternative SW-3 includes extraction wells along the west side of East Ditch, which would prevent migration of LNAPL to East Ditch.

LNAPL, and soil vapor would be extracted through MPE wells, with groundwater being treated at the new Groundwater Hot Spot treatment system; vapor-phase GAC would be used to treat the extracted soil vapor.

This Alternative is effective: it reduces toxicity, mobility, and volume, and also meets the RAO to enhance LNAPL recovery during implementation. The alternative is expected have a short duration (about two years), and MPE is a well-proven remedial technology that is readily implemented and has a relatively low cost. Alternative LNAPL 5 is retained for detailed analysis.

3.3.1.6. Alternative LNAPL 6: Continued Operation of Plant B Followed by Plant B Demolition and Excavation

Under Alternative LNAPL 6, Plant B would continue to operate until the new Groundwater Hot Spot treatment system has been constructed and is operational, after which groundwater would be treated in the new treatment system. Plant B would then be decommissioned and demolished, and LNAPL-impacted soil would be excavated to the bottom of the smear zone.

This Alternative is effective: it reduces toxicity, mobility, and volume of LNAPL by excavation. The alternative is implementable using standard remediation and excavation technologies, and is expected have a short duration (about one year to the completion of excavation and site restoration). This alternative would have a relatively high cost. Because it is expected to be effective and implementable, Alternative LNAPL 6 is retained for detailed analysis.

3.3.2 DAPL Alternatives

Alternative DAPL 1 is the No Action alternative that is required to be retained as a baseline comparison to the other alternatives. As described in the previous section, two active alternatives are described for each of the three DAPL pools (DAPL 2A/B, 3A/B, and 4A/B). All seven alternatives have been retained for detailed analysis.

3.3.3 Groundwater Hot Spot Alternatives

This section provides the initial screening of groundwater hot spot alternatives.

3.3.3.1. Alternative GW 1: No Action

Alternative GW 1 is the no action alternative, which is required to be retained and is typically used only as a baseline for comparison to other remedial alternatives. Alternative GW 1 is not effective because it does nothing to remediate groundwater with high concentrations of NDMA

and does nothing to prevent human exposure to groundwater with site-related COCs. Therefore, it will not achieve the RAOs for groundwater hot spots. This alternative can be readily implemented and has no cost. Because it must be retained as a comparison, Alternative GW 1 is retained.

3.3.3.2. Alternative GW 2: Groundwater Hot Spot Extraction from Two New Extraction Wells at GW-58D and GW-83D from Within the 11,000 ng/L NDMA Contour

Alternative GW 2 includes installation of two new deep overburden groundwater extraction wells to target groundwater containing NDMA within the 11,000 ng/L contour intervals. Extracted groundwater would be conveyed to a new on-Property groundwater treatment plant; treated; and discharged to surface water. This alternative also includes institutional controls to prevent contact with contaminated groundwater; groundwater monitoring; and Five-Year Reviews.

Alternative GW 2 would be effective because it would extract and treat groundwater with the highest concentrations of NDMA, while also preventing human exposure to groundwater with site-related COCs. The alternative is implementable and has a relatively low cost. Alternative GW 2 is retained for detailed analysis.

3.3.3.3. Alternative GW 3: Groundwater Hot Spot Extraction from Three New Extraction Wells from Within the 11,000 ng/L NDMA Contour

Alternative GW 3 includes installation of three new deep overburden groundwater extraction wells to target groundwater containing NDMA within the 11,000 ng/L contour intervals. Extracted groundwater would be conveyed to a new on-property groundwater treatment plant; treated; and discharged to surface water. Alternative GW 3 would also include implementation of institutional controls to prevent contact with contaminated groundwater; groundwater monitoring; and Five-Year Reviews.

Alternative GW 3 would be effective because it would extract and treat groundwater with the highest concentrations of NDMA, while also preventing human exposure to groundwater with site-related COCs. The alternative is implementable and has a relatively low cost. Alternative GW 3 is retained for detailed analysis.

3.3.3.4. Alternative GW 4: Groundwater Hot Spot Extraction from Within the 5,000 ng/L NDMA Contour

Alternative GW 4 includes installation of six new deep overburden groundwater extraction wells to target groundwater containing NDMA within the 5,000 ng/L contour intervals. Extracted

groundwater would be conveyed to a new on-Property groundwater treatment plant; treated; and discharged to surface water. Alternative GW 4 would also include implementation of institutional controls to prevent contact with contaminated groundwater; groundwater monitoring; and Five-Year Reviews.

Alternative GW 4 would be effective because it would extract and treat groundwater with the highest concentrations of NDMA, while also preventing human exposure to groundwater with site-related COCs. Alternative GW 4 is implementable and has a relatively moderate cost. Alternative GW 4 is retained for detailed analysis.

3.3.3.5. Alternative GW 5: Groundwater Hot Spot Extraction from Within the 1,100 ng/L NDMA Contour

Alternative GW 5 includes installation of 12 new deep overburden groundwater extraction wells to target groundwater containing NDMA within the 1,100 ng/L contour intervals. Extracted groundwater would be conveyed to a new on-Property groundwater treatment plant; treated; and discharged to surface water. Alternative GW 5 would also include implementation of institutional controls to prevent contact with contaminated groundwater; groundwater monitoring; and Five-Year Reviews.

Alternative GW 5 would be effective because it would extract and treat groundwater with the highest concentrations of NDMA, while also preventing human exposure to groundwater with site-related COCs. This alternative is implementable and has a relatively high cost. Alternative GW 5 is retained for detailed analysis.

3.3.4 Containment Area Alternatives

This section provides the initial screening of the Containment Area alternatives.

3.3.4.1. Alternative CA 1: No Action

The No action alternative will not be effective because it does not include remedial action components to identify and remove soil within the Containment Area that have potential for leaching of constituents to groundwater or to achieve hydraulic isolation of the Containment Area. This alternative can be readily implemented and has no cost. The No Action alternative provides a baseline for comparison with the other developed alternatives as required by CERCLA and the NCP. Alternative CA 1 is retained for detailed analysis.

3.3.4.2. Alternative CA 2: Capping, Equalization Window Closure, and Institutional Controls

Alternative CA 2 consists of institutional controls, closure of the equalization window in the Containment Area's slurry wall, and installation of a permanent composite cap over the Containment Area to replace the existing temporary cap. Installation of a permanent cap and closure of the equalization window would effectively achieve of hydraulic isolation of the Containment Area and more specifically, effectively eliminate any leaching of constituents from soils to groundwater, thereby meeting the RAO. Capping is implementable at the Site. A composite cap is a moderate to high cost alternative compared to other cap designs, but it provides a more effective infiltration barrier that typical cap designs. Alternative CA 2 is retained for detailed analysis.

3.3.4.3. Alternative CA 3: Targeted Soil Removal

Although there is currently no exposure to soil beneath the temporary cap, inclusion of this alternative has been requested by USEPA to address soils in the Containment Area. This alternative is a stand-alone alternative that is independent of Alternative CA 2 (capping). Alternative CA 3 includes excavating targeted areas within the Containment Area, dewatering and stabilization of soil as necessary, confirmation sampling, transportation, disposal, backfilling, and restoration of the excavated areas.

This alternative would eliminate potential leaching of contaminants to groundwater and prevent potential human exposure. This alternative would thus meet the RAOs for the Containment Area and would thus be effective. This alternative is implementable and would have a moderate to high cost compared to installation of a composite cap. The cost is dependent on the volume of soil to be removed. Because potentially contaminated soil would be removed, long-term monitoring and Five-Year Site Reviews would not be required. Alternative CA 3 is retained for detailed analysis.

3.3.5 Screening of Alternatives Conclusions

Based on the development and screening of remedial alternatives in Subsections 3.2 and 3.3, the following alternatives have been retained for detailed analysis.

<u>Remedial Alternatives for LNAPL</u>

- Alternative LNAPL 1: No Action
- Alternative LNAPL 2: Manual Recovery

- Alternative LNAPL 3: Continual Mechanical Recovery
- Alternative LNAPL 4: MPE
- Alternative LNAPL 5: Continued Operation of Plant B Followed by Plant B Demolition and Expanded MPE
- Alternative LNAPL 6: Continued Operation of Plant B Followed by Plant B Demolition and Excavation

Remedial Alternatives for DAPL

- Alternative DAPL 1: No further action
- Alternative DAPL 2: DAPL Extraction in the Off-PWD DAPL Pool:
    - Alternative DAPL 2A: one replacement extraction well
    - Alternative DAPL 2B: four extraction wells
- Alternative DAPL 3: DAPL Extraction in the Containment Area DAPL Pool:
    - DAPL 3A: one extraction well
    - DAPL 3B: four extraction wells
- Alternative DAPL 4: DAPL Extraction in the Main Street DAPL Pool:
    - DAPL 4A: three extraction wells
    - DAPL 4B: twelve extraction wells

Remedial Alternatives for Groundwater Hot Spots:

- Alternative GW 1: No Action
- Alternative GW 2: Groundwater Hot Spot Extraction from Two New Extraction Wells from Within the 11,000 ng/L NDMA Contour
- Alternative GW 3: Groundwater Hot Spot Extraction from Three New Extraction Wells from Within the 11,000 ng/L NDMA Contour
- Alternative GW 4: Groundwater Hot Spot Extraction from Within the 5,000 ng/L NDMA Contour
- Alternative GW 5: Groundwater Hot Spot Extraction from Within the 1,100 ng/L NDMA Contour

Remedial Alternatives for the Containment Area

- Alternative CA 1: No Action
- Alternative CA 2: Capping, Equalization Window Closure, and Institutional Controls
- Alternative CA 3: Targeted Soil Removal

4.0 ANALYSIS OF ALTERNATIVES

This section presents the detailed analysis of alternatives. Each remedial alternative was evaluated in detail with respect to seven of the nine CERCLA criteria, defined as follows (USEPA, 1988b):

1. Overall protection of human health and the environment
2. Compliance with ARARs
3. Short-term effectiveness
4. Long term effectiveness and permanence
5. Reduction of toxicity, mobility, or volume through treatment
6. Implementability
7. Cost

After detailed evaluation of remedial alternatives with respect to these seven criteria, the media-specific alternatives were then compared with one another to identify their respective strengths and weaknesses (Section 4.6).

Two additional evaluation criteria, state and community acceptance, were not evaluated because state and community feedback is not yet available. These criteria will be evaluated based on comments received during the public comment period for the Proposed Plan and addressed by USEPA during the Record of Decision process.

Cost estimates for the remedial alternatives were prepared using USEPA RI/FS guidance (USEPA, 1988b) and FS cost estimating guidance (USEPA, 2000). The cost estimates include capital costs (where appropriate) and O&M costs. Both total cost and present worth costs are provided. An annual discount rate of 7% was assumed to calculate present worth.

As discussed in Section 3.0, the development and evaluation of remedial alternatives are presented by media in this IAFS Report; that is, for LNAPL, DAPL, groundwater hot spots, and the Containment Area. CERCLA requires that a No Action alternative be included as a baseline for comparison of the remedial alternatives. Because the components and evaluation of the No Action alternative would be the same for each media addressed, the no action alternatives for each media addressed in this IAFS Report are evaluated and discussed in Section 4.1. The analysis of remedial alternatives for LNAPL, DAPL, groundwater hot spots, and the Containment

Area are presented in Sections 4.2, 4.3, 4.4, and 4.5, respectively. The comparative analysis of remedial alternatives is presented in Section 4.6.

4.1 No Action Alternatives: LNAPL 1, DAPL 1, GW 1, and CA 1

4.1.1 Components of the No Action Alternatives

The No Action alternative for each medium does not include additional remedial components to further reduce, control, or eliminate potential risks from exposure to COCs, beyond current conditions. Current actions (such as DAPL extraction in the off-PWD DAPL pool and LNAPL recovery at Plant B) would be maintained under the No Action Alternatives, but no additional remedial actions and no additional monitoring would be implemented. Because contamination would be left on-site at concentrations above risk-based standards, Five-Year Reviews would be required.

4.1.2 Overall Protection of Human Health and the Environment

The No Action Alternatives do not meet the RAOs and are therefore not protective of human health and the environment. Further, the No Action Alternatives do not enhance current source reduction activities and may not be protective of human health and the environment.

4.1.3 Compliance with ARARs

The No Action Alternatives do not comply with ARARs.

4.1.4 Long-term Effectiveness and Permanence

The No Action Alternatives will not be effective in the long-term.

4.1.5 Reduction of Toxicity, Mobility, or Volume through Treatment

The No Action Alternatives will not reduce toxicity, mobility, or volume of contaminants at the site.

4.1.6 Short-term Effectiveness

This criterion addresses the potential short-term effects of a remedial alternative on human health and the environment during the construction and implementation phase. Because the No Action Alternatives do not include any remedial construction or implementation, these

alternatives will not pose short-term risks. Therefore, the No Action alternatives will not cause short term risks.

4.1.7 Implementability

There are no technologies or engineering controls to implement under the No Action Alternatives. There are no services required, no permits to obtain, no administrative approvals for implementation, and no resources required. Therefore, the No Action Alternatives are implementable.

4.1.8 Cost

The No Action Alternatives have no capital or maintenance costs.

4.2 LNAPL Alternatives

The following sections present the detailed evaluation of Alternatives LNAPL 2 through LNAPL 6.

4.2.1 Alternative LNAPL 2: Manual Recovery

Alternative LNAPL 2 consists of implementing institutional controls and manual recovery of LNAPL. In addition to continuing manual recovery of LNAPL from extraction well IW-11 via a mechanical skimmer at Plant B, LNAPL would be recovered manually using absorbent socks from two additional wells (GW-23 and P5) where LNAPL has been observed (**Figure 4.2-1**). LNAPL is currently removed from extraction well IW-11 on a monthly basis; total LNAPL removal from IW-11 is less than one gallon per year. The removed LNAPL would be stored on-site until being disposed in accordance with ARARs.

4.2.1.1. LNAPL 2 Components of the Alternative

The scope of the alternative includes the following major components:

- Institutional controls
- Manual recovery of LNAPL
- Monitoring and O&M
- Off-Site Disposal
- Five-Year Reviews

These components of Alternative LNAPL 2 are described in more detail in the following paragraphs.

Estimated Duration for Alternative LNAPL 2. The timeframe for LNAPL removal is unknown. For the purposes of cost estimation, the overall project duration is assumed to be 30 years, summarized as follows:

- Revisions to LNAPL Removal Workplan 1 month
- LNAPL Recovery, Storage, Off-Site Disposal 15 years
- Monitoring and Reporting 15 years

Institutional Controls Institutional controls that minimize the potential for exposure to contamination and protect the integrity of the response action will be implemented...

Manual LNAPL Recovery. LNAPL would continue to be removed from IW-11 via a manual skimmer. LNAPL would also be removed from existing wells GW-23 and P5 (**Figure 4.2-1**) where measurable LNAPL is observed using hydrophobic absorbent socks. Removed LNAPL would be stored at the Site in accordance with ARARs.

Monitoring and O&M. Quarterly groundwater monitoring, including product thickness measurements, would be performed as LNAPL is being removed and for a period of time after LNAPL recovered ceases, until a Five-Year Review determines that further monitoring is no longer necessary.

Off-Site Disposal. Recovered LNAPL would be stored at the Site and then disposed in accordance with ARARs at a permitted waste facility.

Five-Year Reviews. CERCLA requires that any remedial action that results in contaminants remaining on-site at concentrations above those allowing for unlimited use and unrestricted exposure must be reviewed every five years. Although it is anticipated that this alternative would eventually meet the RAOs for LNAPL, contaminants will remain on-site for an uncertain duration. Therefore, Five-Year Reviews will be conducted as required under CERCLA. For cost estimating purposes, this alternative assumes that Five-Year Reviews will be conducted at five-year intervals for 30 years according to the requirements of the Comprehensive Five-Year Review Guidance (USEPA, 2001).

4.2.1.2. LNAPL 2 Overall Protection of Human Health and the Environment

The RAOs for LNAPL are to remove, to the extent practicable, LNAPL that represents a source of Site contaminants to groundwater and a potential source of TMPs to indoor air vapors, via a vapor intrusion pathway, that could pose an unacceptable risk to indoor workers or building occupants; and to prevent migration of LNAPL to East Ditch to prevent exposure by current and future ecological receptors to LNAPL containing Site contaminants that would result in potential adverse impacts. Manual recovery will remove floating LNAPL and will address LNAPL in the smear zone to the extent that the natural fluctuations in the water table reach the extent of the smear zone. While significant LNAPL mass will remain under this alternative, the removed LNAPL would no longer act as a source of COCs to groundwater. This alternative is protective of human health and the environment by preventing receptors' contact with COCs via institutional controls until RAOs are achieved.

4.2.1.3. LNAPL 2 Compliance with ARARs

Alternative LNAPL 2 would be designed and implemented to comply with ARARs that are identified in **Tables 2.1-1 and 2.1-2**.

Location-specific ARARs are listed in **Table 2.1-1**. There are no floodplains or wetlands associated with the areas of the Site proposed for remedial action under this alternative. This alternative does not include technologies that would impact nearby wetlands, aquatic ecosystems, or sensitive species.

The removal of LNAPL is not based on attainment of media-specific concentrations of specific contaminants or a PRG based on a chemical-specific ARAR.

Action-specific ARARs are listed in **Table 2.1-2**. This alternative would be designed and implemented to comply with the action-specific ARARs including but not limited to federal and state air emission standards and RCRA Subtitle C regulations related to soil characterization, waste identification, waste-handling, storage, treatment, and disposal requirements.

Tables 2.1-1 and 2.1-2 provide a thorough evaluation of ARARs associated with the alternative, including how the alternative would comply with each requirement and citation listed.

4.2.1.4. LNAPL 2 Long-term Effectiveness and Permanence

This alternative is somewhat effective at mitigating risk to human health and the environment in the long-term. LNAPL would be permanently removed from groundwater. Removal of LNAPL

mitigates the risk that LNAPL will act as a continuing source of contamination to groundwater and removes the COCs present in LNAPL from groundwater and soil. Once LNAPL recovery has stopped, quarterly groundwater monitoring would be conducted to verify achievement of RAOs and long-term protection of human health and the environment.

The time expected to remove LNAPL is dependent on the volume of LNAPL present beneath the Plant B foundation. For cost estimating purposes, manual recovery is assumed to occur for 15 years. The time frame assumed for costing purposes, from workplan updates through monitoring and reporting (including Five-Year Reviews), is approximately 30 years.

4.2.1.5. LNAPL 2 Reduction of Toxicity, Mobility, or Volume through Treatment

This alternative would involve physical removal of LNAPL and its constituents from groundwater. Although it is not possible to measure the current volume of LNAPL present at the Site, for comparative purposes, it is assumed that this technology will remove 50% of the LNAPL. This removal of contaminants is irreversible because the contaminants are permanently removed and properly disposed. LNAPL has been identified as a source of dissolved-phase COCs to underlying groundwater. This alternative will reduce the mobility and volume of some of the LNAPL at the Site (through removal, not treatment). This alternative will also reduce the future toxicity of groundwater by removing the mobile LNAPL fraction as a source of dissolved-phase COCs, but would be less effective at removing LNAPL within the smear zone.

4.2.1.6. LNAPL 2 Short-term Effectiveness

This alternative is somewhat effective at mitigating risk to human health and the environment in the short-term. During the estimated 30-year timeframe of remedy implementation, potential short-term risks to the community would be addressed by measures including but not limited to minimizing vehicular traffic associated with the remediation effort from traveling through residential areas. Potential short-term risks to site workers would be addressed through development of a site-specific Health and Safety Plan that adheres to OSHA requirements, including personal protective equipment (PPE) and air monitoring plans as appropriate.

4.2.1.7. LNAPL 2 Implementability

The major components of this alternative are institutional controls, manual LNAPL recovery from IW-11 and two additional existing monitoring wells (GW-23 and P5), monitoring, off-site disposal, and Five-Year Reviews. Most of these components are already implemented at the Site, making this alternative straightforward to implement. A minor workplan amendment would be required to document the additional LNAPL removal procedures, and additional personnel hours

would be required to perform LNAPL removal. Additional required materials, such as hydrophobic absorbent socks, are readily available and proven for this use. Monitoring, off-site disposal, and Five-Year Reviews would continue to be performed.

4.2.1.8. LNAPL 2 Cost

The cost estimate for this alternative is presented in **Table 4.2-1** and includes the following major components:

- Institutional Controls
- LNAPL Removal Workplan Update
- Manual LNAPL Recovery
- Monitoring and Reporting
- Off-site Disposal
- IC Maintenance
- Five-year Reviews

The time expected to remove LNAPL is dependent on the volume of LNAPL present beneath the Plant B foundation. The time frame assumed for costing purposes, from workplan updates through monitoring and reporting (including Five-Year Reviews), is approximately 30 years. It is assumed for cost estimating purposes that LNAPL removal will accomplished after 15 years. Five-Year Reviews and IC maintenance are assumed to continue for 30 years. An annual discount rate of 7% was assumed for present worth calculations.

The cost estimate for this alternative, presented in **Table 4.2-1**, is summarized as follows:

Alternative LNAPL 2: Manual Recovery	
Capital Cost	$5,000
O&M Costs	$38,000
Total Cost	$43,000
Net Present Worth	$20,000
Overall Alternative Duration	30 years

4.2.2 Alternative LNAPL 3: Continual Mechanical Recovery

Alternative LNAPL 3 consists of implementing institutional controls and continuous mechanical recovery of LNAPL from three new recovery wells fitted with automated skimmers. The skimmers contain hydrophobic/oleophilic filters that allow LNAPL to collect inside the skimmer without also entraining water. Pumps in the skimmers are actuated periodically by a centralized controller to pump the collected LNAPL to a drum or other central collection point. The skimmers' elevations fluctuate with the water table to keep the collection port at the product/water interface. The removed LNAPL would be stored on-site until being disposed of in accordance with ARARs. Quarterly groundwater monitoring would continue to be performed until determined to be unnecessary via Five-Year Review.

Figure 4.2-2 presents an overview of Alternative LNAPL 3.

4.2.2.1. LNAPL 3 Components of the Alternative

The scope of this alternative includes the following major components:

- Institutional Controls
- Installation of three new recovery wells
- Continual mechanical recovery
- Monitoring
- Off-Site Disposal
- Five-Year Reviews

These components of Alternative LNAPL 3 are described in more detail in the following paragraphs.

Estimated Duration for Alternative LNAPL 3. The timeframe for LNAPL removal is unknown. For the purposes of cost estimation, the overall project duration is assumed to be thirty years, summarized as follows:

- Remedial Design and LNAPL Removal Workplan Revision 6 months
- Installation of Recovery Wells and Skimmer System 6 months
- LNAPL Removal, Storage, Off-Site Disposal 10 years
- Monitoring and Reporting 20 years

Institutional Controls. Institutional controls that minimize the potential for exposure to contamination and protect the integrity of the response action will be implemented..

Recovery Wells. Three new recovery wells would be installed for LNAPL removal via automated skimmers. The proposed locations are shown on the **Figure 4.2-2**. However, final placement of the wells would be determined during remedial design. A limited direct-push drilling pre-design investigation would be performed to assist in well placement.

Continual Mechanical Recovery. LNAPL would be removed continually with automated skimmers installed in the three new recovery wells. The skimmers would contain hydrophobic/oleophilic filters that allow LNAPL to collect inside the skimmer without also entraining water. Pumps within the skimmers are actuated by a centralized controller to periodically pump the collected LNAPL to a drum or other central collection point. The skimmers' elevations fluctuate with the water table to keep the collection port at the product/water interface.

Monitoring and O&M. Quarterly groundwater monitoring, including product thickness measurements, would be performed while LNAPL is being removed and for a period of time after LNAPL removal ceases, until a Five-Year Review determines that further monitoring is no longer necessary.

Off-Site Disposal. Removed LNAPL would be stored at the site and then disposed of in accordance with ARARs at a permitted waste facility.

Five-Year Reviews. CERCLA requires that any interim remedial action that results in contaminants remaining on-site at concentrations above those allowing for unlimited use and unrestricted exposure must be reviewed every five years. Although it is anticipated that this alternative would eventually meet the RAOs for LNAPL, COCs may remain on-site at concentrations that may not allow for unlimited use and unrestricted exposure (i.e. as use as a residential property, school, or daycare). Therefore, Five-Year Reviews will be conducted as required under CERCLA. For cost estimating purposes, this alternative assumes that Five-Year Reviews will be conducted at five-year intervals for 30 years.

During Five-Year Reviews, an assessment is made as to whether the implemented remedy continues to be protective of human health and the environment, or whether the implementation of additional remedial action is appropriate. The Comprehensive Five-Year Review Guidance (USEPA, 2001) provides guidance on the performance of Five-Year Reviews.

4.2.2.2. LNAPL 3 Overall Protection of Human Health and the Environment

The RAOs for LNAPL are to remove, to the extent practicable, LNAPL that represents a source of Site contaminants to groundwater and a potential source of TMPs to indoor air vapors, via a vapor intrusion pathway, that could pose an unacceptable risk to indoor workers or building occupants; and to prevent migration of LNAPL to East Ditch to prevent exposure by current and future ecological receptors to LNAPL containing Site contaminants that would result in potential adverse impacts. Continual mechanical recovery will remove floating LNAPL and will address LNAPL in the smear zone to the extent that the natural fluctuations in the water table reach the extent of the smear zone. While some LNAPL mass will remain under this alternative, the removed LNAPL would no longer act as a source of COCs to groundwater. This alternative is protective of human health and the environment by preventing receptors' contact with COCs via institutional controls until RAOs are achieved.

4.2.2.3. LNAPL 3 Compliance with ARARs

Alternative LNAPL 3 would be designed and implemented to comply with ARARs that are identified in **Tables 2.1-1 and 2.1-2**.

There are no floodplains or wetlands associated with the areas of the Site proposed for remedial action under this alternative. This alternative does not include technologies that would impact nearby wetlands, aquatic ecosystems, or sensitive species.

The removal of LNAPL is not based on attainment of media-specific concentrations of specific contaminants or a PRG based on a chemical-specific ARAR.

This alternative would be designed and implemented to comply with the action-specific ARARs identified in **Table 2.1-2**, including but not limited to, federal and state air emission standards and RCRA Subtitle C regulations related to soil characterization, waste identification, waste handling, storage, treatment, and disposal requirements.

Refer to **Tables 2.1-1 and 2.1-2** for a more thorough evaluation of ARARs associated with the alternative, including how the alternative would comply with each requirement and citation listed.

4.2.2.4. LNAPL 3 Long-term Effectiveness and Permanence

This alternative is somewhat effective at mitigating risk to human health and the environment in the long-term. LNAPL would be permanently removed from groundwater, and the residual

LNAPL phase will be effectively immobile. Removal of LNAPL mitigates the risk that LNAPL will act as a continuing source of contamination to groundwater and removes the COCs present in LNAPL from groundwater and soil. Post-remediation sampling would be conducted to verify achievement of RAOs and long-term protection of human health and the environment. No controls would be necessary with regard to LNAPL to ensure long-term protection of human health and the environment.

The time expected to remove LNAPL is dependent on the volume of LNAPL present beneath the Plant B foundation. The time frame assumed for costing purposes, from workplan updates through monitoring and reporting (including Five Year Reviews), is 30 years.

4.2.2.5. LNAPL 3 Reduction of Toxicity, Mobility, or Volume through Treatment

This alternative would involve physical removal of LNAPL and its constituents from groundwater. Although it is not possible to measure the current volume of LNAPL present at the Site, for comparative purposes, it is assumed that this technology will remove approximately 75% of the LNAPL. This removal of contaminants is irreversible because the contaminants are permanently removed and properly disposed. LNAPL has been identified as a source of dissolved-phase COCs to underlying groundwater. This alternative will reduce the mobility and volume of some of the LNAPL at the Site (through removal, not treatment). This alternative will also reduce the future toxicity of groundwater by removing the mobile LNAPL fraction as a source of dissolved-phase COCs, but will be less effective in removing LNAPL from within the smear zone.

4.2.2.6. LNAPL 3 Short-term Effectiveness

This alternative is somewhat effective at mitigating risk to human health and the environment in the short-term. During the estimated 30-year timeframe of remedy implementation, potential short-term risks to the community would be addressed by measures including but not limited to minimizing vehicular traffic associated with the remediation effort from traveling through residential areas. Potential short-term risks to site workers would be addressed through development of a site-specific Health and Safety Plan that adheres to OSHA requirements, including PPE and air monitoring plans as appropriate.

4.2.2.7. LNAPL 3 Implementability

The major components of this alternative are institutional controls, continual mechanical recovery from three new recovery wells, monitoring, off-site disposal, and Five-Year Reviews. The technologies used for this alternative are generally implementable, readily available, reliable, and sufficiently demonstrated for use at the Site. Automated skimmers and controllers are well-

established remedial technologies that are available from a number of manufacturers in the industry. Implementation of the remedy would require installation of new wells, automated skimmers, and controllers. Electricity and compressed air, which are necessary to run the skimmers, are already available at Plant B. LNAPL storage is already implemented at Plant B and properly licensed facilities are available for disposal.

4.2.2.8. LNAPL 3 Cost

The cost estimate for this alternative is presented in **Table 4.2-2** and includes the following major components:

- Institutional Controls
- Remedial Design/LNAPL Removal Workplan Addendum
- Wells and Continuous Skimmer System Installation
- O&M
- Monitoring and Reporting
- Off-Site Disposal
- Five-Year Reviews

The time expected to remove LNAPL is dependent on the volume of LNAPL present beneath the Plant B foundation. The time frame assumed for costing purposes, from workplan updates through monitoring and reporting (including Five-Year Reviews), is 30 years. It is estimated that LNAPL removal will accomplished to the extent possible via continual mechanical recovery after about 10 years. Five-Year Reviews and IC maintenance are assumed to continue for 30 years. An annual discount rate of 7% was assumed for present worth calculations.

The cost estimate for this alternative, presented in **Table 4.2-2**, is summarized as follows:

Alternative LNAPL 3: Continual Mechanical Recovery	
Capital Cost	$95,000
O&M Costs	$78,000
Total Cost	$173,000
Net Present Worth	$139,000
Overall Alternative Duration	30 years

4.2.3 Alternative LNAPL 4: Multi-Phase Extraction

Alternative LNAPL 4 consists of implementing institutional controls and installing one multi-phase extraction well to remove LNAPL from under the foundation of Plant B. The proposed locations of the MPE well and the treatment system location are shown on **Figure 4.2-3**.

The MPE treatment system would be skid-mounted and rented from an environmental contractor. The skid mounted MPE treatment system includes the extraction blower, knockout tank to separate the streams, and vapor treatment, if necessary. Extracted LNAPL would be stored at the Site and disposed of in accordance with ARARs. Extracted groundwater would be treated at the existing Plant B.

The multi-phase extraction system will be skid-mounted and rented from an environmental contractor. A slurp tube is lowered to above the water table and high vacuum applied which pulls the water table up around the well. The slurp tube is then progressively lowered into the water table to point that produces a little drawdown. The vacuum pulls water, air and LNAPL phases along the capillary zone to the well. The skid-mounted system is completely automated and includes the extraction blower, knockout tank to separate the streams, and vapor treatment, if necessary. As these phases are pulled into the vacuum side, an automated switch momentarily allows the fluid in the accumulation tank to go to atmosphere and it is transferred to an oil/water separator so the water stream can be separated from the LNAPL. The recovered LNAPL would be stored on-site until being disposed of in accordance with RCRA regulations. Water would be pretreated and sent to Plant B for final treatment and discharge. The skid-mounted system is rented for up to 12 months. LNAPL recovery through MPE decreases over time, and significant amounts of LNAPL are unlikely to be recovered past 12 months.

4.2.3.1. LNAPL 4 Components of the Alternative

The scope of this alternative includes the following major components:

- Institutional Controls
- MPE
- Treatment
- Off-site Disposal
- Monitoring
- Five-Year Reviews

These components of Alternative LNAPL 4 are described in more detail in the following paragraphs.

Estimated Duration for Alternative LNAPL 4. The overall project duration is assumed to take approximately thirty years, summarized as follows:

- Design and Workplan Addendum 6 months
- MPE Installation 6 months
- MPE Operation 12 months
- Monitoring, Reporting, and Five-Year Reviews 30 years

Institutional Controls. Institutional controls that minimize the potential for exposure to contamination and protect the integrity of the response action will be implemented. .

MPE. One MPE well would be installed outside the northeast corner of the Plant B building, near GW-23, where the thickest LNAPL accumulation is observed. The proposed location of the MPE well is shown on **Figure 4.2-3**; however, the final location of the MPE well would be determined during remedial design. A limited direct-push drilling investigation would be performed to assist with well placement. The time expected to remove LNAPL is dependent on the volume of LNAPL present beneath the Plant B foundation. For the purposes of costing, MPE is assumed to operate for 12 months. Extraction pumps, controls, and other hardware are assumed to be provided (rented) by a specialty remediation contractor.

Treatment. A skid-mounted treatment system would be rented from the specialty MPE contractor and installed at Plant B (**Figure 4.2-3**). This treatment system would include an oil/water separator to remove LNAPL and a vapor-phase GAC treatment system to treat air emissions for the duration of the MPE operation. Extracted groundwater would be conveyed to Plant B for treatment, and treated groundwater would be discharged under the RGP.

Verification Sampling. Post-remediation verification sampling would be conducted to confirm achievement of RAOs. Monitoring would include collecting soil boring samples from the smear zone as well as groundwater samples. Soil and groundwater samples would be analyzed for BEHP and Volatile Petroleum Hydrocarbons (VPH), which are the COCs associated with the LNAPL at Plant B.

Monitoring and O&M. Quarterly groundwater monitoring, including product thickness measurements, would be performed as LNAPL is being removed and for a period of time after

LNAPL removal ceases, until a Five-Year Review determines that further monitoring is no longer necessary. For the purposes of costing, quarterly monitoring is assumed to occur for thirty years.

Off-Site Disposal. Removed LNAPL would be stored at the site and then disposed of in accordance with ARARs at a permitted waste facility. The vapors generated during MPE would be treated using GAC to remove contaminants before discharge to the atmosphere. Extracted groundwater treated at Plant B would be discharged in accordance with the Plant B RGP.

Reporting. A Remedial Action Report would be prepared to document the remedial action, including but not limited to installation and operation of the MPE well and system, extracted LNAPL volume, and verification sampling results. The verification sampling and Remedial Action Report are included as Year 1 annual costs. Semi-annual reports of the quarterly LNAPL thickness monitoring are included as annual costs from Years 2 to 30.

Five-Year Reviews. CERCLA requires that any interim remedial action that results in contaminants remaining on-site at concentrations above those allowing for unlimited use and unrestricted exposure must be reviewed every five years. Although it is anticipated that this alternative would eventually meet the RAOs for LNAPL, COCs may remain on-site at concentrations that may not allow for unlimited use and unrestricted exposure (i.e. as use as a residential property, school, or daycare). Therefore, Five-Year Reviews will be conducted as required under CERCLA. For cost estimating purposes, this alternative assumes that Five-Year Reviews will be conducted at five-year intervals for 30 years.

During Five-Year Reviews, an assessment is made as to whether the implemented remedy continues to be protective of human health and the environment, or whether the implementation of additional remedial action is appropriate. The Comprehensive Five-Year Review Guidance (USEPA, 2001) provides guidance on the performance of Five-Year Reviews.

4.2.3.2. LNAPL 4 Overall Protection of Human Health and the Environment

The RAOs for LNAPL are to remove, to the extent practicable, LNAPL that represents a source of Site contaminants to groundwater and a potential source of TMPs to indoor air vapors, via a vapor intrusion pathway, that could pose an unacceptable risk to indoor workers or building occupants; and to prevent migration of LNAPL to East Ditch to prevent exposure by current and future ecological receptors to LNAPL containing Site contaminants that would result in potential

adverse impacts.[11] MPE will remove floating LNAPL as well as LNAPL in the smear zone; however, it is unknown whether a single MPE well will have a large enough radius of influence to cover the full extent of LNAPL presence. If a single well does not have a large enough radius of influence, additional wells may be installed and operated after further assessment. While some LNAPL mass will remain under this alternative, the removed LNAPL would no longer act as a source of COCs to groundwater. This alternative is protective of human health and the environment by preventing receptors' contact with COCs via institutional controls until RAOs are achieved.

4.2.3.3. LNAPL 4 Compliance with ARARs

Alternative LNAPL 4 would be designed and implemented to comply with ARARs that are identified in **Tables 2.1-1 and 2.1-2**.

There are no floodplains or wetlands associated with the areas of the Site proposed for remedial action under this alternative. However, this alternative would be designed and implemented to minimize potential impacts to nearby wetland areas. Restoration activities for any areas that may be impacted would be implemented to comply with location-specific ARARs identified in **Table 2.2-1**, such as compensatory wetlands mitigation, if necessary, to comply with Clean Water Act Section 404 and the Massachusetts Wetland Protection Act, which have been identified as applicable location-specific requirements.

The removal of LNAPL is not based on attainment of media-specific concentrations of specific contaminants or a PRG based on a chemical-specific ARAR.

This alternative would be designed and implemented to comply with the action-specific ARARs identified in **Table 2.1-2**, including but not limited to, federal and state air emission standards and RCRA Subtitle C regulations related to soil characterization, waste identification, waste handling, storage, treatment, and disposal requirements.

[11] In Volume III of the FS report, Alternative LNAPL-4 will be consolidated with Alternative SW-3 from the OU1/OU2 FS. Alternative SW-3 includes extraction wells along the west side of East Ditch, which would prevent migration of LNAPL to East Ditch.

Tables 2.1-1 and 2.1-2 present a more thorough evaluation of ARARs associated with the alternative, including how the alternative would comply with each requirement and citation listed.

4.2.3.4. LNAPL 4 Long-term Effectiveness and Permanence

This alternative would effectively mitigate risk to human health and the environment in the long-term. MPE would permanently remove LNAPL from the groundwater and soil in the smear zone to a certain extent. Removal of LNAPL will mitigate the risk that LNAPL will act as a continuing source of contamination to groundwater and removes the COCs present in LNAPL from groundwater and soil. Post-remediation sampling would be conducted to verify achievement of RAOs and long-term protection of human health and the environment. Quarterly LNAPL monitoring and Five-Year Reviews have been assumed to be performed for 30 years.

Completion of the remedy from design through final verification sampling and reporting (including Five-Year Reviews), is estimated to take approximately thirty years.

4.2.3.5. LNAPL 4 Reduction of Toxicity, Mobility, or Volume through Treatment

This alternative would physically remove LNAPL and its constituents from groundwater, followed by treatment of the groundwater and disposal of the separated LNAPL. Although it is not possible to measure the current volume of LNAPL present at the Site, for comparative purposes, it is assumed that this technology will remove approximately 65% of the LNAPL. MPE is irreversible because the contaminants are permanently removed from the subsurface. MPE is more effective and efficient at removing LNAPL from the smear zone than conventional extraction because it requires less drawdown than conventional extraction. Conventional methods with more drawdown tend to smear free product along the face of the drawdown curve and are less effective in removing LNAPL trapped in the capillary fringe. By inducing a negative pressure, MPE increases the effective hydraulic gradient and increases the rate of fluid extraction (groundwater and LNAPL).

The interpreted extent of LNAPL as of March 2019 is shown on **Figure 4.2-3**. The goal of MPE would be to reduce the volume of LNAPL to the extent practicable, reduce its toxicity as a source of constituents to groundwater, and reduce its mobility through hydraulic capture during treatment. This alternative involves treatment of the extracted groundwater to separate the LNAPL prior to off-site disposal. Therefore, this alternative satisfies the statutory preference for treatment as a principal element.

4.2.3.6. LNAPL 4 Short-term Effectiveness

This alternative is somewhat effective at mitigating risk to human health and the environment in the short-term. During the thirty-year timeframe of remedy implementation, potential short-term risks to the community would be addressed by minimizing dust, implementing a perimeter air monitoring program, and minimizing vehicular traffic associated with the remediation effort from traveling through residential areas. Potential short-term risks to site workers would be addressed through development of a site-specific Health and Safety Plan that adheres to OSHA requirements, including PPE and air monitoring plans as appropriate.

Completion of the remedy, from design through monitoring and reporting, is estimated to take approximately 30 years.

4.2.3.7. LNAPL 4 Implementability

This alternative is implementable at the Site. The major components of this alternative are installation of the MPE well, installation of skid-mounted treatment units to remove LNAPL and treat vapors, monitoring, and Five-Year Reviews. Treatment of groundwater would be accomplished at Plant B. The technologies used for this alternative are generally implementable, readily available, reliable, and sufficiently demonstrated for use at the Site. The necessary equipment, materials, and disposal facility are readily available. The MPE component of this alternative is expected to operate for 6 to 12 months. Installation activities would include verification of the locations of subsurface utilities or current extraction well piping that may be present within the proposed MPE well installation area. No right-of-way or other infrastructure concerns are present in the proposed MPE well installation area. Post-implementation monitoring is straightforward.

4.2.3.8. LNAPL 4 Cost

The cost estimate for this alternative is presented in **Table 4.2-3** and includes the following major components:

- Institutional Controls
- MPE
- Treatment
- Verification Sampling
- Monitoring and Reporting

- Five-Year Reviews

The estimated time to complete the MPE activities associated with this alternative is approximately one year, and the overall duration of this remedy (including design, verification, monitoring, reporting, and five-year site reviews) is estimated to be approximately thirty years.

Costs for MPE and the skid-mounted oil/water separator and vapor phase treatment were provided by an environmental remediation contractor. Costs associated with design, extracted groundwater treatment, monitoring, reporting, and Five-Year Reviews are based on costs for similar projects. An annual discount rate of 7% was assumed for present worth calculations.

The cost estimate for this alternative, presented in **Table 4.2-3**, is summarized as follows:

Alternative LNAPL 4: Multiphase Extraction	
Capital Cost	$180,000
O&M Costs	$148,000
Total Cost	$228,000
Net Present Worth	$208,000
Overall Alternative Duration	30 Years

4.2.4 Alternative LNAPL 5: Continued Operation of Plant B Followed by Plant B Demolition and Expanded Multi-Phase Extraction

Plant B would continue to operate until the Groundwater Hot Spot treatment system has been constructed and is operational. Effluent from the current Plant B extraction wells would be rerouted to the new groundwater treatment system, and then Plant B would be decommissioned and demolished. A pre-design investigation to delineate LNAPL extent, including beneath the Plant B building foundation, would be performed, and based on the results, MPE wells would then be installed within the footprint of the residual LNAPL plume (currently estimated at 3-5 wells).

Groundwater, LNAPL, and soil vapor would be extracted through MPE wells with groundwater being treated at the new Groundwater Hot Spot treatment system. A skid-mounted treatment system would include an oil/water separator to remove the LNAPL and vapor-phase GAC to treat the soil vapor. Demolition of Plant B and installation of the MPE wells, piping, and skid-

mounted treatment system is estimated to be completed in 6 months, following which the MPE component of this alternative is expected to operate for 6 to 12 months. It is assumed the existing Plant B extraction wells would continue operating through the first five-year review following MPE completion.

The proposed MPE well locations and location of the proposed Groundwater Hot Spot treatment system are shown on **Figure 4.2-4**.

4.2.4.1. LNAPL 5 Components of the Alternative

The scope of this alternative includes the following major components:

- Institutional Controls
- Plant B Continued Operation
- Decommissioning/Demolition of Plant B
- Pre-design investigations
- Expanded MPE
- Treatment
- Off-site Disposal
- Five-Year Reviews

These components of Alternative LNAPL 5 are described in more detail in the following paragraphs.

Estimated Duration for Alternative LNAPL 5. The overall project duration is estimated to take approximately five years, summarized as follows:

- Pre-design and design 6 months
- Demolition and MPE installation 6 months
- On-site remedial activities 12 months
- Monitoring and reporting 28 years

Institutional Controls. Institutional controls that minimize the potential for exposure to contamination and protect the integrity of the response action will be implemented.

Plant B Continued Operation. Plant B would continue to operate until the new Groundwater Hot Spot treatment system is operational. At that time, current Plant B extraction wells would be re-routed to the Groundwater Hot Spot treatment system.

Decommission/Demolition of Plant B. Once the new Groundwater Hot Spot treatment system becomes operational, the extracted groundwater, currently being treated at Plant B, would be re-routed to the new treatment system. After the reconfiguration, the Plant B building, tanks, and associated infrastructure would be decommissioned and demolished to grade, removing obstructions prior to investigation and treatment.

Pre-Design Investigations. Pre-design investigations would consist of a direct-push drilling program to confirm the limit of LNAPL in soil and groundwater that requires remediation. Up to six soil borings would be completed to depths of approximately 16 feet bgs with continuous sampling conducted. Soil samples would be collected for field screening for fuel hydrocarbons and off-site laboratory analysis for BEHP and VPH, the primary contaminants associated with the LNAPL. Laser-induced fluorescence (LIF) combined with ultraviolet optical screening tool (UVOST) is a downhole detection system that can identify petroleum products due to the various degrees of fluorescence. LIF with UVOST will be applied to the area of residual LNAPL to assess depth, thickness, and virtual quantity remaining. This assessment will be applied in an unbiased grid pattern with the appropriate frequency of spacing to provide accurate measurement of the in-situ petroleum. For cost estimating purposes, the field effort for this investigation is anticipated to be completed in five days.

Expanded MPE. This alternative includes installation of three to five MPE wells; the location and number of MPE wells would be based on the pre-design investigation results. For purposes of alternative evaluation and cost estimation, five (5) 4-inch diameter MPE wells are assumed. The proposed MPE well locations are shown on **Figure 4.2-4**. Extraction pumps, controls, and other hardware are assumed to be provided (rented) by a specialty remediation contractor. MPE is assumed to operate for 12 months.

Treatment. A skid-mounted treatment system would be installed between Plant B and the proposed new Groundwater Hot Spot treatment system (**Figure 4.2-4**). Extracted groundwater would be conveyed to the new Groundwater Hot Spot treatment system for treatment. The treatment system would include an oil/water separator to remove LNAPL from extracted groundwater and a vapor-phase GAC treatment using for the duration of the MPE operation.

Verification Sampling. A post-remediation verification sampling program would be conducted to confirm achievement of RAOs. This sampling program would include collecting soil boring

samples from the smear zone as well as groundwater samples. Soil and groundwater samples would be analyzed for BEHP and VPH, which are the COCs associated with the LNAPL at Plant B. The currently operating extraction wells are assumed to continue operation through the first Five-Year Review following remedial action.

Monitoring and O&M. Quarterly groundwater monitoring, including product thickness measurements, would be performed as LNAPL is being removed and for a period of time after LNAPL removal ceases, until a Five-Year Review determines that further monitoring is no longer necessary. For the purposes of costing, quarterly monitoring is assumed to occur for thirty years.

Off-Site Disposal. Removed LNAPL would be stored at the site and then disposed of in accordance with ARARs at a permitted waste facility.

Reporting. A Remedial Action Report would be prepared to document the remedial action, including but not limited to decommission/demolition of Plant B, installation and operation of the MPE wells, extracted LNAPL volumes, and verification sampling results. The verification sampling and Remedial Action Report are included as Year 1 annual costs. Annual reports of the quarterly LNAPL thickness monitoring are included as annual costs from Years 2 to 30.

Five-Year Reviews. CERCLA requires that any interim remedial action that results in contaminants remaining on-site at concentrations above those allowing for unlimited use and unrestricted exposure must be reviewed every five years. Although it is anticipated that this alternative would eventually meet the RAOs for LNAPL, COCs may remain on-site at concentrations that may not allow for unlimited use and unrestricted exposure (i.e. as use as a residential property, school, or daycare). Therefore, Five-Year Reviews will be conducted as required under CERCLA. For cost estimating purposes, this alternative assumes that Five-Year Reviews will be conducted at five-year intervals for 30 years.

During Five-Year Reviews, an assessment is made as to whether the implemented remedy continues to be protective of human health and the environment, or whether the implementation of additional remedial action is appropriate. The Comprehensive Five-Year Review Guidance (USEPA, 2001) provides guidance on the performance of Five-Year Reviews.

4.2.4.2. LNAPL 5 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment by physically removing LNAPL in the Plant B area and preventing migration of LNAPL to East Ditch. Expanded MPE would remove LNAPL as a source of dissolved phase constituents to groundwater. The continued operation of the extraction wells, from which groundwater is currently treated by

Plant B but later will be treated by the Groundwater Hot Spot treatment system, will maintain the cone of depression to prevent migration. Therefore, this alternative would achieve the RAOs to remove, to the extent practicable, LNAPL that represents a source of Site contaminants to groundwater and a potential source of TMPs to indoor air vapors, via a vapor intrusion pathway, that could pose an unacceptable risk to indoor workers or building occupants; and to prevent migration of LNAPL to East Ditch to prevent exposure by current and future ecological receptors to LNAPL containing Site contaminants that would result in potential adverse impacts. Removed LNAPL would no longer act as a source of COCs to groundwater. This alternative is protective of human health and the environment by preventing receptors' contact with COCs via institutional controls until RAOs are achieved.

4.2.4.3. LNAPL 5 Compliance with ARARs

Alternative LNAPL 5 would be designed and implemented to comply with ARARs that are identified in **Tables 2.1-1 and 2.1-2**.

There are no floodplains or wetlands associated with the areas of the Site proposed for remedial action under this alternative. However, this alternative would be designed and implemented to minimize potential impacts to nearby wetland areas. Restoration activities for any areas that may be impacted would be implemented to comply with location-specific ARARs identified in **Table 2.2-1**, such as compensatory wetlands mitigation, if necessary, to comply with Clean Water Act Section 404 and the Massachusetts Wetland Protection Act, which have been identified as applicable location-specific requirements.

The removal of LNAPL is not based on attainment of media-specific concentrations of specific contaminants or a PRG based on a chemical-specific ARAR.

This alternative would be designed and implemented to comply with the action-specific ARARs identified in **Table 2.1-2**, including but not limited to, federal and state air emission standards and RCRA Subtitle C regulations related to soil characterization, waste identification, waste handling, storage, treatment, and disposal requirements.

Tables 2.1-1 and 2.1-2 provide a more thorough evaluation of ARARs associated with the alternative, including how the alternative would comply with each requirement and citation listed.

4.2.4.4. LNAPL 5 Long-term Effectiveness and Permanence

This alternative is effective at mitigating risk to human health and the environment in the long-term. Expanded MPE would permanently remove LNAPL from the groundwater and soil in the smear zone. Removal of LNAPL mitigates the risk that LNAPL will act as a continuing source of contamination to groundwater and removes the COCs present in LNAPL from groundwater and soil. Post-remediation sampling would be conducted to verify achievement of RAOs and long-term protection of human health and the environment. No controls would be necessary with regard to LNAPL to ensure long-term protection of human health and the environment.

Completion of the remedy from pre-design investigations through final verification sampling and reporting (including Five-Year Reviews), is estimated to take approximately 30 years.

4.2.4.5. LNAPL 5 Reduction of Toxicity, Mobility, or Volume through Treatment

This alternative would involve physical removal of LNAPL and its constituents from groundwater followed by treatment of the groundwater and disposal of the separated LNAPL. Although it is not possible to measure the current volume of LNAPL present at the Site, for comparative purposes, it is assumed that this technology will remove approximately 90% of the LNAPL. MPE is irreversible because the contaminants are permanently removed. MPE is more effective and efficient at removing LNAPL from the smear zone than conventional extraction because it requires less drawdown than conventional extraction. Conventional methods with more drawdown tend to smear free product along the face of the drawdown curve and have less success in removing LNAPL trapped in the capillary fringe. By inducing a negative pressure, MPE increases the effective hydraulic gradient and increases the rate of fluid extraction (water and LNAPL).

The volume of LNAPL present in the Plant B area would be determined during the pre-design investigation. In March 2019, the LNAPL thickness in wells P5 and GW-23 was 0.01 and 0.02 feet, respectively. LNAPL in all other wells sampled was recorded as non-detect. The interpreted extent of LNAPL as of March 2019 is shown on the **Figure 4.2-4**. The goal of the expanded MPE would be to reduce the volume of LNAPL to the extent practicable, reduce its toxicity as a source of constituents to groundwater, and reduce its mobility through hydraulic capture during treatment.

This alternative involves treatment of the extracted groundwater to separate the LNAPL prior to off-site disposal. Therefore, this alternative satisfies the statutory preference for treatment as a principal element.

4.2.4.6. LNAPL 5 Short-term Effectiveness

This alternative is effective at mitigating risk to human health and the environment in the short-term. During the 30-year timeframe of remedy implementation, potential short-term risks to the community would be addressed by measures including but not limited to: minimizing dust, implementing a perimeter air monitoring program, decontaminating vehicles transporting excavated soil prior to leaving the Site, and minimizing vehicular traffic associated with the remediation effort from traveling through residential areas. Potential short-term risks to site workers would be addressed through development of a site-specific Health and Safety Plan that adheres to OSHA requirements, including PPE and air monitoring plans as appropriate.

Completion of the remedy from pre-design investigations through monitoring and reporting, is estimated to take approximately 30 years.

4.2.4.7. LNAPL 5 Implementability

The major components of this alternative are decommissioning/demolition of Plant B, installation of expanded MPE wells, and installation of skid-mounted treatment units to remove LNAPL and treat vapors. Treatment of groundwater would be accomplished at the Groundwater Hot Spot treatment system. The technologies used for this alternative are generally implementable, readily available, reliable, and sufficiently demonstrated for use at the Site. The alternative would use standard construction equipment, and the equipment, materials, and disposal facility are readily available.

This alternative is based on continued operation of the Plant B groundwater extraction and treatment system and removal of LNAPL until the proposed Groundwater Hot Spot treatment system (described in Section 4.4) has been constructed and is operational. At that time, the Plant B extraction wells would be rerouted to the new groundwater treatment system, and Plant B would be decommissioned and demolished. A pre-design investigation would be conducted to further delineate the extent of LNAPL and to obtain additional data to locate the proposed new MPE wells. Groundwater, LNAPL, and soil vapor would then be extracted through the MPE wells with removal of LNAPL and treatment of vapors using skid-mounted treatment units. Extracted groundwater would be treated at the new Groundwater Hot Spot treatment system. The MPE component of this alternative is expected to operate for 6 to 12 months.

Pre-design investigation activities would include verification of the locations of subsurface utilities or current extraction well piping that may be present within the proposed MPE well installation area. No right-of-way or other infrastructure concerns are present in the proposed MPE well installation area.

Post-implementation sampling is planned to verify the achievement of RAOs and is straightforward to perform.

4.2.4.8. LNAPL 5 Cost

The cost estimate for this alternative is presented in **Table 4.2-4** and includes the following major components:

- Plant B Continued Operation
- Decommission/Demolition of Plant B
- Pre-design investigations
- Expanded MPE
- Treatment
- Monitoring and Reporting
- Five-year site review

The estimated time to complete the MPE activities associated with this alternative is approximately two years, and the overall duration of this remedy (including predesign, design, verification and reporting) is estimated to be approximately 30 years. This alternative includes post-remediation verification sampling to confirm achievement of RAOs. It is anticipated that this alternative would remove LNAPL to the extent practicable.

Costs for the decommissioning/demolition of Plant B, MPE, and skid-mounted oil/water separator and vapor phase treatment were provided by environmental remediation contractors. Costs associated with rerouting current extraction wells, pre-design investigations, extracted groundwater treatment, verification sampling, and reporting are based on costs for similar projects. An annual discount rate of 7% was assumed for present worth calculations.

The cost estimate for this alternative, presented in **Table 4.2-4**, is summarized as follows:

Alternative LNAPL 5: Continued Operation of Plant B and Expanded MPE	
Capital Cost	$704,000
O&M Costs	$2,217,000
Total Cost	$2,291,000
Net Present Worth	$1,627,000
Overall Alternative Duration	30 years

4.2.5 Alternative LNAPL 6: Continued Operation of Plant B Followed by Plant B Demolition and Excavation

Plant B would continue to operate until the new Groundwater Hot Spot treatment system has been constructed and is operational. Current Plant B extraction wells would then be rerouted to the new groundwater treatment system, and Plant B would be decommissioned and demolished. A pre-design investigation would be performed to determine the areal extent of LNAPL and the depth of the smear zone. Based on the results of the investigation, LNAPL-impacted soil would be excavated to the bottom of the smear zone. The limits of excavation would be based on the pre-design investigation as well as the observed extent of LNAPL. The proposed excavation area is shown on **Figure 4.2-5**, along with an overview of Alternative LNAPL 6. If additional LNAPL-impacted soil is encountered during excavation, additional soil would be removed to the extent feasible. The components of Alternative LNAPL 6 are described in more detail below.

The actual depth of excavation would be determined during remedy design. For the purpose of this evaluation, the smear zone is estimated to span 3 feet above and 3 feet below the groundwater table, which is approximately 11 feet bgs. The estimated smear zone is based on the observed seasonal fluctuations at the Site. The estimated total depth of excavation is approximately 14 ft bgs, with the smear zone at approximately 8 to 14 feet bgs. It is assumed that the currently operating extraction wells would continue operating through the first Five-Year Review following remedy implementation.

4.2.5.1. LNAPL 6 Components of the Alternative

The scope of this alternative includes the following major components:

- Institutional Controls
- Plant B Continued Operation
- Decommission/Demolition of Plant B
- Pre-design investigations
- Excavation of LNAPL-impacted soil, with excavation dewatering, as necessary
- Dewatering/stabilization of excavated soil, as necessary
- Off-site disposal of excavated soil
- Verification sampling
- Backfill and restoration
- Reporting
- Five-Year Reviews

These components of Alternative LNAPL 6 are described in more detail in the following paragraphs.

Estimated Duration for Alternative LNAPL 6. The overall project duration is estimated to take approximately five years once the Groundwater Hot Spot Treatment system is operational, summarized as follows:

- Pre-design and design 6 months
- On-site remedial activities 4 months
- O&M, IC maintenance, and Five-Year Reviews 30 years

Institutional Controls. Institutional controls that minimize the potential for exposure to contamination and protect the integrity of the response action will be implemented.

Plant B Continued Operation. Plant B would continue to operate until the new Groundwater Hot Spot treatment system is operational. Once the Groundwater Hot Spot Treatment System is operational, the extracted groundwater currently being treated at Plant B would be re-routed to the Groundwater Hot Spot treatment system.

Decommission/Demolition of Plant B. Groundwater extraction wells would continue to operate during decommission/demolition and would be protected from damage during decommission/demolition activities. If unintended damage did occur, damaged wells would be repaired and/or reinstalled. Next, the Plant B building, tanks, and associated infrastructure would be decommissioned and demolished to grade, removing obstructions to investigation and treatment. It is anticipated that decommissioning and demolition would be completed in about 2 months.

Pre-design investigations. The pre-design investigation would consist of a direct-push drilling program to confirm the limit of LNAPL in soil and groundwater that requires remediation. Up to six soil borings with continuous sampling would be completed to depths of approximately 16 feet bgs. Soil samples would be collected for field screening for fuel hydrocarbons and off-site laboratory analysis for BEHP and VPH, the primary contaminants associated with the LNAPL. LIF combined with UVOST is a downhole detection system that can identify petroleum products due to the various degrees of fluorescence. LIF with UVOST will be applied to the area of residual LNAPL to assess depth, thickness, and virtual quantity remaining. This assessment will be applied in an unbiased grid pattern with the appropriate frequency of spacing to provide accurate measurement of the in-situ petroleum. For cost estimating purposes, the field effort for this investigation is anticipated to be completed in five days.

Excavation of LNAPL-impacted soil. Actual excavation limits would be determined by the pre-design investigation's results as well as the observed extent of LNAPL. For the purpose of alternative evaluation, the following assumptions were made:

- Excavation area: Approximately 1,600 square foot (initial excavation)
- Excavation depth: 14 feet bgs, based on typical depth to water of 11 feet and smear zone of approximately 3 feet relative to water elevation

Excavated vadose zone soil from the surface to 8 feet bgs would be characterized. Alternatives for vadose zone soil will be developed in the Upland Soil portion of the OU1/OU2 FS Report.

The proposed excavation area is shown on **Figure 4.2-5**. This alternative assumes that 6 feet of smear zone soil (approximately 8 – 14 feet bgs) would be characterized as "contaminated" and shipped off-site for disposal. The estimated in-situ volume of soil to be excavated for this alternative is approximately 830 cy of soil from 0 – 14 feet bgs.

If additional LNAPL-impacted soil is encountered during excavation, additional soil would be removed to the extent feasible. For FS costing purposes, this alternative assumes a 1,000 square

foot contingency action area, assumed to include expanding the proposed excavation limits eastward towards East Ditch and the MBTA rail line. This contingency action assumes the 40-foot wide proposed excavation would be expanded to the east approximately 25 feet and would extend to 14 feet bgs, similar to the initial proposed excavation. The additional estimated in-situ volume of excavated soil associated with this contingency action is approximately 520 cy of soil from 0 – 14 feet bgs.

Because the expanded excavation would encroach upon the MBTA rail line, this contingency action assumes a sheet pile wall would be installed between the expanded excavation and the MBTA rail line to avoid impacts to the rail line. The sheet pile wall is assumed to extend approximately 20 feet to the north and south beyond the excavation sidewalls, or a total length of approximately 80 feet. The sheet pile wall would subsequently be removed. The excavation dewatering, soil stabilization, off-site disposal, verification sampling, and backfill/restoration components of the alternative would also apply to the contingency action. These items are accounted for in the cost estimate under the contingency action and are discussed in the following paragraphs.

Excavation Dewatering. The depth of the proposed excavation areas is anticipated to be approximately 14 feet, with an average water table of approximately 11 feet bgs. To the extent possible, the proposed excavations would be conducted during times of low water table conditions to minimize the volume of saturated soil to be excavated and the need for dewatering. However, it is likely that excavation dewatering would be necessary to facilitate excavation to the required depth. It is anticipated that excavation dewatering would require pumping at less than 10 gpm. The extracted groundwater would be treated by the operational Groundwater Hot Spot treatment system prior to being discharged appropriately to surface water.

Dewatering/stabilization of excavated soil. This alternative assumes that saturated zone soil (10 – 14 feet bgs) would require stabilization to reduce the water content of the soil prior to off-site disposal. It is anticipated that recovered water would be captured and treated through the new Groundwater Hot Spot treatment system. Soil would be stabilized using Portland cement, lime, or another suitable stabilizing agent. The estimated in-situ volume of soil anticipated to require stabilization is 240 in-place cy associated with the initial excavation area and 185 in-place cy associated with the contingency action area.

Off-site disposal of excavated soil. The current influent to Plant B contains BEHP, which is a listed RCRA hazardous waste (U028: diethylhexyl phthalate). This alternative assumes that the smear zone soil containing BEHP will require off-site disposal as a hazardous waste. The

estimated in-situ volumes and stabilized masses of excavated soil that will require off-site disposal as a listed hazardous waste are as follows:

- Initial excavation: 355 in-place cy, or approximately 600 tons after stabilization of soil from 10 to 14 feet bgs
- Contingency action (if necessary): 220 cy for the contingency action, or approximately 390 tons after stabilization of soil from 10 to 14 feet bgs

Verification Sampling. A post-remediation verification sampling program would be conducted to confirm achievement of RAOs. This sampling program would include collecting soil samples at the completed excavation limits and analyzing the samples for analytes including BEHP and VPH. Four soil samples would be collected from the excavation bottom and four soil samples from each excavation sidewall (two horizontal locations with two depth intervals at each horizontal location). The contingency action assumes that two additional excavation bottom samples and four samples from each of the three new excavation sidewalls would be collected for laboratory analysis of analytes including BEHP and VPH.

Backfill and restoration. This alternative assumes for both the initial and contingency excavations that the excavation area would be backfilled with imported "clean" soil. The completed excavation area would be backfilled to return the area to original grades (i.e., pre-excavation ground surface elevations) and finished with a 6-inch layer of "clean" soil or crushed stone as appropriate. The sheet pile wall, if installed as part of the contingency excavation would be removed in conjunction with and subsequent to backfilling and restoration activities.

Reporting. A Remedial Action Report would be prepared to document the remedial action, including the final excavation limits, on-site stabilization efforts, waste disposal, and verification sampling results.

Five-Year Reviews. CERCLA requires that any interim remedial action that results in contaminants remaining on-site at concentrations above those allowing for unlimited use and unrestricted exposure must be reviewed every five years. Although it is anticipated that this alternative would eventually meet the RAOs for LNAPL, COCs may remain on-site at concentrations that may not allow for unlimited use and unrestricted exposure (i.e. as use as a residential property, school, or daycare). Therefore, Five-Year Reviews will be conducted as required under CERCLA. For cost estimating purposes, this alternative assumes that Five-Year Reviews will be conducted at five-year intervals for 30 years.

During Five-Year Reviews, an assessment is made as to whether the implemented remedy continues to be protective of human health and the environment, or whether the implementation of additional remedial action is appropriate. The Comprehensive Five-Year Review Guidance (USEPA, 2001) provides guidance on the performance of Five-Year Reviews.

4.2.5.2. LNAPL 6 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment by physically removing LNAPL and smear zone soil in the Plant B area and preventing migration of LNAPL to East Ditch. This alternative would remove LNAPL, which is a source of dissolved phase constituents to groundwater. The continued operation of the extraction wells, from which groundwater is currently treated by Plant B but later will be treated by the Groundwater Hot Spot treatment system, will maintain the cone of depression to prevent migration. Therefore, this alternative would achieve the RAOs to remove, to the extent practicable, LNAPL that represents a source of Site contaminants to groundwater and a potential source of TMPs to indoor air vapors, via a vapor intrusion pathway, that could pose an unacceptable risk to indoor workers or building occupants; and to prevent migration of LNAPL to East Ditch to prevent exposure by current and future ecological receptors to LNAPL containing Site contaminants that would result in potential adverse impacts. Removed LNAPL would no longer act as a source of COCs to groundwater. This alternative is protective of human health and the environment by preventing receptors' contact with COCs via institutional controls until RAOs are achieved.

4.2.5.3. LNAPL 6 Compliance with ARARs

Alternative LNAPL 6 would be designed and implemented to comply with ARARs that are identified in **Tables 2.1-1** and **2.1-2**.

There are no floodplains or wetlands associated with the areas of the Site proposed for remedial action under this alternative. However, this alternative would be designed and implemented to minimize potential impacts to nearby wetland areas. Restoration activities for any areas that may be impacted would be implemented to comply with location-specific ARARs identified in **Table 2.1-1**, such as compensatory wetlands mitigation, if necessary, to comply with Clean Water Act Section 404 and the Massachusetts Wetland Protection Act, which have been identified as applicable location-specific requirements.

The removal of LNAPL is not based on attainment of media-specific concentrations of specific contaminants or a PRG based on a chemical-specific ARAR.

This alternative would be designed and implemented to comply with the action-specific ARARs identified in **Table 2.1-2**, including but not limited to, federal and state air emission standards and RCRA Subtitle C regulations related to soil characterization, waste identification, waste handling, storage, treatment, and disposal requirements.

This alternative involves excavation and off-site disposal of areas of elevated BEHP concentrations in subsurface soil. The BEHP-impacted soil is assumed to contain a listed hazardous waste and would be handled, stored, tracked, and disposed of in accordance with the various requirements of RCRA Subtitle C and Massachusetts Hazardous Waste Rules, both of which have been identified as applicable action-specific requirements for this alternative.

Tables 2.1-1 and 2.1-2 provide a more thorough evaluation of ARARs associated with the alternative, including how the alternative would comply with each requirement and citation listed.

4.2.5.4. LNAPL 6 Long-term Effectiveness and Permanence

This alternative is effective at mitigating risk to human health and the environment in the long-term. Excavation would permanently remove LNAPL from the groundwater and soil in the smear zone. Removal of LNAPL mitigates the risk that LNAPL will act as a continuing source of contamination to groundwater and removes the COCs present in LNAPL from groundwater and soil. Post-remediation sampling would be conducted to verify achievement of RAOs and long-term protection of human health and the environment. No post-remediation controls would be necessary with regard to LNAPL to ensure long-term protection of human health and the environment.

Completion of the remedy from pre-design investigations through final verification sampling, reporting, and Five-Year Reviews, is estimated to take approximately 30 years. Currently operating extraction wells are assumed to be operated for the full duration of the remedy.

4.2.5.5. LNAPL 6 Reduction of Toxicity, Mobility, or Volume through Treatment

This alternative would involve physical removal of soil and groundwater impacted by LNAPL and its constituents. The volume of LNAPL present in the Plant B area would be estimated during the pre-design investigation. Excavation would reduce the mobility and volume of LNAPL by physically removing it from the subsurface, thereby reducing its toxicity as a source of dissolved phase constituents to groundwater. The objective of this alternative is to remove the LNAPL and all smear zone soil associated with the LNAPL; however, some small amount of residual LNAPL may remain in soil pore spaces. Therefore, it is anticipated that 90-95% of the LNAPL and smear

zone soil would be removed by this alternative. The removal of contaminants is irreversible because the contaminants are permanently removed.

This alternative involves the removal of approximately 575 cy (1,040 tons) of smear zone soil to be shipped off-site for disposal. This volume includes the initial excavation area and the proposed contingency action area. This alternative would also remove approximately 12 gallons of LNAPL that are estimated to be present based on the March 2019 LNAPL thickness measurements.

4.2.5.6. LNAPL 6 Short-term Effectiveness

This alternative is effective at mitigating risk to human health and the environment in the short-term. During the five-year timeframe of remedy implementation, potential short-term risks to the community would be addressed by measures including but not limited to: minimizing dust, implementing a perimeter air monitoring program, decontaminating vehicles transporting excavated soil prior to leaving the Site, and minimizing vehicular traffic associated with the remediation effort traveling through residential areas. Potential short-term risks to site workers will be addressed through development of a site-specific Health and Safety Plan that adheres to OSHA requirements, including appropriate PPE and air monitoring plans.

Completion of the remedy from pre-design investigations through final verification sampling and reporting, is estimated to take approximately five years. Five-Year Reviews will continue through year 30.

4.2.5.7. LNAPL 6 Implementability

The major components of this alternative are decommissioning/demolition of Plant B, excavation, soil stabilization/dewatering, and off-site disposal. The technologies used for this alternative are generally implementable, readily available, reliable, and sufficiently demonstrated for use at the Site. The alternative would use standard construction equipment, and the equipment, materials, and disposal facility are readily available.

Implementation requires the demolition of Plant B to investigate and excavate the full extent of LNAPL-impacted soil. Pre-design investigation activities would include verification of the locations of subsurface utilities or current extraction and/or monitoring well piping that may be present within the proposed excavation area. No right-of-way or other infrastructure concerns are present in the proposed excavation area.

Excavation activities may interfere with existing extraction and/or monitoring wells in the vicinity of Plant B, requiring some wells to be abandoned and re-installed. Costs for reinstallation of wells are not included in the cost estimate for this alternative.

This alternative includes a contingency action to be implemented if additional LNAPL-impacted soil is encountered during the initial excavation activities. The intent of the contingency action would be to continue to excavate LNAPL-impacted soil until LNAPL-impacted soil is no longer encountered. Execution of the proposed contingency action would be difficult due to encroachment upon the MBTA rail line. Access to the area within the MBTA right of way would require specific permission under a license agreement from the MBTA. There would also be significant safety concerns related to working in the right of way near this active commuter rail line and installation of sheet piling along the bank of East Ditch.

Post-implementation sampling is planned to monitor the achievement of RAOs and is straightforward to perform.

4.2.5.8. LNAPL 6 Cost

The cost estimate for this alternative is presented in **Table 4.2-5** and includes the following major components:

- Plant B Continued Operation
- Decommission/Demolition of Plant B
- Pre-design investigations
- Excavation, Dewatering, and Stabilization
- Verification Sampling
- Backfill and Restoration
- Continued O&M on currently operating extraction wells
- Reporting
- Five-Year Reviews

The estimated time to complete the on-site remedial activities associated with this alternative is approximately 4 months, and the overall duration of this remedy (including predesign, design, verification sampling, reporting, and five-year reviews) is estimated to be approximately 30 years.

Costs for decommission/demolition of Plant B, excavation, on-site dewatering/stabilization were provided by environmental remediation contractors. Costs associated with rerouting current extraction wells, pre-design investigations, verification sampling, and reporting are based on costs for similar projects. The cost estimate also includes costs associated with the contingency action that would be implemented if additional LNAPL-impacted soil is encountered during the initial excavation activities. An annual discount rate of 7% was assumed for present worth calculations.

The cost estimate for this alternative, presented in **Table 4.2-5**, is summarized as follows:

Alternative LNAPL 6: Continued Operation of Plant B Followed by Demolition and Excavation	
Capital Cost	$1,592,000
O&M Costs	$2,202,000
Total Cost	$3,794,000
Net Present Worth	$2,501,000
Overall Alternative Duration	30 years

4.3 DAPL Alternatives

The following sections present the detailed evaluation of Alternatives DAPL 2A/B, DAPL 3A/B, and DAPL 4A/B.

4.3.1 Alternative DAPL 2A: DAPL Extraction in the Off-PWD DAPL Pool (1 extraction well)

4.3.1.1. Components of Alternative DAPL 2A

Alternative DAPL 2A consists of institutional controls, DAPL extraction in the off-PWD (Jewel Drive) DAPL pool via one extraction well, on-site treatment, off-site disposal of treatment residuals, O&M, monitoring, and Five-Year Reviews.

Institutional controls: Institutional controls to prevent exposure to DAPL and to minimize the migration of DAPL.

DAPL extraction includes one replacement extraction well that would be pumped at 0.25 gpm. It would require approximately 12 years of operation (rounding up to the nearest half year) to address approximately 95% of the estimated 1.3 million gallons of DAPL (1.235 million gallons). **Figure 4.3-1** depicts potential DAPL extraction wells for both DAPL 2 alternatives. **Table 4.3-1** summarizes the estimated DAPL volume, pumping rates, and extraction duration for Alternative DAPL 2A. Alternative DAPL 2A does not directly address DAPL in bedrock, but does address the source of potential future impacts to bedrock.

The new extraction well pump and conveyance system is planned to be similar to the current installation, including variable speed peristaltic-type pumps discharged through a heat-traced conveyance system comprised of a 1½-inch diameter high density polyethylene (HDPE) carrier pipe contained within a 4-inch diameter polyvinyl chloride (PVC) containment pipe.

When Olin installed the DAPL Extraction Pilot Test system, a blank pipe sleeve was installed with the current DAPL transfer pipe. Depending on where new well(s) are installed, piping or DAPL will be routed through existing clean out vaults and conveyance lines or a new conveyance line will be installed. DAPL would be pumped to the current storage tank where it will be stored prior to on-site treatment.

Based on the results of long term DAPL extraction from the off-PWD DAPL pool under the Pilot Test and the DAPL density driven flow considerations discussed in **Section 4.3.1.1**, a DAPL extraction rate of 0.25 gpm was used for costing and DAPL removal timeframe calculations for Alternative DAPL 2A. As DAPL levels drop, it may become necessary to progressively reduce the rate of DAPL extraction with time as DAPL pool volume decreases. Residual DAPL may remain on the bedrock surface in isolated and localized low points within the DAPL pool.

O&M: Alternative DAPL 2A would require long-term O&M to keep the extraction and treatment systems functioning properly and effectively. The scope of the proposed extraction system O&M is based on the Interim Response Steps Work Plan (MACTEC, 2008), Operations, Maintenance, and Performance Monitoring Plan (AMEC, 2012), and DAPL Extraction Pilot Study Performance Evaluation Report (AMEC, 2014). Treatment system O&M requirements would be developed during remedy design.

DAPL extraction system performance monitoring is assumed to occur monthly and consist of multi-level piezometer sampling and induction logging from the monitoring points installed in conjunction with the extraction wells. DAPL treatment system performance monitoring schedules would be evaluated as part of the remedy design.

Annual O&M cost assumptions were based on the O&M costs during the Pilot Test. O&M is assumed to include:

- Routine inspections of the extraction system components, including pumps, pump enclosure vaults, system controls and communication equipment, piping, storage tank(s), and tanker truck loading station(s).
- Periodic evaluation and adjustment of pumping rates.
- Pump maintenance and periodic replacement, as needed.
- Periodic tubing replacement.
- DAPL treatment system O&M.
- Quarterly O&M inspections.
- Monitoring to confirm institutional control compliance.

Monitoring: System performance monitoring will be performed to:

- Evaluate the response of the DAPL and overlying groundwater during pumping.
- Assess trends of monitored parameters in DAPL and groundwater.
- Assess specific chemical characteristics of the extracted DAPL.

Olin currently uses two multilevel piezometers (ML-1 and ML-2) and two induction logging wells (ILW-1 and ILW-2) to monitor progress of DAPL removal at EW-1. Olin uses a third multilevel piezometer (MP-2) farther from the extraction well to monitor DAPL elevation. After EW-1 is replaced, consideration will be given to installing a multilevel device in EW-1 or installing additional multilevel piezometers at appropriate locations.

It is assumed that performance monitoring will be conducted monthly to bi-monthly during system operation and that operating conditions and monitoring data will be reported semi-annually.

On-site DAPL Treatment: Extracted DAPL will be treated on-site. The DAPL treatment train consists of lime precipitation of metals and dewatering/disposal of sludge; stripping of VOCs and ammonia; UV photooxidation of NDMA; and evaporation of remaining water and off-site disposal of the resulting residual solids. Additional details regarding the treatment train are included in **Appendix D**.

Off-site disposal: An estimated 1,376 tons of sludge and soils residuals generated from DAPL treatment (**Table 4.3-1**) would be transported off-site for disposal. This material is assumed to be non-hazardous waste, but will be further characterized prior to off-site disposal.

Five-Year Reviews: CERCLA requires that any remedial action resulting in contaminants remaining on-site at concentrations above those allowing unlimited exposure and unrestricted use must be reviewed at least every five years. Five-Year Reviews would be performed in accordance with Comprehensive Five-Year Review Guidance (USEPA, 2001).

4.3.1.2. DAPL 2A Overall Protection of Human Health and the Environment

The following describes the overall protection of human health and the environment for Alternative DAPL 2A:

- Protection of human health: Removal of the DAPL and its associated COCs would reduce the potential for human exposure in the immediate vicinity of the DAPL pool and downgradient (by reducing the mass available to migrate away from the DAPL pool). In addition, DAPL 2A's institutional controls would prevent human exposure to DAPL containing Site COCs.
- Protection of the environment: Removal of the DAPL would reduce the potential for migration of contamination into overlying groundwater, underlying bedrock, and potentially surface water.

4.3.1.3. DAPL 2A Compliance with ARARs

A detailed evaluation of ARAR compliance for Alternative DAPL 2A is provided in **Tables 2.1-3 and 2.1-4**. The ARAR analysis is the same for DAPL 2A and DAPL 2B, since they differ only in the number and configuration of extraction wells. The following describes Alternative DAPL 2A's compliance with ARARs:

- Chemical-specific ARARs: DAPL extraction and treatment is an interim step that is not based on attainment of concentrations of specific ARARs. Because this alternative would not be expected to attain chemical-specific ARARs, PRGs were not developed based on any chemical-specific ARARs. Instead, DAPL will 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 specific conductivity, metals, anions, and geochemistry are also indicative of DAPL. This definition will be re-evaluated as part of the remedy design. The achievement of chemical-specific

ARARs in groundwater would be addressed in the final remediation action that addresses the restoration of groundwater.

- Action-specific ARARs: Work will comply with action-specific ARARs as listed in **Table 2.1-3**.
- Location-specific ARARs: Work in areas with location-specific ARARs will be performed in accordance with those ARARs as listed in **Table 2.1-4**.

4.3.1.4. DAPL 2A Long-term Effectiveness and Permanence

The following describes the long-term effectiveness and permanence of Alternative DAPL 2A:

- Magnitude of residual risk: The magnitude of residual risk would be reduced with the removal of DAPL. Residual risk would be reduced to the extent that residual DAPL could be effectively targeted. Remaining DAPL may migrate via bedrock fractures and serve as a source of contamination to both overburden and bedrock groundwater via diffusion. The nature and extent of DAPL within bedrock will be part of the OU3 Data Gaps Work Plan.
- Adequacy and reliability of controls: Once removed, the DAPL would not pose further risk to potential future receptors or the environment. This would represent a permanent reduction in risk.

This alternative does not include DAPL extraction beneath the building at the expected bedrock low spot and is expected to have a lower overall effectiveness in capturing as much residual DAPL as possible.

4.3.1.5. DAPL 2A Reduction of Toxicity, Mobility, or Volume Through Treatment

The following describes the reduction in toxicity, mobility, and volume of contaminants by Alternative DAPL 2A:

- Treatment process used and materials treated: DAPL will be treated on-site. Details of the proposed treatment train are included in **Appendix D**.
- Amount of hazardous materials removed or treated: Alternative DAPL 2A would remove an estimated 1.235 million gallons of DAPL for on-site treatment. This estimate will be refined based on investigations to better define the bedrock topography in the area.
- Reduction of toxicity, mobility or volume through treatment: DAPL would be removed from the subsurface and treated on-site, thereby removing a major source for migration

of contaminants in groundwater. Details of the proposed treatment train are included in **Appendix D**.

- Degree to which the treatment is reversible: Removal of DAPL from the subsurface is irreversible. Only liquid would be removed; therefore, trace levels of DAPL precipitate remaining in the subsurface may be remobilized in the future if the aquifer geochemistry changes. DAPL treatment is irreversible.
- Type and quantity of residuals remaining after treatment: Treatment residuals, sludge (metals precipitates) and evaporated solids, will be created from the treatment process. The residuals are expected to be non-hazardous. Approximately 1,376 tons of solids residuals will require off-site disposal. In addition, DAPL precipitates and isolated residual DAPL would remain in the subsurface after the readily extractable liquid is removed.
- Satisfies statutory preference for treatment: DAPL extraction and on-site treatment does satisfy the statutory preference for treatment.

4.3.1.6. DAPL 2A Short-term Effectiveness

The following describes the short-term effectiveness of Alternative DAPL 2A:

- Risks to the community during implementation of remedial action: Installation of extraction and monitoring wells would involve minimal risk to the community and would follow best management practices (BMPs) to alleviate community concerns. DAPL would be piped from the extraction points to a collection tank on the Olin Property. Off-Property piping is expected to be routed underground. Risks from DAPL treatment and off-site disposal of residual solids are expected to be low. Overall risk to the community is low.
- Risks to workers during implementation of remedial action: Installation of extraction and monitoring wells would involve standard construction risks. Risks during extraction and treatment system O&M would be minimal and would be addressed using BMPs.
- Environmental impacts: BMPs during construction and system operation would minimize the likelihood and severity of any DAPL releases. The system would use existing pipelines to the extent practicable, minimizing environmental impacts. Environmental risks during transportation for off-site disposal of treatment residuals are relatively low.
- Sustainability: Alternative DAPL 2A would require moderate resources to treat the DAPL on-site and to transport and dispose of treatment residuals off-site, and some resource to conduct system O&M.

- Time until RAOs are met: Potential for human exposure would be addressed once institutional controls are in place for the off-PWD DAPL pool. DAPL removal (95% effectiveness for accessible DAPL) is anticipated to be completed within 12 years of system construction.

4.3.1.7. DAPL 2A Implementability

The following describes the implementability of Alternative DAPL 2A:

- Ability to construct and operate the technology: Alternative DAPL 2A would use similar technologies that have already been shown to be effective for the off-PWD DAPL pool Pilot Test. The replacement well for current extraction well EW-1 does not have implementability issues. Treatability studies will be required to determine the treatment train, technologies, and materials required to effectively treat the extracted DAPL. Five-year reviews and Institutional Controls are readily implemented.
- Reliability of the technology: Based on the off-PWD DAPL pool Pilot Test, the DAPL extraction is expected to be reliable. On-site treatment should undergo a bench-scale and/or pilot test prior to full-scale implementation.
- Ease of implementing additional remedial actions: Future remedial actions could be readily implemented, although the presence of additional boreholes may complicate some future remedial actions.
- Ability to monitor remedy effectiveness: DAPL recovery and DAPL pool response would be effectively monitored with nearby monitoring points, similar to the Pilot Test.
- Ability to obtain approvals from other agencies: No barriers to other agency approvals have been identified.
- Coordination with other agencies: No issues have been identified with respect to coordination with other agencies.
- Availability of off-site treatment, storage and disposal facilities (TSDFs): The DAPL will be treated on-site and treatment residuals (sludge/solid) will require disposal at an off-site TSDF. The treatment residuals will be disposed of off-site as non-hazardous waste.
- Availability of necessary equipment and specialists: DAPL extraction uses readily available remedial technology. Some infrastructure is already in place to extract, transport, and store DAPL prior to treatment. Bench-scale and/or pilot testing will be conducted during the design phase to assess the DAPL treatment train proposed in **Appendix D**.

- Availability of prospective technologies: Technologies to extract DAPL are readily available. Bench-scale and/or pilot testing will be conducted during the design phase to assess the DAPL treatment train proposed in **Appendix D**.

4.3.1.8. DAPL 2A Cost

Costs for Alternative DAPL 2A are provided in **Table 4.3-2**. The estimated capital costs for this alternative are about $332,000. The total cost estimate is about $2,221,000 and the present value is estimated to be about $1,656,000. These costs are based on a DAPL volume of 1.235 million gallons and one extraction well.

The cost estimate for this alternative, presented in **Table 4.3-2**, is summarized as follows:

Alternative DAPL 2A: DAPL Extraction in the Off-PWD DAPL Pool	
Capital Cost	$332,000
O&M Costs	$1,888,000
Total Cost	$2,220,000
Net Present Worth	$1,656,000
Overall Alternative Duration	30 years

4.3.2 Alternative DAPL 2B: DAPL Extraction in the Off-PWD DAPL Pool (up to 4 extraction wells)

4.3.2.1. Components of Alternative DAPL 2B

Alternative DAPL 2B consists of institutional controls, DAPL extraction in the off-PWD (Jewel Drive) DAPL pool via four extraction wells, on-site treatment, off-site disposal of treatment residuals, O&M, monitoring, and Five-Year Reviews.

Institutional controls Institutional controls will be developed to prevent exposure to DAPL and to minimize the migration of DAPL.

DAPL extraction includes new extraction wells that would be pumped at 0.25 gpm each. It would require approximately 3.5 years of operation (rounding up to the nearest half year) to

address an estimated 1.3 million gallons of DAPL (see **Table 4.3-1**). Alternative DAPL 2B does not directly address DAPL in bedrock, but it does address the source of potential future impacts to bedrock.

Borings will be installed to bedrock to confirm bedrock elevations and geophysical data. The current extraction well may be converted to a multilevel well or replaced with a new multi-level well. Four new extraction wells are proposed for costing and comparative purposes; however, additional extraction wells may be added based on PDI results and/or observations during remedy implementation. Multiple DAPL extraction wells may be required to minimize drawdown, provide flexibility with pumping rates, and target bedrock low spots identified during system design. **Figure 4.3-1** depicts potential DAPL extraction wells for Alternative DAPL 2B, and **Table 4.3-1** summarizes the estimated DAPL volume, pumping rates, and extraction duration for Alternative DAPL 2B and the other DAPL alternatives.

The new extraction well pump and conveyance systems are planned to be like the current installation, including variable speed peristaltic-type pumps discharged through a heat-traced conveyance system comprised of a 1½-inch diameter HDPE carrier pipe contained within a 4-inch diameter PVC containment pipe. When Olin installed the DAPL Extraction Pilot Test system, a blank pipe sleeve was installed with the current DAPL transfer pipe. Depending on where new well(s) are installed, piping or DAPL will be routed through existing clean out vaults and conveyance lines or a new conveyance line will be installed. DAPL would be pumped to the current storage tank where it will be stored prior to on-site treatment. For costing purposes, additional pipe runs were assumed to extend to the existing storage tank.

Based on the results of long term DAPL extraction from the off-PWD DAPL pool under the Pilot Test and the DAPL density driven flow considerations discussed in **Section 4.3.1.1**, a combined DAPL extraction rate of 1 gpm (0.25 gpm for each of the four wells) for costing and DAPL removal timeframe calculations was used. As DAPL levels drop, it may become necessary to progressively reduce the rate of DAPL extraction with time as DAPL pool volume decreases.

O&M: Alternative DAPL 2B would require long-term O&M to keep the extraction and treatment systems functioning properly and effectively. The scope of the proposed extraction system O&M and monitoring is based on the Interim Response Steps Work Plan (MACTEC, 2008), Operations, Maintenance, and Performance Monitoring Plan (AMEC, 2012), and DAPL Extraction Pilot Study Performance Evaluation Report (AMEC, 2014). Treatment system O&M requirements would be developed during remedy design.

DAPL extraction system performance monitoring is assumed to occur monthly and consist of multi-level piezometer sampling and induction logging from the monitoring points installed in conjunction with the extraction wells. DAPL treatment system performance monitoring schedules would be evaluated as part of the remedy design.

Annual O&M cost assumptions were based on the O&M costs during the DAPL Extraction Pilot Test. O&M is assumed to include:

- Routine inspections of the extraction system components, including pumps, pump enclosure vaults, system controls and communication equipment, piping, storage tank(s), and tanker truck loading station(s).
- Periodic evaluation and adjustment of pumping rates.
- Pump maintenance and periodic replacement, as needed.
- Periodic tubing replacement.
- DAPL treatment system O&M.
- Quarterly O&M inspections.
- Monitoring to confirm institutional control compliance.

Monitoring: System performance monitoring will be performed to:

- Evaluate the response of the DAPL and overlying groundwater during pumping.
- Assess trends of monitored parameters in DAPL and groundwater.
- Assess specific chemical characteristics of the extracted DAPL.

Olin currently uses two multilevel piezometers (ML-1 and ML-2) and two induction logging wells (ILW-1 and ILW-2) to monitor progress of DAPL removal at EW-1. Olin uses a third multilevel piezometer (MP-2) farther from the extraction well to monitor DAPL elevation. After EW-1 is replaced, consideration will be given to installing a multilevel device in EW-1 or installing an additional multilevel piezometer at an appropriate location.

It is assumed that performance monitoring will be conducted monthly to bi-monthly during the system operation and that operating conditions and monitoring data will be reported semi-annually.

On-site DAPL Treatment: Extracted DAPL will be treated on-site. The DAPL treatment train consists of lime precipitation of metals and dewatering/disposal of sludge; stripping of VOCs

and ammonia; UV photooxidation of NDMA; and evaporation of remaining water and off-site disposal of the resulting residual solids. Additional details regarding the treatment train are included in **Appendix D**.

Off-site disposal: An estimated 1,448 tons of sludge and soils residuals generated from DAPL treatment will be transported off-site for disposal. This material is assumed to be non-hazardous waste.

Five-Year Reviews: CERCLA requires that any remedial action resulting in contaminants remaining on-site at concentrations above those allowing unlimited exposure and unrestricted use must be reviewed at least every five years. Five-Year Reviews would be performed in accordance with Comprehensive Five-Year Review Guidance (USEPA, 2001).

4.3.2.2. DAPL 2B Overall Protection of Human Health and the Environment

The following describes the overall protection of human health and the environment for Alternative DAPL 2B:

- Protection of human health: Removal of the DAPL and its associated COCs would reduce the potential for human exposure in the immediate vicinity of the DAPL pool and downgradient (by reducing the mass available to migrate away from the DAPL pool). In addition, DAPL 2B's institutional controls would prevent human exposure to DAPL containing Site contaminants in groundwater.
- Protection of the environment: Removal of the DAPL would reduce the potential for migration of contamination into overlying groundwater, underlying bedrock, and potentially surface water.

4.3.2.3. DAPL 2B Compliance with ARARs

A detailed evaluation of ARAR compliance for Alternative DAPL 2B is provided in **Tables 2.1-3 and 2.1-4**. The ARAR analysis is the same for DAPL 2A and DAPL 2B, as these differ only in the number and configuration of extraction wells. The following describes Alternative DAPL 2B's compliance with ARARs:

- Chemical-specific ARARs: DAPL extraction and treatment is an interim step that is not based on attainment of concentrations of specific ARARs. Because this alternative would not be expected to attain chemical-specific ARARs, PRGs were not developed based on any chemical-specific ARARs. Instead, DAPL will 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. This definition will be re-evaluated as part of the remedy design. The achievement of chemical-specific ARARs in groundwater would be addressed in the final remediation action that addresses the restoration of groundwater.

- Action-specific ARARs: Work will comply with action-specific ARARs (**Table 2.1-3**).
- Location-specific ARARs: Work in areas with location-specific ARARs will be performed in accordance with those ARARs (**Table 2.1-4**).

4.3.2.4. DAPL 2B Long-term Effectiveness and Permanence

The following describes the long-term effectiveness and permanence of Alternative DAPL 2B:

- Magnitude of residual risk: The magnitude of residual risk would be reduced with the removal of DAPL. Any remaining DAPL may migrate via bedrock fractures and serve as a source of contamination to both overburden and bedrock groundwater via diffusion.
- Adequacy and reliability of controls: Once removed, the DAPL would not pose further risk to potential future receptors or the environment. This would represent a permanent reduction in risk.

This alternative combines more extraction wells and at least one location beneath the building, allowing for flexibility and targeting of the expected bedrock low spot to capture as much residual DAPL as possible.

4.3.2.5. DAPL 2B Reduction of Toxicity, Mobility, or Volume Through Treatment

The following describes the reduction in toxicity, mobility, and volume of contaminants by Alternative DAPL 2B:

- Treatment process used and materials treated: DAPL will be treated on site. Details of the proposed treatment train are included in **Appendix D**.
- Amount of hazardous materials removed or treated: Alternative DAPL 2B would remove an estimated 1.3 million gallons of DAPL for off-site disposal. This estimate will be refined based on investigations to better define the bedrock topography in the area.
- Reduction of toxicity, mobility or volume through treatment: DAPL would be removed from the subsurface and treated on-site, thereby removing a major source for migration

of contaminants in groundwater. Details of the proposed treatment train are included in **Appendix D**.

- Degree to which the treatment is reversible: Removal of DAPL from the subsurface is irreversible. Only liquid would be removed; therefore, trace levels of DAPL precipitate remaining in the subsurface may be remobilized in the future if the aquifer geochemistry changes. DAPL treatment is irreversible.
- Type and quantity of residuals remaining after treatment: Treatment residuals, sludge (metals precipitates) and evaporated solids, will be created from the treatment process. The residuals are expected to be non-hazardous. Approximately 1,448 tons of solids residuals will require off-site disposal. In addition, DAPL precipitates and isolated residual DAPL would remain in the subsurface after the readily extractable liquid is removed.
- Satisfies statutory preference for treatment: DAPL extraction and on-site treatment does satisfy the statutory preference for treatment.

4.3.2.6. DAPL 2B Short-term Effectiveness

The following describes the short-term effectiveness of Alternative DAPL 2B:

- Risks to the community during implementation of remedial action: Installation of extraction and monitoring wells would involve minimal risk to the community and would follow best BMPs to alleviate community concerns. DAPL would be piped from the extraction points to a collection tank on the Olin Property. Off-Property piping is expected to be routed underground. Risks from DAPL treatment and off-site disposal of residual solids are expected to be low. Overall risk to the community is low.
- Risks to workers during implementation of remedial action: Installation of extraction and monitoring wells would involve standard construction risks. Risks during extraction and treatment system O&M would be minimal and would be addressed using BMPs.
- Environmental impacts: BMPs during construction and system operation would minimize the likelihood and severity of any DAPL releases. The system would use existing pipelines to the extent practicable, minimizing environmental impacts. Environmental risks during transportation for off-site disposal of treatment residuals are relatively low.
- Sustainability: Alternative DAPL 2B would require moderate resources to treat the DAPL on-site and to transport and dispose of treatment residuals off-site, and some resource to conduct system O&M; however, these impacts would be of short duration (estimated to be less than 4 years).

- Time until RAOs are met: Potential for human exposure would be addressed once institutional controls are in place for the off-PWD DAPL pool. DAPL removal is anticipated to be completed after an estimated 3 years of system construction.

4.3.2.7. DAPL 2B Implementability

The following describes the implementability of Alternative DAPL 2B:

- Ability to construct and operate the technology: Alternative DAPL 2B would use similar technologies that have already been shown to be effective for the off-PWD DAPL pool. Installation of additional extraction and monitoring wells may be more difficult to implement because of constraints due to existing building structures, but other technologies exist (such as angled boreholes) to complete construction. Five-year reviews and Institutional Controls are readily implemented.
- Reliability of the technology: Based on the off-PWD DAPL pool Pilot Test, the DAPL extraction is expected to be reliable. On-site treatment should undergo a bench-scale and/or pilot test prior to full-scale implementation.
- Ease of implementing additional remedial actions: Future remedial actions could be readily implemented, although the presence of additional boreholes may complicate some future remedial actions.
- Ability to monitor remedy effectiveness: DAPL recovery and DAPL pool response would be effectively monitored with nearby monitoring points, similar to the Pilot Test.
- Ability to obtain approvals from other agencies: No barriers to other agency approvals have been identified.
- Coordination with other agencies: No issues have been identified with respect to coordination with other agencies.
- Availability of off-site TSDFs: The DAPL will be treated on-site and treatment residuals (sludge/solid) will require disposal at an off-site TSDF. The treatment residuals are expected to be disposed of off-site as non-hazardous waste
- Availability of necessary equipment and specialists: DAPL extraction uses readily available remedial technology. Some infrastructure is already in place to extract, transport, and store DAPL prior to treatment. Bench-scale and/or pilot testing will be conducted during the design phase to assess the DAPL treatment train proposed in **Appendix D**.

- Availability of prospective technologies: Technologies to extract DAPL are readily available. Bench-scale and/or pilot testing will be conducted during the design phase to assess the DAPL treatment train proposed in **Appendix D**.

4.3.2.8. DAPL 2B Cost

Costs for Alternative DAPL 2B are provided in **Table 4.3-3**. The estimated capital costs for this alternative are about $812,000. The total cost estimate is about $2,399,000 and the present value is estimated to be about $2,215,000. These costs are based on a DAPL volume of 1.3 million gallons and four extraction wells.

The cost estimate for this alternative, presented in **Table 4.3-3**, is summarized as follows:

Alternative DAPL 2B: DAPL Extraction in the Off-PWD (Jewel Drive) DAPL Pool	
Capital Cost	$812,000
O&M Costs	$1,587,000
Total Cost	$2,399,000
Net Present Worth	$2,215,000
Overall Alternative Duration	30 years

4.3.3 Alternative DAPL 3A: DAPL Extraction in the Containment Area DAPL Pool (1 extraction well)

4.3.3.1. Components of Alternative DAPL 3A

Alternative DAPL 3A consists of institutional controls, DAPL extraction in the on-Property (Containment Area) DAPL pool via one extraction well, on-site treatment, off-site disposal of treatment residuals, O&M, monitoring, and Five-Year Reviews.

Institutional controls: Institutional controls will be developed to prevent exposure to DAPL and to minimize the migration of DAPL.

DAPL extraction: A DAPL extraction system, like that of the off-PWD DAPL pool, would be installed at the Containment Area DAPL pool. Alternative DAPL 3A does not directly address DAPL in bedrock, but it does address the source of potential future impacts to bedrock.

The proposed extraction well location for Alternative 3A is shown on **Figure 4.3-2**. The extraction well would be constructed similarly to EW-1, except with a 2-foot screen length. Based on soil borings and excavation during the slurry wall installation at the Containment Area, the bottom of the till has numerous boulders; therefore, vertical well construction is considered the most appropriate method for this area. Vertical wells provide more dependable and predictable contact because the screen is designed to intercept the target material. Vertical wells also provide more certainty regarding the elevation and strata that are the focus of the extraction and allow for extraction from the system's lowest point and are less likely to be hindered by boulders during well installation (as compared to angled boreholes or directional drilling).

Induction logging wells and multi-port piezometers would be constructed in the same manner as existing monitoring points in the off-PWD DAPL pool. Extraction pump(s) will be a variable speed peristaltic-type to protect pump mechanics from contact with DAPL. The pump rotation speed and discharge would be regulated by a variable frequency drive set and monitored by the control panel located adjacent to the DAPL storage tank at the Olin Property. The discharge pipe would be an equivalent design as installed at the off-PWD DAPL pool. **Figure 4.3-2** depicts potential DAPL extraction wells. **Table 4.3-1** summarizes the estimated DAPL volume, pumping rates, and extraction duration for Alternative DAPL 3A and the other DAPL alternatives.

Based on the results of long term DAPL extraction from the off-PWD DAPL pool under the Pilot Test and the DAPL density driven flow considerations discussed in **Section 4.3.1.1**, a DAPL extraction rate of 0.25 gpm is assumed for costing and DAPL removal timeframe calculations. As DAPL levels drop, it may become necessary to progressively reduce the rate of DAPL extraction as DAPL pool volume decreases. Residual DAPL may remain on the bedrock surface in isolated and localized low points within the DAPL pool.

O&M: Alternative DAPL 3A would require O&M to keep the extraction and treatment systems functioning properly and effectively. The scope of the proposed extraction system O&M and monitoring is based on the Interim Response Steps Work Plan (MACTEC, 2008), Operations, Maintenance, and Performance Monitoring Plan (AMEC, 2012), and DAPL Extraction Pilot Study Performance Evaluation Report (AMEC, 2014). Treatment system O&M requirements would be developed during remedy design.

DAPL extraction performance monitoring is assumed to occur monthly and consist of multi-level piezometer sampling and induction logging from the monitoring points installed in conjunction with the extraction well. DAPL treatment system performance monitoring schedules would be evaluated as part of the remedy design.

Annual O&M cost assumptions were based on the O&M costs during the DAPL Extraction Pilot Test. O&M is assumed to include:

- Routine inspections of the extraction system components, including pumps, pump enclosure vaults, system controls and communication equipment, piping, storage tank(s), and tanker truck loading station(s).
- Periodic evaluation and adjustment of pumping rates.
- Pump maintenance and periodic replacement, as needed.
- Periodic tubing replacement.
- DAPL treatment system O&M.
- Quarterly O&M inspections.
- Monitoring to confirm institutional control compliance.

Monitoring: System performance monitoring will be performed to;

- Evaluate the response of the DAPL and overlying groundwater during pumping.
- Assess trends of monitored parameters in DAPL and groundwater.
- Assess specific chemical characteristics of the extracted DAPL.

Paired multilevel piezometers and induction logging wells will be installed for the extraction well to monitor DAPL drawdown and groundwater characteristics. It is assumed that performance monitoring will be conducted monthly to bi-monthly during system operation and that operating conditions and monitoring data will be reported semi-annually.

On-site DAPL Treatment: Extracted DAPL will be treated on-site. The DAPL treatment train consists of lime precipitation of metals and dewatering/disposal of sludge; stripping of VOCs and ammonia; UV photooxidation of NDMA; and evaporation of remaining water and off-site disposal of the resulting residual solids. Additional details regarding the treatment train are included in **Appendix D**.

Off-site disposal: An estimated 254 tons of sludge and soils residuals generated from DAPL treatment will be transported off-site for disposal. This material is assumed to be non-hazardous waste.

Five-Year Reviews: CERCLA requires that any remedial action resulting in contaminants remaining on-site at concentrations above those allowing unlimited exposure and unrestricted use must be reviewed at least every five years. Five-Year Reviews would be performed in accordance with Comprehensive Five-Year Review Guidance (USEPA, 2001).

4.3.3.2. DAPL 3A Overall Protection of Human Health and the Environment

The following describes the overall protection of human health and the environment for Alternative DAPL 3A:

- Protection of human health: Removal of the DAPL and its associated COCs would reduce the potential for human exposure in the immediate vicinity of the DAPL pool and reduce the potential for DAPL to escape the Containment Area. In addition, DAPL 3A's institutional controls would prevent human exposure to DAPL containing Site contaminants in groundwater.
- Protection of the environment: Removal of the DAPL would further reduce the potential for migration of contamination beneath or through the slurry wall, or into overlying groundwater, underlying bedrock, and potentially surface water.

4.3.3.3. DAPL 3A Compliance with ARARs

A detailed evaluation of ARAR compliance for Alternative DAPL 3A is provided in **Tables 2.1-5 and 2.1-6**. The ARAR analysis is the same for DAPL 3A and DAPL 3B, which differ only in the number of extraction wells. The following describes Alternative DAPL 3A's compliance with ARARs:

- Chemical-specific ARARs: DAPL extraction and treatment is an interim step that is not based on attainment of concentrations of specific ARARs. Because this alternative would not be expected to attain chemical-specific ARARs, PRGs were not developed based on any chemical-specific ARARs. Instead, DAPL will 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. This definition will be re-evaluated as part of the remedy design. The achievement of chemical-specific ARARs in

groundwater would be addressed in the final remediation action that addresses the restoration of groundwater.

- Action-specific ARARs: Work will comply with action-specific ARARs as listed in **Table 2.1-5**.
- Location-specific ARARs: Work in areas with location-specific ARARs will be performed in accordance with those ARARs (**Table 2.1-6**).

4.3.3.4. DAPL 3A Long-term Effectiveness and Permanence

The following describes the long-term effectiveness and permanence of Alternative DAPL 3A:

- Magnitude of residual risk: The magnitude of residual risk would be reduced with the removal of DAPL. Residual risk would be reduced to the extent that residual DAPL could be effectively targeted. Remaining DAPL may migrate via bedrock fractures and serve as a source of contamination to both overburden and bedrock groundwater via diffusion.
- Adequacy and reliability of controls: Once removed, the DAPL would not pose further risk to potential future receptors or the environment. This would represent a permanent reduction in risk. This alternative has only one extraction well and is expected to have a lower overall effectiveness than Alternative DAPL 3B in capturing as much residual DAPL as possible.

4.3.3.5. DAPL 3A Reduction of Toxicity, Mobility, or Volume Through Treatment

The following describes the reduction in toxicity, mobility, and volume of contaminants by Alternative DAPL 3A:

- Treatment process used and materials treated: DAPL will be treated on-site. Details of the proposed treatment train are included in **Appendix D**.
- Amount of hazardous materials removed or treated: Alternative DAPL 3A would remove an estimated 228,000 gallons of DAPL for on-site treatment. This estimate will be refined based on investigations to better define the bedrock topography in the area.
- Reduction of toxicity, mobility or volume through treatment: DAPL would be removed from the subsurface and treated on-site, thereby removing a major source for migration of contaminants in groundwater. Details of the proposed treatment train are included in **Appendix D**.

- Degree to which the treatment is reversible: Removal of DAPL from the subsurface is irreversible. Only liquid would be removed; therefore, trace levels of DAPL precipitate remaining in the subsurface may be remobilized in the future if the aquifer geochemistry changes. DAPL treatment is irreversible.
- Type and quantity of residuals remaining after treatment: Treatment residuals, sludge (metals precipitates) and evaporated solids, will be created from the treatment process. The residuals are expected to be non-hazardous. Approximately 254 tons of solids residuals will require off-site disposal. In addition, DAPL precipitates and isolated residual DAPL would remain in the subsurface after the readily extractable liquid is removed.
- Satisfies statutory preference for treatment: DAPL extraction and on-site treatment does satisfy the statutory preference for treatment.

4.3.3.6. DAPL 3A Short-term Effectiveness

The following describes the short-term effectiveness of Alternative DAPL 3A:

- Risks to the community during implementation of remedial action: All work would be performed within the Olin Property boundary. Risks from DAPL treatment and off-site disposal of residual solids are expected to be low. Overall risk to the community is low.
- Risks to workers during implementation of remedial action: Installation of extraction and monitoring wells would involve standard construction risks. Risks during extraction and treatment system O&M would be minimal and would be addressed using BMPs.
- Environmental impacts: BMPs during construction and system operation would minimize the likelihood and severity of any DAPL releases. The system would use existing pipelines to the extent practicable, minimizing environmental impacts. Environmental risks during transportation for off-site disposal of treatment residuals are relatively low.
- Sustainability: Alternative DAPL 3A would require moderate resources to treat the DAPL on-site and to transport and dispose of treatment residuals off-site, and some resource to conduct system O&M; however, these impacts would be of short duration (estimated to be approximately 2 years).
- Time until RAOs are met: Potential for human exposure would be addressed once institutional controls are in place for the Containment Area DAPL pool. DAPL removal (95% effectiveness for accessible DAPL) is anticipated to be completed within 3 years of system construction.

4.3.3.7. DAPL 3A Implementability

The following describes the implementability of Alternative DAPL 3A:

- Ability to construct and operate the technology: Alternative DAPL 3A would use similar technologies that have already been shown to be effective for the off-PWD DAPL pool. There are no significant barriers or complications for installation of extraction wells and piping. Treatability studies will be required to determine the treatment train, technologies, and materials required to effectively treat the extracted DAPL. Five-year reviews and institutional controls are readily implemented.
- Reliability of the technology: Based on the off-PWD DAPL pool Pilot Test, the DAPL extraction is expected to be reliable. On-site treatment should undergo a bench-scale and/or pilot test prior to full-scale implementation.
- Ease of implementing additional remedial actions: Future remedial actions could be readily implemented.
- Ability to monitor remedy effectiveness: DAPL recovery and DAPL pool response would be effectively monitored with nearby monitoring points, as was done during the Pilot Test.
- Ability to obtain approvals from other agencies: No barriers to other agency approvals have been identified.
- Coordination with other agencies: No issues have been identified with respect to coordination with other agencies.
- Availability of off-site TSDFs: The DAPL will be treated on-site and treatment residuals (sludge/solid) will require disposal at an off-site TSDF. The treatment residuals are expected to be disposed of off-site as non-hazardous waste.
- Availability of necessary equipment and specialists: DAPL extraction uses readily available remedial technology. Some infrastructure is already in place to transport and store DAPL prior treatment. Bench-scale and/or pilot testing will be conducted during the design phase to assess the DAPL treatment train proposed in **Appendix D**.
- Availability of prospective technologies: Technologies to extract and treat DAPL are readily available. Bench-scale and/or pilot testing will be conducted during the design phase to assess the DAPL treatment train proposed in **Appendix D**.

4.3.3.8. DAPL 3A Cost

Costs for Alternative DAPL 3A are provided in **Table 4.3-4**. The estimated capital costs for this alternative are about $499,000. The total cost estimate is about $983,000 and the present value is estimated to be about $925,000 based on a DAPL volume of 228,000 gallons.

The cost estimate for this alternative, presented in **Table 4.3-4**, is summarized as follows:

Alternative DAPL 3A: DAPL Extraction in the Containment Area DAPL Pool	
Capital Cost	$499,000
O&M Costs	$484,000
Total Cost	$983,000
Net Present Worth	$925,000
Overall Alternative Duration	30 years

4.3.4 Alternative DAPL 3B: DAPL Extraction in the Containment Area DAPL Pool (up to 4 extraction wells)

4.3.4.1. Components of Alternative DAPL 3B

Alternative DAPL 3B consists of institutional controls, DAPL extraction in the on-Property (Containment Area) DAPL pool via 3 extraction wells, on-site treatment, off-site disposal of treatment residuals, O&M, monitoring, and Five-Year Reviews.

Institutional controls: Institutional controls will be developed to prevent exposure to DAPL and to minimize the migration of DAPL.

DAPL extraction: A DAPL extraction system like that of the off-PWD DAPL pool would be installed at the Containment Area DAPL pool. Alternative DAPL 3B does not directly address DAPL in bedrock, but it does address the source of potential future impacts to bedrock.

Extraction well(s) would be constructed similarly to EW-1, except with a 2-foot screen length. Based on soil borings and excavation during the slurry wall installation at the Containment Area, the bottom of the till has numerous boulders; therefore, vertical well construction is considered

the most appropriate method for this area. Vertical wells provide more dependable and predictable contact because the screen is designed to intercept the target material. Vertical wells also provide more certainty regarding the elevation and strata that are the focus of the extraction and allow for extraction from the system's lowest point and are less likely to be hindered by boulders during well installation (as compared to angled boreholes or directional drilling). Extraction well locations will be determined based on PDI results.

Induction logging wells and multi-port piezometers would be constructed in the same manner as existing monitoring points in the off-PWD DAPL pool. Extraction pumps will be a variable speed peristaltic-type to protect pump mechanics from contact with DAPL. The pump rotation speed and discharge would be regulated by a variable frequency drive set and monitored by the control panel located adjacent to the DAPL storage tank at the Olin Property. The discharge pipe would be an equivalent design as installed at the off-PWD DAPL pool.

For planning and comparison purposes, four extraction points are planned to intercept bedrock low spots, provide flexibility with pumping rates, and minimize drawdown at any one point. The number and configuration of extraction wells will be determined based on investigations conducted for remedy design, and additional extraction wells may be added based on PDI results and/or observations during remedy implementation. **Figure 4.3-2** depicts potential DAPL extraction wells for Alternative DAPL 3B. **Table 4.3-1** summarizes the estimated DAPL volume, pumping rates, and extraction duration for Alternative DAPL 3B and the other DAPL alternatives.

Based on the results of long term DAPL extraction from the off-PWD DAPL pool under the Pilot Test and the DAPL density driven flow considerations discussed in **Section 4.3.1.1**, a combined DAPL extraction rate of 1 gpm (0.25 gpm for each of the four wells) is assumed for costing and DAPL removal timeframe calculations. As DAPL levels drop, it may become necessary to progressively reduce the rate of DAPL extraction as DAPL pool volume decreases.

O&M: Alternative DAPL 3B would require O&M to keep the extraction and treatment systems functioning properly and effectively. The scope of the proposed extraction system O&M and monitoring is based on the Interim Response Steps Work Plan (MACTEC, 2008), Operations, Maintenance, and Performance Monitoring Plan (AMEC, 2012), and DAPL Extraction Pilot Study Performance Evaluation Report (AMEC, 2014). Treatment system O&M requirements would be developed during remedy design.

DAPL extraction system performance monitoring is assumed to occur monthly and consist of multi-level piezometer sampling and induction logging from the monitoring points installed in

conjunction with the extraction wells. DAPL treatment system performance monitoring schedules would be evaluated as part of the remedy design.

Annual O&M cost assumptions were based on the O&M costs during the DAPL Extraction Pilot Test. O&M is assumed to include:

- Routine inspections of the extraction system components, including pumps, pump enclosure vaults, system controls and communication equipment, piping, storage tank(s), and tanker truck loading station(s).
- Periodic evaluation and adjustment of pumping rates.
- Pump maintenance and periodic replacement, as needed.
- Periodic tubing replacement.
- DAPL treatment system O&M.
- Quarterly O&M inspections.
- Monitoring to confirm institutional control compliance.

Monitoring: System performance monitoring will be performed to:

- Evaluate the response of the DAPL and overlying groundwater during pumping.
- Assess trends of monitored parameters in DAPL and groundwater.
- Assess specific chemical characteristics of the extracted DAPL.

Paired multilevel piezometers and induction logging wells will be installed for each extraction well to monitor DAPL drawdown and groundwater characteristics. It is assumed that performance monitoring will be conducted monthly to bi-monthly during system operation and that operating conditions and monitoring data will be reported semi-annually.

On-site DAPL Treatment: Extracted DAPL will be treated on-site. The DAPL treatment train consists of lime precipitation of metals and dewatering/disposal of sludge; stripping of VOCs and ammonia; UV photooxidation of NDMA; and evaporation of remaining water and off-site disposal of the resulting residual solids. Additional details regarding the treatment train are included in **Appendix D**.

Off-site disposal: An estimated 267 tons of sludge and soils residuals generated from DAPL treatment will be transported off-site for disposal. This material is assumed to be non-hazardous waste.

Five-Year Reviews: CERCLA requires that any remedial action resulting in contaminants remaining on-site at concentrations above those allowing unlimited exposure and unrestricted use must be reviewed at least every five years. Five-Year Reviews would be performed in accordance with Comprehensive Five-Year Review Guidance (USEPA, 2001).

4.3.4.2. DAPL 3B Overall Protection of Human Health and the Environment

The following describes the overall protection of human health and the environment for Alternative DAPL 3B:

- Protection of human health: Removal of the DAPL and its associated COCs would reduce the potential for human exposure in the immediate vicinity of the DAPL pool and reduce the potential for DAPL to escape the Containment Area. In addition, DAPL 3B's institutional controls would prevent human exposure to DAPL containing Site contaminants in groundwater.
- Protection of the environment: Removal of the DAPL would further reduce the potential for migration of contamination beneath or through the slurry wall, or into overlying groundwater, underlying bedrock, and potentially surface water.

4.3.4.3. DAPL 3B Compliance with ARARs

A detailed evaluation of ARAR compliance for Alternative DAPL 3B is provided in **Tables 2.1-5 and 2.1-6**. The ARAR analysis is the same for DAPL 3A and DAPL 3B, which differ only in the number of extraction wells. The following describes Alternative DAPL 3B's compliance with ARARs:

- Chemical-specific ARARs: DAPL extraction and treatment is an interim step that is not based on attainment of concentrations of specific ARARs. Because this alternative would not be expected to attain chemical-specific ARARs, PRGs were not developed based on any chemical-specific ARARs. Instead, DAPL will 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. This definition will be re-evaluated as part of the remedy design. The achievement of chemical-specific ARARs in groundwater would be addressed in the final remediation action that addresses the restoration of groundwater.
- Action-specific ARARs: Work will comply with action-specific ARARs as listed in **Table 2.1-5**.

- Location-specific ARARs: Work in areas with location-specific ARARs will be performed in accordance with those ARARs (**Table 2.1-6**).

4.3.4.4. DAPL 3B Long-term Effectiveness and Permanence

The following describes the long-term effectiveness and permanence of Alternative DAPL 3B:

- Magnitude of residual risk: The magnitude of residual risk would be reduced with the removal of DAPL. Residual risk would be reduced. Any remaining DAPL may migrate via bedrock fractures and serve as a source of contamination to both overburden and bedrock groundwater via diffusion.
- Adequacy and reliability of controls: Once removed, the DAPL would not pose further risk to potential future receptors or the environment. This would represent a permanent reduction in risk. This alternative installs more extraction wells, allowing for additional flexibility and targeting of bedrock low spots and isolated basins to capture as much residual DAPL as possible.

4.3.4.5. DAPL 3B Reduction of Toxicity, Mobility, or Volume Through Treatment

The following describes the reduction in toxicity, mobility, and volume of contaminants by Alternative DAPL 3B:

- Treatment process used and materials treated: DAPL will be treated on-site. Details of the proposed treatment train are included in **Appendix D**.
- Amount of hazardous materials removed or treated: Alternative DAPL 3B would remove an estimated 240,000 gallons of DAPL for on-site treatment. This estimate will be refined based on investigations to better define the bedrock topography in the area.
- Reduction of toxicity, mobility or volume through treatment: DAPL would be removed from the subsurface and treated on-site, thereby removing a major source for migration of contaminants in groundwater. Details of the proposed treatment train are included in **Appendix D**.
- Degree to which the treatment is reversible: Removal of DAPL from the subsurface is irreversible. Only liquid would be removed; therefore, any anions and cations remaining in the subsurface as a precipitate may be remobilized in the future if the aquifer geochemistry changes. DAPL treatment is irreversible.
- Type and quantity of residuals remaining after treatment: Treatment residuals, sludge (metals precipitates) and evaporated solids, will be created from the treatment process.

The residuals are expected to be non-hazardous. Approximately 267 tons of solids residuals will require off-site disposal. In addition, DAPL precipitates and isolated residual DAPL would remain in the subsurface after the readily extractable liquid is removed.

- Satisfies statutory preference for treatment: DAPL extraction and on-site treatment does satisfy the statutory preference for treatment.

4.3.4.6. DAPL 3B Short-term Effectiveness

The following describes the short-term effectiveness of Alternative DAPL 3B:

- Risks to the community during implementation of remedial action: All work would be performed within the Olin Property boundary. Risks from DAPL treatment and off-site disposal of residual solids are expected to be low. Overall risk to the community is low.
- Risks to workers during implementation of remedial action: Installation of extraction and monitoring wells would involve standard construction risks. Risks during extraction and treatment system O&M would be minimal and would be addressed using BMPs.
- Environmental impacts: BMPs during construction and system operation would minimize the likelihood and severity of any DAPL releases. The system would use existing pipelines to the extent practicable, minimizing environmental impacts. Environmental risks during transportation for off-site disposal of treatment residuals are relatively low.
- Sustainability: Alternative DAPL 3B would require moderate resources to treat the DAPL on-site and to transport and dispose of treatment residuals off-site, and some resource to conduct system O&M; however, these impacts would be of short duration (estimated to be less than 1 year).
- Time until RAOs are met: Potential for human exposure would be addressed once institutional controls are in place for the Containment Area DAPL pool. DAPL removal is anticipated to be completed within 1 year of system construction.

4.3.4.7. DAPL 3B Implementability

The following describes the implementability of Alternative DAPL 3B:

- Ability to construct and operate the technology: Alternative DAPL 3B would use similar technologies that have already been shown to be effective for the off-PWD DAPL pool. There are no significant barriers or complications for installation of extraction wells and piping. Treatability studies will be required to determine the treatment train,

technologies, and materials required to effectively treat the extracted DAPL. Five-year reviews and institutional controls are readily implemented.

- Reliability of the technology: Based on the off-PWD DAPL pool Pilot Test, the DAPL extraction is expected to be reliable. On-site treatment should undergo a bench-scale and/or pilot test prior to full-scale implementation.
- Ease of implementing additional remedial actions: Future remedial actions could be readily implemented.
- Ability to monitor remedy effectiveness: DAPL recovery and DAPL pool response would be effectively monitored with nearby monitoring points, as done during the Pilot Test.
- Ability to obtain approvals from other agencies: No barriers to other agency approvals have been identified.
- Coordination with other agencies: No issues have been identified with respect to coordination with other agencies.
- Availability of off-site TSDFs: The DAPL will be treated on-site and treatment residuals (sludge/solid) will require disposal at an off-site TSDF. The treatment residuals are expected to be disposed of off-site as non-hazardous waste.
- Availability of necessary equipment and specialists: DAPL extraction uses readily available remedial technology. Some infrastructure is already in place to transport and store DAPL prior to treatment. Bench-scale and/or pilot testing will be conducted during the design phase to assess the DAPL treatment train proposed in **Appendix D**.
- Availability of prospective technologies: Technologies to extract DAPL are readily available. Bench-scale and/or pilot testing will be conducted during the design phase to assess the DAPL treatment train proposed in **Appendix D**.

4.3.4.8. DAPL 3B Cost

Costs for Alternative DAPL 3B are provided in **Table 4.3-5**. The estimated capital costs for this alternative are about $967,000. The total cost estimate is about $1,614,000 and the present value is estimated to be about $1,564,000. These costs are based on a DAPL volume of 240,000 gallons and up to four extraction wells.

The cost estimate for this alternative, presented in **Table 4.3-5**, is summarized as follows:

Alternative DAPL 3B: DAPL Extraction in the Containment Area DAPL Pool	
Capital Cost	$967,000
O&M Costs	$647,000
Total Cost	$1,614,000
Net Present Worth	$1,564,000
Overall Alternative Duration	30 years

4.3.5 Alternative DAPL 4A: DAPL Extraction in the Main Street DAPL Pool (3 extraction wells)

4.3.5.1. Components of Alternative DAPL 4A

Alternative DAPL 4A consists of institutional controls, DAPL extraction in the Main Street DAPL pool via three extraction wells, on-site treatment, off-site disposal of treatment residuals, O&M, monitoring, and Five-Year Reviews.

Institutional controls: Institutional controls will be developed to prevent exposure to DAPL and to minimize the migration of DAPL. A NAUL or other institutional controls (such as Town ordinances) will be installed for properties above the footprint of the DAPL pool. These institutional controls will limit the depth of ground disturbance and prohibit installation of wells other than those used for groundwater monitoring and other remedy components.

DAPL extraction: A DAPL extraction system similar to that of the off-PWD DAPL pool under the Pilot Test would be installed at 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. Alternative DAPL 4A does not directly address DAPL in bedrock, but it does address the source of potential future impacts to bedrock.

Extraction wells would be constructed similarly to EW-1, except with a 2-foot screen length. Induction logging wells and multi-port piezometers would be associated with each extraction well and constructed in the same manner as existing monitoring points in the off-PWD DAPL pool. The nature of the localized depressions that will be targeted for extraction well

installations are accessible by vertical well locations and therefore directional drilling offers no advantages. The steeper slopes associated with the Main Street DAPL pool should allow for higher sustainable extraction rates than the DAPL Extraction Pilot Test's rate of less than 0.5 gpm.

For planning and comparison purposes, 3 extraction points are planned to intercept bedrock low spots. **Figure 4.3-3** depicts potential DAPL extraction wells for Alternative DAPL 4A, and **Table 4.3-1** summarizes the estimated DAPL volume, pumping rates, and extraction duration for Alternative DAPL 4A and the other DAPL alternatives.

Alternative DAPL 4A relies on a sustainable pumping rate of 0.5 gpm based on the deeper bedrock and steeper sides of the Main Street DAPL pool. As DAPL levels drop, it may become necessary to progressively reduce the rate of DAPL extraction with time as DAPL pool volumes diminish. Residual DAPL may remain on the bedrock surface in isolated and localized low points within the DAPL pool. For the purpose of comparing alternatives, it is assumed that 5% of the accessible DAPL volume would not be captured by the extraction system.

Extraction pump(s) will be a variable speed peristaltic-type to protect pump mechanics from contact with DAPL. The pump rotation speed and discharge would be regulated by a variable frequency drive set and monitored by the control panel located adjacent to the DAPL storage tank at the Olin Property. The discharge pipe would be an equivalent design as installed at the off-PWD DAPL pool under the Pilot Test.

O&M: Alternative DAPL 4A would require O&M to keep the extraction and treatment systems functioning properly and effectively. The scope of the proposed extraction system O&M is based on the Interim Response Steps Work Plan (MACTEC, 2008), Operations, Maintenance, and Performance Monitoring Plan (AMEC, 2012), and DAPL Extraction Pilot Study Performance Evaluation Report (AMEC, 2014). Treatment system O&M requirements would be developed during remedy design.

DAPL extraction performance monitoring is assumed to occur monthly and consist of multi-level piezometer sampling and induction logging from the monitoring points installed in conjunction with the extraction wells. DAPL treatment system performance monitoring schedules would be evaluated as part of the remedy design.

Annual O&M cost assumptions were based on the O&M costs during the DAPL Extraction Pilot Test. O&M is assumed to include:

- Routine inspections of the extraction system components, including pumps, pump enclosure vaults, system controls and communication equipment, piping, storage tank(s), and tanker truck loading station(s).
- Periodic evaluation and adjustment of pumping rates.
- Pump maintenance and periodic replacement as needed.
- Periodic tubing replacement.
- DAPL treatment O&M.
- Quarterly O&M inspections.
- Monitoring to confirm institutional control compliance.

Monitoring: System performance monitoring will be performed to:

- Evaluate the response of the DAPL and overlying groundwater during pumping.
- Assess trends of monitored parameters in DAPL and groundwater.
- Assess specific chemical characteristics of the extracted DAPL.

Paired multilevel piezometers and induction logging wells will be installed for each extraction well to monitor DAPL drawdown and groundwater characteristics. It is assumed that performance monitoring will be conducted monthly to bi-monthly during system operation and that operating conditions and monitoring data will be reported semi-annually.

On-site DAPL Treatment: Extracted DAPL will be treated on-site. The DAPL treatment train consists of lime precipitation of metals and dewatering/disposal of sludge; stripping of VOCs and ammonia; UV photooxidation of NDMA; and evaporation of remaining water and off-site disposal of the resulting residual solids. Additional details regarding the treatment train are included in **Appendix D**.

Off-site disposal: An estimated 14,075 tons of sludge and soils residuals generated from DAPL treatment will be transported off-site for disposal. This material is assumed to be non-hazardous waste.

Five-Year Reviews: CERCLA requires that any remedial action resulting in contaminants remaining on-site at concentrations above those allowing unlimited exposure and unrestricted use must be reviewed at least every five years. Five-Year Reviews would be performed in accordance with Comprehensive Five-Year Review Guidance (USEPA, 2001).

4.3.5.2. DAPL 4A Overall Protection of Human Health and the Environment

The following describes the overall protection of human health and the environment for Alternative DAPL 4A:

- Protection of human health: Removal of the DAPL and its associated COCs would reduce the potential for human exposure in the immediate vicinity of the DAPL pool and downgradient (by reducing the mass available to migrate away from the DAPL pool). In addition, DAPL 4A's institutional controls would prevent human exposure to DAPL containing Site contaminants in groundwater.
- Protection of the environment: Removal of the DAPL would reduce the potential for migration of contamination into overlying groundwater, underlying bedrock, and potentially surface water.

4.3.5.3. DAPL 4A Compliance with ARARs

A detailed evaluation of ARAR compliance for Alternative DAPL 4A is provided in **Tables 2.1-7 and 2.1-8**. The ARAR analysis is the same for DAPL 4A and DAPL 4B, as these differ only in the number of extraction wells and the extraction rate. The following describes DAPL 4A's compliance with ARARs:

- Chemical-specific ARARs: DAPL extraction and treatment is an interim step that is not based on attainment of concentrations of specific ARARs. Because this alternative would not be expected to attain chemical-specific ARARs, PRGs were not developed based on any chemical-specific ARARs. Instead, DAPL will 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. This definition will be re-evaluated as part of the remedy design. The achievement of chemical-specific ARARs in groundwater would be addressed in the final remediation action that addresses the restoration of groundwater.
- Action-specific ARARs: Work will comply with action-specific ARARs as listed in **Table 2.1-7**.
- Location-specific ARARs: Work in areas with location-specific ARARs will be performed in accordance with those ARARs (**Table 2.1-8**).

4.3.5.4. DAPL 4A Long-term Effectiveness and Permanence

The following describes the long-term effectiveness and permanence of Alternative DAPL 4A:

- Magnitude of residual risk: The magnitude of residual risk would be reduced with the removal of DAPL. Residual risk would be reduced to the extent that residual DAPL could be effectively targeted. Remaining DAPL may migrate via bedrock fractures and serve as a source of contamination to both overburden and bedrock groundwater via diffusion.
- Adequacy and reliability of controls: Once removed, the DAPL would not pose further risk to potential future receptors or the environment. This would represent a permanent reduction in risk. However, this alternative has a minimal number of extraction wells (3) for a large area and is expected to have a lower overall effectiveness in capturing as much residual DAPL as possible.

4.3.5.5. DAPL 4A Reduction in Toxicity, Mobility, and Volume Through Treatment

The following describes the reduction in toxicity, mobility, and volume of contaminants by Alternative DAPL 4A:

- Treatment process used and materials treated: DAPL will be treated on-site. Details of the proposed treatment train are included in **Appendix D**.
- Amount of hazardous materials removed or treated: Alternative DAPL 4A would remove an estimated 12.635 million gallons of DAPL for on-site treatment. This estimate will be refined based on investigations to better define the bedrock topography and elevation of the top of DAPL in the area.
- Reduction of toxicity, mobility or volume through treatment: DAPL would be removed from the subsurface and treated on-site, thereby removing a major source for migration of contaminants in groundwater. Details of the proposed treatment train are included in **Appendix D**.
- Degree to which the treatment is reversible: Removal of DAPL from the subsurface is irreversible. Only liquid would be removed; therefore, trace levels of DAPL precipitate remaining in the subsurface may be remobilized in the future if the aquifer geochemistry changes. DAPL treatment is irreversible.
- Type and quantity of residuals remaining after treatment: Treatment residuals, sludge (metals precipitates) and evaporated solids, will be created from the treatment process. The residuals are expected to be non-hazardous. Approximately 14,075 tons of solids

residuals will require off-site disposal. In addition, DAPL precipitates and isolated residual DAPL would remain in the subsurface after the readily extractable liquid is removed.

- Satisfies statutory preference for treatment: DAPL extraction and on-site treatment does satisfy the statutory preference for treatment.

4.3.5.6. DAPL 4A Short-term Effectiveness

The following describes the short-term effectiveness of Alternative DAPL 4A:

- Risks to the community during implementation of remedial action: Installation of extraction and monitoring wells would involve minimal risk to the community and would follow BMPs to alleviate community concerns. DAPL would be piped from the extraction points to a collection tank on the Olin Property. Off-Property piping is expected to be routed underground. Risks from DAPL treatment and off-site disposal of residual solids are expected to be low. Overall risk to the community is low.
- Risks to workers during implementation of remedial action: Installation of extraction and monitoring wells would involve standard construction risks. Risks during extraction and treatment system O&M would be minimal and would be addressed using BMPs.
- Environmental impacts: BMPs during construction and system operation would minimize the likelihood and severity of any DAPL releases. The system would use existing pipelines to the extent practicable, minimizing environmental impacts. DAPL risks to the environment during transportation for off-site disposal of treatment residuals are relatively low.
- Sustainability: Alternative DAPL 4A would require moderate resources to treat the DAPL on-site and to transport and dispose of treatment residuals off-site, and some resources to conduct system O&M. These impacts would be the longest duration of the active remedy components (20 years).
- Time until RAOs are met: Potential for human exposure would be addressed once institutional controls are in place for the Main Street DAPL pool. DAPL removal (95% effectiveness for accessible DAPL) is anticipated to be completed 20 years after system construction.

4.3.5.7. DAPL 4A Implementability

The following describes the implementability of Alternative DAPL 4A:

- Ability to construct and operate the technology: Alternative DAPL 4A would use similar technologies that have already been shown to be effective for the off-PWD DAPL pool. Alternative 4A would require some coordination and approvals with off-Property landowners to allow for installation of site infrastructure including extraction and monitoring points and piping. There are no significant technical barriers or complications for installation of extraction wells and piping. Treatability studies will be required to determine the treatment train, technologies, and materials required to effectively treat the extracted DAPL. Five-year reviews and institutional controls are readily implemented.
- Reliability of the technology: Based on the off-PWD DAPL pool Pilot Test, the DAPL extraction is expected to be reliable. On-site treatment should undergo a bench-scale and/or pilot test prior to full-scale implementation.
- Ease of implementing additional remedial actions: Future remedial actions could be readily implemented.
- Ability to monitor remedy effectiveness: DAPL recovery and DAPL pool response would be effectively monitored with nearby monitoring points, like the Pilot Test.
- Ability to obtain approvals from other agencies: No barriers to other agency approvals have been identified.
- Coordination with other agencies: No issues have been identified with respect to coordination with other agencies.
- Availability of off-site TSDFs: The DAPL will be treated on-site and treatment residuals (sludge/solid) will require disposal at an off-site TSDF. The treatment residuals are expected to be disposed of off-site as non-hazardous waste
- Availability of necessary equipment and specialists: DAPL extraction uses readily available remedial technology. Some infrastructure is already in place to transport and store DAPL prior to treatment. Bench-scale and/or pilot testing will be conducted during the design phase to assess the DAPL treatment train proposed in **Appendix D.**
- Availability of prospective technologies: Technologies to extract DAPL are readily available. Bench-scale and/or pilot testing will be conducted during the design phase to assess the DAPL treatment train proposed in **Appendix D**.

4.3.5.8. DAPL 4A Cost

Costs for Alternative DAPL 4A are provided in **Table 4.3-6**. The estimated capital costs for this alternative are about $1,567,000. The total cost estimate is about $19,824,000 and the present

value is estimated to be about $11,232,000. These costs are based on a DAPL volume of 12.635 million gallons and three extraction wells.

The cost estimate for this alternative, presented in **Table 4.3-6**, is summarized as follows:

Alternative DAPL 4A: DAPL Extraction in the Main Street DAPL Pool	
Capital Cost	$1,567,000
O&M Costs	$19,667,000
Total Cost	$19,824,000
Net Present Worth	$11,232,000
Overall Alternative Duration	30 years

4.3.6 Alternative DAPL 4B: DAPL Extraction in the Main Street DAPL Pool (12 extraction wells)

4.3.6.1. Components of Alternative DAPL 4B

Alternative DAPL 4B consists of institutional controls, DAPL extraction in the Main Street DAPL pool, on-site treatment, off-site disposal of treatment residuals, O&M, monitoring, and Five-Year Reviews.

Institutional controls: Institutional controls to prevent exposure to DAPL and to minimize the migration of DAPL. .

DAPL extraction: A DAPL extraction system similar to that of the off-PWD DAPL pool under the Pilot Test would be installed at the Main Street DAPL pool. Multiple extraction wells would be used to target bedrock low points and for full coverage across the entire DAPL pool area. Alternative DAPL 4B does not directly address DAPL in bedrock, but it does address the source of potential future impacts to bedrock.

Extraction wells would be constructed similarly to EW-1, except with a 2-foot screen length. Induction logging wells and multi-port piezometers would be associated with each extraction well and constructed in the same manner as existing monitoring points in the off-PWD DAPL pool. The nature of the localized depressions that will be targeted for extraction well

installations are accessible by vertical well locations and therefore directional drilling offers no advantages. The steeper slopes associated with the Main Street DAPL pool should allow for higher sustainable extraction rates than the DAPL Extraction Pilot Test's rate of less than 0.5 gpm.

Extraction pump(s) will be a variable speed peristaltic-type to protect pump mechanics from contact with DAPL. The pump rotation speed and discharge would be regulated by a variable frequency drive set and monitored by the control panel located adjacent to the DAPL storage tank at the Olin Property. The discharge pipe would be an equivalent design as installed at the off-PWD DAPL pool under the Pilot Test.

For planning and comparison purposes, twelve extraction points are planned to intercept bedrock low spots, provide flexibility with pumping rates, and minimize drawdown at any one point. The number and configuration of extraction wells will be determined based on investigations conducted for remedy design, and additional extraction wells may be added based on PDI results and/or observations during remedy implementation. **Figure 4.3-3** depicts potential DAPL extraction wells for Alternative DAPL 4B, and **Table 4.3-1** summarizes the estimated DAPL volume, pumping rates, and extraction duration for Alternative DAPL 4B.

Based on the results of long term DAPL extraction from the off-PWD DAPL pool under the Pilot Test and the DAPL density driven flow considerations discussed in **Section 4.3.1.1**, a combined DAPL extraction rate of 6 gpm (0.5 gpm for each of the twelve wells) was assumed for costing and DAPL removal timeframe calculations. As DAPL levels drop, it may become necessary to progressively reduce the rate of DAPL extraction with time as DAPL pool volumes diminish.

O&M: Alternative DAPL 4B would require O&M to keep the extraction and treatment systems functioning properly and effectively. The scope of the proposed extraction system O&M is based on the Interim Response Steps Work Plan (MACTEC, 2008), Operations, Maintenance, and Performance Monitoring Plan (AMEC, 2012), and DAPL Extraction Pilot Study Performance Evaluation Report (AMEC, 2014). Treatment system O&M requirements would be developed during remedy design.

DAPL extraction system performance monitoring is assumed to occur monthly and consist of multi-level piezometer sampling and induction logging from the monitoring points installed in conjunction with the extraction wells. DAPL treatment system performance monitoring schedules would be evaluated as part of the remedy design.

Annual O&M cost assumptions were based on the O&M costs during the DAPL Extraction Pilot Test. O&M is assumed to include:

- Routine inspections of the extraction system components, including pumps, pump enclosure vaults, system controls and communication equipment, piping, storage tank(s), and tanker truck loading station(s).
- Periodic evaluation and adjustment of pumping rates.
- Pump maintenance and periodic replacement, as needed.
- Periodic tubing replacement.
- DAPL treatment O&M.
- Quarterly O&M inspections.
- Monitoring to confirm institutional control compliance.

Monitoring: System performance monitoring will be performed to:

- Evaluate the response of the DAPL and overlying groundwater during pumping.
- Assess trends of monitored parameters in DAPL and groundwater.
- Assess specific chemical characteristics of the extracted DAPL.

Paired multilevel piezometers and induction logging wells will be installed for each extraction well to monitor DAPL drawdown and groundwater characteristics. It is assumed that performance monitoring will be conducted monthly to bi-monthly during system operation and that operating conditions and monitoring data will be reported semi-annually.

On-site DAPL Treatment: Extracted DAPL will be treated on-site. The DAPL treatment train consists of lime precipitation of metals and dewatering/disposal of sludge; stripping of VOCs and ammonia; UV photooxidation of NDMA; and evaporation of remaining water and off-site disposal of the resulting residual solids. Additional details regarding the treatment train are included in **Appendix D**.

Off-site disposal: An estimated 14,816 tons of sludge and soils residuals generated from DAPL treatment will be transported off-site for disposal. This material is assumed to be non-hazardous waste.

Five-Year Reviews: CERCLA requires that any remedial action resulting in contaminants remaining on-site at concentrations above those allowing unlimited exposure and unrestricted use must be reviewed at least every five years. Five-Year Reviews would be performed in accordance with Comprehensive Five-Year Review Guidance (USEPA, 2001).

4.3.6.2. DAPL 4B Overall Protection of Human Health and the Environment

The following describes the overall protection of human health and the environment for Alternative DAPL 4B:

- Protection of human health: Removal of the DAPL and its associated COCs would reduce the potential for human exposure in the immediate vicinity of the DAPL pool and downgradient (by reducing the mass available to migrate away from the DAPL pool). In addition, DAPL 4B's institutional controls would prevent human exposure to DAPL containing Site contaminants in groundwater.
- Protection of the environment: Removal of the DAPL would reduce the potential for migration of contamination into overlying groundwater, underlying bedrock, and potentially surface water.

4.3.6.3. DAPL 4B Compliance with ARARs

A detailed evaluation of ARAR compliance for Alternative DAPL 4B is provided in **Tables 2.1-7 and 2.1-8**. The ARAR analysis is the same for DAPL 4A and DAPL 4B, which differ only in the number of extraction wells and the extraction rate. The following describes DAPL 4B's compliance with ARARs:

- Chemical-specific ARARs: DAPL extraction and treatment is an interim step that is not based on attainment of concentrations of specific ARARs. Because this alternative would not be expected to attain chemical-specific ARARs, PRGs were not developed based on any chemical-specific ARARs. Instead, DAPL will 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. This definition will be re-evaluated as part of the remedy design. The achievement of chemical-specific ARARs in groundwater would be addressed in the final remediation action that addresses the restoration of groundwater.
- Action-specific ARARs: Work will comply with action-specific ARARs as listed in **Table 2.1-7**.
- Location-specific ARARs: Work in areas with location-specific ARARs will be performed in accordance with those ARARs (**Table 2.1-8**).

4.3.6.4. DAPL 4B Long-term Effectiveness and Permanence

The following describes the long-term effectiveness and permanence of Alternative DAPL 4B:

- Magnitude of residual risk: The magnitude of residual risk would be reduced with the removal of DAPL. Residual risk would be reduced. Any remaining DAPL may migrate via bedrock fractures and serve as a source of contamination to both overburden and bedrock groundwater via diffusion.
- Adequacy and reliability of controls: Once removed, the DAPL would not pose further risk to potential future receptors or the environment. This would represent a permanent reduction in risk. This alternative combines a larger number of extraction wells, allowing for significant flexibility and targeting of bedrock low spots and isolated basins to capture as much residual DAPL as possible.

4.3.6.5. DAPL 4B Reduction of Toxicity, Mobility, or Volume Through Treatment

The following describes the reduction in toxicity, mobility, and volume of contaminants by Alternative DAPL 4B:

- Treatment process used and materials treated: DAPL will be treated on-site. Details of the proposed treatment train are included in **Appendix D**.
- Amount of hazardous materials removed or treated: Alternative DAPL 4B would remove an estimated 13.3 million gallons of DAPL for on-site treatment. This estimate will be refined based on investigations to better define the bedrock topography and elevation of the top of DAPL in the area.
- Reduction of toxicity, mobility or volume through treatment: DAPL would be removed from the subsurface and treated on-site, thereby removing a major source for migration of contaminants in groundwater. Details of the proposed treatment train are included in **Appendix D.**
- Degree to which the treatment is reversible: Removal of DAPL from the subsurface is irreversible. Only liquid would be removed; therefore, trace levels of DAPL precipitate remaining in the subsurface may be remobilized in the future if the aquifer geochemistry changes. DAPL treatment is irreversible.
- Type and quantity of residuals remaining after treatment: Treatment residuals, sludge (metals precipitates) and evaporated solids, will be created from the treatment process. The residuals are expected to be non-hazardous. Approximately 14,816 tons of solids

residuals will require off-site disposal. In addition, DAPL precipitates and isolated residual DAPL would remain in the subsurface after the readily extractable liquid is removed.

- Satisfies statutory preference for treatment: DAPL extraction and on-site treatment does satisfy the statutory preference for treatment.

4.3.6.6. DAPL 4B Short-term Effectiveness

The following describes the short-term effectiveness of Alternative DAPL 4B:

- Risks to the community during implementation of remedial action: Installation of extraction and monitoring wells would involve minimal risk to the community and would follow BMPs to alleviate community concerns. DAPL would be piped from the extraction points to a collection tank on the Olin Property. Off-Property piping is expected to be routed underground. Risks from DAPL treatment and off-site disposal of residual solids are expected to be low. Overall risk to the community is low.
- Risks to workers during implementation of remedial action: Installation of extraction and monitoring wells would involve standard construction risks. Risks during extraction and treatment system O&M would be minimal and would be addressed using BMPs.
- Environmental impacts: BMPs during construction and system operation would minimize the likelihood and severity of any DAPL releases. The system would use existing pipelines to the extent practicable, minimizing environmental impacts. DAPL risks to the environment during transportation for off-site disposal of treatment residuals are relatively low.
- Sustainability: Alternative DAPL 4B would require moderate resources to treat the DAPL on-site and to transport and dispose of treatment residuals off-site, and some resource to conduct system O&M; however, these impacts would be of short duration (estimated to be less than 6 years).
- Time until RAOs are met: Potential for human exposure would be addressed once institutional controls are in place for the Main Street DAPL pool. DAPL removal is anticipated to be completed within 6 years of system construction.

4.3.6.7. DAPL 4B Implementability

The following describes the implementability of Alternative DAPL 4B:

- Ability to construct and operate the technology: Alternative DAPL 4B would use similar technologies that have already been shown to be effective for the off-PWD DAPL pool.

Alternative 4B would require some coordination and approvals with off-Property landowners to allow for installation of site infrastructure including extraction and monitoring points and piping, particularly given the large number of wells and other infrastructure associated with this alternative. There are no significant technical barriers or complications for installation of extraction wells and piping. Treatability studies will be required to determine the treatment train, technologies, and materials required to effectively treat the extracted DAPL. Five-year reviews and institutional controls are readily implemented.

- Reliability of the technology: Based on the off-PWD DAPL pool Pilot Test, the DAPL extraction is expected to be reliable. On-site treatment should undergo a bench-scale and/or pilot test prior to full-scale implementation.
- Ease of implementing additional remedial actions: Future remedial actions could be readily implemented.
- Ability to monitor remedy effectiveness: DAPL recovery and DAPL pool response would be effectively monitored with nearby monitoring points, like the Pilot Test.
- Ability to obtain approvals from other agencies: No barriers to other agency approvals have been identified.
- Coordination with other agencies: No issues have been identified with respect to coordination with other agencies.
- Availability of off-site TSDFs: The DAPL will be treated on-site and treatment residuals (sludge/solid) will require disposal at an off-site TSDF. The treatment residuals are expected to be disposed of off-site as non-hazardous waste.
- Availability of necessary equipment and specialists: DAPL extraction uses readily available remedial technology. Some infrastructure is already in place to transport and store DAPL prior to treatment. Bench-scale and/or pilot testing will be conducted during the design phase to assess the DAPL treatment train proposed in **Appendix D**.
- Availability of prospective technologies: Technologies to extract DAPL are readily available. Bench-scale and/or pilot testing will be conducted during the design phase to assess the DAPL treatment train proposed in **Appendix D**.

4.3.6.8. DAPL 4B Cost

Costs for Alternative DAPL 4B are provided in **Table 4.3-7**. The estimated capital costs for this alternative are about $3.3 million. The total cost estimate is about $22,305,000 and the present

value is estimated to be about $18,614,000. These costs are based on a DAPL volume of 13.3 million gallons and up to twelve extraction wells.

The cost estimate for this alternative, presented in **Table 4.3-7**, is summarized as follows:

Alternative DAPL 4B: DAPL Extraction in the Main Street DAPL Pool	
Capital Cost	$3,300,000
O&M Costs	$19,005,000
Total Cost	$22,305,000
Net Present Worth	$18,614,000
Overall Alternative Duration	30 years

4.4 Groundwater Hot Spot Alternatives

The following sections present the detailed evaluation of Alternatives GW 2 through GW 5.

4.4.1 Alternative GW 2: Groundwater Hot Spot Extraction from Two New Extraction Wells Within the 11,000 ng/L NDMA Contour

This alternative includes installation of two new deep overburden groundwater extraction wells placed near existing wells GW-58D and GW-83D to extract groundwater containing NDMA within the 11,000 ng/L contour intervals. Extracted groundwater would be conveyed to a new groundwater treatment plant, treated, and discharged appropriately to surface water. The new treatment plant would be constructed to treat Site-specific COCs including NDMA to meet discharge standards. Proposed extraction well locations, conveyance lines, and a hypothetical location for the groundwater treatment plant to be constructed on the Olin Property are shown on **Figure 4.4-1**. The new extraction wells would target groundwater within the 11,000 ng/L NDMA contour intervals.

As shown on **Figure 4.4-1**, conveyance piping would connect the two new extraction wells to the on-site location where the treatment system would be constructed. The proposed remediation infrastructure would also include the effluent conveyance system.

Alternative GW 2 is considered an interim remedy. However, there is potential for components or infrastructure constructed for this interim action to be used for a subsequent, long-term remedy.

4.4.1.1. Components of Alternative GW 2

This alternative includes the following major components:

- Institutional Controls
- Adjustment of the location of extraction wells as needed, per the DGWP
- Pre-design investigation and remedial design, followed by review and approval by USEPA
- Agreements with the appropriate parties for access to the wetland in Maple Meadow Brook at GW-83D and with the Town of Wilmington and property owners where conveyance lines would be constructed
- Construction of an access road in Maple Meadow Brook to the area around GW-83D and the marshy area around GW-58D
- Drilling and construction of the two new groundwater extraction wells
- Preparation of the area on-site and performance of civil site work
- Construction of the new groundwater treatment plant
- Connection of conveyance piping and associated surface water discharge infrastructure
- Installation of conveyance piping from the two extraction wells to the new groundwater treatment plant.
- O&M of system components, including solids handling and disposal
- Post-remediation groundwater verification sampling to confirm achievement of RAOs for groundwater hot spots; this would be performed prior to decommissioning of the treatment system and reporting
- Reporting
- Five-Year Reviews

Estimated Duration for Alternative GW 2. Before groundwater extraction begins, approximately 6-12 months will be required for access road construction, new extraction well installation, conveyance piping installation, and civil site work and treatment plant construction. After construction and once the two new extraction wells are operational, the minimum time to

extract 1.5 pore volumes of groundwater from within the 11,000 ng/L NDMA zone[12] is approximately 2.5 years, based on a constant combined extraction rate of 20 gpm.

The exact location of the two extraction wells for this alternative would be selected based on the additional information obtained during implementation of the DGWP and pre-design investigation. The actual location of the groundwater treatment plant would be determined as part of pre-design activities. For purposes of this alternative, the treatment plant is assumed to be located just south of Plant B.

Institutional Controls. Institutional controls will be developed to prevent potential exposure to contaminated groundwater and to minimize the migration of contaminated groundwater.

Adjustment of location/number of extraction wells as needed, per the DGWP. The overall purpose of the DGWP is to install additional monitoring wells and collect further groundwater data to better characterize the lateral and vertical extent of NDMA in groundwater. The exact location of the extraction wells for this alternative may be modified based on the additional information obtained during implementation of the DGWP.

Pre-Design Investigation. The pre-design investigation would be more focused on extraction well design. The pre-design investigation would develop hydraulic data to revise, update, and support calibration of the existing groundwater flow model, which would be updated and used to evaluate optimal well placement for two extraction wells optimal and pumping rates for groundwater capture. Such modeling would also provide quantitative insight on the vertical capture of underlying bedrock groundwater through pumping of deep overburden groundwater. Additionally, the actual location of the groundwater treatment plant would be determined as part of pre-design activities.

Remedial Design. Following implementation of the DGWP and the pre-design investigation, a remedial design would be developed for review and approval by USEPA. The design for remediation infrastructure and the details of the post-construction monitoring program would be developed utilizing information from the DGWP and pre-design investigations, as well as the RAOs.

Access Agreements. Much of the infrastructure for this alternative would not be located on the Olin Property. Extraction wells, access roads through the wetlands, conveyance piping, and

[12] Estimated groundwater pore volume within the 11,000 ng/L NDMA isoconcentration line is about 17.1 million gallons.

access vaults would be located outside of the Olin Property. Thus, new access agreements, as well as revisions to existing access agreements, would be needed with the appropriate parties for access to the wetland in Maple Meadow Brook at GW-83D and with the Town of Wilmington and property owners where conveyance lines would be constructed.

MMB Access Road Construction. This alternative requires construction of access roads in Maple Meadow Brook to the areas around GW-83D and GW-58D for installation of the new extraction wells and associated conveyance piping. The access roads would consist of a temporary mat road and/or a permanent road. A large temporary mat road may be required to decrease wetland impacts and still allow for well drilling equipment and construction equipment to access the required areas in the marsh. These activities would inherently have impacts on the wetland in which construction would be occurring.

Construction of New Groundwater Extraction Wells. After access roads have been installed, drilling and construction equipment would install three new groundwater extraction wells near existing monitoring wells near existing monitoring wells GW-83D and GW-58D.

Installation of New Groundwater Treatment System. After remedial design, site preparation work would be completed and the new groundwater treatment plant, conveyance piping, and associated surface water discharge infrastructure would be constructed. The proposed locations of these system components are shown on **Figure 4.4-1**. The exact location of the treatment plant and piping runs would be verified during the design phase.

The groundwater treatment system would consist of an influent equalization tank; a hypochlorite flash mixer tank for oxidation and removal of metals (iron and manganese) and breakpoint chlorination removal of ammonia; a slow mix flocculation unit; lamella clarifier; GAC unit to ensure high water clarity and UV transmittance; UV oxidation chambers for destruction/removal of NDMA; a cone bottom tank to thicken solids from the oxidation unit and clarifier; and plate-and-frame filter press for solids dewatering.

Installation of Conveyance Piping. Approximately 4,700 feet of conveyance piping would be installed from the two extraction wells to the new groundwater treatment plant. Conveyance piping would be installed underground for frost protection and in accordance with access agreements with property owners. Trenching for pipe installation in and around Maple Meadow Brook may require localized dewatering to minimize the wet conditions for pipe installation. The effluent conveyance piping would use the same utility trench as the main trunk line of the extracted groundwater conveyance piping, which would help consolidate and reduce additional wetland impacts.

Operations and Maintenance. This alternative would require include O&M of the two groundwater extraction wells, conveyance piping, access vaults, groundwater treatment system

components, and discharge piping, as well as solids management and periodic reporting. The estimated operational period to extract 1.5 pore volumes from the 11,000 ng/L NDMA contour intervals using two extraction wells is approximately 2.5 years. Specific system operation, monitoring, and maintenance requirements would be established during remedial design. A preliminary assessment includes the following O&M items.

- Regularly maintain the extraction system, including inspection of the conveyance line and access vaults, as needed.
- Monitor operation of the treatment system, accessible via remote supervisory control and data acquisition (SCADA) system.
- Maintain proper feed rates of sodium hypochlorite for oxidation and removal iron and manganese and breakpoint chlorination removal of ammonia in the mix tank.
- Maintain addition of lime and/or flocculant to adjust pH and optimize slow mix flocculation, and ensure proper settling in the lamella clarifier unit.
- Ensure proper operation of the UV chamber and replace UV lamps.
- Oversee precipitated solids thickening and O&M of automated plate and frame filter press for solids dewatering.
- Ensure regular disposal of dewatered solids. Sample for waste characterization. If solids meet hazardous waste criteria, dewater further to minimize moisture content/water weight of solids before disposal as hazardous waste.

As a component of O&M, system monitoring and performance report(s) would be prepared to document treatment system O&M.

Verification Sampling and Reporting. Remedial Action Reports would be prepared to document treatment system installation, start-up, initial operational period, and post-remediation verification sampling results. During O&M, periodic system monitoring and performance report(s) would be prepared to document treatment system O&M. A post-remediation verification sampling program would be conducted to confirm achievement of RAOs for groundwater hot spots. This sampling program would include collecting groundwater samples from monitoring wells, as well as the extraction wells, and analyzing the samples for NDMA and other Site-related COCs. Post-remediation groundwater verification samples would confirm achievement of RAOs for groundwater hot spots prior to decommissioning of the treatment system.

Five-Year Reviews. CERCLA requires that any interim remedial action that results in contaminants remaining on-site at concentrations above those allowing for unlimited exposure

and unrestricted use must be reviewed every five years. Although it is anticipated that this alternative would meet the RAO for groundwater hot spots in approximately 2.5 years, COCs may remain in groundwater at concentrations that may not allow for unlimited use and unrestricted exposure. Therefore, Five-Year Reviews will be conducted as required under CERCLA. For cost estimating purposes, this alternative assumes that Five-Year Reviews will be conducted throughout the 30-year project duration.

4.4.1.2. GW 2 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment by reducing potential risk and potential exposure pathway by removing and treating contaminated groundwater hot spots to remove COCs, including NDMA in groundwater containing NDMA within the 11,000 ng/L contour intervals. Institutional controls will be implemented to prevent use of or contact with contaminated water, reducing potential risk and potential exposure.

This alternative will remediate highly contaminated NDMA-containing groundwater to reduce, to the extent practicable, the mass of Site contaminants and the further horizontal and vertical migration of Site contaminants in groundwater hot spots, including penetration into bedrock. This alternative will also prevent potential human exposure by a future resident to groundwater containing Site contaminants above levels that pose an unacceptable risk. Thus, the RAOs for groundwater hot spots will be met with Alternative GW 2.

4.4.1.3. GW 2 Compliance with ARARs

Because this alternative would not be expected to attain chemical-specific ARARs, PRGs were not developed based on any chemical-specific ARARs. The achievement of chemical-specific ARARs in groundwater would be addressed in the final remediation action that addresses the restoration of groundwater. Alternative GW 2 would be designed and implemented to comply with ARARs that are identified in **Tables 2.1-9 through 2.1-10**, for location-specific and action-specific ARARs for groundwater alternatives.

Location-Specific ARARs (Table 2.1-9). There are several location-specific ARARs associated with the location of the groundwater hot spot 11,000 ng/L NDMA area proposed for remediation. Specifically, the 11,000 ng/L NDMA area around existing deep overburden groundwater monitoring well GW-83D, which is located in the wetland around Maple Meadow Brook. GW-83D is located just to the west of Maple Meadow Brook. There are floodplains and wetlands associated with the proposed locations of extraction wells at GW-83D and for the conveyance piping connecting this extraction well to the new on-site groundwater treatment plant. Similarly, the proposed discharge of treated effluent from the groundwater treatment

system is to the wetland of Maple Meadow Brook. The effluent conveyance piping would use the same utility trench as the main trunk line of the extracted groundwater conveyance piping, which would help consolidate and reduce additional wetland impacts. For construction and installation, temporary pond mat board roads would be used which would reduce wetland impacts. However, a permanent road may need to be constructed in the wetland to allow access for maintenance of the extraction well and conveyance piping infrastructure.

Floodplain management and protection of wetlands would be done during groundwater extraction well and conveyance piping installation in Maple Meadow Brook. All practical measures would be taken to minimize and mitigate any adverse impacts. Erosion and sediment control measures would be adopted during remedial activities to protect the wetlands and floodplains. After completion of work, there would be no significant net loss of flood storage capacity and no significant net increase in flood stage or velocities. Floodplain habitat would be restored to the extent practicable. Public comment would be solicited as part of the Proposed Plan concerning any proposed alteration to wetlands and floodplains.

Compensatory wetlands mitigation would be done to for this remedial alternative to comply with Clean Water Act section 404 and the Massachusetts Wetland Protection Act and Regulations, which have been identified as applicable location-specific requirements. Ultimately, the alternative selected by USEPA would be evaluated and determined to be the least environmentally damaging practicable alternative that meets the RAOs for groundwater hot spots.

Any hazardous waste and any solid waste generated during remedial activities (investigation derived waste, drill cuttings, well development material, purge water, etc.) would be managed so that it would not impact floodplain resources. Waste management would comply with RCRA floodplain restrictions for hazardous waste facilities, RCRA floodplain restrictions for solid waste disposal facilities and practices, Massachusetts hazardous waste regulations, as well as location standards for land subject to flooding. To the extent any hazardous waste is generated during the remedial activities, the wastes would be managed so that it would not impact floodplain resources.

The installation of an extraction well in the Maple Meadow Brook wetland, at GW-83D, would involve the creation of drill cuttings. These drill cuttings would be dewatered and disposed of as appropriate. Additionally, the installation of conveyance piping would be done using trenching to provide frost protection. Trenching in the wetlands may involve dredged material. Compensatory mitigation would need to be performed to comply with the Massachusetts Water Quality Certification for Discharge of Dredged or Fill Material. Any required removal of

soil/sediment from wetland or surface water areas would be designated for eventual restoration. Excavation and filling activities to be performed impacting the aquatic ecosystem would be in accordance with the substantive requirements of these regulations.

The Massachusetts Areas of Critical Environmental Concern (ACECs) regulations are identified as applicable if an ACEC is identified. No known ACECs have been identified at the Site, but if an ACEC is identified, activities would be controlled to minimize impacts to affected species or resources.

This alternative would be designed and implemented to minimize impacts to the wetland areas. This includes the use of temporary mat pond board roads for construction equipment where possible. Restoration activities for any areas impacted would be implemented to comply with location-specific ARARs identified in **Table 2.1-9**.

Action-Specific ARARs. Any wastes generated during remedial activities would be analyzed under the federal and state standards identified in **Table 2.1-10** to determine whether the wastes are listed or characteristic hazardous waste. Non-hazardous wastes would be disposed of appropriately. Any waste generated during remedial activities that is determined to be hazardous waste would be managed in accordance with these regulations.

Clean Water Act National Pollutant Discharge Elimination System (NPDES) requirements would be met for the groundwater treatment system discharge (if surface water discharge is identified as a more appropriate discharge mechanism than discharge to the municipal sewer) as well as for storm water management (if land disturbing activities for well installation and trenching for conveyance piping installation exceed one acre). The groundwater treatment system would be designed and constructed to have the effluent discharge meet the substantive discharge standards (the Massachusetts Surface Water Discharge Permit Program [314 CMR 3.00] has similar requirements).

If any liquid waste streams are to be discharged to a publicly owned treatment works (POTW), pretreatment of such waste streams would be evaluated for compliance with applicable requirements of the federal General Pretreatment Regulations for Existing and New Sources of Pollution and the MassDEP Operation, Maintenance and Pretreatment standards for Wastewater Treatment Works and Indirect Dischargers.

This alternative does not have underground injection as a component. However, if re-injection or infiltration of treated water is identified as the appropriate discharge mechanism of treated effluent, the underground injection control (UIC) programs for Massachusetts and the federal regulations would be considered.

Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs), SDWA non-zero maximum contaminant level goals (MCLGs), Massachusetts MCLs, Massachusetts non-zero MCLGs, and "to be considered" criteria or guidance (e.g., health advisories, RSLs, and risk assessment guidelines) will be used or considered in determining the extent of required institutional controls for groundwater.

4.4.1.4. GW 2 Long-term Effectiveness and Permanence

This alternative is focused on achieving the RAOs for groundwater hot spots. The first RAO is reduce, to the extent practicable, the mass of Site contaminants in highly contaminated groundwater. The second RAO is to reduce, to the extent practicable, the further horizontal and vertical migration of Site contaminants in groundwater hot spots, including penetration into bedrock. The third RAO is to prevent human exposure by a future resident to groundwater containing Site contaminants above levels that pose an unacceptable risk.

Alternative GW 2 would meet the RAOs for groundwater hot spots and would thus provide long-term effectiveness and permanence by extracting and treating groundwater hot spots. Capture and extraction of groundwater hot spots from within the 11,000 ng/L NDMA contour intervals around GW-83D and GW-58D and subsequent treatment would permanently remove NDMA and Site-related COCs from the aquifer and from groundwater. This would minimize further horizontal and vertical migration of groundwater COCs while also reducing the potential for human exposure to Site-related groundwater containing Site contaminants above levels that pose an unacceptable risk.

The new on-site groundwater treatment plant will remediate extracted groundwater prior to its discharge to surface water. To maintain effective long-term treatment and permanent removal of contaminants, the treatment system components, especially the UV-oxidation units for NDMA removal, must be maintained for the duration of use. O&M of the system during the estimated 2.5 years required for extraction of 1.5 pore volumes of groundwater inside the 11,000 ng/L NDMA contour intervals has been included in the cost estimate for Alternative GW 2. System performance monitoring (e.g., treated water discharge monitoring) will verify effective treatment and would be used to measure compliance with the RAOs.

The Institutional controls implemented to prevent potential risk from and migration of contaminated groundwater, such as restrictions on groundwater use and prohibitions on installation of wells, will prevent use of or contact with contaminated groundwater, reducing potential risk and potential exposure both during and after the 2.5 years of groundwater pumping from the two new extraction wells. Post-remediation groundwater sampling will be

used to verify achievement of RAOs and long-term protection of human health and the environment. Because COCs may remain at concentrations that may not allow for unlimited use and unrestricted exposure, Five-Year Reviews will be conducted as required under CERCLA to periodically evaluate protectiveness of the remedy.

4.4.1.5. GW 2 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative GW 2 would reduce the toxicity, mobility, and volume of contaminated groundwater through extraction and treatment. This alternative would include the extraction and treatment of groundwater hot spots within the 11,000 ng/L NDMA contour intervals around existing monitoring wells GW-58D and GW-83D (**Figure 4.4-1**), thereby reducing the toxicity and volume of contaminated groundwater. Each new extraction well would create a capture zone for groundwater hot spots and decrease the flux of contaminants from areas of higher concentration to the dilute plume, thereby reducing mobility by minimizing further horizontal and vertical migration of hot spot groundwater. In addition, NDMA and other site COCs would be permanently destroyed through treatment of extracted groundwater.

The total pore volume of groundwater hot spots within the 11,000 ng/L NDMA contour intervals was calculated by USEPA/Nobis to be 64,650 cubic meters, or about 17.1 million gallons. A very simple estimate of the mass of NDMA that would be extracted and treated by this alternative is approximately 1,715 grams of NDMA.[13] In practice, the NDMA concentration in extracted groundwater would vary widely due to the complexities of flow within the deep overburden and bedrock. The timeframe for this alternative is about 2.5 years for extraction of 1.5 pore volumes of groundwater (25.6 million gallons) using two extraction wells pumping at 10 gallons per minute each.

A more thorough evaluation of mass removal of NDMA and other Site-related COCs will be conducted as part of the remedial design. Additionally, the exact number and location of extraction wells would be selected based on the additional information obtained during implementation of the DGWP and pre-design investigations.

[13] This estimate assumes an average NDMA concentration of 26,500 ng/L throughout the total pore volume of 17.1 million gallons. The average concentration is based on groundwater analytical data collected between March and May 2019 from GW-58D and GW-83D, which are near the proposed extraction well locations.

4.4.1.6. GW 2 Short-term Effectiveness

This alternative is effective in the short term in that it would meet the groundwater-specific RAOs and also be protective of public health during implementation. Potential short-term risks to the community would be addressed by minimizing dust, decontaminating vehicles transporting materials to and from the Site and construction areas, and minimizing vehicular traffic associated with the remediation efforts from traveling through residential areas to the extent possible.

There are potential short-term risks to site remediation workers due to exposure to potentially contaminated drill cuttings and groundwater; however, these risks can be addressed by development and implementation of a site-specific health and safety plan. Potential short-term risks to drillers and construction workers would be reduced by following a site-specific health and safety plan.

By including Institutional Controls in this alternative, the alternative would prevent in the short term exposure via potable use to COCs at concentrations above levels that pose an unacceptable risk. This alternative would also be protective of the environment by meeting discharge standards prior to discharging treated effluent to surface water.

4.4.1.7. GW 2 Implementability

The major components of Alternative GW 2 are technically implementable. The technical components include construction of access roads into the wetlands, installation of new extraction wells, construction of conveyance piping and the new groundwater treatment plant, O&M of the extraction and treatment system, post-remediation groundwater verification sampling to confirm achievement of RAOs in groundwater; and Five-Year Reviews. The technologies that would be used to implement this alternative are readily available and sufficiently demonstrated for use at the Site, and the necessary equipment and materials are readily available for construction, installation, and operation of Alternative GW 2.

Administratively, Alternative GW 2 is not straightforward to implement due to the logistics of gaining construction access and working in the Maple Meadow Brook wetland. Negotiating access agreements and gaining the necessary approvals from property owners for use of public and private land for installation of conveyance piping will present substantial administrative challenges. Dual-wall conveyance piping (about 5,900 feet) would most likely be installed underground for frost protection and would be installed as per access agreements with property owners.

The locations of the proposed treatment plant and associated piping would be confirmed during the remedial design phase. It would be necessary to secure adequate space for the new groundwater treatment plant on-site and associated treated effluent discharge piping.

Alternative GW 2 includes extraction of groundwater hot spots from two wells installed near existing monitoring wells GW-83D and GW-58D. These wells are downgradient of, but not over, the Main Street DAPL pool. Because the proposed extraction well locations are not directly over a DAPL pool, extraction from these wells at relatively low pumping rates (e.g., 5-10 gpm) is not expected to cause upwelling, entrainment, or capture of DAPL (as has been observed during past operation of the Sanmina wells; Wood, 2019a).

Some precipitation or fouling may occur near the two new extraction well screens but will likely be negligible. Precipitation would reduce efficiency of groundwater extraction and ultimately affect the overall objective of this alternative. In this scenario, the groundwater hot spot extraction wells could become less hydraulically conductive. This could render the groundwater hot spots extraction wells less efficient at decreasing the mass of NDMA.

4.4.1.8. GW 2 Cost

The cost for Alternative GW 2 is presented in **Table 4.4-1**. The estimated capital cost (rounded to the nearest thousand dollars) is $7,474,000, which includes construction of access roads, installation of two new extraction wells, installation of conveyance piping, and construction of a new treatment plant. The treatment plant includes unit operations for oxidation, precipitation, and clarification of iron and manganese; breakpoint chlorination for ammonia removal; GAC adsorption; UV oxidation for NDMA removal; and precipitated solids dewatering. Estimated treatment plant costs also include civil site work; a building to house the treatment system; and mechanical, electrical, and control systems.

Estimated annual cost over the 2.5 years of the active portion of this alternative (groundwater extraction and treatment) consist of system O&M, which would include treatment chemicals, UV replacement lamps, electricity, and system performance monitoring. Because COCs may remain at concentrations that may not allow for unlimited use and unrestricted exposure, it is assumed that Five-Year Reviews will be conducted as required under CERCLA every five years for the 30-year project duration.

The cost estimate for this alternative, presented in **Table 4.4-1**, is summarized as follows:

Alternative GW 2: GW Hot Spot Extraction from 2 New Extraction Wells from Within the 11,000 ng/L NDMA Contour	
Capital Cost	$7,470,000
O&M Costs	$1,171,000
Total Cost	$8,641,000
Net Present Worth	$8,404,000
Overall Alternative Duration	30 years

4.4.2 Alternative GW 3: Groundwater Hot Spot Extraction from Three New Extraction Wells Within the 11,000 ng/L NDMA Contour

This alternative includes installation of three new deep overburden groundwater extraction wells placed near existing wells GW-58D, GW-83D, and GW-84D to extract groundwater containing NDMA within the 11,000 ng/L contour intervals. Extracted groundwater would be conveyed to a new groundwater treatment plant, treated, and discharged appropriately to surface water. The new treatment plant would be constructed to treat Site-specific COCs including NDMA to meet discharge standards. Proposed extraction well locations, conveyance lines, and a hypothetical location for the groundwater treatment plant to be constructed on the Olin Property are shown on **Figure 4.4-2**. The three extraction wells would target groundwater within the 11,000 ng/L NDMA contour intervals.

As shown on **Figure 4.4-2**, conveyance piping would connect the three new extraction wells to the on-site location where the treatment system would be constructed. The proposed remediation infrastructure would also include the effluent conveyance system.

Alternative GW 3 is considered an interim remedy. However, there is potential for components or infrastructure constructed for this interim action to be used for a subsequent, long-term remedy.

4.4.2.1. Components of Alternative GW 3

This alternative includes the following major components:

- Institutional Controls
- Adjustment of the location of extraction wells as needed, per the DGWP
- Pre-design investigation and remedial design, followed by review and approval by USEPA
- Agreements with the appropriate parties for access to the wetland in Maple Meadow Brook at GW-83D and GW-84D and with the Town of Wilmington and property owners where conveyance lines would be constructed
- Construction of access roads in Maple Meadow Brook to the areas around GW-83D and GW-84D and the marshy area around GW-58D
- Drilling and construction of the three new groundwater extraction wells
- Preparation of the area on-site and performance of civil site work
- Construction of the new groundwater treatment plant
- Connection of conveyance piping and associated surface water discharge infrastructure
- Installation of conveyance piping from the three extraction wells to the new groundwater treatment plant.
- O&M of groundwater extraction wells, conveyance piping, access vaults, groundwater treatment system components, solids handling and disposal.
- Post-remediation groundwater verification sampling to confirm achievement of RAOs for groundwater hot spots; this would be performed prior to decommissioning of the treatment system and reporting
- Reporting
- Five-Year Reviews

Estimated Duration for Alternative GW 3. Before extraction begins, approximately 6-12 months will be required for access road construction, new extraction well installation, conveyance piping installation, and civil site work and treatment plant construction. After construction and once the three new extraction wells are operational, the minimum time to extract 1.5 pore volumes of groundwater from within the 11,000 ng/L NDMA zone[14] is estimated at about 1.6 years, based on a constant combined extraction rate of 30 gpm.

[14] Estimated groundwater pore volume within the 11,000 ng/L NDMA isoconcentration line is about 17.1 million gallons.

The exact location of the three extraction wells for this alternative would be selected based on the additional information obtained during implementation of the DGWP and pre-design investigation. The actual location of the groundwater treatment plant would be determined as part of pre-design activities. For purposes of this alternative, the treatment plant is assumed to be located just south of Plant B.

Implementation of Institutional Controls. Institutional controls to prevent exposure to contaminated groundwater and to minimize the migration of contaminated groundwater.

Adjustment of location/number of extraction wells as needed, per the DGWP. The overall purpose of the DGWP is to install additional monitoring wells and collect further groundwater data to better characterize the lateral and vertical extent of NDMA in groundwater. The exact location of the extraction wells for this alternative may be modified based on the additional information obtained during implementation of the DGWP.

Pre-Design Investigation. The pre-design investigation would be more focused on extraction well design. The pre-design investigation would develop hydraulic data to revise, update, and support calibration of the existing groundwater flow model, which would be updated and used to evaluate optimal well placement for three extraction wells optimal and pumping rates for groundwater capture. Such modeling would also provide quantitative insight on the vertical capture of underlying bedrock groundwater through pumping of deep overburden groundwater. Additionally, the actual location of the groundwater treatment plant would be determined as part of pre-design activities.

Remedial Design. Following implementation of the DGWP and the pre-design investigation, a remedial design would be developed for review and approval by USEPA. The design for remediation infrastructure and the details of the post-construction monitoring program would be developed utilizing information from the DGWP and pre-design investigations, as well as the RAOs. This information would inform the number and location of extraction wells, as well as pumping rates, which could result in significant changes to estimated FS-level capital and operating costs.

Access Agreements. Much of the infrastructure for this alternative would not be located on the Olin Property. Extraction wells, access roads through the wetlands, conveyance piping, and access vaults would be located outside of the Olin Property. Thus, new agreements, as well as revisions to existing agreements, would be needed with the appropriate parties for access to the wetland in Maple Meadow Brook at GW-83D and GW-84D and with the Town of Wilmington and property owners where conveyance lines would be constructed.

Maple Meadow Brook Access Road Construction. This alternative requires construction of access roads in Maple Meadow Brook to the area around GW-83D and GW-84D and the area around GW-58D for installation of the new extraction wells and associated conveyance piping. The access roads would consist of a temporary mat road and/or a permanent road. A large temporary mat road may be required to decrease wetland impacts and still allow for well drilling equipment and construction equipment to access the required areas in the marsh. These activities would inherently have impacts on the wetland in which construction would be occurring.

Construction of New Groundwater Extraction Wells. After access roads have been installed, drilling and construction equipment would install three new groundwater extraction wells near existing monitoring wells GW-58D, GW-83D, and GW-84D.

Installation of New Groundwater Treatment System. After remedial design, site preparation work would be completed and the new groundwater treatment plant, conveyance piping, and associated surface water discharge infrastructure would be constructed. The proposed locations of these system components are shown on **Figure 4.4-2**. The exact location of the treatment plant and piping runs would be verified during the design phase. The conceptual design for the Alternative GW 3 groundwater treatment system has the same unit operations as the treatment system described in Section 4.4.1.1 for Alternative GW 2.

Installation of Conveyance Piping. Approximately 5,300 feet of conveyance piping would be installed from the three extraction wells to the new groundwater treatment plant. Conveyance piping would be installed underground for frost protection and in accordance with access agreements with property owners. Trenching for pipe installation in and around Maple Meadow Brook may require some localized dewatering to minimize wet conditions during pipe installation. The effluent conveyance piping would use the same utility trench as the main trunk line of the extracted groundwater conveyance piping, which would help consolidate and reduce additional wetland impacts.

Operations and Maintenance. O&M for this remedial alternative includes O&M of the three groundwater extraction wells, conveyance piping, access vaults, groundwater treatment system components, and discharge piping, as well as solids management and periodic reporting. The estimated operational period to extract 1.5 pore volumes from the 11,000 ng/L NDMA contour intervals using three extraction wells is approximately 1.6 years. Specific system operation, monitoring, and maintenance requirements would be established during remedial design. A preliminary assessment includes the following O&M items:

- Regularly maintain the extraction system, including inspection of the conveyance line and access vaults, as needed.
- Monitor operation of the treatment system, accessible via remote supervisory control and data acquisition (SCADA) system.
- Maintain proper feed rates of sodium hypochlorite for oxidation and removal iron and manganese and breakpoint chlorination removal of ammonia in the mix tank.
- Maintain addition of lime and/or flocculant to adjust pH and optimize slow mix flocculation, and ensure proper settling in the lamella clarifier unit.
- Ensure proper operation of the UV chamber and replace UV lamps.
- Oversee precipitated solids thickening and O&M of automated plate and frame filter press for solids dewatering.
- Ensure regular disposal of dewatered solids. Sample for waste characterization. If solids meet hazardous waste criteria, dewater further to minimize moisture content/water weight of solids before disposal as hazardous waste.

As a component of O&M, system monitoring and performance report(s) would be prepared to document treatment system O&M.

Verification Sampling and Reporting. Remedial Action Reports would be prepared to document treatment system installation, start-up, initial operational period, and post-remediation verification sampling results. During O&M, periodic system monitoring and performance report(s) would be prepared to document treatment system O&M. A post-remediation verification sampling program would be conducted to confirm achievement of RAOs for groundwater hot spots. This sampling program would include collecting groundwater samples from monitoring wells, as well as the extraction wells, and analyzing the samples for NDMA and other Site-related COCs. Post-remediation groundwater verification samples would confirm achievement of RAOs for groundwater hot spots prior to decommissioning of the treatment system.

Five-Year Reviews. CERCLA requires that any interim remedial action that results in contaminants remaining on-site at concentrations above those allowing for unlimited exposure and unrestricted use must be reviewed every five years. Although it is anticipated that this alternative would meet the RAO for groundwater hot spots in approximately 1.6 years, COCs may remain in groundwater at concentrations that may not allow for unlimited use and unrestricted exposure. Therefore, Five-Year Reviews will be conducted as required under CERCLA. For cost estimating purposes, this alternative assumes that Five-Year Reviews will be conducted throughout the 30-year project duration.

4.4.2.2. GW 3 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment by reducing potential risk and potential exposure pathway by removing and treating contaminated groundwater hot spots to remove COCs, including NDMA in groundwater containing NDMA within the 11,000 ng/L contour intervals. Institutional controls will be implemented to prevent use of or contact with contaminated water, reducing potential risk and potential exposure.

This alternative will remediate highly contaminated NDMA-containing groundwater to reduce, to the extent practicable, the mass of Site contaminants and the further horizontal and vertical migration of Site contaminants in groundwater hot spots, including penetration into bedrock. This alternative will also prevent potential human exposure by a future resident to groundwater containing Site contaminants above levels that pose an unacceptable risk. Thus, the RAOs for groundwater hot spots will be met with Alternative GW 3.

4.4.2.3. GW 3 Compliance with ARARs

Because this alternative would not be expected to attain chemical-specific ARARs, PRGs were not developed based on any chemical-specific ARARs. The achievement of chemical-specific ARARs in groundwater would be addressed in the final remediation action that addresses the restoration of groundwater. Alternative GW 3 would be designed and implemented to comply with ARARs that are identified in **Tables 2.1-9 through 2.1-10**, for location-specific and action-specific ARARs for groundwater alternatives.

Location-Specific ARARs (Table 2.1-9). There are several location-specific ARARs associated with the location of the groundwater hot spot 11,000 ng/L NDMA area proposed for remediation. Specifically, the 11,000 ng/L NDMA area around existing deep overburden groundwater monitoring wells GW-83D and GW-84D, which are located in the wetland around Maple Meadow Brook. GW-83D is located just to the west of Maple Meadow Brook. There are floodplains and wetlands associated with the proposed locations of extraction wells at GW-83D and GW-84D and for the conveyance piping connecting these extraction wells to the new on-site groundwater treatment plant. Similarly, the proposed discharge of treated effluent from the groundwater treatment system is to the wetland of Maple Meadow Brook. The effluent conveyance piping would use the same utility trench as the main trunk line of the extracted groundwater conveyance piping, which would help consolidate and reduce additional wetland impacts. For construction and installation, temporary pond mat board roads would be used which would reduce wetland impacts. However, a permanent road may need to be constructed

in the wetland to allow access for maintenance of the extraction well and conveyance piping infrastructure.

Floodplain management and protection of wetlands would be done during groundwater extraction well and conveyance piping installation in Maple Meadow Brook. All practical measures would be taken to minimize and mitigate any adverse impacts. Erosion and sediment control measures would be adopted during remedial activities to protect the wetlands and floodplains. After completion of work, there would be no significant net loss of flood storage capacity and no significant net increase in flood stage or velocities. Floodplain habitat would be restored to the extent practicable. Public comment would be solicited as part of the Proposed Plan concerning any proposed alteration to wetlands and floodplains.

Compensatory wetlands mitigation would be done to for this remedial alternative to comply with Clean Water Act section 404 and the Massachusetts Wetland Protection Act and Regulations, which have been identified as applicable location-specific requirements. Ultimately, the alternative selected by USEPA would be evaluated and determined to be the least environmentally damaging practicable alternative that meets the RAOs for groundwater hot spots.

Any hazardous waste and any solid waste generated during remedial activities (investigation derived waste, drill cuttings, well development material, purge water, etc.) would be managed so that it would not impact floodplain resources. Waste management would comply with RCRA floodplain restrictions for hazardous waste facilities, RCRA floodplain restrictions for solid waste disposal facilities and practices, Massachusetts hazardous waste regulations, as well as location standards for land subject to flooding. To the extent any hazardous waste is generated during the remedial activities, the wastes would be managed so that it would not impact floodplain resources.

The installation of extraction wells would generate drill cuttings. These drill cuttings would be dewatered and disposed of as appropriate. Additionally, the installation of conveyance piping would be done using trenching to provide frost protection. Trenching in the wetlands may involve generation of dredged material. Compensatory mitigation would need to be performed to comply with the Massachusetts Water Quality Certification for Discharge of Dredged or Fill Material. Any required removal of soil/sediment from wetland or surface water areas would be designated for eventual restoration. Excavation and filling activities to be performed impacting the aquatic ecosystem would be in accordance with the substantive requirements of these regulations.

The Massachusetts Areas of Critical Environmental Concern (ACECs) regulations are identified as applicable if an ACEC is identified. No known ACECs have been identified at the Site, but if an ACEC is identified, activities would be controlled to minimize impacts to affected species or resources.

This alternative would be designed and implemented to minimize impacts to the wetland areas. This includes the use of temporary mat pond board roads for construction equipment where possible. Restoration activities for any areas impacted would be implemented to comply with location-specific ARARs identified in **Table 2.1-9**.

Action-Specific ARARs. Any wastes generated during remedial activities would be analyzed under the federal and state standards identified in **Table 2.1-10** to determine whether the wastes are listed or characteristic hazardous waste. Non-hazardous wastes would be disposed of appropriately. Any waste generated during remedial activities that is determined to be hazardous waste would be managed in accordance with these regulations.

Clean Water Act National Pollutant Discharge Elimination System (NPDES) requirements would be met for the groundwater treatment system discharge (if surface water discharge is identified as a more appropriate discharge mechanism than discharge to the municipal sewer) as well as for storm water management (if land disturbing activities for well installation and trenching for conveyance piping installation exceed one acre). The groundwater treatment system would be designed and constructed to have the effluent discharge meet the substantive discharge standards (the Massachusetts Surface Water Discharge Permit Program [314 CMR 3.00] has similar requirements).

If any liquid waste streams are to be discharged to a POTW, pretreatment of such waste streams would be evaluated for compliance with applicable requirements of the federal General Pretreatment Regulations for Existing and New Sources of Pollution and the MassDEP Operation, Maintenance and Pretreatment standards for Wastewater Treatment Works and Indirect Dischargers.

This alternative does not have underground injection as a component. However, if re-injection or infiltration of treated water is identified as the appropriate discharge mechanism of treated effluent, the underground injection control (UIC) programs for Massachusetts and the federal regulations would be considered.

Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs), SDWA non-zero maximum contaminant level goals (MCLGs), Massachusetts MCLs, Massachusetts non-zero MCLGs, and "to be considered" criteria or guidance (e.g., health advisories, RSLs, and risk

assessment guidelines) will be used or considered in determining the extent of required institutional controls for groundwater.

4.4.2.4. GW 3 Long-term Effectiveness and Permanence

This alternative is focused on achieving the RAOs for groundwater hot spots. The first RAO is to reduce, to the extent practicable, the mass of Site contaminants in highly contaminated groundwater. The second RAO is to reduce, to the extent practicable, the further horizontal and vertical migration of Site contaminants in groundwater hot spots, including penetration into bedrock. The third RAO is to prevent human exposure by a future resident to groundwater containing Site contaminants above levels that pose an unacceptable risk..

Alternative GW 3 would meet the RAOs for groundwater hot spots and would thus provide long-term effectiveness and permanence by extracting and treating groundwater hot spots. Capture and extraction of groundwater hot spots from within the 11,000 ng/L NDMA contour intervals around GW-58D, GW-83D, and GW-84D and subsequent treatment would permanently remove NDMA and Site-related COCs from the aquifer and from groundwater. This would minimize further horizontal and vertical migration of groundwater COCs while also reducing the potential for human exposure to Site-related groundwater containing Site contaminants above levels that pose an unacceptable risk.

The new on-site groundwater treatment plant will remediate extracted groundwater prior to its discharge to surface water. To maintain effective long-term treatment and permanent removal of contaminants, the treatment system components, especially the UV-oxidation units for NDMA removal, must be maintained for the duration of use. O&M of the system during the estimated 1.6 years required for extraction of 1.5 pore volumes of groundwater inside the 11,000 ng/L NDMA contour intervals has been included in the cost estimate for Alternative GW 3. System performance monitoring (e.g., treated water discharge monitoring) will verify effective treatment and would be used to measure compliance with the RAOs.

Institutional controls would prevent use of or contact with contaminated groundwater, reducing potential risk and potential exposure both during and after the 1.6 years of groundwater pumping from the three new extraction wells. Post-remediation groundwater sampling will be used to verify achievement of RAOs and long-term protection of human health and the environment. Because COCs may remain at concentrations that may not allow for unlimited use and unrestricted exposure, Five-Year Reviews will be conducted as required under CERCLA to periodically evaluate protectiveness of the remedy.

4.4.2.5. GW 3 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative GW 3 would reduce the toxicity, mobility, and volume of contaminated groundwater through extraction and treatment. This alternative would include the extraction and treatment of groundwater hot spots within the 11,000 ng/L NDMA contour intervals around existing monitoring wells GW-58D, GW-83D, and GW-84D (**Figure 4.4-2**), thereby reducing the toxicity and volume of contaminated groundwater. Each new extraction well would create a capture zone for groundwater hot spots and decrease the flux of contaminants from areas of higher concentration to the dilute plume, thereby reducing mobility by minimizing further horizontal and vertical migration of groundwater containing site COCs above levels that pose an unacceptable risk. In addition, NDMA and other site COCs would be permanently destroyed through treatment of extracted groundwater.

The total pore volume of groundwater hot spots within the 11,000 ng/L NDMA contour intervals was calculated by USEPA/Nobis to be 64,650 cubic meters, or about 17.1 million gallons. A very simple estimate of the mass of NDMA that would be extracted and treated by this alternative is approximately 1,715 grams of NDMA.[15] In practice, the NDMA concentration in extracted groundwater would vary widely due to the complexities of flow within the deep overburden and bedrock. The timeframe for this alternative is about 1.6 years for extraction of 1.5 pore volumes of groundwater (25.6 million gallons) using three extraction wells pumping at 10 gallons per minute each.

A more thorough evaluation of mass removal of NDMA and other Site-related COCs will be conducted as part of the remedial design. Additionally, the exact number and location of extraction wells would be selected based on the additional information obtained during implementation of the DGWP and pre-design investigations.

4.4.2.6. GW 3 Short-term Effectiveness

This alternative is effective in the short term in that it would meet the groundwater-specific RAOs and also be protective of public health during implementation. Potential short-term risks to the community would be addressed by minimizing dust, decontaminating vehicles transporting materials to and from the Site and construction areas, and minimizing vehicular

[15] This estimate assumes an average NDMA concentration of 26,500 ng/L throughout the total pore volume of 17.1 million gallons. The average concentration is based on groundwater analytical data collected between March and May 2019 from GW-58D and GW-83D, which are near the proposed extraction well locations.

traffic associated with the remediation efforts from traveling through residential areas to the extent possible.

There are potential short-term risks to site remediation workers due to exposure to potentially contaminated drill cuttings and groundwater; however, these risks can be addressed by development and implementation of a site-specific health and safety plan. Potential short-term risks to drillers and construction workers would be reduced by following a site-specific health and safety plan.

By including Institutional Controls in this alternative, the alternative would prevent in the short term exposure via potable use to COCs at concentrations above levels that pose an unacceptable risk. This alternative would also be protective of the environment by meeting discharge standards prior to discharging treated effluent to surface water.

4.4.2.7. GW 3 Implementability

The major components of Alternative GW 3 are technically implementable. The technical components include construction of access roads into the wetlands, installation of new extraction wells, construction of conveyance piping and the new groundwater treatment plant, O&M of the extraction and treatment system, post-remediation groundwater verification sampling to confirm achievement of RAOs groundwater hot spots; and Five-Year Reviews. The technologies that would be used to implement this alternative are readily available and sufficiently demonstrated for use at the Site, and the necessary equipment and materials are readily available for construction, installation, and operation of Alternative GW 3.

As with Alternative GW 2, the administrative implementability of Alternative GW 3 is not straightforward due to the logistics of gaining construction access and working in the Maple Meadow Brook wetland. Negotiating access agreements and gaining the necessary approvals from property owners for use of public and private land for installation of conveyance piping will present substantial administrative challenges. Dual-wall conveyance piping (about 5,900 feet) would most likely be installed underground for frost protection and would be installed as per access agreements with property owners.

The locations of the proposed treatment plant and associated piping would be confirmed during the remedial design phase. It would be necessary to secure adequate space for the new groundwater treatment plant on-site and associated treated effluent discharge piping.

Alternative GW 3 includes extraction of groundwater hot spots from three wells installed near existing monitoring wells GW-58D, GW-83D, and GW-84D. These wells are downgradient of, but not over, the Main Street DAPL pool.

Some precipitation or fouling may occur near the three new extraction well screens but will likely be negligible. Precipitation would reduce efficiency of groundwater extraction and ultimately affect the overall objective of this alternative. In this scenario, the groundwater hot spot extraction wells could become less hydraulically conductive. This could render the groundwater hot spots extraction wells less efficient at decreasing the mass of NDMA

4.4.2.8. GW 3 Cost

The cost for Alternative GW 3 is presented in **Table 4.4-2**. The estimated capital cost (rounded to the nearest thousand dollars) is $8,238,000, which includes construction of access roads, installation of three new extraction wells, installation of conveyance piping, and construction of a new treatment plant. The treatment plant includes unit operations for oxidation, precipitation, and clarification of iron and manganese; breakpoint chlorination for ammonia removal; GAC adsorption; UV oxidation for NDMA removal; and precipitated solids dewatering. Estimated treatment plant costs also include civil site work; a building to house the treatment system; and mechanical, electrical, and control systems.

Estimated annual cost over the 1.6 years of the active portion of this alternative (groundwater extraction and treatment) consist of system O&M, which would include treatment chemicals, UV replacement lamps, electricity, and system performance monitoring. Because COCs may remain at concentrations that may not allow for unlimited use and unrestricted exposure, it is assumed that Five-Year Reviews will be conducted as required under CERCLA every five years for the 30-year project duration.

The cost estimate for this alternative, presented in **Table 4.4-2**, is summarized as follows:

Alternative GW 3: GW Hot Spot Extraction from 3 New Extraction Wells from Within the 11,000 ng/L NDMA Contour	
Capital Cost	$8,238,000
O&M Costs	$976,000
Total Cost	$9,214,000
Net Present Worth	$9,006,000
Overall Alternative Duration	30 years

4.4.3 Alternative GW 4: Groundwater Hot Spot Extraction from Within the 5,000 ng/L NDMA Contour

This alternative includes a total of six new deep overburden extraction wells to extract groundwater containing NDMA within the 5,000 ng/L contour intervals. This includes the three new extraction wells described in Alternative GW 3 (near existing wells GW-58D, GW-83D, and GW-84D), one new extraction well installed adjacent to GW-85D, and two new extraction wells installed over the Main Street DAPL pool and screened in the diffuse layer over the DAPL surface. These extraction wells would target groundwater within the 5,000 ng/L NDMA contour intervals.

Extracted groundwater would be conveyed to a new on-site groundwater treatment plant, treated, and discharged appropriately to surface water. The new treatment plant would treat Site-specific COCs including NDMA to meet discharge standards. Proposed extraction well locations, conveyance lines, and a hypothetical location for the groundwater treatment plant to be constructed on the Olin Property are shown on **Figure 4.4-3**.

Alternative GW 4 is considered an interim remedy. However, there is potential for components or infrastructure constructed for this interim action to be used for a subsequent, long-term remedy.

4.4.3.1. Components of Alternative GW 4

This alternative includes the following major components:

- Institutional Controls
- Adjustment of the location of extraction wells as needed, per the DGWP
- Pre-design investigation and remedial design, followed by review and approval by USEPA
- Agreements with the appropriate parties for access to the wetland in Maple Meadow Brook at GW-83D, GW-84D, and GW-85D and with the Town of Wilmington and property owners where conveyance lines would be constructed
- Construction of access roads in Maple Meadow Brook to the areas around GW-83D, GW-84D, and GW-85D and the area around GW-58D
- Drilling and construction of the new groundwater extraction wells
- Preparation of the area on-site and performance of civil site work
- Construction of the new groundwater treatment plant
- Connection of conveyance piping and associated surface water discharge infrastructure
- Installation of approximately 5,900 feet conveyance piping from the six extraction wells to the new groundwater treatment plant. Conveyance piping would be installed underground for frost protection and in accordance with access agreements with property owners.
- O&M of groundwater extraction wells, conveyance piping, access vaults, and groundwater treatment system components, and solids handling and disposal.
- Post-remediation groundwater verification sampling to confirm achievement of RAOs for groundwater hot spots; this would be performed prior to decommissioning of the treatment system and reporting
- Reporting
- Five-Year Reviews

Estimated Duration for Alternative GW 4. Before extraction begins, approximately 6-12 months will be required for access road construction, new extraction well installation, conveyance piping installation, and civil site work and treatment plant construction. After construction and once the new extraction wells are operational, the minimum time to extract 1.5

pore volumes of groundwater from within the 5,000 ng/L NDMA zone[16] is estimated at about 6.5 years, assuming constant pumping from six extraction wells at 10 gpm each.

The exact location of the six extraction wells for this alternative would be selected based on the additional information obtained during implementation of the DGWP and pre-design investigation. The actual location of the groundwater treatment plant would be determined as part of pre-design activities. For purposes of this alternative, the treatment plant is assumed to be located just south of Plant B.

Implementation of Institutional Controls. Institutional controls to prevent exposure to contaminated groundwater and to minimize the migration of contaminated groundwater.

Adjustment of location/number of extraction wells as needed, per the DGWP. The overall purpose of the DGWP is to install additional monitoring wells and collect further groundwater data to better characterize the lateral and vertical extent of NDMA in groundwater. The exact location of the extraction wells for this alternative may be modified based on the additional information obtained during implementation of the DGWP.

Pre-Design Investigation. The pre-design investigation would be more focused on extraction well design. The pre-design investigation would develop hydraulic data to revise, update, and support calibration of the existing groundwater flow model, which would be updated and used to evaluate optimal placement for the six extraction wells optimal and pumping rates for groundwater capture. Such modeling would also provide quantitative insight on methods to prevent the vertical capture of underlying bedrock groundwater through pumping of deep overburden groundwater. Additionally, the actual location of the groundwater treatment plant would be determined as part of pre-design activities.

Remedial Design. Following implementation of the DGWP and the pre-design investigation, a remedial design would be developed for review and approval by USEPA. The design for remediation infrastructure and the details of the post-construction monitoring program would be developed utilizing information from the DGWP and pre-design investigations, as well as the RAOs. This information would inform the number and location of extraction wells, as well as

[16] Estimated groundwater pore volume within the 5,000 ng/L NDMA isoconcentration line is about 68.4 million gallons.

pumping rates, which could result in significant changes to estimated FS-level capital and operating costs.

Access Agreements. Much of the infrastructure for this alternative would not be located on the Olin Property. Extraction wells, access roads through the wetlands, conveyance piping, and access vaults would be located outside of the Olin Property. Thus, new agreements as well as revisions to existing agreements, would be needed with the appropriate parties for access to the wetland in Maple Meadow Brook at GW-83D, GW-84D, and GW-85D and with the Town of Wilmington and property owners where conveyance lines would be constructed.

Maple Meadow Brook Access Road Construction. This alternative requires construction of an access road in Maple Meadow Brook to the area around GW-83D, GW-84D, and GW-85D and the area around GW-58D for installation of the new extraction wells and associated conveyance piping. The access roads would consist of a temporary mat road and/or a permanent road. A large temporary mat road may be required to decrease wetland impacts and still allow for well drilling equipment and construction equipment to access the required areas in the marsh. These activities would inherently have impacts on the wetland in which construction would be occurring.

Construction of New Groundwater Extraction Wells. After access roads have been installed, drilling and construction equipment would install six new groundwater extraction wells. Two of the new extraction wells would be over the Main Street DAPL pool; additional extraction wells would be installed near existing monitoring wells GW-58D, GW-83D, GW-84D, GW-85D.

Installation of New Groundwater Treatment System. After remedial design, site preparation work would be completed and the new groundwater treatment plant, conveyance piping, and associated surface water discharge infrastructure would be constructed. The proposed locations of these system components are shown on **Figure 4.4-3**. The exact location of the treatment plant and piping runs would be verified during the design phase. The conceptual design for the Alternative GW 4 groundwater treatment system has the same unit operations as the treatment system described in Section 4.4.1.1 for Alternative GW 2.

Installation of Conveyance Piping. Approximately 5,900 feet of conveyance piping would be installed from the six extraction wells to the new groundwater treatment plant. Conveyance piping would be installed underground for frost protection and in accordance with access agreements with property owners. Trenching for pipe installation in and around Maple Meadow Brook may require some localized dewatering to minimize the wet conditions for pipe installation. The effluent conveyance piping would use the same utility trench as the main trunk

line of the extracted groundwater conveyance piping, which would help consolidate and reduce additional wetland impacts.

Operations and Maintenance. O&M for this remedial alternative includes O&M of six groundwater extraction wells, conveyance piping, access vaults, groundwater treatment system components, and discharge piping, as well as solids management and periodic reporting. The estimated operational period to extract 1.5 pore volumes from the 5,000 ng/L NDMA contour intervals using six extraction wells is approximately 6.5 years. Specific system operation, monitoring, and maintenance requirements would be established during remedial design. A preliminary assessment includes the following O&M items.

- Regular extraction system maintenance, including conveyance line and access vault inspections as needed.
- Monitor operation of the treatment system, accessible via remote supervisory control and data acquisition (SCADA) system.
- Maintain proper feed rates of sodium hypochlorite for oxidation and removal iron and manganese and breakpoint chlorination removal of ammonia in the mix tank.
- Maintain addition of lime and/or flocculant to adjust pH and optimize slow mix flocculation, and ensure proper settling in the lamella clarifier unit.
- Ensure proper operation of the UV chamber and replace UV lamps.
- Oversee precipitated solids thickening and O&M of automated plate and frame filter press for solids dewatering.
- Ensure regular disposal of dewatered solids, including sampling for waste characterization. If solids meet hazardous waste criteria, dewater further to minimize moisture content/water weight of solids before disposal as hazardous waste.

As a component of O&M, system monitoring and performance report(s) would be prepared to document treatment system O&M.

Verification Sampling and Reporting. Remedial Action Reports would be prepared to document treatment system installation, start-up, initial operational period, and post-remediation verification sampling results. During O&M, periodic system monitoring and performance report(s) would be prepared to document treatment system O&M. A post-remediation verification sampling program would be conducted to confirm achievement of RAOs for groundwater hot spots. This sampling program would include collecting groundwater samples from monitoring wells, as well as the extraction wells, and analyzing the samples for NDMA and other Site-related COCs. Post-remediation groundwater verification samples would

confirm achievement of RAOs for groundwater hot spots prior to decommissioning of the treatment system.

Five-Year Reviews. CERCLA requires that any interim remedial action that results in contaminants remaining on-site at concentrations above those allowing for unlimited exposure and unrestricted use must be reviewed every five years. Although it is anticipated that this alternative would meet the RAO for groundwater hot spots in approximately 6.5 years, COCs may remain in groundwater at concentrations that may not allow for unlimited use and unrestricted exposure. Therefore, Five-Year Reviews will be conducted as required under CERCLA. For cost estimating purposes, this alternative assumes that Five-Year Reviews will be conducted throughout the 30-year project duration.

4.4.3.2. GW 4 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment by reducing potential risk and potential exposure pathway by removing and treating contaminated groundwater hot spots to remove COCs, including NDMA in groundwater containing NDMA within the 5,000 ng/L contour intervals. Institutional controls will be implemented to prevent use of or contact with contaminated water, reducing potential risk and potential exposure.

This alternative will remediate highly contaminated NDMA-containing groundwater to reduce, to the extent practicable, the mass of Site contaminants and the further horizontal and vertical migration of Site contaminants in groundwater hot spots, including penetration into bedrock. This alternative will also prevent potential human exposure by a future resident to groundwater containing Site contaminants above levels that pose an unacceptable risk. Thus, the RAOs for groundwater hot spots will be met with Alternative GW 4.

4.4.3.3. GW 4 Compliance with ARARs

Because this alternative would not be expected to attain chemical-specific ARARs, PRGs were not developed based on any chemical-specific ARARs. The achievement of chemical-specific ARARs in groundwater would be addressed in the final remediation action that addresses the restoration of groundwater. Alternative GW 4 would be designed and implemented to comply with ARARs that are identified in **Tables 2.1-9 through 2.1-10**, for location-specific and action-specific ARARs for groundwater alternatives.

Location-Specific ARARs (Table 2.1-9). There are several location-specific ARARs associated with the location of the groundwater hot spot 5,000 ng/L NDMA area proposed for remediation. Specifically, the 5,000 ng/L NDMA area around existing deep overburden groundwater

monitoring wells GW-83D, GW-84D, and GW-85D which are located in the wetland around Maple Meadow Brook. GW-83D is located just to the west of Maple Meadow Brook. There are floodplains and wetlands associated with the proposed locations of extraction wells at GW-83D, GW-84D, and GW-85D and for the conveyance piping connecting these extraction wells to the new groundwater treatment plant. Similarly, the proposed discharge of treated effluent from the groundwater treatment system is to the wetland of Maple Meadow Brook. The effluent conveyance piping would use the same utility trench as the main trunk line of the extracted groundwater conveyance piping, which would help consolidate and reduce additional wetland impacts. For construction and installation, temporary pond mat board roads would be used which would reduce wetland impacts. However, a permanent road may need to be constructed in the wetland to allow access for maintenance of the extraction well and conveyance piping infrastructure.

Floodplain management and protection of wetlands would be done during groundwater extraction well and conveyance piping installation in Maple Meadow Brook. All practical measures would be taken to minimize and mitigate any adverse impacts. Erosion and sediment control measures would be adopted during remedial activities to protect the wetlands and floodplains. After completion of work, there would be no significant net loss of flood storage capacity and no significant net increase in flood stage or velocities. Floodplain habitat would be restored to the extent practicable. Public comment would be solicited as part of the Proposed Plan concerning any proposed alteration to wetlands and floodplains.

Compensatory wetlands mitigation would be done to for this remedial alternative to comply with Clean Water Act section 404 and the Massachusetts Wetland Protection Act and Regulations, which have been identified as applicable location-specific requirements. Ultimately, the alternative selected by USEPA would be evaluated and determined to be the least environmentally damaging practicable alternative that meets the RAOs for groundwater hot spots.

Any hazardous waste and any solid waste generated during remedial activities (investigation derived waste, drill cuttings, well development material, purge water, etc.) would be managed so that it would not impact floodplain resources. Waste management would comply with RCRA floodplain restrictions for hazardous waste facilities, RCRA floodplain restrictions for solid waste disposal facilities and practices, Massachusetts hazardous waste regulations, as well as location standards for land subject to flooding. To the extent any hazardous waste is generated during the remedial activities, the wastes would be managed so that it would not impact floodplain resources.

The installation of extraction wells would generate drill cuttings. These drill cuttings would be dewatered and disposed of as appropriate. Additionally, the installation of conveyance piping would be done using trenching to provide frost protection. Trenching in the wetlands may generate dredged material. Compensatory mitigation would need to be performed to comply with the Massachusetts Water Quality Certification for Discharge of Dredged or Fill Material. Any required removal of soil/sediment from wetland or surface water areas would be designated for eventual restoration. Excavation and filling activities to be performed impacting the aquatic ecosystem would be in accordance with the substantive requirements of these regulations.

The Massachusetts Areas of Critical Environmental Concern (ACECs) regulations are identified as applicable if an ACEC is identified. No known ACECs have been identified at the Site, but if an ACEC is identified, activities would be controlled to minimize impacts to affected species or resources.

This alternative would be designed and implemented to minimize impacts to the wetland areas. This includes the use of temporary mat pond board roads for construction equipment where possible. Restoration activities for any areas impacted would be implemented to comply with location-specific ARARs identified in **Table 2.1-9**.

Action-Specific ARARs. Any wastes generated during remedial activities would be analyzed under the federal and state standards identified in **Table 2.1-10** to determine whether the wastes are listed or characteristic hazardous waste. Non-hazardous wastes would be disposed of appropriately. Any waste generated during remedial activities that is determined to be hazardous waste would be managed in accordance with these regulations.

Clean Water Act National Pollutant Discharge Elimination System (NPDES) requirements would be met for the groundwater treatment system discharge (if surface water discharge is identified as a more appropriate discharge mechanism than discharge to the municipal sewer) as well as for storm water management (if land disturbing activities for well installation and trenching for conveyance piping installation exceed one acre). The groundwater treatment system would be designed and constructed to have the effluent discharge meet the substantive discharge standards (the Massachusetts Surface Water Discharge Permit Program [314 CMR 3.00] has similar requirements).

If any liquid waste streams are to be discharged to a POTW, pretreatment of such waste streams would be evaluated for compliance with applicable requirements of the federal General Pretreatment Regulations for Existing and New Sources of Pollution and the MassDEP

Operation, Maintenance and Pretreatment standards for Wastewater Treatment Works and Indirect Dischargers.

This alternative does not have underground injection as a component. However, if re-injection or infiltration of treated water is identified as the appropriate discharge mechanism of treated effluent, the underground injection control (UIC) programs for Massachusetts and the federal regulations would be considered.

Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs), SDWA non-zero maximum contaminant level goals (MCLGs), Massachusetts MCLs, Massachusetts non-zero MCLGs, and "to be considered" criteria or guidance (e.g., health advisories, RSLs, and risk assessment guidelines) will be used or considered in determining the extent of required institutional controls for groundwater.

4.4.3.4. GW 4 Long-term Effectiveness and Permanence

This alternative is focused on achieving the RAOs for groundwater hot spots. The first RAO is to reduce, to the extent practicable, the mass of Site contaminants in highly contaminated groundwater. The second RAO is to reduce, to the extent practicable, the further horizontal and vertical migration of Site contaminants in groundwater hot spots, including penetration into bedrock. The third RAO is to prevent human exposure by a future resident to groundwater containing Site contaminants above levels that pose an unacceptable risk.

Alternative GW 4 would meet the RAOs for groundwater hot spots and would thus provide long-term effectiveness and permanence by extracting and treating groundwater hot spots. Capture and extraction of groundwater hot spots from within the 5,000 ng/L NDMA contour intervals using the six new extraction wells and subsequent treatment would permanently remove NDMA and Site-related COCs from the aquifer and from extracted groundwater. This would minimize further horizontal and vertical migration of groundwater COCs while also reducing the potential for human exposure to Site-related groundwater containing Site contaminants above levels that pose an unacceptable risk.

The new on-site groundwater treatment plant will remediate extracted groundwater prior to its discharge to surface water. To maintain effective long-term treatment and permanent removal of contaminants, the treatment system components, especially the UV-oxidation units for NDMA removal, must be maintained for the duration of use. O&M of the system during the estimated 6.5 years required for extraction of 1.5 pore volumes of groundwater inside the 5,000 ng/L NDMA contour intervals has been included in the cost estimate for Alternative GW 4. System

performance monitoring (e.g., treated water discharge monitoring) will verify effective treatment and would be used to measure compliance with the RAOs.

Institutional controls would prevent use of or contact with contaminated groundwater, reducing potential risk and potential exposure both during and after the 6.5 years of groundwater pumping from the six new extraction wells. Post-remediation groundwater sampling will be used to verify achievement of RAOs and long-term protection of human health and the environment. Because COCs may remain at concentrations that may not allow for unlimited use and unrestricted exposure, Five-Year Reviews will be conducted as required under CERCLA to periodically evaluate protectiveness of the remedy.

4.4.3.5. GW 4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative GW 4 would reduce the toxicity, mobility, and volume of contaminated groundwater through extraction and treatment. This alternative would include the extraction and treatment of groundwater hot spots within the 5,000 ng/L NDMA contour intervals (**Figure 4.4-3**), thereby reducing the toxicity and volume of contaminated groundwater. Each of the six new extraction wells would create a capture zone for groundwater hot spots and decrease the flux of contaminants from areas of higher concentration to the dilute plume, thereby reducing mobility by minimizing further horizontal and vertical migration of groundwater containing site COCs above levels that pose an unacceptable risk. In addition, NDMA and other site COCs would be permanently destroyed through treatment of extracted groundwater.

The total pore volume of groundwater hot spots within the 5,000 ng/L NDMA contour intervals was calculated by USEPA/Nobis to be 259,060 cubic meters, or about 68.4 million gallons. A very simple estimate of the mass of NDMA that would be extracted and treated by this alternative is approximately 4,440 grams of NDMA[17]. In practice, the NDMA concentration in extracted groundwater would vary widely due to the complexities of flow within the deep overburden and bedrock. The timeframe for this alternative is about 6.5 years for extraction of 1.5 pore volumes of groundwater (102.6 million gallons) using six extraction wells pumping at 10 gallons per minute each.

[17] This estimate assumes an average NDMA concentration of 17,150 ng/L throughout the total pore volume of 68.4 million gallons within the 5,000 ng/L NDMA isoconcentration line. The average concentration is based on groundwater analytical data collected between March and May 2019 from wells GW-44D, GW-45D, GW-58D, GW-70D, GW-83D, GW-84D, GW-85D, and MP-3 #01, which are near the proposed extraction well locations.

A more thorough evaluation of mass removal of NDMA and other Site-related COCs will be conducted as part of the remedial design. Additionally, the exact number and location of extraction wells would be selected based on the additional information obtained during implementation of the DGWP and pre-design investigations.

4.4.3.6. GW 4 Short-term Effectiveness

This alternative is effective in the short term in that it would meet the groundwater-specific RAOs and also be protective of public health during implementation. Potential short-term risks to the community would be addressed by minimizing dust, decontaminating vehicles transporting materials to and from the Site and construction areas, and minimizing vehicular traffic associated with the remediation efforts from traveling through residential areas to the extent possible.

There are potential short-term risks to site remediation workers due to exposure to potentially contaminated drill cuttings and groundwater; however, these risks can be addressed by development and implementation of a site-specific health and safety plan. Potential short-term risks to drillers and construction workers would be reduced by following a site-specific health and safety plan.

By including Institutional Controls in this alternative, the alternative would prevent in the short term exposure via potable use to COCs at concentrations above levels that pose an unacceptable risk. This alternative would also be protective of the environment by meeting discharge standards prior to discharging treated effluent to surface water.

4.4.3.7. GW 4 Implementability

The major components for Alternative GW 4 are implementation of institutional controls; access agreements with property owners to construct conveyance piping; construction of access roads into the wetlands; installation of six new extraction wells; construction of the new groundwater treatment plant and conveyance piping; O&M of the extraction and treatment system; post-remediation groundwater verification sampling to confirm achievement of RAOs for groundwater hot spots; and Five-Year Reviews. The technologies that would be used to implement this alternative are readily available and sufficiently demonstrated for use at the Site, and the necessary equipment, materials, and methods are readily available for construction, installation, and operation of Alternative GW 4.

As with Alternatives GW 2 and GW 3, Alternative GW 4 is not straightforward to implement due to the logistics of gaining construction access and working in the Maple Meadow Brook wetland. Gaining the necessary approvals from property owners for use of public and private land for conveyance piping through access agreements will present administrative challenges. Dual-wall conveyance piping (about 5,900 feet) would most likely be installed underground for frost protection and would be installed as per access agreements with property owners.

This alternative has additional challenges associated with installation and operation of two extraction wells directly above the Main Street DAPL pool. These two extraction wells would initially be screened in the diffuse layer immediately above the DAPL pool to target groundwater with elevated NDMA concentrations. The hydraulic conductivity of the medium to coarse sands and gravelly sands present have adequate transmissivity to install short screen extraction wells within this narrow interval above the DAPL interface.

However, extraction of this very narrow vertical layer of contaminated groundwater would be challenging. The relatively low pumping rates (e.g., 5-10 gpm) could result in excessive drawdown near the extraction wells that could promote upwelling, entrainment, and capture of DAPL immediately underlying the base of the well screen.

Vertical entrainment of DAPL could result in unfavorable geochemical conditions around the extraction wells as high concentrations of sulfate, dissolved metals, and other constituents from the low pH, reducing conditions present in DAPL mix with the overlying groundwater with higher pH and more oxidizing conditions. Precipitation of iron hydroxides and acid sulfate minerals could occur near these two wells (including the sand packs and well screens). Precipitation or fouling would reduce hydraulic conductivity, reducing the efficiency of groundwater extraction. Design elements should be considered including well placement, extraction rates and possible cycling of pumps to minimize the opportunity for fouling.

Additionally, DAPL extraction would be occurring simultaneously with groundwater hot spots extraction. Operation of the off-PWD DAPL extraction system has shown that lowering of the DAPL interface results in lowering of the diffuse layer and reductions in concentrations of NDMA and other constituents. As a result, groundwater hot spot extraction well screens may need to be sequentially lowered as DAPL is removed. Alternatively, it may be possible to use the DAPL extraction wells to remove the hot spot groundwater after DAPL is removed when the diffuse layer is at the elevation of the DAPL extraction wells. The sequence and placement of DAPL and hot spot groundwater extraction wells will be further evaluated during the predesign investigations.

These factors could reduce the efficiency of groundwater extraction using wells overlying the DAPL pools. Based on these factors, the implementability of Alternative GW 4 for groundwater hot spot remediation is considered to be less feasible than GW 2 and 3.

4.4.3.8. GW 4 Cost

The cost for Alternative GW 4 is presented in **Table 4.4-3**. The estimated capital cost (rounded to the nearest thousand dollars) is $10,547,000, which includes construction of access roads, installation of six new extraction wells to target areas with groundwater containing NDMA within the 5,000 ng/L contour intervals, installation of conveyance piping, and construction of a new treatment plant. The treatment plant includes unit operations for oxidation, precipitation, and clarification of iron and manganese; breakpoint chlorination for ammonia removal; GAC adsorption; UV oxidation for NDMA removal; and precipitated solids dewatering. Estimated treatment plant costs also include civil site work; a building to house the treatment system; and mechanical, electrical, and control systems.

Estimated annual cost over the 6.5 years of the active portion of this alternative (groundwater extraction and treatment) consist of system O&M, which would include treatment chemicals, UV replacement lamps, electricity, and system performance monitoring. Because COCs may remain at concentrations that may not allow for unlimited use and unrestricted exposure, it is assumed that Five-Year Reviews will be conducted as required under CERCLA every five years for the 30-year project duration.

The cost estimate for this alternative, presented in **Table 4.4-3**, is summarized as follows:

Alternative GW 4: GW Hot Spot Extraction from 6 New Extraction Wells from Within the 5,000 ng/L NDMA Contour	
Capital Cost	$10,547,000
O&M Costs	$3,380,000
Total Cost	$13,927,000
Net Present Worth	$13,104,000
Overall Alternative Duration	30 years

4.4.4 Alternative GW 5: Groundwater Hot Spot Extraction from Within the 1,100 ng/L NDMA Contour

This alternative includes installation of 12 new deep overburden groundwater extraction wells to extract groundwater containing NDMA within the 1,100 ng/L contour intervals. This includes the six wells described above for Alternative GW 4 and six additional wells that would be installed as follows: two wells between the Off-Property West Ditch (off-PWD) and Main Street DAPL pool, one well in the GW-413D area, two additional wells in the Main Street DAPL pool screened in the diffuse layer over the DAPL surface, and a well on-site near GW-55D. These locations are proposed to address groundwater within the 1,100 ng/L NDMA contour intervals.

As with the other groundwater hot spot alternatives, extracted groundwater would be conveyed to a new groundwater treatment plant, treated, and discharged appropriately. The new treatment plant would be constructed to treat Site-specific COCs including NDMA to meet discharge standards. Proposed extraction well locations, conveyance lines, and a hypothetical location for the groundwater treatment plant to be constructed on the Olin Property are shown on **Figure 4.4-4**. Conveyance piping would connect the 12 new extraction wells to the on-site location where the treatment system would be constructed. This area would also contain the effluent conveyance system.

Alternative GW 5 is considered an interim remedy. However, there is potential for components or infrastructure constructed for this interim action to be used for a subsequent, long-term remedy.

4.4.4.1. Components of Alternative GW 5

This alternative includes the following major components:

- Institutional Controls.
- Adjustment of the location of extraction wells as needed as per the DGWP
- Pre-design investigation and remedial design, followed by review and approval by USEPA
- Agreements with the appropriate parties for access to the wetland in Maple Meadow Brook at GW-83D, GW-84D, and GW-85D and with the Town of Wilmington and property owners where conveyance lines will be constructed
- Agreements with the appropriate parties for access to the wetland in Maple Meadow Brook at GW-83D, GW-84D, and GW-85D and with the Town of Wilmington and property owners where conveyance lines would be constructed

- Construction of access roads in Maple Meadow Brook to the areas around GW-83D, GW-84D, and GW-85D, the wetland around GW-55D, and the area around GW-58D
- Drilling and construction of the new groundwater extraction wells
- Preparation of the area on-site and performance of civil site work
- Construction of the new groundwater treatment plant
- Installation of approximately 8,600 feet of conveyance piping from the twelve extraction wells to the new groundwater treatment plant. Conveyance piping installed underground for frost protection and in accordance with access agreements with property owners.
- Connection of conveyance piping and associated surface water discharge infrastructure
- O&M of groundwater extraction wells, conveyance piping, access vaults, and groundwater treatment system components, and solids handling and disposal.
- Post-remediation groundwater verification sampling to confirm achievement of RAOs for groundwater hot spots; this would be performed prior to decommissioning of the treatment system and reporting
- Reporting
- Five-Year Reviews

Overall Estimated Duration for the Alternative. The estimated project duration of the extraction and treatment portion of this alternative is estimated at approximately 7.9 years post construction and system installation, based on an estimated groundwater pore volume of approximately 110.3 million gallons within the 1,100 ng/L NDMA contour intervals, a minimum extraction volume of 1.5 pore volumes of groundwater, and using 12 extraction wells pumping at 10 gallons per minute each. Access road construction, new injection well installation, conveyance piping installation, and civil site work and treatment plant construction is estimated to take 6-12 months.

Implementation of Institutional Controls. Institutional controls to prevent exposure to contaminated groundwater and to minimize the migration of contaminated groundwater.

Adjustment of location/number of extraction wells as needed, per the DGWP. The overall purpose of the DGWP is to install additional monitoring wells and collect further groundwater data to better characterize the lateral and vertical extent of NDMA in groundwater. The exact location of the extraction wells for this alternative may be modified based on the additional information obtained during implementation of the DGWP.

Pre-Design Investigation. The pre-design investigation would be more focused on extraction well design. The pre-design investigation would develop hydraulic data to revise, update, and support calibration of the existing groundwater flow model, which would be updated and used to evaluate optimal placement for the 12 extraction wells optimal and pumping rates for groundwater capture. Such modeling would also provide quantitative insight on methods to prevent the vertical capture of underlying bedrock groundwater through pumping of deep overburden groundwater. Additionally, the actual location of the groundwater treatment plant would be determined as part of pre-design activities.

Remedial Design. Following implementation of the DGWP and the pre-design investigation, a remedial design would be developed for review and approval by USEPA. The design for remediation infrastructure and the details of the post-construction monitoring program would be developed utilizing information from the DGWP and pre-design investigations, as well as the RAOs. This information would inform the number and location of extraction wells, as well as pumping rates, which could result in significant changes to estimated FS-level capital and operating costs.

Access Agreements. Much of the infrastructure for this alternative would not be located on the Olin Property. Extraction wells, access roads through the wetlands, conveyance piping, and access vaults would be located outside of the Olin Property. Thus, new agreements as well as revisions to existing agreements, would be needed with the appropriate parties for access to the wetland in Maple Meadow Brook at GW-83D, GW-84D, and GW-85D and with the Town of Wilmington and property owners where conveyance lines would be constructed.

Maple Meadow Brook Access Road Construction. This alternative requires construction of an access road in Maple Meadow Brook to the area around GW-83D, GW-84D, and GW-85D and the marshy area around GW-55D for installation of the new extraction wells and associated conveyance piping. The access roads would consist of a temporary mat road and/or a permanent road. A large temporary mat road may be required to decrease wetland impacts and still allow for well drilling equipment and construction equipment to access the required areas in the marsh. These activities would inherently have impacts on the wetland in which construction would be occurring.

Construction of New Groundwater Extraction Wells. After access roads have been installed, drilling and construction equipment would install 12 new groundwater extraction wells near existing monitoring wells GW-58D, GW-83D, GW-84D, GW-85D, four wells over the Main Street DAPL pool screened in the diffuse layer over the DAPL surface, two wells between the off-PWD and Main Street DAPL pool, one well in the GW-413D area, and a well on-site near GW-55D.

Installation of New Groundwater Treatment System. After remedial design, site preparation work would be completed and the new groundwater treatment plant, conveyance piping, and associated surface water discharge infrastructure would be constructed. The proposed locations of these system components are shown on **Figure 4.4-4**. The exact location of the treatment plant and piping runs would be verified during the design phase. The conceptual design for the Alternative GW 5 groundwater treatment system has the same unit operations as the treatment system described in Section 4.4.1.1 for Alternative GW 2.

Installation of Conveyance Piping. Approximately 8,600 feet of conveyance piping would be installed from the 12 extraction wells to the new groundwater treatment plant. Conveyance piping would be installed underground for frost protection and in accordance with access agreements with property owners. Trenching for pipe installation in and around Maple Meadow Brook may require some localized dewatering to minimize the wet conditions for pipe installation. The effluent conveyance piping would use the same utility trench as the main trunk line of the extracted groundwater conveyance piping, which would help consolidate and reduce additional wetland impacts.

Operations and Maintenance. O&M for this remedial alternative includes O&M of six groundwater extraction wells, conveyance piping, access vaults, groundwater treatment system components, and discharge piping, as well as solids management and periodic reporting. The estimated operational period to extract 1.5 pore volumes from the 1,100 ng/L NDMA contour intervals using 12 extraction wells is approximately 7.9 years. Specific system operation, monitoring, and maintenance requirements would be established during remedial design. A preliminary assessment includes the following O&M items.

- Regular extraction system maintenance, including conveyance line and access vault inspections as needed.
- Monitor operation of the treatment system, accessible via remote supervisory control and data acquisition (SCADA) system.
- Maintain proper feed rates of sodium hypochlorite for oxidation and removal iron and manganese and breakpoint chlorination removal of ammonia in the mix tank.
- Maintain addition of lime and/or flocculant to adjust pH and optimize slow mix flocculation, and ensure proper settling in the lamella clarifier unit.
- Ensure proper operation of the UV chamber and replace UV lamps.
- Oversee precipitated solids thickening and O&M of automated plate and frame filter press for solids dewatering.

- Ensure regular disposal of dewatered solids, including sampling for waste characterization. If solids meet hazardous waste criteria, dewater further to minimize moisture content/water weight of solids before disposal as hazardous waste.

As a component of O&M, system monitoring and performance report(s) would be prepared to document treatment system O&M.

Verification Sampling and Reporting. Remedial Action Reports would be prepared to document treatment system installation, start-up, initial operational period, and post-remediation verification sampling results. During O&M periodic system monitoring and performance report(s) would be prepared to document treatment system O&M. A post-remediation verification sampling program would be conducted to confirm achievement of RAOs for groundwater hot spots. This sampling program would include collecting groundwater samples from monitoring wells as well as the extraction wells and analyzing the samples for NDMA and other Site-related COCs. Post-remediation groundwater verification samples would confirm achievement of RAOs groundwater hot spots prior to decommissioning of the treatment system.

Five-Year Reviews. CERCLA requires that any interim remedial action that results in contaminants remaining on-site at concentrations above those allowing for unlimited exposure and unrestricted use must be reviewed every five years. Although it is anticipated that this alternative would meet the RAO for groundwater hot spots in approximately 7.9 years, COCs may remain in groundwater at concentrations that may not allow for unlimited use and unrestricted exposure. Therefore, Five-Year Reviews will be conducted as required under CERCLA. For cost estimating purposes, this alternative assumes that Five-Year Reviews will be conducted throughout the 30-year project duration.

4.4.4.2. GW 5 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment by reducing potential risk and potential exposure pathway by removing and treating contaminated groundwater hot spots to remove COCs, including NDMA in groundwater containing NDMA within the 1,100 ng/L contour intervals. Institutional controls will be implemented to prevent use of or contact with contaminated water, reducing potential risk and potential exposure.

This alternative will remediate highly contaminated NDMA-containing groundwater to reduce, to the extent practicable, the mass of Site contaminants and the further horizontal and vertical migration of Site contaminants in groundwater hot spots, including penetration into bedrock. This alternative will also prevent potential human exposure by a future resident to groundwater

containing Site contaminants above levels that pose an unacceptable risk. Thus, the RAOs for groundwater hot spots will be met with Alternative GW 5.

4.4.4.3. GW 5 Compliance with ARARs

Because this alternative would not be expected to attain chemical-specific ARARs, PRGs were not developed based on any chemical-specific ARARs. The achievement of chemical-specific ARARs in groundwater would be addressed in the final remediation action that addresses the restoration of groundwater. Alternative GW 5 would be designed and implemented to comply with ARARs that are identified in **Tables 2.1-9 through 2.1-10**, for location-specific and action-specific ARARs for groundwater alternatives.

Location-Specific ARARs (Table 2.1-9). There are several location-specific ARARs associated with the location of the groundwater hot spot 1,100 ng/L NDMA area proposed for remediation. Specifically, the 1,100 ng/L NDMA area around existing deep overburden groundwater monitoring wells GW-83D, GW-84D, and GW-85D which are located in the wetland around Maple Meadow Brook. GW-83D is located just to the west of Maple Meadow Brook. There are floodplains and wetlands associated with the proposed locations of extraction wells at GW-83D, GW-84D, and GW-85D as well as on-site at GW-55D and for the conveyance piping connecting these extraction wells to the new on-site groundwater treatment plant. Similarly, the proposed discharge of treated effluent from the groundwater treatment system is to the wetland of Maple Meadow Brook. The effluent conveyance piping would use the same utility trench as the main trunk line of the extracted groundwater conveyance piping, which would help consolidate and reduce additional wetland impacts. For construction and installation, temporary pond mat board roads would be used which would reduce wetland impacts. However, a permanent road may need to be constructed in the wetland to allow access for maintenance of the extraction well and conveyance piping infrastructure.

Floodplain management and protection of wetlands would be done during groundwater extraction well and conveyance piping installation in Maple Meadow Brook. All practical measures would be taken to minimize and mitigate any adverse impacts. Erosion and sediment control measures would be adopted during remedial activities to protect the wetlands and floodplains. After completion of work, there would be no significant net loss of flood storage capacity and no significant net increase in flood stage or velocities. Floodplain habitat would be restored to the extent practicable. Public comment would be solicited as part of the Proposed Plan concerning any proposed alteration to wetlands and floodplains.

Compensatory wetlands mitigation would be done to for this remedial alternative to comply with Clean Water Act section 404 and the Massachusetts Wetland Protection Act and Regulations, which have been identified as applicable location-specific requirements. Ultimately, the alternative selected by USEPA would be evaluated and determined to be the least environmentally damaging practicable alternative that meets the RAOs for groundwater hot spots.

Any hazardous waste and any solid waste generated during remedial activities (investigation derived waste, drill cuttings, well development material, purge water, etc.) would be managed so that it would not impact floodplain resources. Waste management would comply with RCRA floodplain restrictions for hazardous waste facilities, RCRA floodplain restrictions for solid waste disposal facilities and practices, Massachusetts hazardous waste regulations, as well as location standards for land subject to flooding. To the extent any hazardous waste is generated during the remedial activities, the wastes would be managed so that it would not impact floodplain resources.

The installation of extraction wells would generate drill cuttings. These drill cuttings would be dewatered and disposed of as appropriate. Additionally, the installation of conveyance piping would be done using trenching to provide frost protection. Trenching in the wetlands may generate dredged material. Compensatory mitigation would need to be performed to comply with the Massachusetts Water Quality Certification for Discharge of Dredged or Fill Material. Any required removal of soil/sediment from wetland or surface water areas would be designated for eventual restoration. Excavation and filling activities to be performed impacting the aquatic ecosystem would be in accordance with the substantive requirements of these regulations.

The Massachusetts Areas of Critical Environmental Concern (ACECs) regulations are identified as applicable if an ACEC is identified. No known ACECs have been identified at the Site, but if an ACEC is identified, activities would be controlled to minimize impacts to affected species or resources.

This alternative would be designed and implemented to minimize impacts to the wetland areas. This includes the use of temporary mat pond board roads for construction equipment where possible. Restoration activities for any areas impacted would be implemented to comply with location-specific ARARs identified in **Table 2.1-9**.

Action-Specific ARARs. Any wastes generated during remedial activities would be analyzed under the federal and state standards identified in **Table 2.1-10** to determine whether the wastes are listed or characteristic hazardous waste. Non-hazardous wastes would be disposed of

appropriately. Any waste generated during remedial activities that is determined to be hazardous waste would be managed in accordance with these regulations.

Clean Water Act National Pollutant Discharge Elimination System (NPDES) requirements would be met for the groundwater treatment system discharge (if surface water discharge is identified as a more appropriate discharge mechanism than discharge to the municipal sewer) as well as for storm water management (if land disturbing activities for well installation and trenching for conveyance piping installation exceed one acre). The groundwater treatment system would be designed and constructed to have the effluent discharge meet the substantive discharge standards (the Massachusetts Surface Water Discharge Permit Program [314 CMR 3.00] has similar requirements).

If any liquid waste streams are to be discharged to a POTW, pretreatment of such waste streams would be evaluated for compliance with applicable requirements of the federal General Pretreatment Regulations for Existing and New Sources of Pollution and the MassDEP Operation, Maintenance and Pretreatment standards for Wastewater Treatment Works and Indirect Dischargers.

This alternative does not have underground injection as a component. However, if re-injection or infiltration of treated water is identified as the appropriate discharge mechanism of treated effluent, the underground injection control (UIC) programs for Massachusetts and the federal regulations would be considered.

Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs), SDWA non-zero maximum contaminant level goals (MCLGs), Massachusetts MCLs, Massachusetts non-zero MCLGs, and "to be considered" criteria or guidance (e.g., health advisories, RSLs, and risk assessment guidelines) will be used or considered in determining the extent of required institutional controls for groundwater.

4.4.4.4. GW 5 Long-term Effectiveness and Permanence

This alternative is focused on achieving the RAOs for groundwater hot spots. The first RAO is to reduce, to the extent practicable, the mass of Site contaminants in highly contaminated groundwater. The second RAO is to reduce, to the extent practicable, the further horizontal and vertical migration of Site contaminants in groundwater hot spots, including penetration into bedrock. The third RAO is to prevent human exposure by a future resident to groundwater containing Site contaminants above levels that pose an unacceptable risk.

Alternative GW 5 would meet the RAOs for groundwater hot spots and would thus provide long-term effectiveness and permanence by extracting and treating groundwater hot spots. Capture and extraction of groundwater hot spots from within the 1,100 ng/L NDMA contour intervals using 12 new extraction wells and subsequent treatment would permanently remove NDMA and Site-related COCs from the aquifer and from groundwater. This would minimize further horizontal and vertical migration of groundwater COCs while also reducing the potential for human exposure to Site-related groundwater that exceed ARARs and health-protective, risk-based standards.

The new on-site groundwater treatment plant will remediate extracted groundwater prior to its discharge to surface water. To maintain effective long-term treatment and permanent removal of contaminants, the treatment system components, especially the UV-oxidation units for NDMA removal, must be maintained for the duration of use. O&M of the system during the estimated 7.9 years required for extraction of 1.5 pore volumes of groundwater inside the 1,100 ng/L NDMA contour intervals has been included in the cost estimate for Alternative GW 5. System performance monitoring (e.g., treated water discharge monitoring) will verify effective treatment and would be used to measure compliance with the RAOs.

Institutional controls would prevent use of or contact with contaminated groundwater, reducing potential risk and potential exposure both during and after the 7.9 years of groundwater pumping from the 12 new extraction wells. Post-remediation groundwater sampling will be used to verify achievement of RAOs and long-term protection of human health and the environment. Because COCs may remain at concentrations that may not allow for unlimited use and unrestricted exposure, Five-Year Reviews will be conducted as required under CERCLA to periodically evaluate protectiveness of the remedy.

4.4.4.5. GW 5 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative GW 5 would reduce the toxicity, mobility, and volume of contaminated groundwater through extraction and treatment. This alternative would include the extraction and treatment of groundwater hot spots within the 1,100 ng/L NDMA contour intervals (**Figure 4.4-4**), thereby reducing the toxicity and volume of contaminated groundwater. Each of the 12 new extraction wells would create a capture zone for groundwater hot spots and decrease the flux of contaminants from areas of higher concentration to the dilute plume, thereby reducing mobility by minimizing further horizontal and vertical migration of groundwater containing site COCs above ARARs and health-protective, risk-based standards. In addition, NDMA and other site COCs would be permanently destroyed through treatment of extracted groundwater.

The total pore volume of groundwater hot spots within the 1,100 ng/L NDMA contour intervals was calculated by USEPA/Nobis to be 417,381 cubic meters, or about 110.3 million gallons. A very simple estimate of the mass of NDMA that would be extracted and treated by this alternative is approximately 4,747 grams of NDMA[18]. In practice, the NDMA concentration in extracted groundwater would vary widely due to the complexities of flow within the deep overburden and bedrock. The timeframe for this alternative is about 7.9 years for extraction of 1.5 pore volumes of groundwater (165.4 million gallons) using 12 extraction wells pumping at 10 gallons per minute each.

A more thorough evaluation of mass removal of NDMA and other Site-related COCs will be conducted as part of the remedial design. Additionally, the exact number and location of extraction wells would be selected based on the additional information obtained during implementation of the DGWP and pre-design investigations.

4.4.4.6. GW 5 Short-term Effectiveness

This alternative is effective in the short term in that it would meet the groundwater-specific RAOs and also be protective of public health during implementation. Potential short-term risks to the community would be addressed by minimizing dust, decontaminating vehicles transporting materials to and from the Site and construction areas, and minimizing vehicular traffic associated with the remediation efforts from traveling through residential areas to the extent possible.

There are potential short-term risks to site remediation workers due to exposure to potentially contaminated drill cuttings and groundwater; however, these risks can be addressed by development and implementation of a site-specific health and safety plan. Potential short-term risks to drillers and construction workers would be reduced by following a site-specific health and safety plan.

By including Institutional Controls in this alternative, the alternative would prevent in the short term exposure via potable use to COCs at concentrations above levels that pose an

[18] This estimate assumes an average NDMA concentration of 11,371 ng/L throughout the total pore volume of 110.3 million gallons. The average concentration is based on groundwater analytical data collected between March and May 2019 from wells GW-44D, GW-45D, GW-55D, GW-58D, GW-69D, GW-70D, GW-83D, GW-84D, GW-85D, GW-413D, MP-1 #01, MP-2 #01, MP-3 #01, and MP-5 #08, which are near the proposed extraction well locations.

unacceptable risk. This alternative would also be protective of the environment by meeting discharge standards prior to discharging treated effluent to surface water.

4.4.4.7. GW 5 Implementability

The major components of Alternative GW 5 are implementation of institutional controls; access agreements with property owners to construct conveyance piping; construction of access roads into the wetlands; installation of 12 new extraction wells; construction of the new groundwater treatment plant and conveyance piping; O&M of the extraction and treatment system; post-remediation groundwater verification sampling to confirm achievement of RAOs for groundwater hot spots; and Five-Year Reviews. The technologies that would be used to implement this alternative are readily available and sufficiently demonstrated for use at the Site, and the necessary equipment, materials, and methods are readily available for construction, installation, and operation of Alternative GW 5.

As with the other groundwater hot spot alternatives, Alternative GW 5 has challenges to implement due to the logistics of gaining construction access and working in the Maple Meadow Brook wetland. Gaining the necessary approvals from property owners for use of public and private land for conveyance piping through access agreements will present administrative challenges. Dual-wall conveyance piping (about 8,600 feet) would most likely be installed underground for frost protection and would be installed as per access agreements with property owners.

This alternative has additional challenges associated with installation and operation of four extraction wells directly above the Main Street DAPL pool (**Figure 4.4-4**). These four extraction wells would initially be screened in the diffuse layer immediately above the DAPL pool to target groundwater with elevated NDMA concentrations. The hydraulic conductivity of the medium to coarse sands and gravelly sands present have adequate transmissivity to install short screen extraction wells within this narrow interval above the DAPL interface.

However, extraction of this very narrow vertical layer of contaminated groundwater would be challenging. The relatively low pumping rates (e.g., 5-10 gpm) could result in excessive drawdown near the extraction wells that could promote upwelling, entrainment, and capture of DAPL immediately underlying the base of the well screen

Vertical entrainment of DAPL could result in unfavorable geochemical conditions around the extraction wells as high concentrations of sulfate, dissolved metals, and other constituents from the low pH, reducing conditions present in DAPL mix with the overlying groundwater with

higher pH and more oxidizing conditions. Precipitation of iron hydroxides and acid sulfate minerals could occur near these two wells (including the sand packs and well screens). Precipitation or fouling would reduce hydraulic conductivity, reducing the efficiency of groundwater extraction. Design elements should be considered including well placement, extraction rates and possible cycling of pumps to minimize the opportunity for fouling.

Additionally, DAPL extraction would be occurring simultaneously with groundwater hot spots extraction. Operation of the off-PWD DAPL extraction system has shown that lowering of the DAPL interface results in lowering of the diffuse layer and reductions in concentrations of NDMA and other constituents. As a result, groundwater hot spot extraction well screens may need to be sequentially lowered as DAPL is removed. Alternatively, it may be possible to use the DAPL extraction wells to remove the hot spot groundwater after DAPL is removed when the diffuse layer is at the elevation of the DAPL extraction wells. The sequence and placement of DAPL and hot spot groundwater extraction wells will be further evaluated during the predesign investigations.

These factors could reduce the efficiency of groundwater extraction using wells overlying the DAPL pools. Based on these factors, the implementability of Alternative GW 5 for groundwater hot spots remediation is considered to be less feasible than GW 2 and 3 and similar to GW 4.

4.4.4.8. GW 5 Cost

The cost for Alternative GW 5 is presented in **Table 4.4-4**. The estimated capital cost (rounded to the nearest thousand dollars) is $14,212,000, which includes construction of access roads, installation of 12 new extraction wells to target areas with groundwater containing NDMA within the 1,100 ng/L contour intervals, installation of conveyance piping, and construction of a new treatment plant. The treatment plant includes unit operations for oxidation, precipitation, and clarification of iron and manganese; breakpoint chlorination for ammonia removal; GAC adsorption; UV oxidation for NDMA removal; and precipitated solids dewatering. Estimated treatment plant costs also include civil site work; a building to house the treatment system; and mechanical, electrical, and control systems.

Estimated annual cost over the 7.9 years of the active portion of this alternative (groundwater extraction and treatment) consist of system O&M, which would include treatment chemicals, UV replacement lamps, electricity, and system performance monitoring. Because COCs may remain at concentrations that may not allow for unlimited use and unrestricted exposure, it is assumed that Five-Year Reviews will be conducted as required under CERCLA every five years for the 30-year project duration.

The cost estimate for this alternative, presented in **Table 4.4-4**, is summarized as follows:

Alternative GW 5: GW Hot Spot Extraction from Approximately 12 New Extraction Wells from Within the 1,100 ng/L NDMA Contour	
Capital Cost	$14,212,000
O&M Costs	$5,279,000
Total Cost	$19,491,000
Net Present Worth	$18,071,000
Overall Alternative Duration	30 years

4.5 Containment Area Alternatives

The following sections present the detailed evaluation of Alternatives CA 2 and CA 3.

4.5.1 Alternative CA 2: Capping, Equalization Window Closure, and Institutional Controls

This alternative involves placing a permanent cap over the containment area. The final cap design and cap type (i.e., RCRA Subtitle C or D type cap) will be determined based on the results of the November 2019 containment area investigation and future remedial design investigation; for the purposes of cost estimation in this FS, a cap generally complying with RCRA Subtitle D requirements has been assumed. Similar to the existing temporary cap, the proposed footprint of the cap is shown on **Figure 4.5-1** and extends approximately 30-50 feet beyond the boundary of the containment area, except where the detention basin is adjacent to the southern end of the Containment Area. The proposed cap would minimize infiltration levels and have a hydraulic conductivity comparable to the Containment Area's slurry wall, or as appropriate based on pre-design investigations and applicable regulations. The Containment Area's existing equalization window would be closed by grouting in place.

4.5.1.1. Components of Alternative CA 2

The scope of this alternative includes the following major components:

- Institutional Controls
- Pre-design investigations and design

- Equalization window closure
- Cap construction
- Long-term O&M
- Reporting
- Five-Year Reviews

Estimated Duration for Alternative CA 2. The overall project duration for this alternative is summarized as follows:

- Pre-design and design 12 months
- On-site remedial activities 6 months
- O&M, IC maintenance, and Five-Year Reviews 30 years

Institutional controls. 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 over the Containment Area. Institutional controls may be added to address potential VI concerns if these concerns become evident in pre-design studies.

Pre-design investigations and design. Pre-design investigations would consist of a direct-push drilling program to obtain geotechnical information in support of the remedial design. For cost estimating purposes, the field effort for this investigation is anticipated to be completed in approximately one week. The geotechnical data obtained during the pre-design investigations, along with settlement and slope stability evaluations, would be used to design the cap. The remedial design would also help identify the inspections and O&M requirements necessary to maintain the integrity of the cap over time.

The pre-design investigations would also include a stormwater study to verify the current understanding that the Containment Area elevation (85 ft above mean sea level [msl]) is above the 500-year flood elevation (82 ft msl), which would mean that this alternative would not result in the occupancy and modification of the 500-year floodplain at the Olin 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 design activities and implemented during the Remedial Action (RA) phase.

Equalization window closure. The existing equalization window is an approximately 10-foot by 40-foot opening in the west side of the Containment Area's 3-foot wide slurry wall. The

equalization window is filled with crushed stone and would be sealed and grouted in place to eliminate the flow of groundwater through the slurry.

Cap construction over the Slurry Wall/Containment Area. The final cap design and cap type (i.e., RCRA Subtitle C or D type cap) will be determined based on the results of the November 2019 containment area investigation and future remedial design investigation; for the purposes of cost estimation in this IAFS Report, a cap generally complying with RCRA Subtitle D requirements has been assumed.

The temporary cap would be removed and a cap meeting RCRA Subtitle D requirements would be installed. The objective of the cap is to permanently minimize infiltration into the containment structure. **Figure 4.5-1** shows the existing Slurry Wall/Containment Area that this alternative would address as well as the proposed staging area for remedial activities. The approximate limits of the proposed cap as shown on **Figure 4.5-1** are based on a maximum of 7.5 feet of subgrade soil (average depth of approximately 2.5 feet) to achieve a 3% minimum slope prior to construction of the approximately 2-foot thick composite cap. For FS costing purposes, the proposed cap is anticipated to extend horizontally approximately 50 feet beyond the limits of the slurry wall; however, the actual limits of the proposed cap would be established during remedial design.

RCRA Subtitle D and the Massachusetts solid waste management regulations require that a final cover minimize infiltration and erosion through construction of an infiltration layer of earthen material that has a permeability less than or equal to the permeability of the bottom liner system or natural soil present or a permeability no greater than 1×10^{-7} centimeters per second (cm/sec), whichever is less. The Containment Area does not have a synthetic bottom liner; therefore, in accordance with Subtitle D, the infiltration barrier may be constructed from soil and designed to meet the required minimum permeability. However, the existing slurry wall surrounding the containment area has an effective permeability of approximately 1×10^{-8} cm/sec, and an appropriate cover system would be designed to meet this lower permeability. For the purpose of costing in this FS, a composite (geomembrane over a GCL) cover system has been assumed. Any leaks through imperfections in the geomembrane are sealed by hydration of the bentonite clay in the underlying GCL. The GCL is not subject to the desiccation problems caused by freezing/thawing that are common to clay soil liners in composite caps. The composite cap proposed will provide hydraulic performance equal to or better (lower) than the hydraulic conductivity of the slurry wall.

Prior to construction of the RCRA Subtitle D cap, the equalization window would be closed by grouting in place. The cap footprint area would be re-graded by cut-and-fill activities to create

positive grades allowing surface water to drain to a perimeter ditch that would carry surface water to the existing detention basin.

A typical cross-section of the proposed RCRA Subtitle D cap, as shown on **Figure 4.5-2**, is assumed to be composed of the following layers from depth to surface:

- compacted subgrade fill
- 12 inches of soil
- GCL
- linear low-density polyethylene geomembrane
- geocomposite drainage layer
- 18 inches of soil cover
- vegetative layer with 6 inches of topsoil

Waste materials that would typically create methane gas when degrading over time are not present within the Containment Structure. Therefore, the proposed cap would not require a gas venting layer.

Construction of the Subtitle D cap is estimated to take approximately six months to complete.

Long-term O&M. Periodic inspections of the RCRA Subtitle D cap would be conducted to verify the structural integrity of the cap. Damaged cap areas would be repaired to maintain its integrity. The inspections for the RCRA Subtitle D cap are assumed to be conducted on a quarterly basis for the first year and annually thereafter. Routine maintenance activities are assumed to include mowing of the vegetative cover twice during the growing season, general site maintenance and repairs (e.g., maintenance of access roads and perimeter drainage system), and repairs due to erosion of the vegetative cover. For cost estimating purposes to support this IAFS Report, O&M and inspections have been assumed for 30 years.

Reporting. A Remedial Action Report would be prepared to document the remedial action, including but not limited to grading plans (e.g., existing conditions, cover system subgrade, final grading, and site drainage and erosion control measures) and quality assurance/quality control testing associated with the various components of the composite cover system.

Annual monitoring reports would be prepared to document inspections and O&M activities. For cost estimating purposes to support this FS, annual reporting has been assumed for 30 years.

Five-Year Reviews. During Five-Year Reviews, an assessment is made as to whether the implemented remedy continues to be protective of human health and the environment, or whether the implementation of additional remedial action is appropriate. The USEPA document Comprehensive Five-Year Review Guidance (USEPA, 2001) provides guidance on the performance of Five-Year Reviews. This alternative is expected to isolate soil containing COCs with concentrations above PRGs; however, COCs will remain at concentrations that may not allow for unlimited use and unrestricted exposure (for example, as a residential property, school, or daycare facility). Therefore, Five-Year Reviews will be conducted as required under CERCLA. For cost estimating purposes, this alternative assumes Five-Year Reviews will be conducted for 30 years.

4.5.1.2. CA 2 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment by permanently minimizing infiltration into the Slurry Wall/Containment Area structure and by physically closing the equalization window to eliminate the flow of groundwater through the slurry wall.

Capping the Containment Area and closing the equalization window would reduce potential risk to human receptors and achieve the RAO of preventing human exposure via direct contact, ingestion, and/or inhalation to soil containing Site contaminants exceeding ARARs and health-protective risk-based standards. This alternative would also achieve the RAO of preventing or minimizing leaching of Site contaminants within the Containment Area into groundwater, surface water, and sediments at levels that pose unacceptable risk to human health and the environment.

4.5.1.3. CA 2 Compliance with ARARs

Alternative CA 2 would be designed and implemented to comply with ARARs that are identified in **Tables 2.1-11 through 2.1-13**.

This alternative would be designed and implemented to minimize potential impacts to adjacent wetland areas. The proposed footprint of the cap extends into wetland areas. Restoration activities would be implemented to comply with identified location-specific ARARs identified in **Table 2.1-11**, such as compensatory wetlands mitigation, if necessary, to comply with Clean Water Act Section 404 and the Massachusetts Wetland Protection Act, which have been identified as applicable location-specific requirements.

Site-specific PRGs have been developed to comply with the identified chemical-specific ARARs identified in **Table 2.1-12**. In particular, PRG development considered USEPA risk assessment

guidance documents and Regional Screening Levels, which are listed as "to be considered" criteria or guidance.

This alternative would be designed and implemented to comply with the action-specific ARARs identified in **Table 2.1-13**, including but not limited to, federal and state air emission standards and hazardous waste regulations related to soil characterization and disposal. Additionally, the proposed RCRA Subtitle D cap would be designed and constructed to comply with the RCRA Subtitle D municipal solid waste landfill requirements and the Massachusetts solid waste management regulations (relevant and appropriate requirement) related to a final cover system and post-closure monitoring and O&M. Any hazardous waste generated during the remedial action would be handled, stored, tracked, and disposed of in accordance with the requirements of RCRA Subtitle C and Massachusetts Hazardous Waste Rules, both of which have been identified as applicable action-specific requirements for this alternative.

Tables 2.1-11 through 2.1-13 provide a more thorough evaluation of ARARs associated with the alternative, including how the alternative would comply with each requirement and citation listed.

4.5.1.4. CA 2 Long-term Effectiveness and Permanence

This alternative would provide long-term effectiveness by installing a RCRA Subtitle D cap to permanently minimize infiltration into the Slurry Wall/Containment Area structure and by physically closing the equalization window to eliminate the flow of groundwater through the slurry wall.

Installing a RCRA Subtitle D cap and closing the equalization window would reduce potential risk to human receptors and achieve the RAO of preventing human exposure to indoor air vapors, via a vapor intrusion pathway, containing Site contaminants above levels that pose an unacceptable risk. This alternative would also achieve the RAO of preventing or minimizing leaching of Site contaminants within the Containment Area into groundwater, surface water, and sediments at levels that pose unacceptable risk to human health and the environment.

Completion of the on-site activities from pre-design investigations through construction of the RCRA Subtitle D cap and closure of the equalization window are estimated to take approximately 1.5 years. Additionally, for FS costing purposes, this alternative assumes inspections and long-term O&M activities would be conducted for 30 years.

4.5.1.5. CA 2 Reduction of Toxicity, Mobility, or Volume through Treatment

This alternative provides a reduction in mobility of contaminants by constructing a permanent RCRA Subtitle D cap over the Slurry Wall/Containment Area structure. This alternative does not provide any reduction in toxicity or volume of contaminants. Additionally, this alternative does not involve any treatment technologies and therefore does not satisfy the statutory preference for treatment as a principal element.

4.5.1.6. CA 2 Short-term Effectiveness

This alternative includes installing a RCRA Subtitle D cap over the Containment Area to permanently minimize infiltration into the Slurry Wall /Containment Area structure and closing the equalization window to eliminate the flow of groundwater through the slurry wall. This alternative would be protective of human health and the environment upon completion of the active, construction-related activities associated with this remedy. Potential short-term risks to on-site workers involved in the remedial activities would be minimized by conducting the work in accordance with a site-specific health and safety plan. Potential short-term risks to the community would be addressed by minimizing dust, implementing an air monitoring program as appropriate, decontaminating vehicles transporting excavated soil prior to leaving the Site, and minimizing vehicular traffic associated with the remediation effort from traveling through residential areas.

4.5.1.7. CA 2 Implementability

The major components of this alternative are construction of a permanent RCRA Subtitle D cap over the Slurry Wall/Containment Area structure and closure of the equalization window. The technologies used for this alternative are available and sufficiently demonstrated for use at the Site. The necessary equipment and materials are readily available.

4.5.1.8. CA 2 Cost

The cost estimate for this alternative is presented in **Table 4.5-1** and includes the following major components:

- Institutional controls
- Pre-design investigations and design
- Equalization window closure
- Cap construction over the Slurry Wall/Containment Area

- Long-term O&M
- Reporting
- Five-Year Reviews

The overall project duration is summarized as follows:

- Pre-design and design 12 months
- On-site remedial activities 6 months
- O&M, reporting, and five-year reviews 30 years

The cost estimate for this alternative, presented in **Table 4.5-1**, is summarized as follows:

Alternative CA 2: Capping, Equalization Window Closure, and Institutional Controls	
Capital Cost	$2,618,000
O&M Costs	$767,000
Total Cost	$3,385,000
Net Present Worth	$2,936,000
Overall Alternative Duration	30 years

4.5.2 Alternative CA 3: Targeted Soil Removal

This alternative includes excavating targeted areas within the Containment Area, dewatering and stabilization of soil as necessary, confirmation sampling, transportation, disposal, backfilling, and restoration of the excavated areas. This alternative would also include installation of sheet pile wall to protect the structural integrity of the Containment Area's slurry wall and equalization window when excavation occurs near the wall. The actual limits of excavation will be determined based on existing available data as well as data from the November 2019 Containment Area Investigation (Appendix B). For the purposes of cost estimation in this FS, excavation areas have been assumed based on existing and available analytical results where PRGs of 3 mg/kg for BEHP or 1,000 mg/kg for chromium were exceeded. The assumed areas of excavation are shown on **Figure 4.5-3**.

The water table within the Containment Area is generally around 8 feet bgs. Depth to bedrock under the Containment Area varies from approximately 15 to 35 feet bgs. The depth of the chromium-impacted soil is not fully known at this time and will be further evaluated as part of the pre-design investigations. For the purposes of cost estimation in this IAFS Report, excavation areas are assumed either to 1- or 10-feet bgs.

The proposed excavation areas are summarized below.

Containment Area Proposed Excavation Areas

Excavation Area	Area (sf)	Excavation Depth (ft)	In-situ Volume (cf)	In-situ Volume (cy)
0 – 1 ft bgs	9,364	1	9,364	347
0 – 10 ft bgs	119,506	10	1,196,060	44,261
Total	**128,870**	**-**	**857,700**	**44,608**

Current data do not indicate the presence of RCRA hazardous soil within the excavation zones. However, it is possible that shallow soil, ranging from 3 to 8 feet bgs, may fail TCLP for chromium (based on the available total chromium concentrations detected in soil). Excavated soil that fails TCLP would be stabilized prior to disposal so that it may be disposed of as non-hazardous. Therefore, for costing purposes, a portion of the excavated soil has been assumed to need stabilization. The volume of soil assumed to need stabilization is approximately 16,114 cy, or about 36% of the total volume of soil requiring off-site disposal. This would account for unanticipated RCRA hazardous soil that could be identified during predesign or the Data Gaps Work Plan investigations.

Post-excavation verification sampling would be conducted to document soil impact limits and to confirm achievement of RAOs and PRGs. Upon confirmation that impacted soils have has been removed, excavated areas would be backfilled to grade with “clean” imported soil.

Under this alternative, the slurry wall and equalization window would remain in place and continue to function as intended.

4.5.2.1. Components of Alternative CA 3

The scope of this alternative includes the following major components:

- Institutional controls
- Pre-design investigations
- Targeted excavation of soil within the Containment Area
- Installation of sheet pile wall at some locations, as necessary
- Excavation dewatering, as necessary
- Dewatering/stabilization of excavated soil, as necessary
- Off-site disposal of excavated soil
- Verification sampling
- Backfill and restoration
- Reporting
- Five-Year Reviews

Estimated Duration for Alternative CA 3. The overall project duration for this alternative is summarized as follows:

- Pre-design and design 9 months
- On-site remedial activities 6 months
- Five-Year Reviews and IC Maintenance 30 years

Institutional Controls. Institutional controls will be implemented to limit and restrict future activities within the confines of the Slurry Wall/Containment Area. Institutional controls may be added to address potential VI concerns if these concerns become evident in pre-design studies.

Pre-design investigations. Pre-design investigations would consist of a direct-push drilling program to confirm the limits of the excavation areas that require remediation. For cost estimating purposes, the field effort for this investigation is anticipated to be completed in approximately one week.

The pre-design investigations would also include a stormwater evaluation to verify that the Containment Area elevation (85 ft msl) is above the 500-year flood elevation (82 ft msl), this would mean that this alternative would not result in the occupancy and modification of the 500-year floodplain at the Olin Property. If additional site preparation work is required to provide for adequate drainage and storage within the 500-year floodplain, this will be evaluated as part of design activities and implemented during the Remedial Action (RA) phase.

Targeted excavation of soil in the Containment Area. The excavation limits would be determined during remedial design and would be based on current available data, the November 2019 Containment Area Investigation (Appendix B), as well as pre-design investigations in support of the remedial action.

Excavation limits assumed for the purpose of costing this FS are shown on **Figure 4.5-3** and are based on sampling locations where soil concentrations exceeded PRGs for BEHP and/or chromium. **Figure 4.5-3** shows areas where excavation is assumed to be completed to 1 ft bgs as well as areas where excavation is assumed to be completed to 10 ft bgs. The assumed volume of soil to be excavated are summarized in the table above.

Ten groundwater monitoring wells are located in the various excavation zones. If it is determined during design that the groundwater wells are necessary for sampling after remediation, the design would incorporate protecting and excavating around the wells. Any repair or replacement of unintentionally damaged wells would be covered by the contingencies included in capital costs.

Installation of sheet pile wall. The Containment Area's slurry wall was previously installed to provide hydraulic containment of the on-Property DAPL pool and the associated diffuse groundwater. The equalization window is a part of the slurry wall that allows upper level groundwater to equilibrate with the water table outside the slurry wall. Some of the proposed excavation areas are near or abutting the existing slurry wall and/or the equalization window. Installation of a sheet pile wall would be necessary to maintain structural integrity of the slurry wall during excavation; proposed locations for sheet pile wall installations are shown on **Figure 4.5-3.** For the purposes of cost estimating in this FS, the sheet pile wall is assumed to extend from ground surface down to one and a half times the depth of the excavation; however, the actual sheet pile configuration would be determined during remedial design. Once the excavation areas are backfilled, the sections of sheet pile wall would be cut a few feet below ground surface, and the remaining sheet pile would be left in-place.

Excavation dewatering. The depths of the proposed excavation areas are anticipated to range from approximately 1 to 10 feet bgs, with an average water table of approximately 8 feet bgs. To the extent possible, the proposed excavations would be conducted during times of low water table conditions to minimize the volume of saturated soil to be excavated. However, due to the depths of the proposed excavation areas and the relatively shallow water table, some amount of dewatering would likely be necessary. It is anticipated that excavation dewatering would require pumping at less than 10 gpm. The extracted groundwater would be treated through the existing on-site treatment plant or using a portable GAC water treatment system followed by discharge

to surface water. Frac tanks would be used for temporary storage of dewatering fluids: one tank to store water prior to treatment and one tank to store treated water prior to discharge.

Dewatering/stabilization of excavated soil. Excavated soil that fails TCLP regulatory limits for chromium and excavated soil from below the water table would be stabilized on-site prior to transportation and off-site disposal. This soil would be chemically and physically stabilized using Portland cement, lime, or other suitable stabilizing agent. Once stabilized, the soil previously failing TCLP would be re-tested to determine if it passes TCLP and could therefore be transported and disposed of off-site as a non-hazardous waste. The in-situ volume of soil requiring ex-situ stabilization is estimated to be 16,144 cubic yards, or approximately 36% of the total estimated volume of soil requiring excavation and off-site disposal (44,608 cubic yards).

Off-site disposal of excavated soil. As discussed under the excavation component of this alternative, the total estimated in-situ volume of soil to be excavated and disposed of off-site is approximately 44,608 cubic yards (approximately 80,000 tons). This includes the soil discussed above that would require stabilization prior to off-site disposal as non-hazardous waste.

Verification sampling. A post-remediation verification sampling program would be conducted to confirm achievement of RAOs and PRGs for the Containment Area soil. This sampling program would include collecting soil samples at the completed excavation limits and analyzing the samples for the identified COCs to verify that concentrations of these constituents are below the established PRGs.

Backfill and restoration. This alternative assumes that the completed excavation areas would be backfilled to grade with imported "clean" soil. The completed excavation areas would be backfilled to return the areas to original grades (i.e., pre-excavation ground surface elevations).

Reporting. A Remedial Action Report would be prepared to document the work, including but not limited to the final excavation limits, post-excavation sampling results, on-site stabilization efforts, waste disposal, and stabilization verification sampling results.

Five-Year Reviews. During Five-Year Reviews, an assessment is made as to whether the implemented remedy continues to be protective of human health and the environment, or whether the implementation of additional remedial action is appropriate. The USEPA document Comprehensive Five-Year Review Guidance (USEPA, 2001) provides guidance on the performance of Five-Year Reviews. This alternative is expected to reduce COC concentrations to below PRGs; however, COCs may remain at concentrations that may not allow for unlimited use and unrestricted exposure (for example, as a residential property, school, or daycare facility).

Therefore, Five-Year Reviews will be conducted as required under CERCLA. For cost estimating purposes, this alternative assumes Five-Year Reviews will be conducted for 30 years.

4.5.2.2. CA 3 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment by physically removing soil with site-related COC concentrations above PRGs within the Containment Area, thereby reducing potential risk to human receptors and achieving the RAO of preventing human exposure to indoor air vapors, via a vapor intrusion pathway, containing Site contaminants above levels that pose an unacceptable risk.

Physically removing soil with site-related COC concentrations above PRGs within the Containment Area would achieve the RAO of preventing or minimizing leaching of Site contaminants within the Containment Area into groundwater, surface water, and sediments at levels that pose unacceptable risk to human health and the environment.

4.5.2.3. CA 3 Compliance with ARARs

Alternative CA 3 would be designed and implemented to comply with ARARs that are identified in **Tables 2.1-11 through 2.1-13**

This alternative would be designed and implemented to minimize potential impacts to adjacent wetland areas. Restoration activities would be implemented to comply with identified location-specific ARARs identified in **Table 2.1-11**, such as compensatory wetlands mitigation, if necessary, to comply with Clean Water Act Section 404 and the Massachusetts Wetland Protection Act, which have been identified as applicable location-specific requirements.

Site-specific PRGs have been developed to comply with the identified chemical-specific ARARs identified in **Table 2.1-12**. In particular, PRG development considered USEPA risk assessment guidance documents and Regional Screening Levels, which are listed as "to be considered" criteria or guidance.

This alternative would be designed and implemented to comply with the action-specific ARARs identified in **Table 2.1-13**, including but not limited to, federal and state air emission standards and hazardous waste regulations related to soil characterization and disposal.

This alternative involves excavation and off-site disposal of soil within the Slurry Wall/Containment Area. At least a portion of the excavated soil would likely exceed chromium TCLP regulatory limits. Excavated soil would be analyzed to determine whether the material may

be classified as a RCRA characteristic hazardous waste. Any hazardous waste generated during the remedial action would be handled, stored, tracked, and disposed of in accordance with the requirements of RCRA Subtitle C and Massachusetts Hazardous Waste Rules, both of which have been identified as applicable action-specific requirements for this alternative.

Tables 2.1-11 through 2.1-13 provide a more thorough evaluation of ARARs associated with the alternative, including how the alternative would comply with each requirement and citation listed.

4.5.2.4. CA 3 Long-term Effectiveness and Permanence

This alternative would provide long-term effectiveness by permanently removing soil within the Containment Area with site-related COC concentrations above PRGs. Post-remediation sampling would be conducted to verify achievement of PRGs and long-term protection of human health and the environment.

Removing impacted soil within the Containment Area would achieve the RAO to prevent human exposure to indoor air vapors, via a vapor intrusion pathway, containing Site contaminants above levels that pose an unacceptable risk. Removing these soils this soil would also meet the RAO to prevent or minimize leaching of Site contaminants into groundwater, surface water, and sediments. By achieving these RAOs, this alternative would provide long-term effectiveness and permanence.

Completion of the on-site activities from pre-design investigations through final verification sampling and reporting, are estimated to take approximately 1.5 years. Five-year reviews are assumed to be conducted for thirty years.

This alternative involves physical removal of impacted soil within the Containment Area. The goal of the alternative is to remove soil with contaminant concentrations above the PRGs, as well as any soil characterized as hazardous waste, thereby resulting in minimal contamination remaining and minimal risk to receptors following completion of this alternative.

4.5.2.5. CA 3 Reduction of Toxicity, Mobility, or Volume through Treatment

This alternative would involve physical removal of soil from within the Containment Area with site-related COC concentrations above PRGs, as well as soil that may be characterized as a hazardous waste. Physical removal of this soil would reduce the toxicity, mobility, or volume of site-related COCs in soil within the Containment Area.

Approximately 44,600 cy (approximately 80,000 tons) of soil would be excavated from within the Containment Area and shipped off-site for disposal. Of this total excavated volume, approximately 16,144 cubic yards (approximately 37,000 tons) of soil are anticipated to require stabilization due to chromium (and potentially other chemical constituents) that may fail TCLP, as well as the saturated zone soil that is removed. This material, which is approximately 36% of the total excavated volume, would be stabilized on-site prior to transportation to an off-site disposal facility. On-site stabilization of soil would reduce the potential for leaching, reducing the mobility of chromium, and allow all excavated soil to be shipped off-site for disposal as non-hazardous waste.

Based on available site data, approximately 13.35 tons of chromium and 51.6 tons of BEHP are associated with the soil proposed to be removed from within the Containment Area.

This alternative would involve excavation of soil below the water table, which would likely require dewatering of the excavation to facilitate removal of impacted subsurface soil. Excavation dewatering fluids would be treated on-site using a portable (e.g., skid-mounted) treatment unit consisting of GAC. The treated water would then be discharged to South Ditch.

This alternative involves on-site stabilization to treat the excavated soil prior to off-site disposal. Therefore, this alternative satisfies the statutory preference for treatment as a principal element.

4.5.2.6. CA 3 Short-term Effectiveness

This alternative would involve excavation, on-site treatment (i.e., soil stabilization), and off-site disposal, which would be effective at removing site-related COCs from subsurface soil within the Containment Area. This alternative would be protective of human health and the environment and would provide short-term effectiveness upon completion of construction-related activities associated with this alternative, which is estimated to be approximately 1.5 years. Potential short-term risks to on-site workers involved in the remedial activities would be minimized by conducting the work in accordance with a site-specific HASP. Potential short-term risks to the community would be addressed by minimizing dust, implementing an air monitoring program as appropriate, decontaminating vehicles transporting excavated soil prior to leaving the Site, and minimizing vehicular traffic associated with the remediation effort from traveling through residential areas.

An appropriate air monitoring program would be implemented to assess emissions associated with the excavation and soil handling activities and alert operators to make adjustments if emissions may impact nearby receptors.

4.5.2.7. CA 3 Implementability

The major components of this alternative are excavation, on-site treatment (soil stabilization), and off-site disposal. The technologies used for this alternative are generally implementable, readily available, and sufficiently demonstrated for use at the Site. The alternative would use standard construction equipment, and the equipment, materials, and disposal facility are readily available.

Due to the depths and proximity of the excavation areas to the existing slurry wall, installation of a sheet pile wall would be necessary to maintain its structural integrity. Materials and equipment to install the sheet pile wall are readily available, and the use of sheet piling for excavation stability is a well-known, commonly implemented technology.

This alternative would require soil to be excavated to depths up to 10 feet bgs, which is below the water table that is generally around 8 feet bgs. Therefore, removal of this soil would likely require dewatering of the excavations. Excavation dewatering would likely involve treating this water on-site using a portable (e.g., skid-mounted) treatment unit consisting of GAC. The treated water would then be discharged to a surface water body (e.g., South Ditch). These technologies are also readily implementable and are well proven techniques for excavation dewatering.

This alternative includes on-site stabilization of soil due to chromium (and potentially other chemical constituents) that may fail TCLP, as well as the saturated zone soil that is removed. This soil would be stabilized using Portland cement, lime, or some other suitable stabilizing agent. Once stabilized, the soil would no longer fail TCLP and therefore, would be transported and disposed of off-site as a non-hazardous waste. Soil stabilization using Portland cement is a proven and commonly used technology for which the materials and equipment are readily available.

An appropriate air monitoring program would be implemented to assess emissions associated with the excavation and soil handling activities and to alert operators to make adjustments if emissions may impact nearby receptors.

4.5.2.8. CA 3 Cost

The cost estimate for this alternative is presented in **Table 4.5-2** and includes the following major components:

- Pre-design investigations

- Targeted excavation of soil in the Containment Area
- Installation of sheet pile wall at some locations, as necessary
- Excavation dewatering, as necessary
- Dewatering/stabilization of excavated soil, as necessary
- Off-site disposal of excavated soil
- Verification sampling
- Backfill and restoration
- Reporting
- Five-Year Reviews

The estimated time to complete the on-site remedial activities associated with this alternative is approximately six months, and the overall duration of the remedy (including predesign, design, verification, and reporting) is estimated to be approximately 30 years.

Costs for excavation, sheet pile installation, dewatering, on-site stabilization, off-site disposal, backfill, and restoration were provided by environmental remediation contractors. Costs associated with pre-design investigations, verification sampling, and reporting are based on costs for similar projects.

The cost estimate for this alternative, presented in **Table 4.5-2**, is summarized as follows:

Alternative CA 3 Targeted Soil Removal	
Capital Cost	$14,434,000
O&M Costs	$30,000
Total Cost	$14,464,000
Net Present Worth	$14,445,000
Overall Alternative Duration	30 years

5.0 REFERENCES

Amec Foster Wheeler, 2015a. Final Data Gap Analysis and Additional Field Studies Work Plan – Operable Unit 3, Olin Chemical Superfund Site, Wilmington, Massachusetts, July 3, 2015.

Amec Foster Wheeler, 2015b. Final Remedial Investigation Report Operable Unit 1 & Operable Unit 2, Olin Chemical Superfund Site; Wilmington, Massachusetts; July 24, 2015.

Amec Foster Wheeler, 2017. Focused Remedial Investigation Report – Dense Aqueous Phase Liquid (DAPL), Olin Chemicals Superfund Site, Wilmington, Massachusetts, October 5, 2017.

Amec Foster Wheeler, 2018a. Draft Remedial Investigation Report - Operable Unit 3; Olin Chemical Superfund Site, Wilmington, Massachusetts, March 30, 2018

Amec Foster Wheeler, 2018b. Draft Operable Unit 1 & Operable Unit 2 Feasibility Study, Olin Chemical Superfund Site, Wilmington, Massachusetts, March 30, 2018.

Amec Foster Wheeler, 2018c. Draft Operable Unit 3 Feasibility Study, Olin Chemical Superfund Site, Wilmington, Massachusetts, March 30, 2018.

AMEC, 2012. Final Operations, Maintenance, and Performance Monitoring Plan – DAPL Extraction Pilot Test; Olin Chemical Superfund Site; Wilmington, Massachusetts; October 8, 2012.

AMEC, 2014. DAPL Extraction Pilot Study Performance Evaluation Report; Olin Chemical Superfund Site; Wilmington, Massachusetts; November 7, 2014.

GEI, 2000. Release Abatement Measure Status Report No. 1, Drum Removal; Olin Wilmington Property; 51 Eames Street; Wilmington, Massachusetts; December 22, 2000.

GEI, 2001. Drum Removal Release Abatement Measure Status Report No. 2 and Completion Statement; Olin Wilmington Property; 51 Eames Street; Wilmington, Massachusetts; July 2001.

Geomega, 2019. Comprehensive Data Gaps Work Plan, Olin Chemical Superfund Site, Wilmington, MA. August 1.

Geomega, 2020. Memorandum Re: DAPL Volume and NDMA Mass Calculations for the Olin Chemical Superfund Site, Wilmington, MA. Submitted January 15.

MACTEC, 2007. Draft Focused Remedial Investigation Report; Olin Chemical Superfund Site; Wilmington, Massachusetts; October 2007.

MACTEC, 2008. Final Interim Response Steps Work Plan; Olin Chemical Superfund Site; Wilmington, Massachusetts; August 8, 2008.

USEPA, 1988a. CERCLA Compliance with Other Laws Manual; Interim Final, USEPA Office of Emergency and Remedial Response, Washington, D.C.; EPA/540/G 89/006, August.

USEPA, 1988b. USEPA Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final. Office of Emergency and Remedial Response. EPA/540/G-89/004. OSWER Directive 9355.3-01. October.

USEPA, 1990. National Oil and Hazardous Substances Pollution Contingency Plan, Code of Federal Regulations, Title 40, Part 300; March 8, 1990; Final Rule: Federal Register; Vol. 55, No. 46; pp. 8666 et seq.

USEPA, 1991a. Guide to Developing Superfund No Action, Interim Action, and Contingency Remedy RODs, Publication: 9355.3-02FS-3, Office of Solid Waste and Emergency Response, April.

USEPA, 1991b. A Guide to Principal Threat and Low Level Threat Wastes; Washington, D.C.; OSWER Directive 9380.3-06FS; November.

USEPA, 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents; Washington, D.C.; OSWER Directive 9200.1-23P, EPA 540-R-98-031; July.

USEPA, 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, Office of Solid Waste and Emergency Response; Washington, D.C.; OSWER Directive 9355.0-75, EPA 540/R-00-002; July.

USEPA, 2001. Comprehensive Five-Year Review Guidance, Office of Solid Waste and Emergency Response; Washington, D.C.; OSWER Directive 9355.7-03B-P, EPA 540/R-01-007; June.

USEPA, 2007a. Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study.

USEPA, 2007b. Statement of Work Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study.

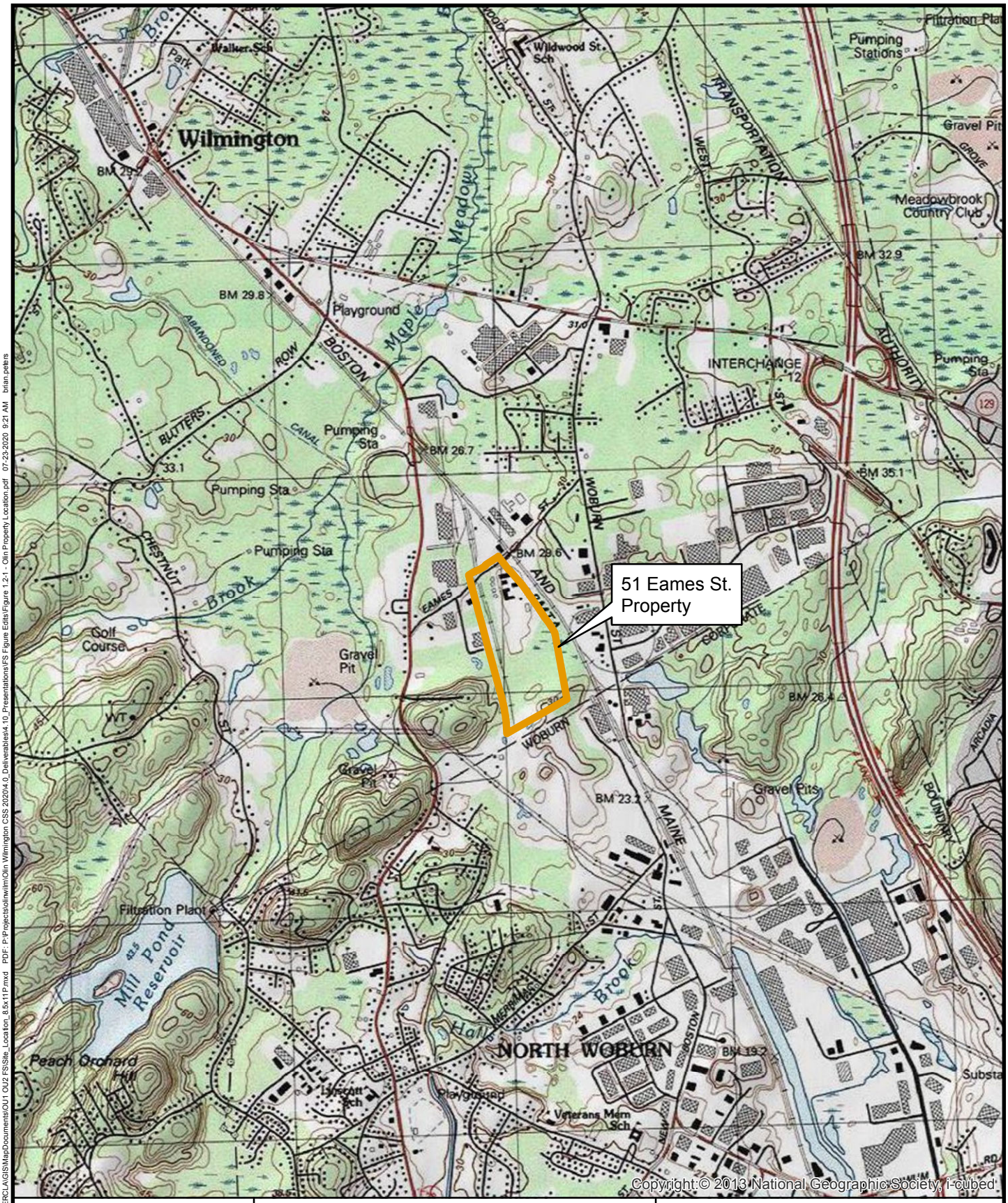
Wood, 2019a. Revised Draft Remedial Investigation Report - Operable Unit 3; Olin Chemical Superfund Site, Wilmington, Massachusetts, June.

Wood, 2019b. Semi-Annual Status Report No. 23, Olin Chemical Superfund Site, Wilmington, Massachusetts, January 3.

Wood, 2020a. 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. Olin Chemical Superfund Site, Wilmington, Massachusetts, July 1.

Wood, 2020b. Supplemental Characterization of Soil Within the Containment Area (November 2019). Olin Chemical Superfund Site, Wilmington, Massachusetts, March 20.

FIGURES



Massachusetts

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N

0 1,000 2,000 4,000 Feet

Figure 1.2-1
Olin Property Location

Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 07-23-20 | Checked/Date: BKH 07-23-20

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Butters Row
Butters Row Treatment Plant
Butters Row #2
Butters Row #1
Town Park
Chestnut St
Chestnut St #1A/2
Chestnut St #1
Sawmill Brook
Maple Meadow Brook
Maple Meadow Brook Wetland
GW-83D DAPL Area
Upper East Ditch
Main St
Eames St
PanAM Railways
Spinazola Landfill
Main St. DAPL Pool
Plant B
MBTA Rail Line
Sanmina Property
Jewel Dr
Plant B Discharge
Lower East Ditch
On-PWD
Off-Property West Ditch DAPL Pool
Off-Property West Ditch
Containment Area
Cook Ave
On-Property DAPL Pool
Delta
South Ditch
Conservation Area
EA5
Off-Property South Ditch
Border Ave
Calcium Sulfate Landfill
Town of Wilmington
City of Woburn
Woburn Landfill
North Pond
New Boston Street Drainway
South Pond
Landfill Brook

Legend

- Aberjona River Watershed
- Ipswich River Watershed
- Approximate DAPL Pool
- Operable Unit 1
- 51 Eames St. Property Boundary
- Town Wells
- Town Line
- Paved Road
- Unpaved Road
- Structures
- Surface Water
- Wooded Areas
- Wetland Boundary
- Culvert

Notes:
1. Off-Property West Ditch DAPL Pool and On-Property DAPL Pool formerly referred to as Upper DAPL Pool
2. Watersheds obtained from MassGIS: https://docs.digital.mass.gov/dataset/massgis-data-major-drainage-basins
3. Operable Unit 2 is portion shown outside of OU1

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N

0 350 700 1,400 Feet

Figure 1.2-2
Watershed, DAPL Pools and Site Features

Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 04-20-20 | Checked/Date: LB 04-20-20

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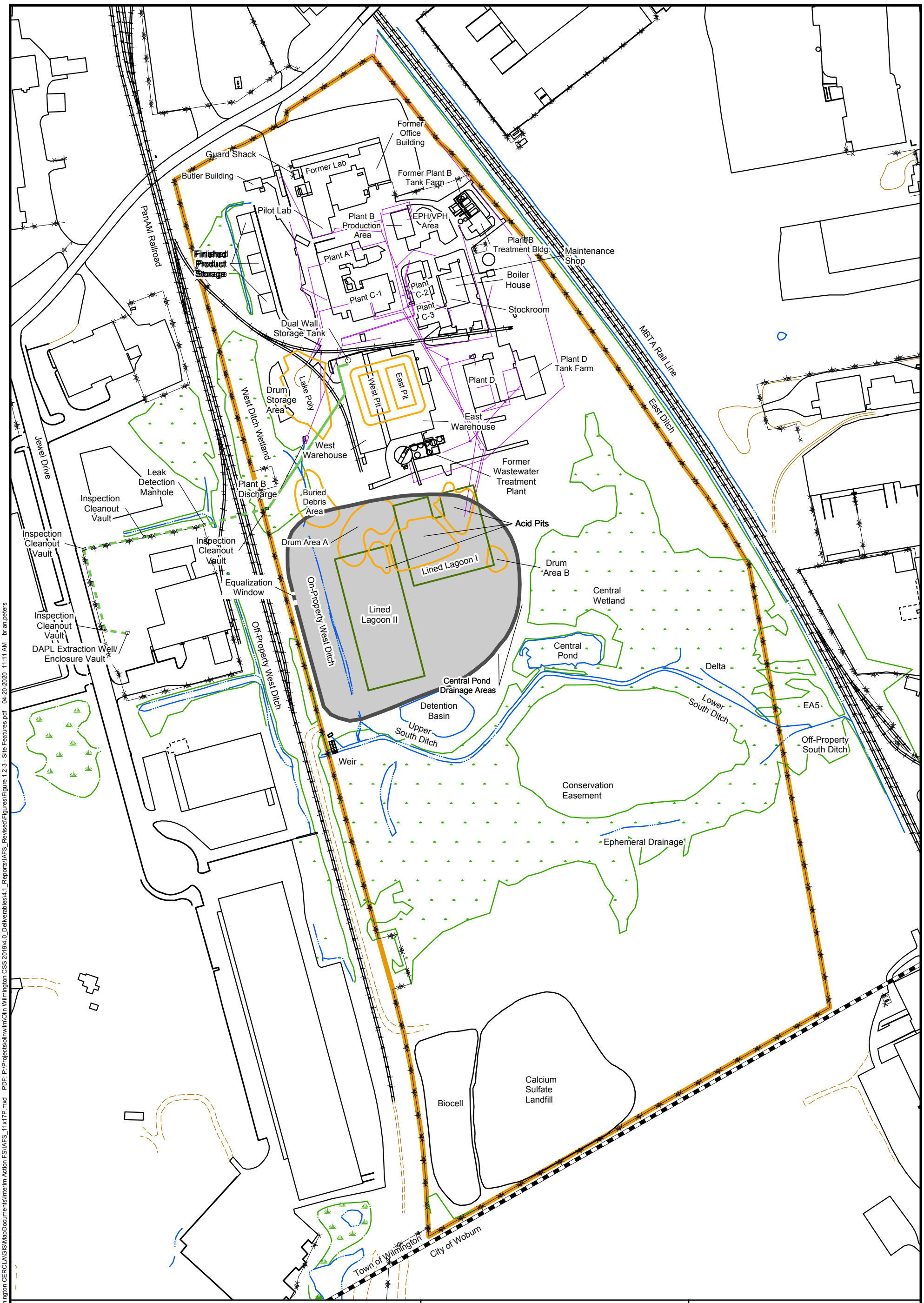

Legend

- 51 Eames St. Property Boundary
- Slurry Wall
- Containment Structure
- Historical Disposal Area
- Aboveground Conveyance Piping
- Underground Conveyance Piping
- Structure
- Paved Road
- Unpaved Road
- Railroad
- Town Line
- Fence
- Trail
- Drain/Sewer Line
- Surface Water
- Wetland Boundary

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N

0 100 200 400 Feet

Figure 1.2-3
Site Features (Current and Historic)

Interim Action Feasibility Study
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Wilmington, Massachusetts

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MP-4 #101
Main Street DAPL Pool
GW-44D
MP-3 #01
GW-70D
GW-59D
GW-45D
GW-43D
Off-Property West Ditch DAPL Pool
On-Property DAPL Pool
GW-42D
MP-2 #01
MP-1 #01
GW-27D

Legend

- Well is screened in DAPL at the time of installation
- Approximate DAPL Pool Boundary
- 51 Eames St. Property Boundary
- Wilmington/Woburn Town Line
- Paved Road
- Unpaved Road
- Railroad
- Structure
- Water
- Wetland Boundary

Note:
Off-Property West Ditch DAPL Pool and On-Property DAPL Pool formerly referred to as Upper DAPL Pool

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N
0 250 500
Feet

Figure 1.3-1
Current Location of DAPL Pools

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Olin Chemical Superfund Site
Wilmington, Massachusetts

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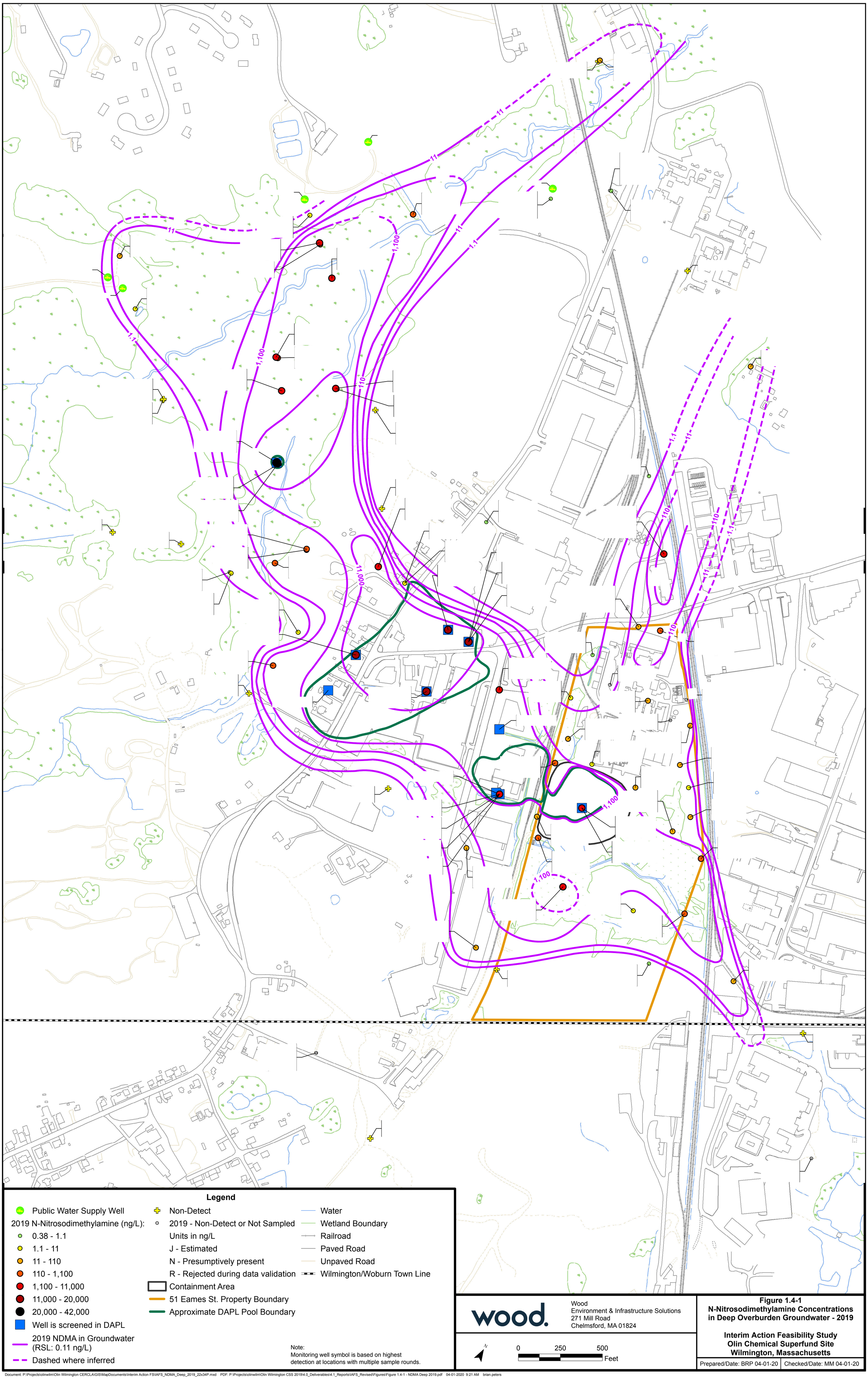

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Figure 1.4-1
N-Nitrosodimethylamine Concentrations in Deep Overburden Groundwater - 2019

Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 04-01-20 | Checked/Date: MM 04-01-20

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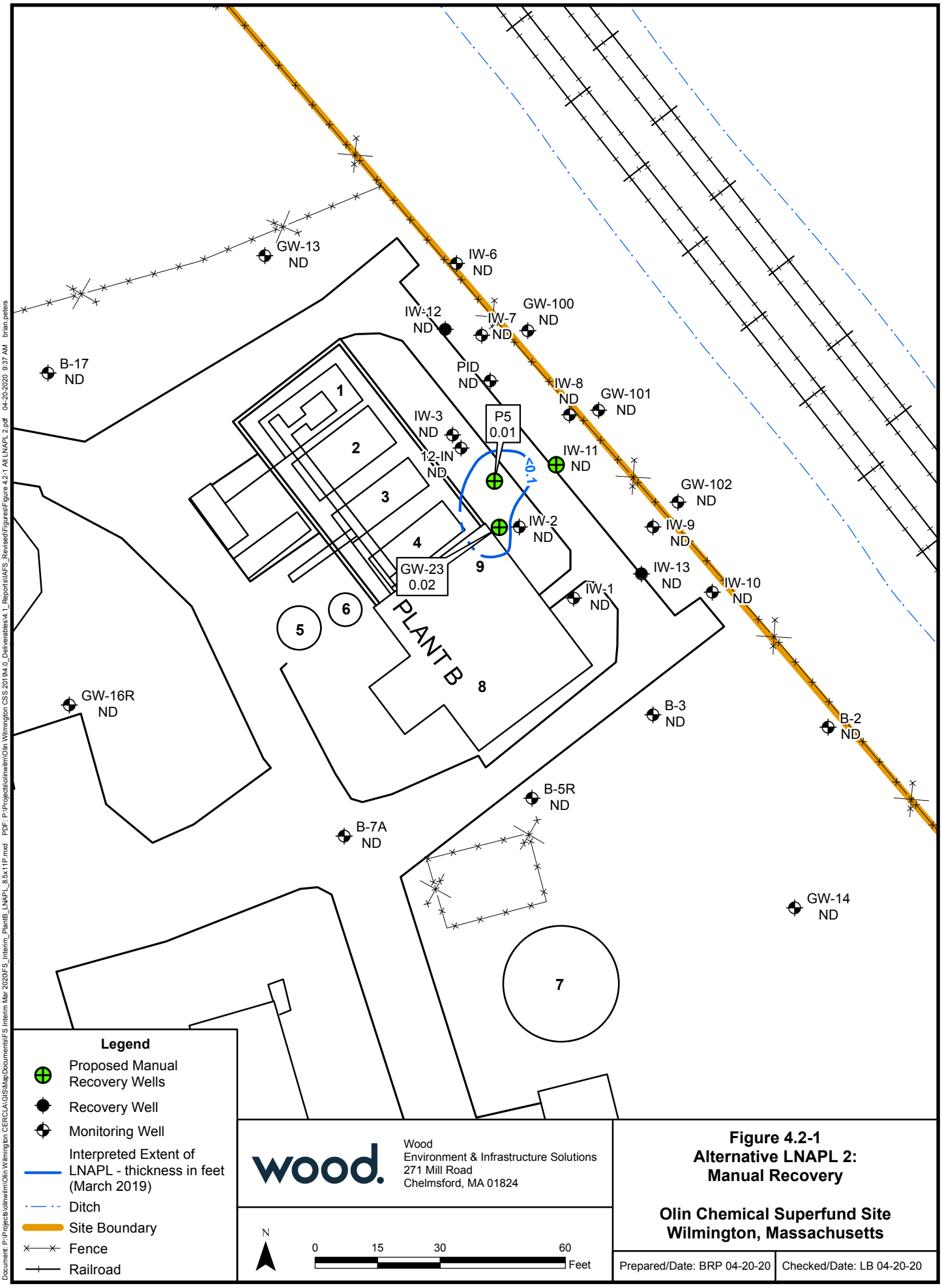

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Figure 4.2-1
Alternative LNAPL 2:
Manual Recovery

Olin Chemical Superfund Site
Wilmington, Massachusetts

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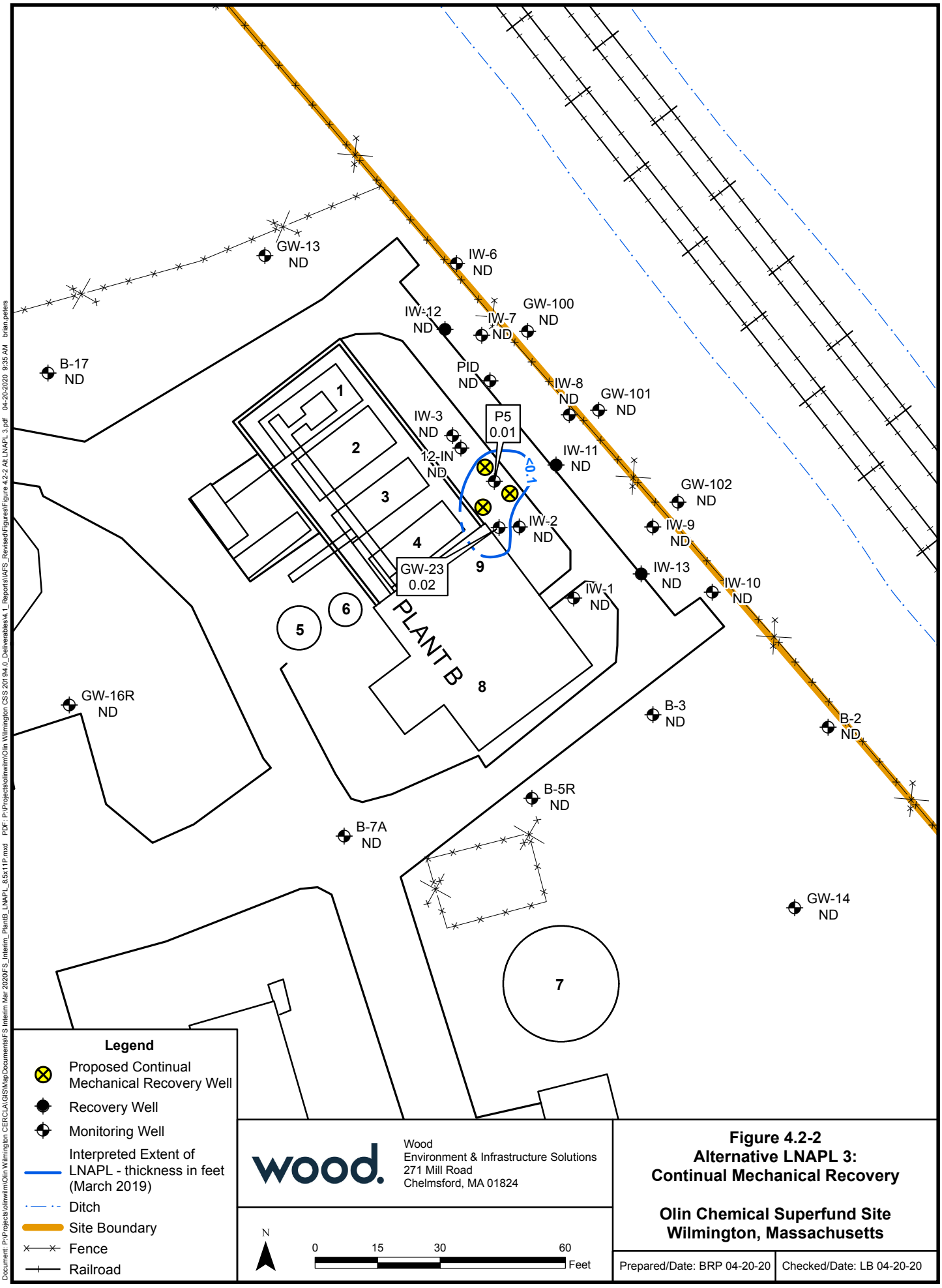

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Figure 4.2-2
Alternative LNAPL 3:
Continual Mechanical Recovery

Olin Chemical Superfund Site
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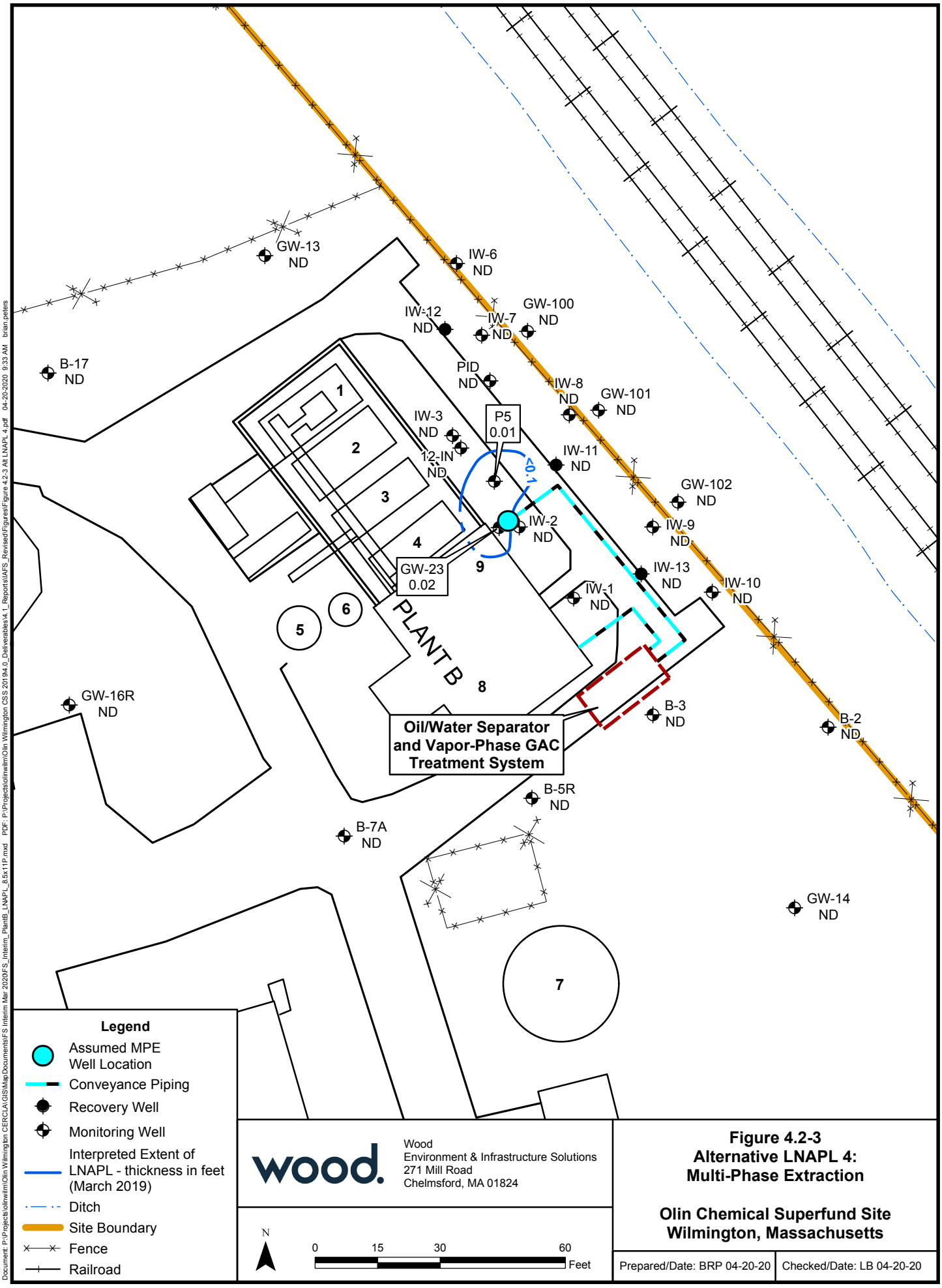

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Figure 4.2-3
Alternative LNAPL 4:
Multi-Phase Extraction

Olin Chemical Superfund Site
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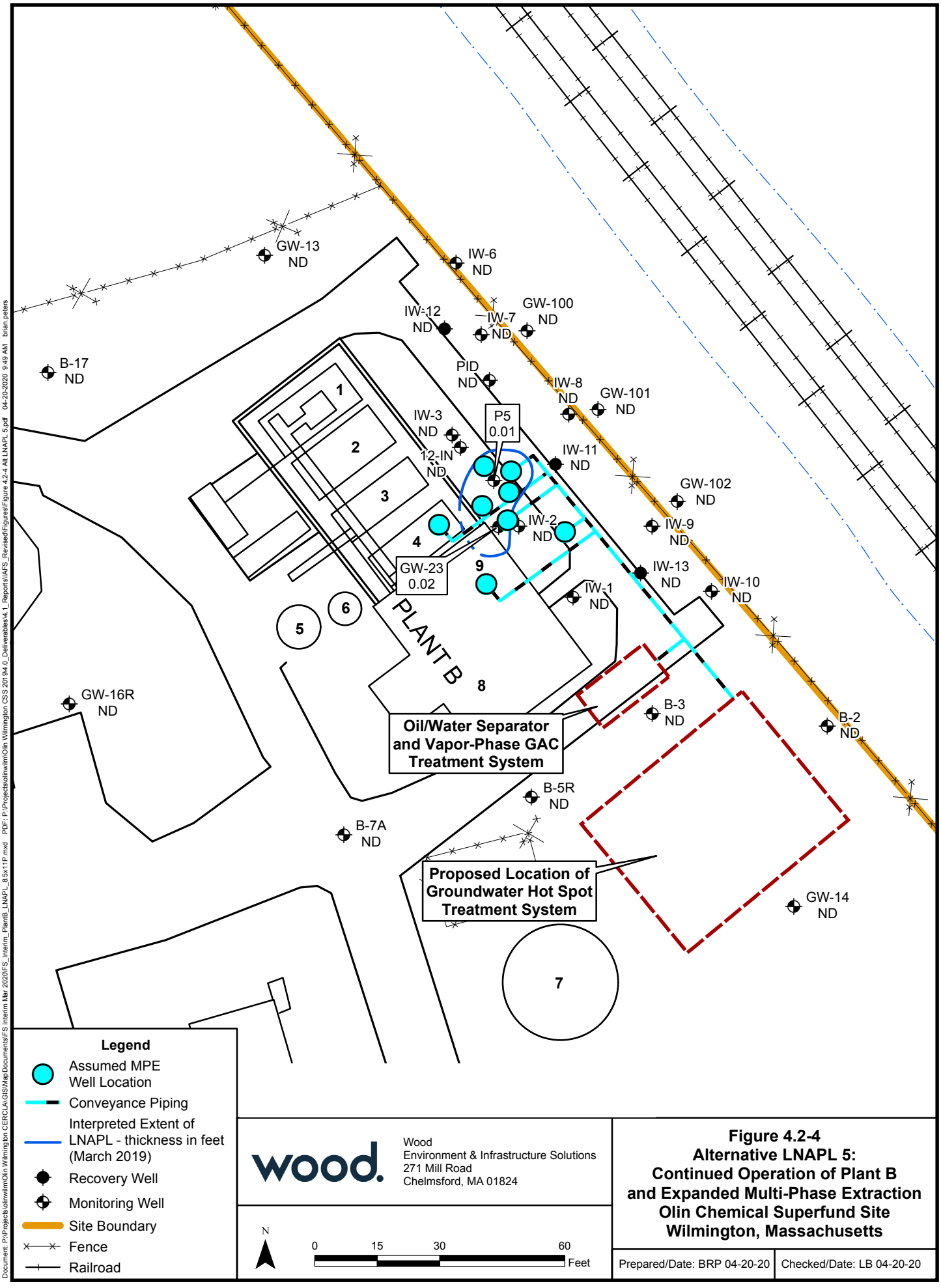
GW-13
ND
IW-6
ND
GW-100
ND
IW-12
ND
IW-7
ND
B-17
ND
PID
ND
IW-8
ND
GW-101
ND
P5
0.01
IW-3
ND
12-IN
ND
IW-11
ND
GW-102
ND
IW-2
ND
IW-9
ND
GW-23
0.02
IW-13
ND
IW-10
ND
IW-1
ND
PLANT B
GW-16R
ND
B-3
ND
B-2
ND
Oil/Water Separator
and Vapor-Phase GAC
Treatment System
B-5R
ND
B-7A
ND
Proposed Location of
Groundwater Hot Spot
Treatment System
GW-14
ND
1
2
3
4
5
6
7
8
9
Legend
Assumed MPE
Well Location
Conveyance Piping
Interpreted Extent of
LNAPL - thickness in feet
(March 2019)
Recovery Well
Monitoring Well
Site Boundary
Fence
Railroad
N
0
15
30
60
Feet
wood.
Wood
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Figure 4.2-4
Alternative LNAPL 5:
Continued Operation of Plant B
and Expanded Multi-Phase Extraction
Olin Chemical Superfund Site
Wilmington, Massachusetts
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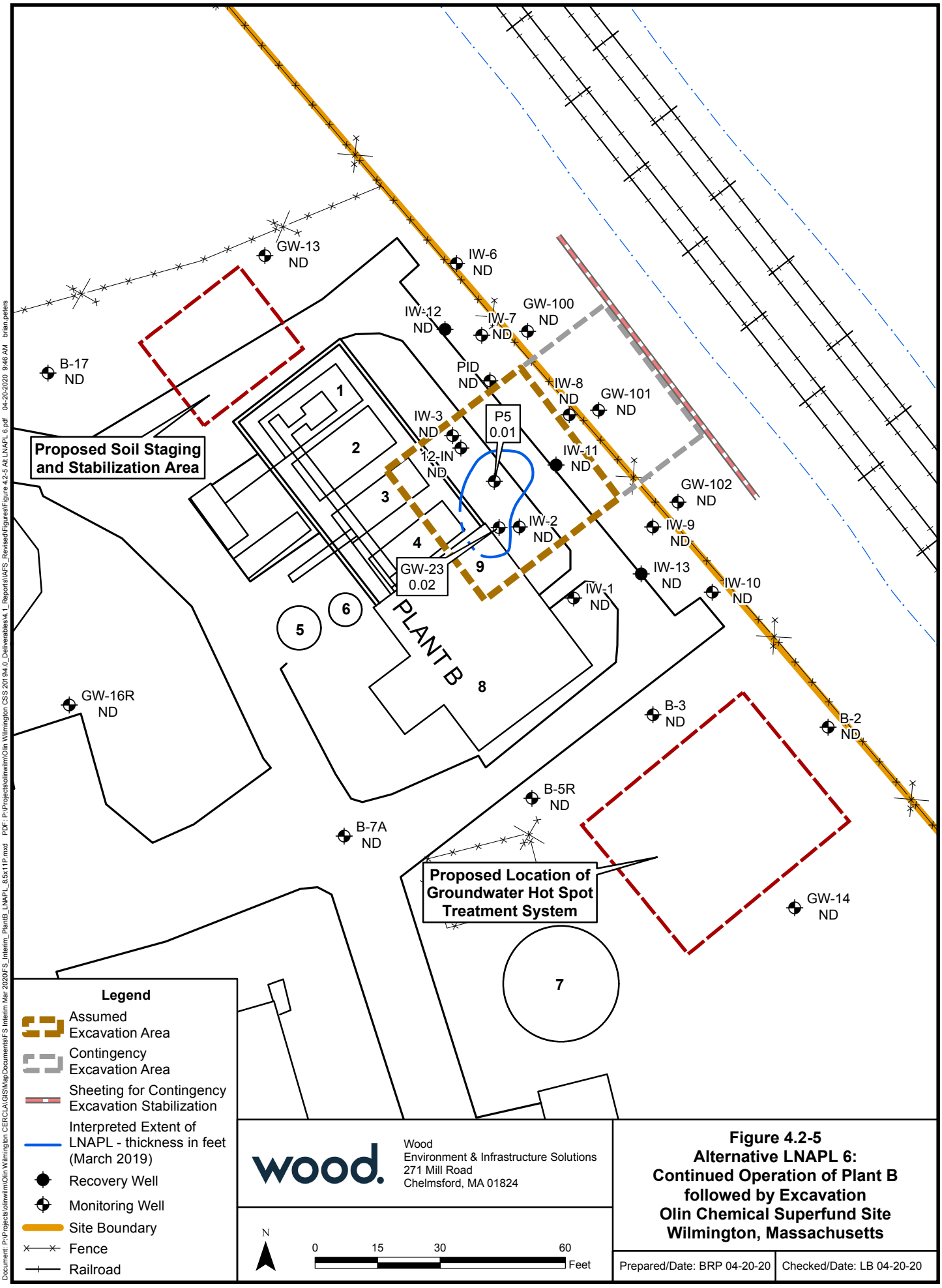

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Figure 4.2-5
Alternative LNAPL 6:
Continued Operation of Plant B followed by Excavation
Olin Chemical Superfund Site
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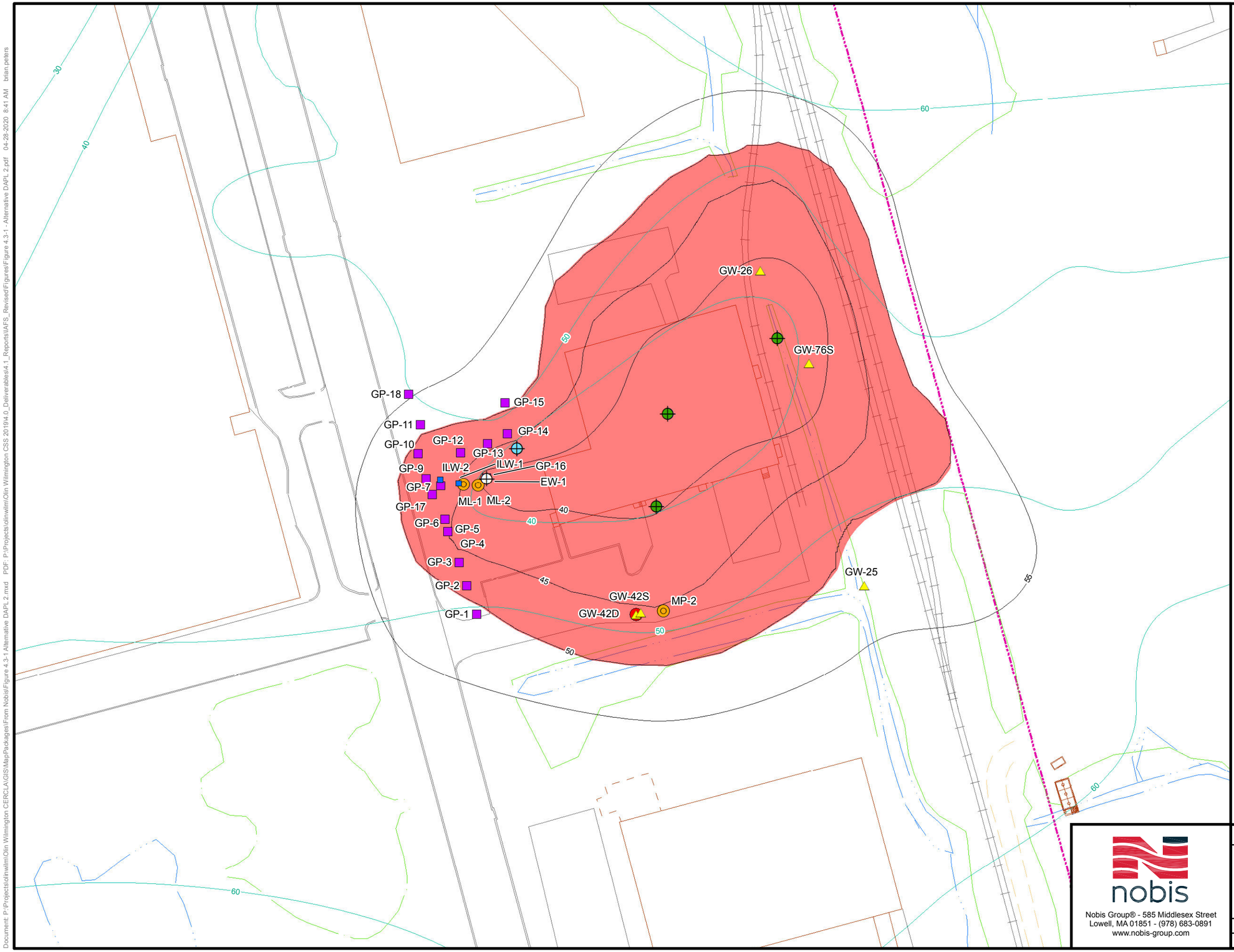

Notes:

1. Bedrock contours from AMEC, 2015. DAPL Extraction Pilot Study Performance Evaluation Report Supplemental Water Level and Hydraulic Analysis. February 5.

2. This Site Sketch was developed from elevation data from Mactec, Amec Foster Wheeler, Wood, and observations made by Nobis.

3. Locations of site features depicted hereon are approximate and given for illustrative purposes only.

4. Extent of DAPL to be confirmed during data gaps and pre-design investigations.

Legend

- Conventional Screened Well
- Bedrock Confirmation Location
- Multi-Port Well
- Induction Logging Well
- Existing Extraction Well
- DAPL 2A Proposed Extraction Well
- DAPL 2B potential DAPL extraction wells
- DPT Locations
- Most recent bedrock contours supplied by Olin
- Nobis Bedrock Contour
- Maximum estimated DAPL extent
- Paved Road
- Unpaved Road
- Rail
- Site Boundary
- Water Features
- Buildings
- Wetlands

0 37.5 75 150

Feet

1 inch = 75 feet

N

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FIGURE 4.3-1

ALTERNATIVE DAPL 2
JEWEL DRIVE
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSASHUSETTS

PREPARED BY: JH	CHECKED BY: JL
PROJECT NO. 80021	DATE: NOVEMBER 2019

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. Locations of site features depicted hereon are approximate and given for illustrative purposes only.

4. Extent of DAPL to be confirmed during data gaps and pre-design investigations.

Legend

- Conventional Screened Wells
- Bedrock Confirmation Location
- Multi-Port Well
- Existing Extraction Well
- DAPL 3A Proposed Extraction Well
- DAPL 3B potential DAPL extraction wells
- Most recent bedrock contours supplied by Olin
- Nobis Bedrock Contour
- Maximum estimated DAPL extent
- Containment Area
- Paved Road
- Unpaved Road
- Rail
- Site Boundary
- Water Features
- Buildings
- Wetlands

0 37.5 75 150

Feet

1 inch = 75 feet

N

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FIGURE 4.3-2

ALTERNATIVE DAPL 3
CONTAINMENT AREA
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSASHUSETTS

PREPARED BY: JH	CHECKED BY: JL
PROJECT NO. 80021	DATE: NOVEMBER 2019

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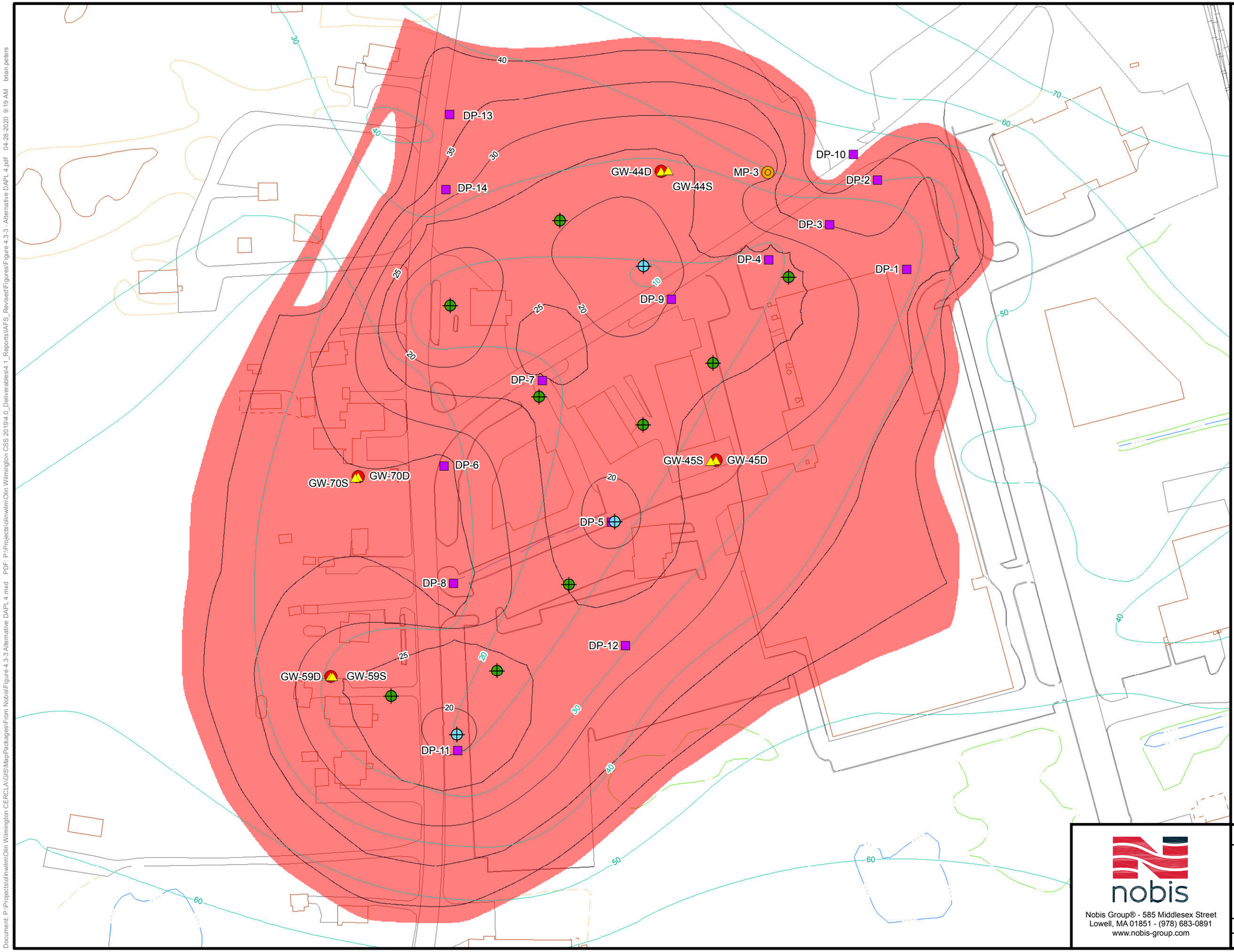

Notes:

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. Locations of site features depicted hereon are approximate and given for illustrative purposes only.

4. Extent of DAPL to be confirmed during data gaps and pre-design investigations.

Legend

- Bedrock Confirmation Location
- Multi-Port Well
- Conventional Screened Well
- DPT Locations
- DAPL 4A proposed extraction well
- DAPL 4B potential DAPL extraction well
- Maximum estimated DAPL extent
- Most recent bedrock contours supplied by Olin
- Nobis Bedrock Contour
- Paved Road
- Unpaved Road
- Rail
- Site Boundary
- Water Features
- Buildings
- Wetlands

N

0 62.5 125 250

Feet

1 inch = 125 feet

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FIGURE 4.3-3

ALTERNATIVE DAPL 4
MAIN STREET
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSASHUSETTS

PREPARED BY: JH	CHECKED BY: JL
PROJECT NO. 80021	DATE: NOVEMBER 2019

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1,100
1,100
5,000
11,000
11,000
1,100
1,100

Legend

- Public Water Supply Well
- 2019 N-Nitrosodimethylamine (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
- Proposed Extraction Well
- Proposed Treatment Plant
- Proposed Piping
- Water
- Wetland Boundary
- Railroad
- Paved Road
- Unpaved Road
- Wilmington/Woburn Town Line

Note:
Monitoring well symbol is based on highest detection at locations with multiple sample rounds.

Alternative GW 2: Groundwater Extraction via Two New Extraction Wells at the Local Bedrock Low by Utilizing Existing Wells GW-83D and GW-58D. Groundwater treatment plant location to be confirmed during remedial design.

wood.
Wood
Environment & Infrastructure Solutions
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure 4.4-1
Alternative GW 2:
Two New Extraction Wells
Inside 11,000 ng/L NDMA Contour

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 03/03/20 | Checked/Date: MM 03/03/20

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1,100
1,100
5,000
11,000
11,000
1,100
1,100

Legend

- Public Water Supply Well
- 2019 N-Nitrosodimethylamine (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
- Proposed Extraction Well
- Proposed Treatment Plant
- Proposed Piping
- Water
- Wetland Boundary
- Railroad
- Paved Road
- Unpaved Road
- Wilmington/Woburn Town Line

Note:
Monitoring well symbol is based on highest detection at locations with multiple sample rounds.

Alternative GW 3: Groundwater Extraction from 3 New Extraction Wells Inside the 11,000 ng/L NDMA Contours and Treatment via New Water Treatment Plant for Surface Water Discharge. The final number of wells will be determined based on the GDWP and remedial design criteria. Groundwater treatment plant location to be confirmed during remedial design.

wood.
Wood
Environment & Infrastructure Solutions
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure 4.4-2
Alternative GW 3:
Three New Extraction Wells
Inside 11,000 ng/L NDMA Contour

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 03/03/20 | Checked/Date: MM 03/03/20

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1,100
1,100
5,000
11,000
11,000
1,100
1,100

Legend

- Public Water Supply Well
- 2019 N-Nitrosodimethylamine (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
- Proposed Extraction Well
- Proposed Treatment Plant
- Proposed Piping
- Water
- Wetland Boundary
- Railroad
- Paved Road
- Unpaved Road
- Wilmington/Woburn Town Line

Note:
Monitoring well symbol is based on highest detection at locations with multiple sample rounds.

Alternative GW 4: Groundwater Extraction from 6 New Extraction Wells Inside the 5,000 ng/L NDMA Contours and Treatment via New Water Treatment Plant for Surface Water Discharge. The final number of wells will be determined based on the GDWP and remedial design criteria. Groundwater treatment plant location to be confirmed during remedial design.

wood.
Wood
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271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure 4.4-3
Alternative GW 4:
Six New Extraction Wells
Inside 5,000 ng/L NDMA Contour

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 03/03/20 | Checked/Date: MM 03/03/20

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1,100
1,100
5,000
11,000
11,000
5,000
1,100

Legend

- Public Water Supply Well
- 2019 N-Nitrosodimethylamine (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
- Proposed Extraction Well
- Proposed Treatment Plant
- Proposed Piping
- Water
- Wetland Boundary
- Railroad
- Paved Road
- Unpaved Road
- Wilmington/Woburn Town Line

Note:
Monitoring well symbol is based on highest detection at locations with multiple sample rounds.

Alternative GW 5: Groundwater Extraction via Approximately 12 New Extraction Wells Inside the 1,100 ng/L NDMA Contour and Treatment via Two New Water Treatment Plants for Surface Water Discharge [this alternative will evaluate different number of extraction well options]. Groundwater treatment plant location to be confirmed during remedial design.

Wood
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N

0 250 500 Feet

Figure 4.4-4
Alternative GW 5:
Approximately 12 New Extraction Wells Inside 1,100 ng/L NDMA Contour

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 03/03/20 | Checked/Date: MM 03/03/20

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Plant B
Discharge

West
Warehouse

East
Warehouse

Former
Wastewater
Treatment
Plant

Equalization Window to be Closed by Sealing and/or Grouting

Off-Property West Ditch

Containment
Area

Weir

Approximate Limits of Proposed Cap

Detention
Basin

Central
Pond

South Ditch

Legend

- Approximate Limits of Proposed Cap
- Proposed Staging Area
- Slurry Wall
- Containment Structure
- Aboveground Conveyance Piping
- Underground Conveyance Piping
- 51 Eames St. Property Boundary
- Paved Road
- Unpaved Road
- Structure
- Railroad
- Fence
- Trail
- Drain/Sewer Line
- Surface Water
- Wetland Boundary

Note: The actual limits of the proposed cap will be established during remedial design.

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N

0 35 70 140 Feet

Figure 4.5-1
Alternative CA 2:
Capping, Equalization Window Closure, and Institutional Controls
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: ICD 03/16/20 | Checked/Date: KPW 03/16/20

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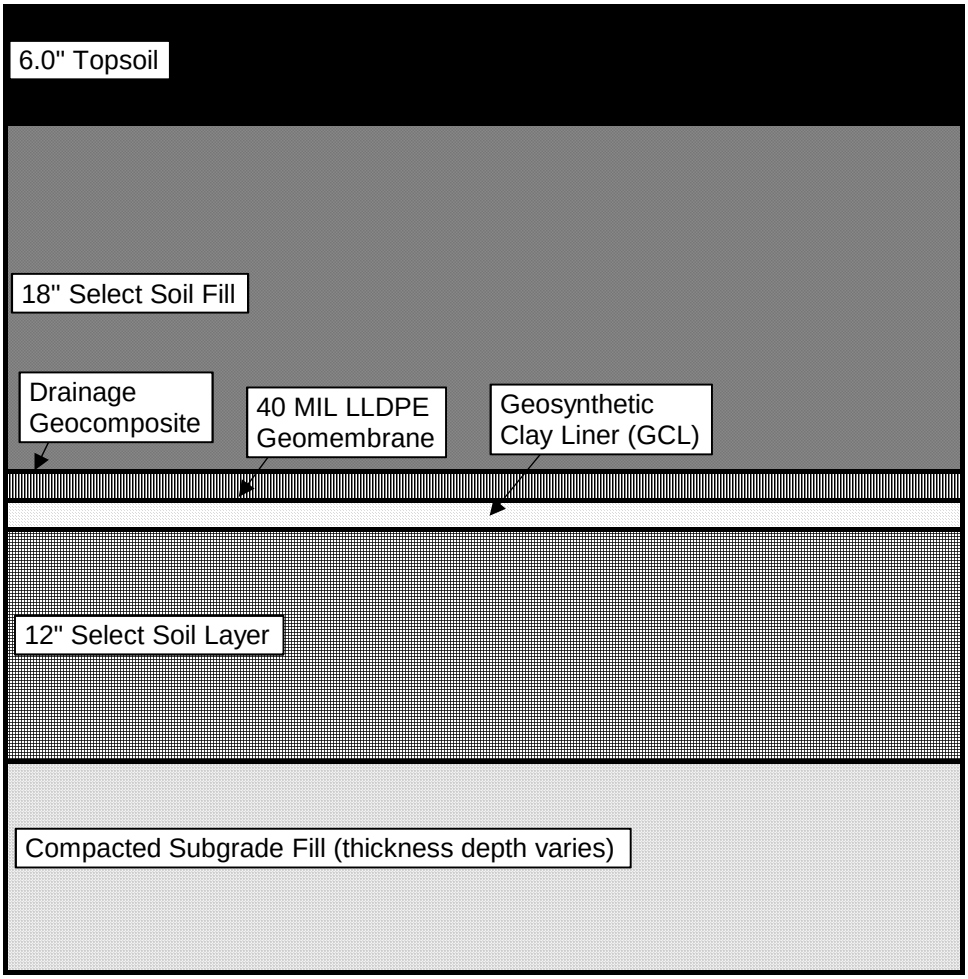

LLDPE = Linear low-density polyethylene

OLIN CHEMICAL SUPERFUND SITE WILMINGTON, MA	wood.	FIGURE 4.5-2 PROPOSED RCRA D CAP

Plant B Discharge
West Warehouse
East Warehouse
Former Wastewater Treatment Plant
GW-CA1
GW-CA2
GW-35D
GW-35S
GW-CA3S
GW-CA3D
MP-1
Containment Area
GW-412
GW-409
BR-1
PZ-24
GW-CA4S
GW-410
Off-Property West Ditch
Weir
Detention Basin
Central Pond
South Ditch

Legend

- Estimated Excavation Areas 0-10 Feet
- Estimated Excavation Areas 0-1 Feet
- Proposed Sheet Pile Wall
- Proposed Staging Area
- Monitoring Well

Upland Soils:

- Below Both PRGs
- Above BEHP PRG (3 mg/kg)
- Above Chromium PRG (1000 mg/kg)
- Above Both PRGs
- Containment Area Soil
- Slurry Wall
- Equalization Window
- Aboveground Conveyance Piping
- Underground Conveyance Piping
- 51 Eames St. Property Boundary
- Paved Road
- Unpaved Road
- Structure
- Railroad
- Fence
- Trail
- Drain/Sewer Line
- Surface Water
- Wetland Boundary

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N

0 35 70 140 Feet

Figure 4.5-3
Alternative CA 3:
Targeted Soil Removal

Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: ICD 03/16/20 | Checked/Date: KPW 03/16/20

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TABLES

Table 2.1-1
Location-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL Alternatives
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Characteristic	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement	LNAPL Near Plant B Alternatives					
						LNAPL 1 - No Action	LNAPL 2 - Manual Removal	LNAPL 3 - Continual Mechanical Removal	LNAPL 4 - Multi-Phase Extraction (MPE)	LNAPL 5 - Continued Operation of Plant B Followed by Demolition of Plant B and Expanded MPE	LNAPL 6 - Demolition, Excavation, Dewatering, Treatment, Disposal
Federal Standards											
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 species have been identified in the vicinity of the OCSS. However, protection of endangered species and their habitat will be considered during development and design of remedial alternatives.	No action, therefore not applicable.	No endangered species have been identified in the remediation area. However, if encountered, protection of endangered species and their habitat would be considered during development and design of the alternative.				
Historical/ Archeological Resources	National Historic Preservation Act	54 USC §§ 300101 et seq., 36 CFR Part 800	Applicable, if subject historical resources are present	When a federal agency finds, or is notified, that its activities may have adverse effects on historic properties, such agency is required to consult with federal and state historic preservation officials to resolve the adverse effects, including avoidance, minimization, or mitigation of the adverse effects.	If protected resources are identified in the Site area, measures to avoid, minimize and/or mitigate any adverse effects to protected resources will be implemented in consultation with federal and state historic preservation officials.	No action, therefore not applicable.	No such resources are known to exist in the remedial action area; however, if resources were discovered, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to protected resource areas.				
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 (USFWS) 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 in the site area, measures to avoid, minimize and/or mitigate any impacts to protected resource areas will be implemented in consultation with appropriate USFWS officials.	No action, therefore not applicable.	Remedial activities would be evaluated to protect migratory birds, their nests, and eggs. If migratory bird protected areas are identified in the site area, measures would be implemented in consultation with appropriate USFWS officials.				
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).	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.	No action, therefore not applicable.	Not applicable because these alternatives do not involve alteration to wetlands or floodplains.	Under these alternatives, any remedial activities within wetlands and the 100 foot buffer zone or 200 feet from a perennial stream will be performed in accordance with the substantive requirements of these regulations. This alternative will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.			
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 species have been identified in the vicinity of the Site. However, if identified, protection of state listed endangered species and their habitat will be considered during design and implementation of remedial alternatives.	No action, therefore not applicable.	No state-listed species have been identified in the remedial area. However, if they were to be identified, the protection of state-listed species would be considered during development and design of remedial alternatives				
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.	If protected resources are identified in the Site area, measures to avoid, minimize and/or mitigate any impacts to protected resources will be implemented in consultation with federal and state historic preservation officials.	No action, therefore not applicable.	No such resources are known to exist in the remedial action area; however, if resources were discovered, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to protected resource areas.				

Table 2.1-1
Location-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL Alternatives
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Characteristic	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement	LNAPL Near Plant B Alternatives					
						LNAPL 1 - No Action	LNAPL 2 - Manual Removal	LNAPL 3 - Continual Mechanical Removal	LNAPL 4 - Multi-Phase Extraction (MPE)	LNAPL 5 - Continued Operation of Plant B Followed by Demolition of Plant B and Expanded MPE	LNAPL 6 - Demolition, Excavation, Dewatering, Treatment, Disposal
Area of Critical Environmental Concern	Massachusetts Areas of Critical Environmental Concern (ACECs) Regulations	310 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 ACECs have been identified at the Site. If an ACEC is identified in the Site area, activities will be controlled to minimize impacts to affected species or resources if identified.	No action, therefore not applicable.	No such ACECs have been identified at the Site; however, if identified, activities would be controlled to minimize impacts to affected species or resources identified.				

Prepared By / Date: KPW 03/25/2020
Checked By / Date: MCM 04/06/2020

Notes:
ACEC = Areas 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
DAPL = Dense Aqueous Phase Liquid
FEMA = Federal Emergency Management Agency
LEDPA = Least Environmentally Damaging Practicable Alternative
MGL = Massachusetts General Law
RCRA = Resource Conservation and Recovery Act
USEPA = United States Environmental Protection Agency
USFWS = United States Fish and Wildlife Service
USC = United States Code

Table 2.1-2
Action-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL Alternatives
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement	LNAPL Near Plant B Alternatives					
						LNAPL 1 - No Action	LNAPL 2 - Manual Removal	LNAPL 3 - Continual Mechanical Removal	LNAPL 4 - Multi-Phase Extraction (MPE)	LNAPL 5 - Continued Operation of Plant B Followed by Demolition of Plant B and Expanded MPE	LNAPL 6 - Demolition, Excavation, Dewatering, Treatment, Disposal
Federal Standards											
Hazardous Waste Treatment, Storage, Disposal	Resource Conservation and Recovery Act (RCRA) Subtitle C; Hazardous Waste Identification; Generator and Handler Requirements; Tracking Requirements; Storage, Treatment 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. Non-hazardous wastes will be disposed of appropriately. Any waste generated during remedial activities that is determined to be hazardous waste will be managed in accordance with these regulations. Alternatives generating hazardous waste or using treatment, storage or disposal facilities for hazardous waste will be implemented to comply with this ARAR.	No action, therefore not applicable.	Removed LNAPL and groundwater would be analyzed to determine whether they are hazardous waste. Any hazardous waste management will comply with this ARAR through appropriate design implementation and operation				Excavated soil, LNAPL, and groundwater would be analyzed under these standards to determine whether it is hazardous waste. LNAPL, groundwater and soil characterized as hazardous waste will comply with this ARAR through appropriate design implementation and operation.
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. Relevant and Appropriate, if less than thresholds.	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 by weight or greater.	Process vents, air equipment, tanks, surface impoundments or containers will be managed in accordance with these air emission regulations.	No action, therefore not applicable.	Management of VOCs in excavated LNAPL would be in accordance with these air emission regulations.	Management of VOCs in excavated LNAPL would be in accordance with these air emission regulations.	Management of VOCs in excavated LNAPL and groundwater, including in vapor treatment equipment used with MPE. would be in accordance with these air emission regulations.	Management of VOCs in excavated LNAPL and groundwater, including in vapor treatment equipment used with MPE. would be in accordance with these air emission regulations.	Management of VOCs in excavated LNAPL, groundwater, and soil would 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 (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 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).	No action, therefore not applicable.	Not applicable because these alternatives would not involve discharge to surface water.		Discharges to surface water will be treated to meet these standards. Best management practices will be used to control and manage stormwater runoff during construction for remedial activities		Water generated during dewatering of excavated soil and/or dewatering of the excavation pit discharged to surface water will be treated to meet these standards. Best management practices will be used to control and manage stormwater runoff during construction for remedial activities.
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).	If remedial activities result in discharges to a POTW, the discharge will be monitored and treated, if necessary, to comply with pretreatment standards.	No action, therefore not applicable.	Not applicable because these alternatives would not involve discharge to a POTW		Any discharges to a POTW will be treated to meet the pretreatment standards.		Any discharges to a POTW will be treated to meet the pretreatment standards.

Table 2.1-2
Action-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL Alternatives
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement	LNAPL Near Plant B Alternatives					
						LNAPL 1 - No Action	LNAPL 2 - Manual Removal	LNAPL 3 - Continual Mechanical Removal	LNAPL 4 - Multi-Phase Extraction (MPE)	LNAPL 5 - Continued Operation of Plant B Followed by Demolition of Plant B and Expanded MPE	LNAPL 6 - Demolition, Excavation, Dewatering, Treatment, Disposal
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.	No action, therefore not applicable.	Not applicable because these alternatives are not expected to generate air emissions.		Air emissions generated by MPE would be managed in accordance with these regulations.		Air emissions generated during construction would be managed in accordance with these regulations.
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 this remedial alternative will be managed based on guidance standards.	No action, therefore not applicable.	IDW generated during remedial activities would be managed to comply with the substantive requirements of this guidance.				
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.	Alternatives to address sources of contamination to overburden and bedrock aquifers are to be developed in consideration of this guidance.	No action, therefore not applicable.	Remedial alternatives will be designed and constructed 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.	These Massachusetts regulations supplement federal RCRA requirements. 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.	No action, therefore not applicable.	Removed LNAPL and groundwater would be analyzed to determine whether it is hazardous waste and would be managed in accordance with these regulations .				Excavated soil, groundwater, and LNAPL would be analyzed under these standards to determine whether it is hazardous waste. LNAPL, groundwater, and soil characterized as hazardous waste will be managed in accordance with these regulations.
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.	If any remedial activity generates hazardous wastes, the wastes will be managed in accordance with the substantive requirements of these regulations.	No action, therefore not applicable.	Removed LNAPL and groundwater would be analyzed to determine whether it is hazardous waste. Any hazardous waste management will comply with this ARAR through appropriate design implementation and operation.				Excavated soil would be analyzed under these standards to determine whether it contains hazardous waste. LNAPL and soil characterized as hazardous waste will comply with this ARAR through appropriate design implementation and operation.
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 waste generated during remedial activities that is determined to be hazardous waste will be managed in accordance with these regulations. Alternatives generating hazardous waste or using treatment, storage or disposal facilities for hazardous waste will be implemented to comply with this ARAR.	No action, therefore not applicable.	Removed LNAPL and groundwater would be analyzed to determine whether it is hazardous waste. Any hazardous waste management will comply with this ARAR through appropriate design implementation and operation.				Excavated soil, groundwater, and LNAPL would be analyzed under these standards to determine whether it is hazardous waste. LNAPL, groundwater, and soil characterized as hazardous waste will comply with this ARAR through appropriate design implementation and operation.
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 waste generated during remedial activities that is determined to be hazardous waste will be managed in accordance with these regulations. Alternatives generating hazardous waste or using treatment, storage or disposal facilities for hazardous waste will be implemented to comply with this ARAR.	No action, therefore not applicable.	Removed LNAPL and groundwater would be analyzed to determine whether it is hazardous waste. Any hazardous waste management will comply with this ARAR through appropriate design implementation and operation.				Excavated soil, groundwater, and LNAPL would be analyzed under these standards to determine whether it is hazardous waste. LNAPL, groundwater and soil characterized as hazardous waste will comply with this ARAR through appropriate design implementation and operation.

Table 2.1-2
Action-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL Alternatives
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement	LNAPL Near Plant B Alternatives					
						LNAPL 1 - No Action	LNAPL 2 - Manual Removal	LNAPL 3 - Continual Mechanical Removal	LNAPL 4 - Multi-Phase Extraction (MPE)	LNAPL 5 - Continued Operation of Plant B Followed by Demolition of Plant B and Expanded MPE	LNAPL 6 - Demolition, Excavation, Dewatering, Treatment, Disposal
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 waste generated during remedial activities that is determined to be hazardous waste will be managed in accordance with these regulations, if applicable. Alternatives treating hazardous waste in tanks prior to discharge to surface water or a POTW will be implemented to comply with this ARAR.	No action, therefore not applicable.	Not applicable, no treatment and/or discharge is required under this alternative.		Any management/treatment of groundwater extracted via MPE that is a hazardous waste will comply with the substantive standards.		Any management/treatment of water generated from dewatering excavated soil and dewatering the excavation pit that is a hazardous waste will comply with the substantive standards.
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 the remedial alternative will be managed to prevent contaminant migration to groundwater.	No action, therefore not applicable.	Not applicable, hazardous waste will not be managed in units subject to these requirements under these remedial alternatives.				Excavated soil, groundwater, and LNAPL generated during remedial activities would be evaluated to determine whether it is hazardous waste. Under this alternative, any management of hazardous waste in waste piles will comply with in this ARAR through appropriate design, implementation and operation.
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.	Establishes requirements for the management of containers, such as drums, that are used to store hazardous wastes. Alternatives utilizing containers of hazardous waste will comply with this ARAR.	No action, therefore not applicable.	Any hazardous waste generated by these remedial alternatives that is managed in containers will comply with the ARAR through appropriate design and implementation.				Any hazardous waste generated by this remedial alternative that is managed in containers will comply with the ARAR through appropriate design and implementation.
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.	Alternatives utilizing tanks for storage or treatment of hazardous waste will comply with this ARAR.	No action, therefore not applicable.	Any hazardous waste generated by these remedial alternatives that is managed in containers will comply with the ARAR through appropriate design and implementation.				
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 wastes that may be generated during remedial activities will be managed in accordance with these regulations.	No action, therefore not applicable.	Not applicable, hazardous waste will not be managed in waste piles under these remedial alternatives.				Excavated soil, groundwater, and LNAPL generated during remedial activities would be evaluated to determine whether it is hazardous waste. Under this alternative, any management of hazardous waste in waste piles will comply with in this ARAR through appropriate design, implementation and operation.
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 related to excavation and dewatering activities will be treated to meet the substantive discharge standards of the Massachusetts Surface Water Discharge Permit (314 CMR 4.00).	No action, therefore not applicable.	Not applicable because these alternatives would not involve discharge to surface water.		Groundwater extracted via MPE and discharged to surface water will be treated to meet these standards.		Water generated during dewatering of excavated soil and dewatering the excavation pit and discharged to surface water would be treated to meet these standards.
Discharges to Surface Water	Massachusetts Clean Water Act; MA Surface Water Quality Standards (MSWQS)	M.G.L. 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.	Alternatives that incorporate discharges to surface waters will need to have the discharges meet the MSWQS.	No action, therefore not applicable.	Not applicable because these alternatives would not involve discharge to surface water.		Groundwater extracted via MPE and discharged to surface water will be treated to meet these standards		Water generated during dewatering of excavated soil and dewatering the excavation pit and discharged to surface water would be treated to meet these 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.	If remedial actions result in discharges to a POTW, the discharge will be monitored and treated, if necessary, to comply with pretreatment standards.	No action, therefore not applicable.	Not applicable because these alternatives would not involve discharge to a POTW.		Groundwater extracted via MPE and discharged to a POTW will be treated to meet these standards.		Water generated during dewatering of excavated soil and dewatering the excavation pit and discharged to a POTW would be treated to meet these standards

Table 2.1-2
Action-Specific ARARs, Criteria, Advisories, and Guidance for LNAPL Alternatives
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement	LNAPL Near Plant B Alternatives					
						LNAPL 1 - No Action	LNAPL 2 - Manual Removal	LNAPL 3 - Continual Mechanical Removal	LNAPL 4 - Multi-Phase Extraction (MPE)	LNAPL 5 - Continued Operation of Plant B Followed by Demolition of Plant B and Expanded MPE	LNAPL 6 - Demolition, Excavation, Dewatering, Treatment, Disposal
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.	Alternatives that involve management of hazardous waste prior to discharge to surface waters will meet the substantive standards.	No action, therefore not applicable.	Not applicable, this alternative does not include management of hazardous waste prior to discharge to surface water.		Any management/treatment of groundwater that is a hazardous waste prior to discharge to surface water will comply with the substantive standards.		Any management/treatment of groundwater that is a hazardous waste prior to discharge to surface water will comply with the substantive 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.	Remedial activities would be implemented in accordance with these rules. No air emissions from remedial activities would cause air quality standards to be exceeded.	No action, therefore not applicable.	These alternatives will comply with the ARAR by ensuring that dust standards are not exceeded during remedial activities, and the associated air emissions standards will also be met.		These alternatives will comply with the ARAR by ensuring that dust standards are not exceeded during remedial activities, and the associated air emissions standards will also be met.		These alternatives will comply with the ARAR by ensuring that dust standards are not exceeded during remedial activities, and the associated air emissions standards will also be met.
Air Quality	Division of Air Quality Control (DAQC)	DAQC Policy 90-001, re: Noise Regulation,	To Be Considered	Guidance on sound emissions.	The guidance will be used to assess whether any remedial measure exceed Stae noise guidance levels.	No action, therefore not applicable.	These alternatives will comply with the ARAR 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 activity that are determined to not be hazardous wastes will be managed in accordance with this regulation .	No action, therefore not applicable.	Not applicable because these alternatives would not involve management of solid waste.		Not applicable because these alternatives would not involve management of solid waste.	Any solid waste generated by these remedial alternatives, including asbestos waste, will comply with the ARAR through appropriate design and implementation.	
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 rules. No air emissions from remedial activities will cause air quality standards to be exceeded.	No action, therefore not applicable.	These alternatives will comply with the ARAR by ensuring that dust standards are not exceeded during remedial activities, and the associated air emissions standards will also be met for air emissions associated with LNAPL.		These alternatives will comply with the ARAR by ensuring that dust standards are not exceeded during remedial activities, and the associated air emissions standards will also be met for air emissions generated by MPE.		These alternatives will comply with the ARAR by ensuring that dust standards are not exceeded during remedial activities, and the associated air emissions standards will also be met for air emissions associated with LNAPL or excavated soil.
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 will be installed, maintained and decommissioned based on these guidance standards.	No action, therefore not applicable.	Remedial activities would be implemented in accordance with these regulations.				
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.	Remedial activities will be managed to control erosion and sedimentation.	No action, therefore not applicable.	Not applicable because these alternatives are not expected to affect erosion or stormwater.		Remedial alternatives will be designed to meet the substantive requirements of this guidance to control erosion and sedimentation.		

Prepared By / Date: KPW 03/25/2020
Checked By / Date: MCM 04/06/2020

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 Pollution Discharge Elimination System
OSWER = Office of Solid Waste and Emergency Response
PCB = Polychlorinated Biphenyl
POTW = Publicly Owned Treatment Works
ppmw = parts per million by weight
RCRA = Resource Conservation and Recovery Act
USC = United States Code
USEPA = United States Environmental Protection Agency

Table 2.1-3
Action-Specific ARARs for DAPL Alternatives 2A and 2B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance			
Clean Air Act, National Emission Standards for Hazardous Air Pollutants (NESHAPs); 42 USC § 112(b)(1); 40 CFR Part 61	These regulations establish emissions standards for 189 hazardous air pollutants.	Applicable	Emissions from well drilling activities, DAPL extraction and treatment system operation, and O&M will be implemented in accordance with these requirements.
Clean Water Act, National Pollution Discharge Elimination System (NPDES), 40 CFR Parts 122 and 125	These regulations include stormwater standards for construction activities disturbing more than one acre and requirements for stormwater discharges from hazardous waste treatment, storage and disposal facilities. The NPDES permit program also specifies the permissible concentration or level of contaminants in the discharge from any point source to waters of the United States.	Applicable	The discharge of treated effluent from the treatment of DAPL to a surface water would meet the substantive discharge standards.
General Pretreatment Regulations for Existing and New Sources of Pollution 40 CFR Part 403	Standards for discharge into a Publicly Owned Treatment Works (POTW).	Applicable, if discharge into a POTW occurs	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If discharge to POTW were to be selected, construction and operation would comply with these regulations.
Resource Conservation and Recovery Act (RCRA), Subtitle C, 42 USC §§ 6901 et seq.; 40 CFR Parts 260-262, 264 (including Subparts B-G, I-N, W, X) and 268	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. These provisions have been adopted by the Commonwealth.	Applicable	DAPL, treatment residuals, and any investigation derived waste (IDW) determined to be hazardous will be properly stored and disposed off-site at a licensed facility. Under this alternative, any generation, treatment, or storage of hazardous waste will comply with this ARAR through appropriate design, implementation and operation.
RCRA, Air Emission Standards for Process Vents, Equipment Leaks, Tanks, Surface Impoundments, and Containers, 40 CFR Part 264, Subparts AA, BB, and CC	RCRA emissions standards not delegated to Massachusetts. Standards for process vents for systems that manage hazardous wastes that have organic concentrations of at least 10 ppmw (Subpart AA). Standards for air equipment leaks for systems that manage hazardous wastes with organic concentrations of at least 10% by weight (Subpart BB). Standards for certain tanks and containers that treat, store, or dispose of hazardous wastes (Subpart CC).	Applicable, if hazardous waste with volatile organic concentrations (VOCs) of at least 10 parts per million by weight (ppmw) (Subpart AA), with organic concentrations of at least 10 % by weight (Subpart BB), will be treated, stored, or disposed of in tanks, surface impoundments, or containers, and thresholds are met (Subpart CC). Relevant and Appropriate, if less than thresholds.	No waste generated in these remedial activities is expected to have concentrations over these thresholds. Management and treatment of VOCs in DAPL would be in accordance with these air emission regulations.

Table 2.1-3
Action-Specific ARARs for DAPL Alternatives 2A and 2B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance (cont.)			
SDWA Underground Injection Control (UIC) Program, 40 CFR Parts 144, 146, and 147 (Subpart W)	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.	Applicable, if treated effluent is injected underground	These guidelines were considered during development of PRGs.
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	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.	Relevant and Appropriate	MCLs were used to determine the extent of required institutional controls to be established under this alternative.
SDWA National Primary Drinking Water Regulations, Maximum Contaminant Level Goals (MCLGs), 42 USC § 300f et seq.;	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 nonenforceable health-based goals set equal to or lower than MCLs.	Relevant and Appropriate for non-zero MCLGs only; MCLGs set as zero are To Be Considered	MCLGs were used to determine the extent of required institutional controls to be established under this alternative.
EPA, Office of Water, Drinking Water Health Advisories	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.	To Be Considered	HAs were considered in determining the extent of required institutional controls to be established under this alternative.
EPA Risk Reference Doses (RfDs)	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.	To Be Considered	RfDs were considered in determining the extent of required institutional controls to be established under this alternative.
Human Health Assessment Cancer Slope Factors (CSFs)	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.	To Be Considered	CSFs were considered in determining the extent of required institutional controls to be established under this alternative.
Guidelines for Carcinogenic Risk Assessment, EPA/630/P-03/001F, March 2005	Guidance values are to be used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	To Be Considered	These guidance values were considered in determining the extent of required institutional controls to be established under this alternative.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA/630/R-03/003F, March 2005	Guidance values are to be used to evaluate the potential carcinogenic hazard to children caused by exposure to contaminants.	To Be Considered	These guidance values were considered in determining the extent of required institutional controls to be established under this alternative.

Table 2.1-3
Action-Specific ARARs for DAPL Alternatives 2A and 2B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance (cont.)			
EPA Regional Screening Levels (RSLs) for Chemical Contamination at Superfund Sites	Provides risk-based screening levels for various environmental media and for residential and industrial exposure scenarios.	To Be Considered	These screening levels were considered in determining the extent of required institutional controls to be established under this alternative.
Guide to Management of Investigation Derived Wastes (IDW); OSWER 9345.303FS (1992)	Guidance on managing IDW in a manner that ensures protection of human health and the environment.	To Be Considered	IDW generated as part of this remedial alternative will be managed based on guidance standards.
Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration, OSWER 9283.1-33 (June 26, 2009)	Guidance on developing groundwater remedies at CERCLA sites.	To Be Considered	This remedial alternative was developed with guidance from this publication.
State Criteria, Advisories, and Guidance			
Massachusetts Hazardous Waste Regulations, 310 CMR 30.000, including 30.100 (identification and listing of hazardous waste), 30.300 (requirements for generators), 30.680 (containers), 30.690 (tanks), 30.500 (facility management standards), 30.513 (waste analysis)	Massachusetts is delegated to administer RCRA through its state regulations. These regulations address the generation, storage, treatment, and disposal of hazardous waste. The regulations for tank systems used to store or treat hazardous waste provide specifications for design and installation of tanks systems; require secondary containment, leak detection systems, and inspections; and identify general operating requirements and closure and post-closure care.	Applicable, if management of hazardous waste triggers the pertinent regulations	All DAPL treatment residuals determined to be a hazardous waste will be managed as a hazardous waste and disposed of off-site at a licensed facility. Under this alternative, any generation, treatment, or storage of hazardous waste will comply with these ARARs through appropriate design, implementation, and operation.
Massachusetts Ambient Air Quality Standards, 310 CMR 6.00	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 rules. No air emissions from remedial activities will cause air quality standards to be exceeded.	Applicable	Extraction and management of DAPL and any DAPL treatment will be implemented in accordance with these rules. Emission standards, including for dust, will be complied with during DAPL extraction and treatment.
Massachusetts Air Pollution Control Regulations, 310 CMR 7.00	These regulations set emission limits necessary to attain ambient air quality standards, including standards for visible emissions (310 CMR 7.06); dust, odor, construction and demolition (310 CMR 7.09); noise (310 CMR 7.10); and volatile organic compounds (310 CMR 7.18). Remedial activities will be implemented in accordance with these rules. No air emissions from remedial activities will cause air quality standards to be exceeded.	Applicable	Extraction and management of DAPL and any DAPL treatment will be implemented in accordance with these rules. Emission standards, including for dust, will be complied with during DAPL extraction and treatment.
Massachusetts Clean Water Act; Surface Water Discharge Permit Regulations; MGL c. 21, §§ 26-53; 314 CMR 3.00	These regulations provide that discharges to waters of the Commonwealth shall not result in exceedances of Massachusetts Surface Water Quality Standards (MSWQS) (314 CMR 4.00).	Applicable, if treated effluent is discharged to a surface water	The discharge of treated effluent from the treatment of DAPL to a surface water would meet the substantive discharge standards.

Table 2.1-3
Action-Specific ARARs for DAPL Alternatives 2A and 2B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
State Criteria, Advisories, and Guidance (cont.)			
Massachusetts Clean Water Act; MA Surface Water Quality Standards (MSWQS) M.G.L. c. 21, §§ 26-53; 314 CMR 4.00	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.	Relevant and Appropriate	The discharge of treated effluent from the treatment of DAPL to a surface water would meet the substantive discharge standards.
Massachusetts Operation, Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Dischargers 314 CMR 12.00	Standards for pretreatment requirements for sources to a POTW.	Applicable, if discharges to a POTW occur	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If discharge to POTW were to be selected, construction and operation would comply with these regulations.
Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities MGL c. 21, §§ 26-53; 314 CMR 8.00	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.	Applicable, if hazardous waste is generated and surface water discharge occurs	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If extracted DAPL were to be characterized as hazardous and the treated effluent were to be discharged, the discharge from the DAPL treatment system would be managed to be in compliance with these requirements.
Massachusetts Drinking Water Regulations, 310 CMR 22.00	Establishes maximum contaminant levels 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.	Relevant and Appropriate; MCLGs set as zero are To Be Considered	Massachusetts MCLs and MCLGs were considered during the development of PRGs.
Massachusetts Drinking Water Guidelines	MassDEP's Office of Research and Standards issues guidance for chemicals other than those with Massachusetts MCLs in drinking water.	To Be Considered	These Guidelines were considered during the development of PRGs.
Massachusetts Solid Waste Management Regulations 310 CMR 19.000	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.	Applicable, if solid waste is generated	Any wastes generated by remedial activity that are determined to not be hazardous wastes will be managed in accordance with this regulation.
Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, Prepared for Massachusetts Executive Office of Environmental Affairs (2003)	Guidance on preventing erosion and sedimentation.	To Be Considered	Remedy design, construction, and operation would be implemented with guidance from this publication.

Table 2.1-3
Action-Specific ARARs for DAPL Alternatives 2A and 2B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
State Criteria, Advisories, and Guidance (cont.)			
Massachusetts Underground Injection Control Regulations, 310 CMR 27.00	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.	Applicable, if treated effluent is injected underground	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If this alternative includes underground injection of treated effluent, such injection will be treated to meet these standards.
Monitoring Well Guidance, WSC-310-91	Guidance on locating, drilling, installing, sampling, and decommissioning monitoring wells.	To Be Considered	Monitoring well design, installation, operation, and decommissioning would be implemented in accordance with this guidance.
Division of Air Quality Control (DAQC) DAQC Policy 90-001, re: Noise Regulation, February 1990	Guidance on sound emissions.	To Be Considered	These remedial alternatives will comply with the ARAR 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.

Table 2.1-4
Location-Specific ARARs for DAPL Alternatives 2A and 2B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance			
Floodplain Management and Protection of Wetlands; FEMA Regulations (44 CFR Part 9) (implementing Executive Orders 11988 and 11990)	These 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). Prohibits 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. Requires the avoidance of impacts associated with the occupancy and modification of federally designated 100-year and 500-year floodplains and the avoidance of development within the floodplain wherever there is a practicable alternative. An assessment of impacts to the 500-year floodplain is required for critical actions, which include siting facilities such as those which produce, use or store highly volatile, flammable, explosive, toxic or water-reactive materials in a floodplain. Requires public notice when proposing any action in or affecting a floodplain or wetlands.	Applicable, if alternative alters wetlands or floodplains	The infrastructure for DAPL extraction from the Jewel Drive DAPL pool will not result in the occupancy or modification of the 100 or 500-year floodplain; therefore, the floodplain management requirements do not apply. If this alternative alters wetlands, it will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
Clean Water Act Guidelines for Specification of Disposal Sites for Dredged or Fill Material 33 USC § 1344(b)(1); 40 CFR Parts 230 and 231, and 33 CFR Parts 320-323	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 (T&E) 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” (LEDPA) to protect wetland and aquatic resources.	Applicable, if there is a discharge of fill material into water bodies or wetlands	The infrastructure for DAPL extraction from the Jewel Drive DAPL pool will not impact the aquatic ecosystem. However, if it is later determined that there are impacts on the aquatic ecosystem, this alternative will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
Fish and Wildlife Coordination Act (16 USC §§ 661 et seq.)	Requires consultation with appropriate agencies to protect fish and wildlife when federal actions may alter waterways. Must develop measures to prevent and mitigate potential loss to the maximum extent practicable.	Applicable, if wildlife habitat is altered	If this alternative alters wildlife habitat, it will comply with this ARAR through appropriate consultation and implementation of measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife.
Migratory Bird Treaty Act (16 USC §§ 703 et seq.)	Protects migratory birds, their nests and eggs. A depredation permit issued by the U.S. Fish and Wildlife Service (USFWS) is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Applicable, if protected areas are present	Under this alternative, if migratory bird protected areas are identified in the site area, measures to avoid, minimize and/or mitigate any impacts to protected resource areas will be implemented in consultation with appropriate USFWS officials.

Table 2.1-4
Location-Specific ARARs for DAPL Alternatives 2A and 2B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance (cont.)			
National Historic Preservation Act (NHPA) and related laws, 54 USC §§ 306108, 306107, and 312502, 36 CFR Parts 65 and 800	When a federal agency finds, or is notified, that its activities in connection with a federal construction project may cause irreparable loss or destruction of significant scientific, pre-historical, historical, or archeological data, or harm historic properties or landmarks, the substantive standards under these statutes and regulations must be met.	Applicable, if protected resource areas are present	No protected resources are known to exist in the area impacted by this alternative; however, if resources are identified, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to protected resources.
Endangered Species Act, 50 CFR §§ 17.11- 17.12; 50 CFR Part 402	Requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	Applicable, if such species are present	If endangered or threatened species in the remedial area are identified, remedial activities would avoid actions that adversely affect endangered or threatened species or their habitats.
U.S. Army Corps of Engineers, New England District Compensatory Mitigation Guidance, (09-07-2016).	This Guidance is to be considered when compensatory mitigation to address impacts to federal jurisdiction wetlands is appropriate for a particular remedial activity.	To Be Considered, if alternative alters wetlands	If this alternative requires alteration of federal jurisdictional wetlands, the mitigation and restoration will be conducted in accordance with this guidance.
State Criteria, Advisories, and Guidance			
Massachusetts Hazardous Waste Regulations, Location Standards for Land Subject to Flooding 310 CMR 30.701	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.	Applicable, if hazardous waste is managed within a floodplain	Hazardous waste is not expected to be managed in a 100-year floodplain under these alternatives. If hazardous wastes are generated during remedial activities, they will be managed so that they will not impact floodplain resources.
Massachusetts Antiquities Act (MGL c. 9, §§ 26-27C); Massachusetts Historical Commission Regulations, 950 CMR 70.00; Protection of Properties Included in the State Register of Historic Places, 950 CMR 71.00	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.	Applicable, if protected resources are present	No protected resources are known to exist in the area impacted by this alternative; however, if resources are identified, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to protected resources.

Table 2.1-4
Location-Specific ARARs for DAPL Alternatives 2A and 2B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
State Criteria, Advisories, and Guidance (cont.)			
Wetlands Protection Act and Regulations, MGL c. 131, § 40; 310 CMR 10.00	Regulations restrict dredging, filling, altering, or polluting inland wetland resource areas and impose performance standards for work in such areas. Protected resource areas include banks (10.54), bordering vegetated wetlands (10.55), land under water (10.56), bordering land subject to flooding (10.57) and riverfront areas (10.58).	Applicable, if alternative alters wetlands	Under this alternative, DAPL extraction may impact state regulated wetland resource areas. If this alternative alters state regulated wetland resource areas, it will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
Massachusetts Water Quality Certification for Discharge of Dredged or Fill Material, MGL c. 21, §§ 26-53; 314 CMR 9.00	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 or minimization are possible, then mitigate potential adverse impacts.	Applicable, if alternative discharges dredged or fill material into wetlands	If this alternative requires alteration of wetlands, installation and maintenance of monitoring and extraction wells, access ways, and treatment systems to address DAPL will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
Massachusetts Endangered Species Regulations, 321 CMR 10.00	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.	Applicable, if such species are present	No Massachusetts-listed rare, threatened, or endangered species have been identified at the Site to date. If Massachusetts-listed rare, threatened, or endangered species in the remedial area are identified, remedial activities will avoid actions that would adversely affect such species or their habitats.
Massachusetts Areas of Critical Environmental Concern (ACEC), 310 CMR 12.00	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.	Applicable, if ACEC is present	No known ACECs have been identified at the Site. If an ACEC is identified in the Site area, activities will be controlled to minimize impacts to affected species or resources if identified.

Table 2.1-5
Action-Specific ARARs for DAPL Alternatives 3A and 3B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance			
Clean Air Act, National Emission Standards for Hazardous Air Pollutants (NESHAPs); 42 USC § 112(b)(1); 40 CFR Part 61	These regulations establish emissions standards for 189 hazardous air pollutants.	Applicable	Emissions from well drilling activities, DAPL extraction and treatment system operation, and O&M will be implemented in accordance with these requirements.
Clean Water Act, National Pollution Discharge Elimination System (NPDES), 40 CFR Parts 122 and 125	These regulations include stormwater standards for construction activities disturbing more than one acre and requirements for stormwater discharges from hazardous waste treatment, storage and disposal facilities. The NPDES permit program also specifies the permissible concentration or level of contaminants in the discharge from any point source to waters of the United States.	Applicable	The discharge of treated effluent from the treatment of DAPL to a surface water would meet the substantive discharge standards.
General Pretreatment Regulations for Existing and New Sources of Pollution 40 CFR Part 403	Standards for discharge into a Publicly Owned Treatment Works (POTW).	Applicable, if discharge to a POTW occurs.	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If discharge to POTW were to be selected, construction and operation would comply with these regulations.
Resource Conservation and Recovery Act (RCRA), Subtitle C, 42 USC §§ 6901 et seq.; 40 CFR Parts 260-262, 264 (including Subparts B-G, I-N, W, X) and 268	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. These provisions have been adopted by the Commonwealth.	Applicable	DAPL, treatment residuals, and any investigation derived waste (IDW) determined to be hazardous will be properly stored and disposed off-site at a licensed facility. Under this alternative, any generation, treatment, or storage of hazardous waste will comply with this ARAR through appropriate design, implementation and operation.

Table 2.1-5
Action-Specific ARARs for DAPL Alternatives 3A and 3B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance (cont.)			
RCRA, Air Emission Standards for Process Vents, Equipment Leaks, Tanks, Surface Impoundments, and Containers, 40 CFR Part 264, Subparts AA, BB, and CC	RCRA emissions standards not delegated to Massachusetts. Standards for process vents for systems that manage hazardous wastes that have organic concentrations of at least 10 ppmw (Subpart AA). Standards for air equipment leaks for systems that manage hazardous wastes with organic concentrations of at least 10% by weight (Subpart BB). Standards for certain tanks and containers that treat, store, or dispose of hazardous wastes (Subpart CC).	Applicable, if hazardous waste with volatile organic concentrations (VOCs) of at least 10 parts per million by weight (ppmw) (Subpart AA), with organic concentrations of at least 10 % by weight (Subpart BB), will be treated, stored, or disposed of in tanks, surface impoundments, or containers, and thresholds are met (Subpart CC).Relevant and Appropriate, if less than thresholds.	No waste generated in these remedial activities is expected to have concentrations over these thresholds. Management and treatment of VOCs in DAPL would be in accordance with these air emission regulations.
SDWA Underground Injection Control (UIC) Program, 40 CFR Parts 144, 146, and 147 (Subpart W)	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.	Applicable, if treated effluent is injected underground	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If underground injection were to be selected, construction and operation would comply with these regulations
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	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.	Relevant and Appropriate	MCLs were used to determine the extent of required institutional controls to be established under this alternative.
SDWA National Primary Drinking Water Regulations, Maximum Contaminant Level Goals (MCLGs), 42 USC § 300f et seq.;	Establish MCLGs for several organic and inorganic contaminants in public drinking water supplies. MCLGs specify the maximum concentration at which no known or anticipated	Relevant and Appropriate for non-zero MCLGs only; MCLGs set as zero are To Be Considered	MCLGs were used to determine the extent of required institutional controls to be established under this alternative.
EPA, Office of Water, Drinking Water Health Advisories	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.	To Be Considered	HAs were considered in determining the extent of required institutional controls to be established under this alternative.
EPA Risk Reference Doses (RfDs)	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.	To Be Considered	RfDs were considered in determining the extent of required institutional controls to be established under this alternative.

Table 2.1-5
Action-Specific ARARs for DAPL Alternatives 3A and 3B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance (cont.)			
Human Health Assessment Cancer Slope Factors (CSFs)	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.	To Be Considered	CSFs were considered in determining the extent of required institutional controls to be established under this alternative.
Guidelines for Carcinogenic Risk Assessment, EPA/630/P-03/001F, March 2005	Guidance values are to be used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	To Be Considered	These guidance values were considered in determining the extent of required institutional controls to be established under this alternative.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA/630/R-03/003F, March 2005	Guidance values are to be used to evaluate the potential carcinogenic hazard to children caused by exposure to contaminants.	To Be Considered	These guidance values were considered in determining the extent of required institutional controls to be established under this alternative.
EPA Regional Screening Levels (RSLs) for Chemical Contamination at Superfund Sites	Provides risk-based screening levels for various environmental media and for residential and industrial exposure scenarios.	To Be Considered	These screening levels were considered in determining the extent of required institutional controls to be established under this alternative.
Guide to Management of Investigation Derived Wastes (IDW); OSWER 9345.3-03FS (1992)	Guidance on managing IDW in a manner that ensures protection of human health and the environment.	To Be Considered	IDW generated as part of this remedial alternative will be managed based on guidance standards.
Summary of Key Existing EPA CERCLA Guidance on developing Policies for Groundwater Restoration, OSWER 9283.1-33 (June 26, 2009)	This alternative to address a source of contamination to overburden and bedrock aquifers was developed in consideration of this guidance	To Be Considered	This remedial alternative was developed with guidance from this publication.
State Criteria, Advisories, and Guidance			
Massachusetts Hazardous Waste Regulations, 310 CMR 30.000, including 30.100 (identification and listing of hazardous waste), 30.300 (requirements for generators), 30.680 (containers), 30.690 (tanks), 30.500 (facility management standards), 30.513 (waste analysis)	Massachusetts is delegated to administer RCRA through its state regulations. These regulations address the generation, storage, treatment, and disposal of hazardous waste. The regulations for tank systems used to store or treat hazardous waste provide specifications for design and installation of tanks systems; require secondary containment, leak detection systems, and inspections; and identify general operating requirements and closure and post-closure care.	Applicable, if management of hazardous waste triggers the pertinent regulations	All DAPL treatment residuals determined to be a hazardous waste will be managed as a hazardous waste and disposed of off-site at a licensed facility. Under this alternative, any generation, treatment, or storage of hazardous waste will comply with these ARARs through appropriate design, implementation, and operation.

Table 2.1-5
Action-Specific ARARs for DAPL Alternatives 3A and 3B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
State Criteria, Advisories, and Guidance (cont.)			
Massachusetts Ambient Air Quality Standards, 310 CMR 6.00	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 rules. No air emissions from remedial activities will cause air quality standards to be exceeded.	Applicable	Extraction and management of DAPL and any DAPL treatment will be implemented in accordance with these rules. Emission standards, including for dust, will be complied with during DAPL extraction and treatment.
Massachusetts Air Pollution Control Regulations, 310 CMR 7.00	These regulations set emission limits necessary to attain ambient air quality standards, including standards for visible emissions (310 CMR 7.06); dust, odor, construction and demolition (310 CMR 7.09); noise (310 CMR 7.10); and volatile organic compounds (310 CMR 7.18). Remedial activities will be implemented in accordance with these rules. No air emissions from remedial activities will cause air quality standards to be exceeded.	Applicable	Extraction and management of DAPL and any DAPL treatment will be implemented in accordance with these rules. Emission standards, including for dust, will be complied with during DAPL extraction and treatment.
Massachusetts Clean Water Act; Surface Water Discharge Permit Regulations; MGL c. 21, §§ 26-53; 314 CMR 3.00	These regulations provide that discharges to waters of the Commonwealth shall not result in exceedances of Massachusetts Surface Water Quality Standards (MSWQS) (314 CMR 4.00).	Applicable, if treated effluent is discharged to a surface water	The discharge of treated effluent from the treatment of DAPL to a surface water would meet the substantive discharge standards.
Massachusetts Clean Water Act; MA Surface Water Quality Standards (MSWQS) M.G.L. c. 21, §§ 26-53; 314 CMR 4.00	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.	Applicable, if surface water discharge occurs	The discharge of treated effluent from the treatment of DAPL to a surface water would meet the substantive discharge standards.
Massachusetts Operation, Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Dischargers 314 CMR 12.00	Standards for pretreatment requirements for sources to a POTW.	Applicable, if discharges to a POTW occur	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If discharge to POTW were to be selected, construction and operation would comply with these regulations.
Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities MGL c. 21, §§ 26-53; 314 CMR 8.00	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.	Applicable, if hazardous waste is generated and surface water discharge occurs.	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If extracted DAPL were to be characterized as hazardous and the treated effluent were to be discharged, the discharge from the DAPL treatment system would be managed to be in compliance with these requirements.

Table 2.1-5
Action-Specific ARARs for DAPL Alternatives 3A and 3B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
State Criteria, Advisories, and Guidance (cont.)			
Massachusetts Drinking Water Regulations, 310 CMR 22.00	Establishes maximum contaminant levels 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.	Relevant and Appropriate; MCLGs set as zero are To Be Considered	Massachusetts MCLs and MCLGs were considered during the development of PRGs.
Massachusetts Drinking Water Guidelines	MassDEP's Office of Research and Standards issues guidance for chemicals other than those with Massachusetts MCLs in drinking water.	To Be Considered	These Guidelines were considered during the development of PRGs.
Massachusetts Solid Waste Management Regulations 310 CMR 19.000	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.	Applicable, if solid waste is generated	Any wastes generated by remedial activity that are determined to not be hazardous wastes will be managed in accordance with this regulation.
Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, Prepared for Massachusetts Executive Office of Environmental Affairs (2003)	Guidance on preventing erosion and sedimentation.	To Be Considered	Remedy design, construction, and operation would be implemented with guidance from this publication.
Massachusetts Underground Injection Control Regulations, 310 CMR 27.00	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.	Applicable, if treated effluent is injected underground	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If this alternative includes underground injection of treated effluent, such injection will be treated to meet these standards.
Monitoring Well Guidance, WSC-310-91	Guidance on locating, drilling, installing, sampling, and decommissioning monitoring wells.	To Be Considered	Monitoring well design, installation, operation, and decommissioning would be implemented in accordance with this guidance.
Division of Air Quality Control (DAQC) DAQC Policy 90-001, re: Noise Regulation, February 1990	Guidance on sound emissions.	To Be Considered	These remedial alternatives will comply with the ARAR 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.

Table 2.1-6
Location-Specific ARARs for DAPL Alternatives 3A and 3B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance			
Floodplain Management and Protection of Wetlands; FEMA Regulations (44 CFR Part 9) (implementing Executive Orders 11988 and 11990)	These 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). Prohibits 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. Requires the avoidance of impacts associated with the occupancy and modification of federally designated 100-year and 500-year floodplains and the avoidance of development within the floodplain wherever there is a practicable alternative. An assessment of impacts to the 500-year floodplain is required for critical actions, which include siting facilities such as those which produce, use or store highly volatile, flammable, explosive, toxic or water-reactive materials in a floodplain. Requires public notice when proposing any action in or affecting a floodplain or wetlands.	Applicable, if alternative alters wetlands or floodplains	The Containment Area elevation (85 ft msl) is above the 500-year flood elevation (82 ft msl), which would mean that the infrastructure for DAPL extraction from the Containment Area DAPL pool would not result in the occupancy and modification of the 500-year floodplain at the Olin Property. If additional site preparation work is required to provide for adequate drainage and storage within the 500-year floodplain, this will be evaluated as part of design activities and implemented during the Remedial Action (RA) phase. If this alternative alters wetlands, it will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
Clean Water Act Guidelines for Specification of Disposal Sites for Dredged or Fill Material 33 USC § 1344(b)(1); 40 CFR Parts 230 and 231, and 33 CFR Parts 320-323	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 (T&E) 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" (LEDPA) to protect wetland and aquatic resources.	Applicable, if there is a discharge of fill material into water bodies or wetlands	The infrastructure for DAPL extraction from the Containment Area DAPL pool will not impact the aquatic ecosystem. However, if it is later determined that there are impacts on the aquatic ecosystem, this alternative will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
Fish and Wildlife Coordination Act (16 USC §§ 661 et seq.)	Requires consultation with appropriate agencies to protect fish and wildlife when federal actions may alter waterways. Must develop measures to prevent and mitigate potential loss to the maximum extent practicable.	Applicable, if wildlife habitat is altered	If this alternative alters wildlife habitat, it will comply with this ARAR through appropriate consultation and implementation of measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife.
Migratory Bird Treaty Act (16 USC §§ 703 et seq.)	Protects migratory birds, their nests and eggs. A depredation permit issued by the U.S. Fish and Wildlife Service (USFWS) is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Applicable, if protected areas are present	Under this alternative, if migratory bird protected areas are identified in the site area, measures to avoid, minimize and/or mitigate any impacts to protected resource areas will be implemented in consultation with appropriate USFWS officials.

Table 2.1-6
Location-Specific ARARs for DAPL Alternatives 3A and 3B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance (cont.)			
National Historic Preservation Act (NHPA) and related laws, 54 USC §§ 306108, 306107, and 312502, 36 CFR Parts 65 and 800	When a federal agency finds, or is notified, that its activities in connection with a federal construction project may cause irreparable loss or destruction of significant scientific, pre-historical, historical, or archeological data, or harm historic properties or landmarks, the substantive standards under these statutes and regulations must be met.	Applicable, if protected resource areas are present	No protected resources are known to exist in the area impacted by this alternative; however, if resources are identified, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to protected resources.
Endangered Species Act, 50 CFR §§ 17.11- 17.12; 50 CFR Part 402	Requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	Applicable, if such species are present	If endangered or threatened species in the remedial area are identified, remedial activities would avoid actions that adversely affect endangered or threatened species or their habitats.
U.S. Army Corps of Engineers, New England District Compensatory Mitigation Guidance (09-07-2016).	This Guidance is to be considered when compensatory mitigation to address impacts to federal jurisdiction wetlands is appropriate for a particular remedial activity.	To Be Considered, if alternative alters wetlands	If this alternative requires alteration of federal jurisdictional wetlands, the mitigation and restoration will be conducted in accordance with this guidance.
State Criteria, Advisories, and Guidance			
Massachusetts Hazardous Waste Regulations, Location Standards for Land Subject to Flooding 310 CMR 30.701	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.	Applicable, if hazardous waste is managed within a floodplain	Hazardous waste is not expected to be managed in a 100-year floodplain under these alternatives. If hazardous wastes are generated during remedial activities, they will be managed so that they will not impact floodplain resources.

Table 2.1-6
Location-Specific ARARs for DAPL Alternatives 3A and 3B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
State Criteria, Advisories, and Guidance (cont.)			
Massachusetts Antiquities Act (MGL c. 9, §§ 26-27C); Massachusetts Historical Commission Regulations, 950 CMR 70.00; Protection of Properties Included in the State Register of Historic Places, 950 CMR 71.00	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.	Applicable, if protected resources are present	No protected resources are known to exist in the area impacted by this alternative; however, if resources are identified, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to protected resources.
Wetlands Protection Act and Regulations, MGL c. 131, § 40; 310 CMR 10.00	Regulations restrict dredging, filling, altering, or polluting inland wetland resource areas and impose performance standards for work in such areas. Protected resource areas include banks (10.54), bordering vegetated wetlands (10.55), land under water (10.56), bordering land subject to flooding (10.57) and riverfront areas (10.58).	Applicable, if alternative alters wetlands	Under this alternative, DAPL extraction may impact state regulated wetland resource areas. If this alternative alters state regulated wetland resource areas, it will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
Massachusetts Water Quality Certification for Discharge of Dredged or Fill Material, MGL c. 21, §§ 26-53; 314 CMR 9.00	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 or minimization are possible, then mitigate potential adverse impacts.	Applicable, if alternative discharges dredged or fill material into wetlands	If this alternative requires alteration of wetlands, installation and maintenance of monitoring and extraction wells, access ways, and treatment systems to address DAPL will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
Massachusetts Endangered Species Regulations, 321 CMR 10.00	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.	Applicable, if such species are present	No Massachusetts-listed rare, threatened, or endangered species have been identified at the Site to date. If Massachusetts-listed rare, threatened, or endangered species in the remedial area are identified, remedial activities will avoid actions that would adversely affect such species or their habitats.

Table 2.1-6
Location-Specific ARARs for DAPL Alternatives 3A and 3B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
State Criteria, Advisories, and Guidance (cont.)			
Massachusetts Areas of Critical Environmental Concern, 310 CMR 12.00	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.	Applicable, if ACEC is present	No known ACECs have been identified at the Site. If an ACEC is identified in the Site area, activities will be controlled to minimize impacts to affected species or resources if identified

Table 2.1-7
Action-Specific ARARs for DAPL Alternatives 4A and 4B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance			
Clean Air Act, National Emission Standards for Hazardous Air Pollutants (NESHAPs); 42 USC § 112(b)(1); 40 CFR Part 61	These regulations establish emissions standards for 189 hazardous air pollutants.	Applicable	Emissions from well drilling activities, DAPL extraction and treatment system operation, and O&M will be implemented in accordance with these requirements.
Clean Water Act, National Pollution Discharge Elimination System (NPDES), 40 CFR Parts 122 and 125	These regulations include stormwater standards for construction activities disturbing more than one acre and requirements for stormwater discharges from hazardous waste treatment, storage and disposal facilities. The NPDES permit program also specifies the permissible concentration or level of contaminants in the discharge from any point source to waters of the United States.	Applicable	The discharge of treated effluent from the treatment of DAPL to a surface water would meet the substantive discharge standards.
General Pretreatment Regulations for Existing and New Sources of Pollution 40 CFR Part 403	Standards for discharge into a Publicly Owned Treatment Works (POTW).	Applicable, if discharge to a POTW occurs.	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If discharge to POTW were to be selected, construction and operation would comply with these regulations.
Resource Conservation and Recovery Act (RCRA), Subtitle C, 42 USC §§ 6901 et seq.; 40 CFR Parts 260-262, 264 (including Subparts B-G, I-N, W, X) and 268	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. These provisions have been adopted by the Commonwealth.	Applicable	DAPL, treatment residuals, and any investigation derived waste (IDW) determined to be hazardous will be properly stored and disposed off-site at a licensed facility. Under this alternative, any generation, treatment, or storage of hazardous waste will comply with this ARAR through appropriate design, implementation and operation.

Table 2.1-7
Action-Specific ARARs for DAPL Alternatives 4A and 4B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance (cont.)			
RCRA, Air Emission Standards for Process Vents, Equipment Leaks, Tanks, Surface Impoundments, and Containers, 40 CFR Part 264, Subparts AA, BB, and CC	RCRA emissions standards not delegated to Massachusetts. Standards for process vents for systems that manage hazardous wastes that have organic concentrations of at least 10 ppmw (Subpart AA). Standards for air equipment leaks for systems that manage hazardous wastes with organic concentrations of at least 10% by weight (Subpart BB). Standards for certain tanks and containers that treat, store, or dispose of hazardous wastes (Subpart CC).	Applicable, if hazardous waste with volatile organic concentrations (VOCs) of at least 10 parts per million by weight (ppmw) (Subpart AA), with organic concentrations of at least 10 % by weight (Subpart BB), will be treated, stored, or disposed of in tanks, surface impoundments, or containers, and thresholds are met (Subpart CC).Relevant and Appropriate, if less than thresholds.	No waste generated in these remedial activities is expected to have concentrations over these thresholds. Management and treatment of VOCs in DAPL would be in accordance with these air emission regulations.
SDWA Underground Injection Control (UIC) Program, 40 CFR Parts 144, 146, and 147 (Subpart W)	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.	Applicable, if treated effluent is injected underground	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If underground injection were to be selected, construction and operation would comply with these regulations.
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	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.	Relevant and Appropriate	MCLs were used to determine the extent of required institutional controls to be established under this alternative.
SDWA National Primary Drinking Water Regulations, Maximum Contaminant Level Goals (MCLGs), 42 USC § 300f et	Establish MCLGs for several organic and inorganic contaminants in public drinking water supplies. MCLGs specify the maximum concentration at which no known or anticipated	Relevant and Appropriate for non-zero MCLGs only; MCLGs set as zero are To Be Considered	MCLGs were used to determine the extent of required institutional controls to be established under this alternative.
EPA, Office of Water, Drinking Water Health Advisories	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.	To Be Considered	HAs were considered in determining the extent of required institutional controls to be established under this alternative.
EPA Risk Reference Doses (RfDs)	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.	To Be Considered	RfDs were considered in determining the extent of required institutional controls to be established under this alternative.
Human Health Assessment Cancer Slope Factors (CSFs)	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.	To Be Considered	CSFs were considered in determining the extent of required institutional controls to be established under this alternative.

Table 2.1-7
Action-Specific ARARs for DAPL Alternatives 4A and 4B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance (cont.)			
Guidelines for Carcinogenic Risk Assessment, EPA/630/P-03/001F, March 2005	Guidance values are to be used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	To Be Considered	These guidance values were considered in determining the extent of required institutional controls to be established under this alternative.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, EPA/630/R-03/003F, March 2005	Guidance values are to be used to evaluate the potential carcinogenic hazard to children caused by exposure to contaminants.	To Be Considered	These guidance values were considered in determining the extent of required institutional controls to be established under this alternative.
EPA Regional Screening Levels (RSLs) for Chemical Contamination at Superfund Sites	Provides risk-based screening levels for various environmental media and for residential and industrial exposure scenarios.	To Be Considered	These screening levels were considered in determining the extent of required institutional controls to be established under this alternative.
Guide to Management of Investigation Derived Wastes (IDW); OSWER 9345.3-03FS (1992)	Guidance on managing IDW in a manner that ensures protection of human health and the environment.	To Be Considered	IDW generated as part of this remedial alternative will be managed based on guidance standards.
Summary of Key Existing EPA CERCLA Guidance on developing Policies for Groundwater Restoration, OSWER 9283.1-33 (June 26, 2009)	This alternative to address a source of contamination to overburden and bedrock aquifers was developed in consideration of this guidance	To Be Considered	This remedial alternative was developed with guidance from this publication.
State Criteria, Advisories, and Guidance			
Massachusetts Hazardous Waste Regulations, 310 CMR 30.000, including 30.100 (identification and listing of hazardous waste), 30.300 (requirements for generators), 30.680 (containers), 30.690 (tanks), 30.500 (facility management standards), 30.513 (waste analysis)	Massachusetts is delegated to administer RCRA through its state regulations. These regulations address the generation, storage, treatment, and disposal of hazardous waste. The regulations for tank systems used to store or treat hazardous waste provide specifications for design and installation of tanks systems; require secondary containment, leak detection systems, and inspections; and identify general operating requirements and closure and post-closure care.	Applicable, if management of hazardous waste triggers the pertinent regulations	All DAPL treatment residuals determined to be a hazardous waste will be managed as a hazardous waste and disposed of off-site at a licensed facility. Under this alternative, any generation, treatment, or storage of hazardous waste will comply with these ARARs through appropriate design, implementation, and operation.
Massachusetts Ambient Air Quality Standards, 310 CMR 6.00	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 rules. No air emissions from remedial activities will cause air quality standards to be exceeded.	Applicable	Extraction and management of DAPL and any DAPL treatment will be implemented in accordance with these rules. Emission standards, including for dust, will be complied with during DAPL extraction and treatment.
Massachusetts Air Pollution Control Regulations, 310 CMR 7.00	These regulations set emission limits necessary to attain ambient air quality standards, including standards for visible emissions (310 CMR 7.06); dust, odor, construction and demolition (310 CMR 7.09); noise (310 CMR 7.10); and volatile organic compounds (310 CMR 7.18). Remedial activities will be implemented in accordance with these rules. No air emissions from remedial activities will cause air quality standards to be exceeded.	Applicable	Extraction and management of DAPL and any DAPL treatment will be implemented in accordance with these rules. Emission standards, including for dust, will be complied with during DAPL extraction and treatment.

Table 2.1-7
Action-Specific ARARs for DAPL Alternatives 4A and 4B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
State Criteria, Advisories, and Guidance (cont.)			
Massachusetts Clean Water Act; Surface Water Discharge Permit Regulations; MGL c. 21, §§ 26-53; 314 CMR 3.00	These regulations provide that discharges to waters of the Commonwealth shall not result in exceedances of Massachusetts Surface Water Quality Standards (MSWQS) (314 CMR 4.00).	Applicable, if treated effluent is discharged to a surface water	The discharge of treated effluent from the treatment of DAPL to a surface water would meet the substantive discharge standards.
Massachusetts Clean Water Act; MA Surface Water Quality Standards (MSWQS) M.G.L. c. 21, §§ 26-53; 314 CMR 4.00	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.	Applicable, if surface water discharge occurs	The discharge of treated effluent from the treatment of DAPL to a surface water would meet the substantive discharge standards.
Massachusetts Operation, Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Dischargers 314 CMR 12.00	Standards for pretreatment requirements for sources to a POTW.	Applicable, if discharges to a POTW occur	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If discharge to POTW were to be selected, construction and operation would comply with these regulations.
Massachusetts Supplemental Requirements for Hazardous Waste Management Facilities MGL c. 21, §§ 26-53; 314 CMR 8.00	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.	Applicable, if hazardous waste is generated and surface water discharge occurs.	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If extracted DAPL were to be characterized as hazardous and the treated effluent were to be discharged, the discharge from the DAPL treatment system would be managed to be in compliance with these requirements.
Massachusetts Drinking Water Regulations, 310 CMR 22.00	Establishes maximum contaminant levels 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.	Relevant and Appropriate; MCLGs set as zero are To Be Considered	Massachusetts MCLs and MCLGs were considered during the development of PRGs.
Massachusetts Drinking Water Guidelines	MassDEP's Office of Research and Standards issues guidance for chemicals other than those with Massachusetts MCLs in drinking water.	To Be Considered	These Guidelines were considered during the development of PRGs.
Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, Prepared for Massachusetts Executive Office of Environmental Affairs (2003)	Guidance on preventing erosion and sedimentation.	To Be Considered	Remedy design, construction, and operation would be implemented with guidance from this publication.
Massachusetts Underground Injection Control Regulations, 310 CMR 27.00	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.	Applicable, if treated effluent is injected underground	The most appropriate discharge method for the DAPL treatment system would be selected during remedial design. If this alternative includes underground injection of treated effluent, such injection will be treated to meet these standards.

Table 2.1-7
Action-Specific ARARs for DAPL Alternatives 4A and 4B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
State Criteria, Advisories, and Guidance (cont.)			
Monitoring Well Guidance, WSC-310-91	Guidance on locating, drilling, installing, sampling, and decommissioning monitoring wells.	To Be Considered	Monitoring well design, installation, operation, and decommissioning would be implemented in accordance with this guidance.
Division of Air Quality Control (DAQC). DAQC Policy 90-001, re: Noise Regulation, February 1990	Guidance on sound emissions.	To Be Considered	These remedial alternatives will comply with the ARAR 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.

Table 2.1-8
Location-Specific ARARs for DAPL Alternatives 4A and 4B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance			
Floodplain Management and Protection of Wetlands; FEMA Regulations (44 CFR Part 9) (implementing Executive Orders 11988 and 11990)	These 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). Prohibits 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. Requires the avoidance of impacts associated with the occupancy and modification of federally designated 100-year and 500-year floodplains and the avoidance of development within the floodplain wherever there is a practicable alternative. An assessment of impacts to the 500-year floodplain is required for critical actions, which include siting facilities such as those which produce, use or store highly volatile, flammable, explosive, toxic or water-reactive materials in a floodplain. Requires public notice when proposing any action in or affecting a floodplain or wetlands.	Applicable, if alternative alters wetlands or floodplains	The infrastructure for DAPL extraction from the Main Street DAPL pool will not result in the occupancy or modification of the 100 or 500-year floodplain; therefore, the floodplain management requirements do not apply. If this alternative alters wetlands, it will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
Clean Water Act Guidelines for Specification of Disposal Sites for Dredged or Fill Material 33 USC § 1344(b)(1); 40 CFR Parts 230 and 231, and 33 CFR Parts 320-323	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 (T&E) 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” (LEDPA) to protect wetland and aquatic resources.	Applicable, if there is a discharge of fill material into water bodies or wetlands	The infrastructure for DAPL extraction from the Main Street DAPL pool will not impact the aquatic ecosystem. However, if it is later determined that there are impacts on the aquatic ecosystem, this alternative will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
Fish and Wildlife Coordination Act (16 USC §§ 661 et seq.)	Requires consultation with appropriate agencies to protect fish and wildlife when federal actions may alter waterways. Must develop measures to prevent and mitigate potential loss to the maximum extent practicable.	Applicable, if wildlife habitat is altered	If this alternative alters wildlife habitat, it will comply with this ARAR through appropriate consultation and implementation of measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife.
Migratory Bird Treaty Act (16 USC §§ 703 et seq.)	Protects migratory birds, their nests and eggs. A depredation permit issued by the U.S. Fish and Wildlife Service (USFWS) is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Applicable, if protected areas are present	Under this alternative, if migratory bird protected areas are identified in the site area, measures to avoid, minimize and/or mitigate any impacts to protected resource areas will be implemented in consultation with appropriate USFWS officials.

Table 2.1-8
Location-Specific ARARs for DAPL Alternatives 4A and 4B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
Federal Criteria, Advisories, and Guidance (cont.)			
National Historic Preservation Act (NHPA) and related laws, 54 USC §§ 306108, 306107, and 312502, 36 CFR Parts 65 and 800	When a federal agency finds, or is notified, that its activities in connection with a federal construction project may cause irreparable loss or destruction of significant scientific, pre-historical, historical, or archeological data, or harm historic properties or landmarks, the substantive standards under these statutes and regulations must be met.	Applicable, if protected resource areas are present	No protected resources are known to exist in the area impacted by this alternative; however, if resources are identified, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to protected resources.
Endangered Species Act, 50 CFR §§ 17.11-17.12; 50 CFR Part 402	Requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	Applicable, if such species are present	If endangered or threatened species in the remedial area are identified, remedial activities would avoid actions that adversely affect endangered or threatened species or their habitats.
U.S. Army Corps of Engineers, New England District Compensatory Mitigation Guidance (09-07-2016).	This Guidance is to be considered when compensatory mitigation to address impacts to federal jurisdiction wetlands is appropriate for a particular remedial activity.	To Be Considered, if alternative alters wetlands	If this alternative requires alteration of federal jurisdictional wetlands, the mitigation and restoration will be conducted in accordance with this guidance.
State Criteria, Advisories, and Guidance			
Massachusetts Hazardous Waste Regulations, Location Standards for Land Subject to Flooding 310 CMR 30.701	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.	Applicable, if hazardous waste is managed within a floodplain	Hazardous waste is not expected to be managed in a 100-year floodplain under these alternatives. If hazardous wastes are generated during remedial activities, they will be managed so that they will not impact floodplain resources.
Massachusetts Antiquities Act (MGL c. 9, §§ 26-27C); Massachusetts Historical Commission Regulations, 950 CMR 70.00; Protection of Properties Included in the State Register of Historic Places, 950 CMR 71.00	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.	Applicable, if protected resources are present	No protected resources are known to exist in the area impacted by this alternative; however, if resources are identified, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to protected resources.

Table 2.1-8
Location-Specific ARARs for DAPL Alternatives 4A and 4B
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Requirement	Requirement Synopsis	ARAR Status	Action to Attain ARAR
State Criteria, Advisories, and Guidance (cont.)			
Wetlands Protection Act and Regulations, MGL c. 131, § 40; 310 CMR 10.00	Regulations restrict dredging, filling, altering, or polluting inland wetland resource areas and impose performance standards for work in such areas. Protected resource areas include banks (10.54), bordering vegetated wetlands (10.55), land under water (10.56), bordering land subject to flooding (10.57) and riverfront areas (10.58).	Applicable, if alternative alters wetlands	Under this alternative, DAPL extraction may impact state regulated wetland resource areas. If this alternative alters state regulated wetland resource areas, it will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
Massachusetts Water Quality Certification for Discharge of Dredged or Fill Material, MGL c. 21, §§ 26-53; 314 CMR 9.00	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 or minimization are possible, then mitigate potential adverse impacts.	Applicable, if alternative discharges dredged or fill material into wetlands	If this alternative requires alteration of wetlands, installation and maintenance of monitoring and extraction wells, access ways, and treatment systems to address DAPL will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
Massachusetts Endangered Species Regulations, 321 CMR 10.00	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.	Applicable, if such species are present	No Massachusetts-listed rare, threatened, or endangered species have been identified at the Site to date. If Massachusetts-listed rare, threatened, or endangered species in the remedial area are identified, remedial activities will avoid actions that would adversely affect such species or their habitats.
Massachusetts Areas of Critical Environmental Concern, 310 CMR 12.00	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.	Applicable, if ACEC is present	No known ACECs have been identified at the Site. If an ACEC is identified in the Site area, activities will be controlled to minimize impacts to affected species or resources if identified.

Table 2.1-9
Location-Specific ARARs, Criteria, Advisories, and Guidance for Groundwater Hot Spot Alternatives
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

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Federal Standards										
Floodplains and Wetlands	Floodplain Management and Protection of Wetlands	44 CFR Part 9 (implementing Executive Orders 11988 and 11990)	Applicable	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. Standards for excavating and managing contaminated soil, sediment, and groundwater/DAPL, etc. within the 100-year and 500-year floodplains will be attained. After completion of work, 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. Public comment will be solicited as part of the Proposed Plan concerning any proposed alteration to wetlands and floodplains.	No action, therefore not applicable	These alternatives include the use of extraction wells, access roads, conveyance piping, and associated infrastructure constructed in/adjacent to wetlands and floodplains and would comply with this ARAR through appropriate avoidance, minimization, mitigation and/or restoration. Federal jurisdictional wetlands altered by remedial infrastructure would be restored in place. Remedial work within the regulated 100-year and 500-year floodplains would result in no significant net loss of flood storage capacity and no significant net increase in flood stage or velocities. Floodplain habitat would 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; 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. USEPA must determine which alternative is the "Least Environmentally Damaging Practicable Alternative" (LEDPA) to protect wetland and aquatic resources.	Remedial alternatives will be developed and designed to comply with these regulations. Compensatory wetlands mitigation will need to be performed as necessary to comply with this ARAR. The selected alternative will need to be determined to be the least environmentally damaging practicable alternative that meets the remedial action objectives.	No action, therefore not applicable	These alternatives include the use of extraction wells, access roads, conveyance piping, and associated infrastructure constructed in/adjacent to wetlands and would comply with this ARAR through appropriate avoidance, minimization, mitigation and/or restoration. Federal jurisdictional wetlands altered by remedial infrastructure would 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.	Any hazardous waste generated during remedial activities will be managed so that it will not impact floodplain resources.	No action, therefore not applicable	The proposed wastewater treatment system location is not in a 100-year floodplain. The treatment plant would be built and operated to prevent washout and to result in no adverse effects on human health or the environment.			
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 remedial activities involving excavation activities will be managed so that it will not impact floodplain resources.	No action, therefore not applicable	Solids generated during construction of the remedies and solids generated during operation of the groundwater extraction and treatment plant would be managed in accordance with these regulations so as to no impact floodplain resources.			
Wetlands	U.S. Army Corps of Engineers, New England District Compensatory Mitigation Guidance (09-07-2016)	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 jurisdiction wetlands is appropriate for a particular remedial activity.	Activities affecting federal jurisdictional wetlands will be conducted in accordance with these guidance standards for mitigation and restoration.	No action, therefore not applicable	These alternatives would be constructed and operated to minimize impact to federal jurisdiction wetlands; mitigation and restoration would be performed where appropriate.			

Table 2.1-9
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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 species have been identified in the vicinity of the OCSS. However, protection of endangered species and their habitat will be considered during development and design of remedial alternatives.	No action, therefore not applicable	No endangered or threatened species have been identified at the Site to date. If endangered or threatened species in the remedial area are identified, remedial activities would be designed and implemented to avoid affects to 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	When a federal agency finds, or is notified, that its activities may have adverse effects on historic properties, such agency is required to consult with federal and state historic preservation officials to resolve the adverse effects, including avoidance, minimization, or mitigation of the adverse effects.	If protected resources are identified in the Site area, measures to avoid, minimize and/or mitigate any adverse effects to protected resources will be implemented in consultation with federal and state historic preservation officials.	No action, therefore not applicable	No protected resources are known to exist in the area impacted by this alternative; however, a potentially significant resource is the Middlesex Canal, located in close proximity to Maple Meadow Brook. If protected resources are identified, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to 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 (USFWS), National Marine Fisheries Service, and other related state agencies. That federal agency must consult with the appropriate government entities and also take action to prevent, mitigate, or compensate for project-related losses of or damage to endangered species, fish and wildlife resources.	All appropriate state and federal agencies, such as the USFWS, will be consulted to ensure that losses of or damage to habitat and wildlife will be prevented, mitigated, or compensated to the extent necessary.	No action, therefore not applicable	If this alternative alters wildlife habitat, it will comply with this ARAR through appropriate consultation and implementation of measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife.			
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 (USFWS) 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 in the site area, measures to avoid, minimize and/or mitigate any impacts to protected resource areas will be implemented in consultation with appropriate USFWS officials.	No action, therefore not applicable	Remedial activities would be evaluated to protect migratory birds, their nests, and eggs. If migratory bird protected areas are identified in the site area, measures would be implemented in consultation with appropriate USFWS officials.			
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).	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.	No action, therefore not applicable	This alternative includes the use of extraction wells, access roads, conveyance piping, and associated infrastructure constructed in/adjacent to wetlands and floodplains and would comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.			
Area of Critical Environmental Concern	Massachusetts Areas of Critical Environmental Concern (ACECs) Regulations	310 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 ACECs have been identified at the Site. If an ACEC is identified in the Site area, activities will be controlled to minimize impacts to affected species or resources if identified.	No action, therefore not applicable	No such ACECs have been identified at the Site; however, if identified, activities would be controlled to minimize impacts to affected species or resources identified.			

Table 2.1-9
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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 wastes will be managed so that it will not impact floodplain resources.	No action, therefore not applicable	Hazardous waste is not expected to be managed in a 100-year floodplain under these alternatives. If hazardous wastes are generated during remedial activities, they will be managed so that they will not impact floodplain resources.			
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 species have been identified in the vicinity of the Site. However, if identified, protection of state listed endangered species and their habitat will be considered during design and implementation of remedial alternatives.	No action, therefore not applicable	Endangered or threatened species have not been identified at the Site to date. If state listed endangered or threatened species in the site area are identified, remedial 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.	If protected resources are identified in the Site area, measures to avoid, minimize and/or mitigate any impacts to protected resources will be implemented in consultation with federal and state historic preservation officials.	No action, therefore not applicable	No protected resources are known to exist in the area impacted by this alternative; however, a potentially significant resource is the Middlesex Canal, located in close proximity to Maple Meadow Brook. If protected resources are identified, federal and state preservation officials would be consulted to address measures to avoid, minimize and/or mitigate any impacts to protected resources.			

Prepared By / Date: BLR 03/26/2020
Checked By / Date: KPW 03/27/2020

Notes:
ACEC = Areas 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
DAPL = Dense Aqueous Phase Liquid
FEMA = Federal Emergency Management Agency
LEDPA = Least Environmentally Damaging Practicable Alternative
MGL = Massachusetts General Law
RCRA = Resource Conservation and Recovery Act
USC = United States Code
USEPA = United States Environmental Protection Agency
USFWS = United States Fish and Wildlife Service

Table 2.1-10
Action-Specific ARARs, Criteria, Advisories, and Guidance for Groundwater Hot Spot Alternatives
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Wilmington, Massachusetts

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Federal Standards										
Hazardous Waste Treatment, Storage, Disposal	Resource Conservation and Recovery Act (RCRA) Subtitle C; Hazardous Waste Identification; Generator and Handler Requirements; Tracking Requirements; Storage, Treatment 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. Non-hazardous wastes will be disposed of appropriately. Any waste generated during remedial activities that is determined to be hazardous waste will be managed in accordance with these regulations. Alternatives generating hazardous waste or using treatment, storage or disposal facilities for hazardous waste will be implemented to comply with this ARAR.	No action, therefore not applicable	Wastes generated during remedial activities would be analyzed under these standards and managed 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: 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. Relevant and Appropriate, if less than thresholds.	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 by weight or greater.	Process vents, air equipment, tanks, surface impoundments or containers will be managed in accordance with these air emission regulations.	No action, therefore not applicable	No waste generated in these remedial activities is expected to have concentrations over these thresholds. Management and treatment of VOCs in highly contaminated groundwater would 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 (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 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).	No action, therefore not applicable	Best management practices will be used to control and manage stormwater runoff during construction and operation of the groundwater hot spot extraction and treatment system. The discharge of treated effluent from the treatment of highly contaminated groundwater to a surface water would meet the substantive discharge standards.			

Table 2.1-10
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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).	If remedial actions result in discharges to a POTW, the discharge will be monitored and treated, if necessary, to comply with pretreatment standards.	No action, therefore not applicable	The most appropriate discharge method for the groundwater hot spot treatment system would be selected during remedial design. If discharge to POTW were to be selected, construction and operation would 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 remedial actions currently developed in this FS do not have underground injection as a component of a treatment train. However, if the alternatives incorporate re-injection or infiltration of treated water, such re-injection or infiltration will meet these requirements.	No action, therefore not applicable	The most appropriate discharge method for the groundwater hot spot treatment system would be selected during remedial design. If underground injection were to be selected, construction and operation would comply with these regulations.			
Air Emissions	Clean Air Act (CAA), Hazardous Air Pollutants; National Emission Standards for Hazardous Air Pollutants (NESHAPs)	42 USC § 112(b)(1); 40 CFR Part 61	Applicable	These regulations establish emissions standards for 189 hazardous air pollutants.	No air emissions from remedial activities, such as soil excavation, would cause air quality standards to be exceeded. Dust standards would be complied with during remedial activities.	No action, therefore not applicable	Emissions from well drilling activities, groundwater hot spot extraction and treatment system operation, and O&M will be implemented in accordance with these requirements.			
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 under this alternative.	No action, therefore not applicable	MCLs were used to determine the extent of required institutional controls to be established under this alternative.			
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 under this alternative.	No action, therefore not applicable	MCLGs were used to determine the extent of required institutional controls to be established under this alternative.			
Institutional Controls	EPA Risk Reference Doses (RfDs)	0	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 under this alternative .	No action, therefore not applicable	RfDs were considered in determining the extent of required institutional controls to be established under this alternative.			
Institutional Controls	Human Health Assessment Cancer Slope Factors (CSFs)	0	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 under this alternative .	No action, therefore not applicable	CSFs were considered in determining the extent of required institutional controls to be established under this alternative.			
Institutional Controls	EPA, Office of Water, Drinking Water Health Advisories	0	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 under this alternative .	No action, therefore not applicable	HAs were considered in determining the extent of required institutional controls to be established under this alternative.			

Table 2.1-10
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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 under this alternative .	No action, therefore not applicable	These guidance values were considered in determining the extent of required institutional controls to be established under this alternative.			
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 under this alternative .	No action, therefore not applicable	These guidance values were considered in determining the extent of required institutional controls to be established under this alternative.			
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 under this alternative .	No action, therefore not applicable	These screening levels were considered in determining the extent of required institutional controls to be established under this alternative.			
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 this remedial alternative will be managed based on guidance standards.	No action, therefore not applicable	IDW generated as part of this remedial alternative would by managed 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.	Alternatives to address sources of contamination to overburden and bedrock aquifers are to be developed in consideration of this guidance.	No action, therefore not applicable	Remedial alternatives were developed with guidance from this publication.			
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 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.	No action, therefore not applicable	Waste management would comply with these regulations for hazardous waste facilities.			

Table 2.1-10
Action-Specific ARARs, Criteria, Advisories, and Guidance for Groundwater Hot Spot Alternatives
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

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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.	If any remedial activity generates hazardous wastes, the wastes will be managed in accordance with the substantive requirements of these regulations.	No action, therefore not applicable	Waste management would comply with these regulations for hazardous waste facilities.			
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 waste generated during remedial activities that is determined to be hazardous waste will be managed in accordance with these regulations. Alternatives generating hazardous waste or using treatment, storage or disposal facilities for hazardous waste will be implemented to comply with this ARAR.	No action, therefore not applicable	Waste management would comply with these regulations for hazardous waste facilities.			
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 waste generated during remedial activities that is determined to be hazardous waste will be managed in accordance with these regulations. Alternatives generating hazardous waste or using treatment, storage or disposal facilities for hazardous waste will be implemented to comply with this ARAR.	No action, therefore not applicable	Waste management would comply with these regulations for hazardous waste facilities.			
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 waste generated during remedial activities that is determined to be hazardous waste will be managed in accordance with these regulations, if applicable. Alternatives treating hazardous waste in tanks prior to discharge to surface water or a POTW will be implemented to comply with this ARAR.	No action, therefore not applicable	If extracted groundwater or solids generated in the treatment process are characterized as hazardous waste, they would be managed in compliance 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 the remedial alternative will be managed to prevent contaminant migration to groundwater.	No action, therefore not applicable	If extracted groundwater or solids generated in the treatment process are characterized as hazardous waste, they would be managed in compliance 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.	Establishes requirements for the management of containers, such as drums, that are used to store hazardous wastes. Alternatives utilizing containers of hazardous waste will comply with this ARAR.	No action, therefore not applicable	If extracted groundwater or solids generated in the treatment process are characterized as hazardous waste, containers and drums would 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.	Alternatives utilizing tanks for storage or treatment of hazardous waste will comply with this ARAR.	No action, therefore not applicable	If extracted groundwater is characterized as hazardous waste, tanks in the treatment system would comply with these regulations.			

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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 related to excavation and dewatering activities will be treated to meet the substantive discharge standards of the Massachusetts Surface Water Discharge Permit (314 CMR 4.00).	No action, therefore not applicable	The discharge of treated effluent from the treatment of highly contaminated groundwater to a surface water would meet the substantive discharge standards.			
Discharges to Surface Water	Massachusetts Clean Water Act; MA Surface Water Quality Standards (MSWQS)	M.G.L. 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.	Alternatives that incorporate discharges to surface waters will need to have the discharges meet the MSWQS.	No action, therefore not applicable	The discharge of treated effluent from the treatment of highly contaminated groundwater to a surface water would 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.	Alternatives that involve management of hazardous waste prior to discharge to surface waters will meet the substantive standards.	No action, therefore not applicable	The most appropriate discharge method for the groundwater hot spot treatment system would be selected during remedial design. If extracted groundwater were to be characterized as hazardous and the treated effluent were to be discharged, the discharge from the groundwater treatment system would be managed to be in compliance with these requirements.			
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.	If remedial actions result in discharges to a POTW, the discharge will be monitored and treated, if necessary, to comply with pretreatment standards.	No action, therefore not applicable	The most appropriate discharge method for the groundwater hot spot treatment system would be selected during remedial design. If discharge to POTW were to be selected, construction and operation would comply with these regulations.			
Underground Injection	Massachusetts Underground Injection Control Regulations	310 CMR 27.00	Potentially Applicable	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 remedial actions currently developed in this FS do not have underground injection as a component of a treatment train. However, if the alternatives incorporate re-injection or infiltration of treated water, both these Massachusetts and the federal regulations will be considered.	No action, therefore not applicable	The most appropriate discharge method for the groundwater hot spot treatment system would be selected during remedial design. If underground injection were to be selected, construction and operation would 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 would be implemented in accordance with these rules. No air emissions from remedial activities would cause air quality standards to be exceeded.	No action, therefore not applicable	Extraction and management of highly contaminated groundwater and any groundwater hot spot treatment will be implemented in accordance with these rules. Emission standards, including for dust, will be complied with during 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).	Remedial activities will be implemented in accordance with these rules. No air emissions from remedial activities will cause air quality standards to be exceeded.	No action, therefore not applicable	Extraction and management of highly contaminated groundwater and any groundwater hot spot treatment will be implemented in accordance with these rules. Emission standards, including for dust, will be complied with during 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 considered during the development of PRGs.	No action, therefore not applicable	Massachusetts MCLs and MCLGs were used to determine the extent of required institutional controls to be established under this alternative.			
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 during the development of PRGs.	No action, therefore not applicable	These guidelines were considered during the development of PRGs.			
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 will be installed, maintained and decommissioned based on these guidance standards.	No action, therefore not applicable	Monitoring well design, installation, operation, and decommissioning would be implemented in accordance with this guidance.			

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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.	Remedial activities will be managed to control erosion and sedimentation.	No action, therefore not applicable	Remedy design, construction, and operation would be implemented with guidance from this publication.			
Air Quality	Division of Air Quality Control (DAQC)	DAQC Policy 90-001, re: Noise Regulation,	To Be Considered	Guidance on sound emissions.	The guidance will be used to assess whether any remedial measure exceed Stae noise guidance levels.	No action, therefore not applicable	These remedial alternatives will comply with the ARAR 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.			

Prepared By / Date: *BLR 03/26/2020*
Checked By / Date: *KPW 03/27/2020*

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
DEP = Department of Environmental Protection
IDW = Investigation Derived Waste
MGL = Massachusetts General Law
MSWQS = Massachusetts Surface Water Quality Standards
NESHAP = National Emission Standards for Hazardous Air Pollutant
NPDES = National Pollution Discharge Elimination System
OSWER = Office of Solid Waste and Emergency Response
PCB = Polychlorinated Biphenyl
POTW = Publicly Owned Treatment Works
ppmw = parts per million by weight
RCRA = Resource Conservation and Recovery Act
UIC = Underground Injection Control
USC = United States Code
USEPA = United States Environmental Protection Agency
WSC = Waste Site Cleanup

Table 2.1-11
Location-Specific ARARs, Criteria, Advisories, and Guidance for Containment Area Alternatives
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Federal Standards								
Floodplains and Wetlands	Floodplain Management and Protection of Wetlands	44 CFR Part 9 (implementing Executive Orders 11988 and 11990)	Applicable	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. Standards for excavating and managing contaminated soil, sediment, and groundwater/DAPL, etc. within the 100-year and 500-year floodplains will be attained. After completion of work, 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. Public comment will be solicited as part of the Proposed Plan concerning any proposed alteration to wetlands and floodplains.	No action, therefore not applicable.	The Containment Area elevation (85 ft msl) is above the 500-year flood elevation (82 ft msl), which would mean that the infrastructure for the Containment Area cap would not result in the occupancy and modification of the 500-year floodplain at the Olin Property. If additional site preparation work is required to provide for adequate drainage and storage within the 500-year floodplain, this will be evaluated as part of design activities and implemented during the Remedial Action (RA) phase. If this alternative alters wetlands, it will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.	The Containment Area elevation (85 ft msl) is above the 500-year flood elevation (82 ft msl), which would mean that the targeted soil removal would not result in the occupancy and modification of the 500-year floodplain at the Olin Property. If additional site preparation work is required to provide for adequate drainage and storage within the 500-year floodplain, this will be evaluated as part of design activities and implemented during the Remedial Action (RA) phase. If this alternative alters wetlands, it will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration.
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.	Any hazardous waste generated during remedial activities will be managed so that it will not impact floodplain resources.	No action, therefore not applicable.	Hazardous waste is not expected to be managed in a 100-year floodplain under this alternative. Any hazardous waste generated during these remedial activities would be managed so that it would not impact floodplain resources.	Hazardous waste is not expected to be managed in a 100-year floodplain under this alternative. Any hazardous waste generated during these remedial activities would be managed so that it would 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 remedial activities involving excavation activities will be managed so that it will not impact floodplain resources.	No action, therefore not applicable.	Solid waste is not expected to be managed in a 100-year floodplain under this alternative. Any solid waste generated during these remedial activities would be managed so that it would not impact floodplain resources.	Solid waste is not expected to be managed in a 100-year floodplain under this alternative. Any solid waste generated during these remedial activities would be managed so that it would not impact floodplain resources.

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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. USEPA must determine which alternative is the "Least Environmentally Damaging Practicable Alternative" (LEDPA) to protect wetland and aquatic resources.	Remedial alternatives will be developed and designed to comply with these regulations. Compensatory wetlands mitigation will need to be performed as necessary to comply with this ARAR. The selected alternative will need to be determined to be the least environmentally damaging practicable alternative that meets the remedial action objectives.	No action, therefore not applicable.	Under this alternative, the capping may 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 restoration.	Not applicable because remedial alternative is not expected to impact wetlands.
Wetlands	U.S. Army Corps of Engineers, New England District Compensatory Mitigation Guidance (09-07-2016)	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 jurisdiction wetlands is appropriate for a particular remedial activity.	Activities affecting federal jurisdictional wetlands will be conducted in accordance with these guidance standards for mitigation and restoration.	No action, therefore not applicable.	Under this alternative, the capping may impact federal jurisdictional wetlands. Activities affecting federal jurisdictional wetlands will be conducted in accordance with these guidance standards for mitigation and/or restoration.	Not applicable because remedial alternative is not expected to impact wetlands
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 (USFWS), National Marine Fisheries Service, and other related state agencies. That federal agency must consult with the appropriate government entities and also take action to prevent, mitigate, or compensate for project-related losses of or damage to endangered species, fish and wildlife resources.	All appropriate state and federal agencies, such as the USFWS, will be consulted to ensure that losses of or damage to habitat and wildlife will be prevented, mitigated, or compensated to the extent necessary.	No action, therefore not applicable.	Consultation with appropriate federal and state agencies will be maintained during planning and implementation of the remedial work to ensure that losses of or damage to habitat and wildlife will be prevented, mitigated, or compensated.	Not applicable because remedial alternative is not expected to impact wetlands or water bodies.
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 species have been identified in the vicinity of the OCSS. However, protection of endangered species and their habitat will be considered during development and design of remedial alternatives.	No action, therefore not applicable.	No endangered or threatened species have been identified at the Site to date. If endangered or threatened species in the remedial area are identified, remedial activities would avoid actions that adversely affect endangered or threatened species or their habitats.	

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Historical/ Archeological Resources	National Historic Preservation Act	54 USC §§ 300101 et seq., 36 CFR Part 800	Applicable, if subject historical resources are present	When a federal agency finds, or is notified, that its activities may have adverse effects on historic properties, such agency is required to consult with federal and state historic preservation officials to resolve the adverse effects, including avoidance, minimization, or mitigation of the adverse effects.	If protected resources are identified in the Site area, measures to avoid, minimize and/or mitigate any adverse effects to protected resources will be implemented in consultation with federal and state historic preservation officials.	No action, therefore not applicable.	If protected resource areas are identified in the remedial area, measures to avoid, minimize and/or mitigate any impacts to protected resource areas will be implemented in consultation with federal and state historic preservation officials.	
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 (USFWS) 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 in the site area, measures to avoid, minimize and/or mitigate any impacts to protected resource areas will be implemented in consultation with appropriate USFWS officials.	No action, therefore not applicable.	Remedial activities would be evaluated to protect migratory birds, their nests, and eggs. If migratory bird protected areas are identified in the Site area, measures would be implemented in consultation with appropriate USFWS 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 the remedial activities, the wastes will be managed so that it will not impact floodplain resources.	No action, therefore not applicable.	Hazardous waste is not expected to be managed in a 100-year floodplain under this alternative. Any hazardous waste generated during remedial activities would be managed so that it would not impact floodplain resources.	Hazardous waste is not expected to be managed in a 100-year floodplain under this alternative. Any hazardous waste generated during remedial activities would be managed so that it would not impact floodplain resources.

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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).	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.	No action, therefore not applicable.	Under this alternative, the capping will likely be performed within wetlands and the 100 foot buffer zone or 200 feet from a perennial stream, and will be performed in accordance with the substantive requirements of these regulations. This alternative will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration. 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.	Any soil excavation to be performed within wetlands and the 100 foot buffer zone or 200 feet from a perennial stream will be conducted in accordance with the substantive requirements of these regulations and will comply with this ARAR through appropriate avoidance, minimization, mitigation and restoration. 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 or minimization are possible, then mitigate potential adverse impacts	The remedial alternatives' effects 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. The selected alternative will need to be determined to be the least environmentally damaging practicable alternative that meets the remedial action objectives. Any required removal of soil/sediment from wetland or surface water areas will be designated for eventual restoration. Excavation and filling activities to be performed impacting the aquatic ecosystem will be in accordance with the substantive requirements of these regulations	No action, therefore not applicable.	Under this alternative any dredging/filling of wetlands during capping will be conducted so as to not impair surface water quality.	Not applicable because remedial alternative is not expected to impact wetlands or water bodies.
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 species have been identified in the vicinity of the Site. However, if identified, protection of state listed endangered species and their habitat will be considered during design and implementation of remedial alternatives.	No action, therefore not applicable.	No endangered or threatened species have been identified at the Site to date. If state listed endangered or threatened species in the site area are identified, remedial activities would avoid actions that adversely affect endangered or threatened species or their habitats.	

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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.	If protected resources are identified in the Site area, measures to avoid, minimize and/or mitigate any impacts to protected resources will be implemented in consultation with federal and state historic preservation officials.	No action, therefore not applicable.	If protected resource areas are identified in the Site area, measures to avoid, minimize and/or mitigate any impacts to protected resource areas will be implemented in consultation with federal and state historic preservation officials.	
Area of Critical Environmental Concern	Massachusetts Areas of Critical Environmental Concern (ACECs) Regulations	310 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 ACECs have been identified at the Site. If an ACEC is identified in the Site area, activities will be controlled to minimize impacts to affected species or resources if identified.	No action, therefore not applicable.	No known ACECs have 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.	

Prepared By / Date: KPW 03/25/2020
Checked By / Date: MCM 04/06/2020

Notes:
ACEC = Areas 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
DAPL = Dense Aqueous Phase Liquid
FEMA = Federal Emergency Management Agency
LEDPA = Least Environmentally Damaging Practicable Alternative
MGL = Massachusetts General Law
RCRA = Resource Conservation and Recovery Act
USC = United States Code
USEPA = United States Environmental Protection Agency
USFWS = United States Fish and Wildlife Service

Table 2.1-12
Chemical-Specific ARARs, Criteria, Advisories, and Guidance for Containment Area Alternatives
Olin Chemical Superfund Site
Interim Action Feasibility Study
Wilmington, Massachusetts

Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement	Containment Area Alternatives		
					CA 1 - No Action	CA 2 - Capping, Equalization Window Closure, and ICs	CA 3 - Targeted Soil Removal
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.	RfDs were considered during development of PRGs.	No action, therefore not applicable.	Were considered in development of PRGs.	
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.	CSFs were considered during development of PRGs.	No action, therefore not applicable.	Were considered in development of PRGs.	
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 guidelines were considered during development of PRGs.	No action, therefore not applicable.	Were considered in development of PRGs.	
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 guidelines were considered during development of PRGs.	No action, therefore not applicable.	Were considered in development of PRGs.	
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.	RSLs were used to assess health risks due to exposure to chemicals in soil and to develop soil PRGs. .	No action, therefore not applicable.	Were considered in development of PRGs.	
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.	This guidance was used to assess health risks due to exposure to chemicals in soil and to develop soil PRGs.	No action, therefore not applicable.	Were considered in development of PRGs.	
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.	This guidance was used to assess health risks due to exposure to chemicals in soil and to develop soil PRGs.	No action, therefore not applicable.	Were considered in development of PRGs.	
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.	This guidance was used to assess ecological risks due to exposure to chemicals in soil and to develop soil PRGs.	No action, therefore not applicable.	Were considered in development of PRGs.	
Ecological Soil Screening Levels (Eco-SSLs)	EPA, https://www.epa.gov/risk/ecological-soil-screening-level-eco-ssl-guidance-	To Be Considered	Provides nonregulatory soil screening criteria and toxicity reference values for the protection of ecological receptors.	The eco-SSLs provide ecological toxicity reference values which were considered in the development of soil PRGs.	No action, therefore not applicable.	Were considered in development of PRGs.	

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					CA 1 - No Action	CA 2 - Capping, Equalization Window Closure, and ICs	CA 3 - Targeted Soil Removal
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.	This guidance was used to to develop soil PRGs.	No action, therefore not applicable.	Were considered in development of PRGs.	
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, 1997) http://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.	This guidance was used to to develop soil PRGs.	No action, therefore not applicable.	Were considered in development of PRGs.	
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.	This guidance was used to develop soil PRGs.	No action, therefore not applicable.	Were considered in development of PRGs.	

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Notes:
ARAR = Applicable or Relevant and Appropriate Requirement
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CSF = cancer slope factor
DEP = Department of Environmental Protection
MCLGs = Maximum Contaminant Level Goals
MCLs = Maximum Contaminant Levels
PRGs = Preliminary Remediation Goals
RfD = reference dose
SDWA = Safe Drinking Water Act

Table 2.1-13
Action-Specific ARARs, Criteria, Advisories, and Guidance for Containment Area Alternatives
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Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement	Containment Area Alternatives		
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Federal Standards								
Municipal Solid Waste Landfills	RCRA Subtitle D; 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	Current soil sampling data do not indicate the presence of RCRA hazardous waste within the Containment Area. If a remedial alternative includes the containment of the solid wastes in the Containment Area, such containment would be in accordance with these RCRA Subtitle D requirements. A cover would be designed, constructed, and provided post-closure care in accordance with these regulations.	No action, therefore not applicable.	The Containment Area will be capped and closed in accordance with these requirements	Not applicable because this alternative does not include containment of solid waste.
Hazardous Waste Treatment, Storage, Disposal	Resource Conservation and Recovery Act (RCRA) Subtitle C; Hazardous Waste Identification; Generator and Handler Requirements; Tracking Requirements; Storage, Treatment 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. Non-hazardous wastes will be disposed of appropriately. Any waste generated during remedial activities that is determined to be hazardous waste will be managed in accordance with these regulations. Alternatives generating hazardous waste or using treatment, storage or disposal facilities for hazardous waste will be implemented to comply with this ARAR.	No action, therefore not applicable.	No hazardous waste is expected to be generated by these remedial activities. Any generation, treatment, or storage of hazardous waste will comply with this ARAR through appropriate design implementation and operation.	Excavated soil and waste would be analyzed under these standards to determine whether it is hazardous waste. Under this alternative, any generation, treatment, or storage of hazardous waste will comply with this ARAR through appropriate design implementation and operation.
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	Current soil sampling data do not indicate the presence of RCRA hazardous waste within the Containment Area. If later hazardous waste is determined to have been disposed in the Containment Area, a remedial alternative that includes the containment of such hazardous wastes in the Containment Area would be in accordance with these RCRA Subtitle C requirements. A cover would be designed, constructed, and provided post-closure care in accordance with these regulations.	No action, therefore not applicable.	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 would be capped and closed in accordance with these regulations.	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, the waste would be excavated, and the Containment Area would be closed in accordance 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.	Current soil sampling data do not indicate the presence of hazardous waste within the Containment Area. If later hazardous waste is determined to have been disposed in the Containment Area, a remedial alternative that includes the containment of such hazardous wastes in the Containment Area would be in accordance with these hazardous waste requirements. A cover would be designed, constructed, and provided post-closure care in accordance with these regulations.	No action, therefore not applicable.	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 would be capped and closed in accordance with these regulations.	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, the waste would be excavated, and the Containment Area would be closed in accordance with these regulations.

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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. Relevant and Appropriate, if less than thresholds.	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 by weight or greater.	Process vents, air equipment, tanks, surface impoundments or containers will be managed in accordance with these air emission regulations.	No action, therefore not applicable.	No waste generated in these remedial activities is expected to have concentrations over these thresholds. Management of VOCs in excavated soil would be in accordance with these air emission regulations.	No waste generated in these remedial activities is expected to have concentrations over these thresholds. Management of VOCs in excavated soil would be in accordance with these air emission regulations.
Air Emissions	Clean Air Act (CAA), Hazardous Air Pollutants; National Emission Standards for Hazardous Air Pollutants (NESHAPs)	42 USC § 112(b)(1); 40 CFR Part 61	Applicable	These regulations establish emissions standards for 189 hazardous air pollutants.	No air emissions from remedial activities, such as soil excavation, would cause air quality standards to be exceeded. Dust standards would be complied with during remedial activities.	No action, therefore not applicable.	This alternative will comply with the ARAR by ensuring that dust standards are not exceeded during remedial activities	This alternative will comply with the ARAR by ensuring that dust standards are not exceeded during remedial activities, and the associated air emissions standards will also be met during excavation and/or emissions from treatment systems.
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 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).	No action, therefore not applicable.	Not applicable, no dewatering, treatment and/or discharge is expected under this alternative. Best management practices will be used to control and manage stormwater runoff during construction of the cap.	Excavation dewatering, treatment and discharge will be required. Any discharge to surface water will be treated to meet these standards. Best management practices will be used to control and manage stormwater runoff during construction for the soil excavation.
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).	If remedial actions result in discharges to a POTW, the discharge will be monitored and treated, if necessary, to comply with pretreatment standards.	No action, therefore not applicable.	Not applicable, no dewatering, treatment and/or discharge to a POTW is expected under this alternative.	Any water generated during soil excavation/ management and excavation dewatering discharged to a POTW will be treated to meet these standards.

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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 this remedial alternative will be managed based on guidance standards.	No action, therefore not applicable.	IDW generated during remedial activities would be managed in accordance with the substantive requirements 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.	These Massachusetts regulations supplement federal RCRA requirements. 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.	No action, therefore not applicable.	No hazardous waste is expected to be generated by these remedial activities Any generation of hazardous waste will comply with this ARAR through appropriate design implementation and operation.	Excavated soil and waste generated during remedial activities would be evaluated to determine whether it is hazardous waste and be managed in accordance with these regulations.
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.	If any remedial activity generates hazardous wastes, the wastes will be managed in accordance with the substantive requirements of these regulations.	No action, therefore not applicable.	No hazardous waste is expected to be generated by these remedial activities. Any generation of hazardous waste will comply with this ARAR through appropriate design implementation and operation.	Excavated soil and waste generated during remedial activities would be evaluated to determine whether it is hazardous waste. Under this alternative, any generation of hazardous waste will comply with this ARAR through appropriate design, implementation and operation.
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 waste generated during remedial activities that is determined to be hazardous waste will be managed in accordance with these regulations. Alternatives generating hazardous waste or using treatment, storage or disposal facilities for hazardous waste will be implemented to comply with this ARAR.	No action, therefore not applicable.	No hazardous waste is expected to be generated in these remedial activities. Any generation, treatment or storage of hazardous waste will comply with this ARAR through appropriate design implementation and operation.	Excavated soil and waste generated during remedial activities would be evaluated to determine whether it is hazardous waste. Under this alternative, any generation of hazardous waste will comply with this ARAR through appropriate design, implementation and operation.
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 waste generated during remedial activities that is determined to be hazardous waste will be managed in accordance with these regulations. Alternatives generating hazardous waste or using treatment, storage or disposal facilities for hazardous waste will be implemented to comply with this ARAR.	No action, therefore not applicable.	Not applicable because this alternative is not expected to generate waste.	Excavated soil and waste generated during remedial activities would be evaluated to determine whether it is hazardous or non-hazardous, and would be managed in accordance with this guidance. Under this alternative, any management of hazardous waste will comply with this ARAR through appropriate design, implementation and operation.
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 waste generated during remedial activities that is determined to be hazardous waste will be managed in accordance with these regulations, if applicable. Alternatives treating hazardous waste in tanks prior to discharge to surface water or a POTW will be implemented to comply with this ARAR.	No action, therefore not applicable.	Not applicable, no dewatering, treatment and/or discharge is required under this alternative.	Any management/treatment of dewatering liquid that is a hazardous waste prior to discharge to surface water will comply with the substantive standards.

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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.	Current soil sampling data do not indicate the presence of hazardous waste within the Containment Area. If later hazardous waste is determined to have been disposed in the Containment Area, a remedial alternative that includes the containment of such hazardous wastes in the Containment Area would be in accordance with these hazardous waste requirements. A cover would be designed, constructed, and provided post-closure care in accordance with these regulations.	No action, therefore not applicable.	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 would be capped and closed in accordance with these regulations.	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, the waste would be excavated, and the Containment Area would be closed in accordance with these regulations.
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.	Current soil sampling data do not indicate the presence of hazardous waste within the Containment Area. If later hazardous waste is determined to have been disposed in the Containment Area, a remedial alternative that includes the containment of such hazardous wastes in the Containment Area would be in accordance with these hazardous waste requirements. A cover would be designed, constructed, and provided	No action, therefore not applicable.	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 would be capped and closed in accordance with these regulations.	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, the waste would be excavated, and the Containment Area would be 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 wastes that may be generated during remedial activities will be managed in accordance with these regulations.	No action, therefore not applicable.	No hazardous waste is expected to be generated by these remedial activities. Any management of hazardous waste in waste piles will comply with this ARAR through appropriate design implementation and operation.	Excavated soil and waste generated during remedial activities would be evaluated to determine whether it is hazardous waste. Under this alternative, any management of hazardous waste in waste piles will comply with in this ARAR through appropriate design, implementation and operation.
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 the remedial alternative will be managed to prevent contaminant migration to groundwater.	No action, therefore not applicable.	No hazardous waste is expected to be generated by these remedial activities Any management of hazardous waste in waste piles will comply with this ARAR through appropriate design implementation and operation.	Excavated soil and waste generated during remedial activities would be evaluated to determine whether it is hazardous waste. Under this alternative, any management of hazardous waste in waste piles will comply with in this ARAR through appropriate design, implementation and operation.
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.	Establishes requirements for the management of containers, such as drums, that are used to store hazardous wastes. Alternatives utilizing containers of hazardous waste will comply with this ARAR.	No action, therefore not applicable.	No hazardous waste is expected to be generated by these remedial activities. Any hazardous waste generated by these remedial alternatives that is managed in containers will comply with the ARAR through appropriate design and implementation.	Any hazardous waste generated by this remedial alternative that is managed in containers will comply with the ARAR through appropriate design and implementation.
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.	Alternatives utilizing tanks for storage or treatment of hazardous waste will comply with this ARAR.	No action, therefore not applicable.	No hazardous waste is expected to be generated by these remedial activities. Any hazardous waste generated by these remedial alternatives that is managed in tanks will comply with the ARAR through appropriate design and implementation.	Any hazardous waste generated by this remedial alternative that is managed in tanks will comply with the ARAR through appropriate design and implementation.
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 related to excavation and dewatering activities will be treated to meet the substantive discharge standards of the Massachusetts Surface Water Discharge Permit (314 CMR 4.00).	No action, therefore not applicable.	Not applicable, no dewatering, treatment and/or discharge is required under this alternative.	Excavation dewatering, treatment and discharge will be required. Any discharge to surface water will be treated to meet these standards.

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Discharges to Surface Water	Massachusetts Clean Water Act; MA Surface Water Quality Standards (MSWQS)	M.G.L. 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.	Alternatives that incorporate discharges to surface waters will need to have the discharges meet the MSWQS.	No action, therefore not applicable.	Not applicable, no dewatering, treatment and/or discharge is required under this alternative.	Any discharge to surface water from soil excavation/ management and excavation dewatering will be treated to meet these 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.	Alternatives that involve management of hazardous waste prior to discharge to surface waters will meet the substantive standards.	No action, therefore not applicable.	Not applicable, no dewatering, treatment and/or discharge is required under this alternative.	Any management/treatment of dewatering liquid that is a hazardous waste prior to discharge to surface water will comply with the substantive 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.	If remedial actions result in discharges to a POTW, the discharge will be monitored and treated, if necessary, to comply with pretreatment standards.	No action, therefore not applicable.	Not applicable because this alternative is not expected to discharge to a POTW.	Any water generated during soil excavation/ management and excavation dewatering will be treated to meet these standards, if the water is to be discharged to the POTW.
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 activity that are determined to not be hazardous wastes will be managed in accordance with this regulation .	No action, therefore not applicable.	Any solid waste generated by these remedial alternatives will comply with the ARAR through appropriate design and implementation	
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.	Current soil sampling data do not indicate the presence of hazardous waste. If a remedial alternative includes the containment of the solid wastes in the Containment Area, such containment would be in accordance with these Massachusetts solid waste landfill requirements. A cover would be designed and constructed, and post-closure care would be provided in accordance with these regulations .	No action, therefore not applicable.	The Containment Area will be capped and closed in accordance with these requirements.	Not applicable because this alternative does not include containment of solid waste
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 would be implemented in accordance with these rules. No air emissions from remedial activities would cause air quality standards to be exceeded.	No action, therefore not applicable.	Cap would be designed and constructed to comply with these regulations.	Remedial activities would be implemented in accordance with emission limits and air quality standards established by 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 rules. No air emissions from remedial activities will cause air quality standards to be exceeded.	No action, therefore not applicable.	Cap would be designed and constructed to comply with these regulations.	Remedial activities would be implemented in accordance with emission limits and air quality standards established by these regulations.
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.	Remedial activities will be managed to control erosion and sedimentation.	No action, therefore not applicable.	Remedial activities would be managed to control erosion and sedimentation in accordance with this guidance.	

Table 2.1-13
Action-Specific ARARs, Criteria, Advisories, and Guidance for Containment Area Alternatives
Olin Chemical Superfund Site
Interim Action Feasibility Study
Wilmington, Massachusetts

Action/Trigger	Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement	Containment Area Alternatives		
						CA 1 - No Action	CA 2 - Capping, Equalization Window Closure, and ICs	CA 3 - Targeted Soil Removal
Air Quality	Division of Air Quality Control (DAQC)	DAQC Policy 90-001, re: Noise Regulation,	To Be Considered	Guidance on sound emissions.	The guidance will be used to assess whether any remedial measure exceed Stae noise guidance levels.	No action, therefore not applicable.	These remedial alternatives will comply with the ARAR 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.	

Prepared By / Date: KPW 03/25/2020
Checked By / Date: MCM 04/06/2020

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 Pollution Discharge Elimination System
OSWER = Office of Solid Waste and Emergency Response
PCB = Polychlorinated Biphenyl
POTW = Publicly Owned Treatment Works
ppmw = parts per million by weight
RCRA = Resource Conservation and Recovery Act
USC = United States Code
USEPA = United States Environmental Protection Agency

Table 2.3-1
Screening of LNAPL Remedial Technologies
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

General Response Action	Remediation Technology and Process Option	Description of Process Option	Effectiveness	Implementability	Cost	Retained	Screening Comments
No Action	None	No action taken	Not effective	Implementable	No Cost	Yes	Required for baseline comparison
Institutional Controls	Access and Use Restrictions						
	Notice of Activity and Use Limitation (NAULs)	Prohibit groundwater use, ground disturbance, and development of site through restrictive language in deeds and other instruments of property transfer.	Effective	Implementable	Low	Yes	Deed covenants currently in place. Modify or verify presence of existing deed covenants to restrict future use and activities including ground disturbance, groundwater use, and subsurface activities.
	Environmental Monitoring						
	Sampling and Analysis	Collection and analysis of groundwater and/or LNAPL samples.	Effective	Implementable	Low	Yes	May be used in conjunction with other technologies and to assess remedy effectiveness.
Treatment	Biodegradation	Amendments and/or nutrients are injected into the subsurface to enhance/accelerate natural degradation processes.	Somewhat Effective. Biodegradation was limited by ammonia and phosphate.	Implementable	Medium-High	No	A nutrient injection system operated from 2002-2005 to enhance the natural biodegradation of LNAPL-related constituents. The nutrient injection system was shut down in 2005 due to high levels of ammonia and phosphate that limited the biodegradation process.
	Air Sparging/Soil Vapor Extraction (AS/SVE)	Air is injected into the subsurface to volatilize free phase and smear zone LNAPL constituents, and vapors are extracted using a vacuum source. Vapors are then treated as needed.	Effective only for the lighter, more volatile fraction of free phase or smear zone LNAPL	Implementable	Medium-High	No	An AS/SVE system combined with multi-phase extraction was installed in 2000 to enhance the removal of VOCs in soil and groundwater. The effectiveness of the vapor treatment systems diminished over time due to the significantly decreasing influent concentrations.
	In-situ Chemical Oxidation	Oxidizing chemicals are injected into the subsurface to deplete free phase or smear zone LNAPL by accelerating LNAPL solubilization and chemical oxidation.	Effective	Implementable	Medium	No	Due to the minimal thickness of LNAPL observed in monitoring and extraction wells (typically <0.1 foot), this technology would not efficiently remove LNAPL, and may have impacts to the East Ditch.
	Co-solvent Flushing	A solvent is injected that increases free phase or smear zone LNAPL solubilization and mobility. The dissolved phase and LNAPL are then recovered via hydraulic recovery.	Effective	Implementable	Medium	No	Due to the minimal thickness of LNAPL observed in monitoring and extraction wells (typically <0.1 foot), this technology would not efficiently remove LNAPL, and may have impacts to the East Ditch.

Table 2.3-1
Screening of LNAPL Remedial Technologies
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

General Response Action	Remediation Technology and Process Option	Description of Process Option	Effectiveness	Implementability	Cost	Retained	Screening Comments
Treatment (continued)	Steam/Hot Air Injection	Free phase or smear zone LNAPL is removed by forcing steam into the aquifer to vaporize, solubilize, and induce LNAPL flow. Vapors, dissolved phase, and LNAPL are recovered via vapor extraction and hydraulic recovery.	Effective	Implementable	High	No	Due to the minimal thickness of LNAPL observed in monitoring and extraction wells (typically <0.1 foot), this technology would not efficiently remove LNAPL, and may have impacts to the East Ditch.
	Radio-Frequency Heating	Electromagnetic energy is used to heat soil and groundwater to reduce the viscosity and interfacial tension of free phase or smear zone LNAPL for enhanced hydraulic recovery. Vapors and dissolved phase may also be recovered via vapor extraction and hydraulic recovery.	Effective	Implementable	High	No	Due to the minimal thickness of LNAPL observed in monitoring and extraction wells (typically <0.1 foot), this technology would not efficiently remove LNAPL, and may have impacts to the East Ditch.
Removal	Multi-Phase Extraction (MPE)	Dedicated pumps are used to remove LNAPL, vapors, and groundwater. Vacuum enhancement can be added to increase LNAPL hydraulic recovery rates. Can be accomplished using single pump or dual pumps.	Effective	Implementable	Medium	Yes	Can effectively remove thin layers of free phase LNAPL and smear zone LNAPL. May be used in conjunction with treatment and/or disposal technologies.
	LNAPL Skimming	Accumulated LNAPL is physically removed by skimming the product from the water table surface. Can be passive or active methods. These materials can be deployed at a fixed depth within a well or placed to freely float on the fluid surface in the well.	Effective for free phase LNAPL; limited effectiveness for smear zone LNAPL	Implementable	Low	Yes	May be used alone or in conjunction with groundwater extraction technologies. Could involve passive methods (e.g., absorbent socks) or active methods (e.g., pneumatic pump or belt skimmer). LNAPL saturated adsorbent materials removed from the wells would need to be disposed of as a hazardous waste, similar to the LNAPL currently being removed from wells near Plant B.
Disposal	Discharge						
	Permitted discharge	Water is discharged via RGP, NPDES, or other permit after treatment.	Effective	Implementable	Low	No	Would require NPDES Permit for discharge of treated groundwater to a surface water body. Would be used in conjunction with groundwater extraction, which is not retained. Therefore, permitted discharge is also not retained.

Table 2.3-1
Screening of LNAPL Remedial Technologies
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

General Response Action	Remediation Technology and Process Option	Description of Process Option	Effectiveness	Implementability	Cost	Retained	Screening Comments
	Off-Site Disposal						
	Treatment Facility	Removed LNAPL is shipped off-site to a permitted commercial treatment facility where waste streams are treated and blended prior to permitted discharge.	Effective	Implementable	Medium-High	Yes	LNAPL removed from the vicinity of Plant B is currently being manifested and shipped as hazardous waste to a permitted treatment, storage, or disposal facility.

Prepared by: APP 02/05/2019
Checked by: MCM 03/16/2020

Notes:
AS = Air Sparging
LNAPL = Light Non-Aqueous Phase Liquid
MPE = Multi-Phase Extraction
NPDES = National Pollutant Discharge Elimination System
RGP = Remediation General Permit
SVE = Soil Vapor Extraction

Table 2.3-2
Screening of DAPL Remedial Technologies
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

General Response Action	Remediation Technology and Process Option	Description of Process Option	Effectiveness	Implementability	Cost	Retained	Screening Comments
No Action	None	No action taken	Not effective	Implementable	No Cost	Yes	Required for baseline comparison
Institutional Controls	<u>Access and Use Restrictions</u>						
	Notice of Activity and Use Limitation (NAULs)	Prohibit groundwater use, ground disturbance, and development of site through restrictive language in deeds and other instruments of property transfer.	Effective	Implementable	Low	Yes	Modify or verify presence of existing deed covenants to restrict future use and activities including ground disturbance, groundwater use, and pumping of DAPL.
	<u>Environmental Monitoring</u>						
	Sampling and Analysis	Collection and analysis of groundwater and/or DAPL samples.	Effective	Implementable	Low	Yes	May be used in conjunction with other technologies and to assess remedy effectiveness.
Containment							
	Slurry Wall	Excavate trenches and backfill with bentonite slurry to form a subsurface boundary around DAPL pools. Already in-place for on-Property DAPL Pool.	Effective	Difficult to Implement	Medium	No	A slurry wall is already in-place for the on-Property DAPL Pool. Implementation for the other DAPL pools would be very difficult due to buildings and transportation/utility infrastructures both above ground and subsurface.
	Grouted Sheet Pile Wall	Form a subsurface boundary around DAPL pools by driving piling into the ground and sealing joints with grout.	Effective	Difficult to Implement	Medium	No	Implementation would be very difficult due to buildings and transportation/utility infrastructures both above ground and subsurface.
	In-Situ Grouting	Place conventional or synthetic grout material horizontally and/or vertically under the footprint of the off-PWD and Main Street DAPL Pools to reduce transmissivity of bedrock underlying DAPL pools. Could be applied as targeted injections in specific bedrock fracture systems and as secondary containment method to prevent further contaminant migration.	Effective	Difficult to Implement	High	No	Requires closely spaced drilling fences and boreholes. Would not be able to implement over the entire extent of the DAPL pools due to buildings, utilities, and transportation infrastructure. Targeted grout injections would require extensive investigations for detailed characterization of fracture systems before grout could be applied accurately and effectively. Grout injections could potentially displace and mobilize DAPL and associated contaminants.
	Capping	Install a cover system to reduce weathering and erosion, and provide a significant reduction in infiltration. Depending on the objective of the cover system, it might consist of soil, geosynthetics, asphalt, or a combination of materials.	Effective	Implementable	Medium-Low to Medium-High, depending on the objective and type of cover system	No	Implementation for the Off-PWD and Main Street DAPL pools would be very difficult due to buildings and transportation/utility infrastructures both above ground and subsurface. Could potentially be retained in a later iteration of this IAFS for use in capping the Slurry Wall/Containment Area if it is determined that additional remedial action is warranted for the Containment Area.

Table 2.3-2
Screening of DAPL Remedial Technologies
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

General Response Action	Remediation Technology and Process Option	Description of Process Option	Effectiveness	Implementability	Cost	Retained	Screening Comments
Containment (continued)	Hydraulic Containment by Groundwater Extraction	Contain DAPL by pumping groundwater to control the potentiometric surface.	Not Effective	Implementable	High	No	DAPL is already contained by the natural subsurface geology; additional containment is unnecessary and could increase mobility of dissolved-phase constituents from DAPL to groundwater. Would require full-scale groundwater treatment plant to treat COCs in extracted groundwater.
Treatment	Enhanced Biodegradation	Amendments and nutrients are injected into the subsurface to enhance/accelerate natural degradation processes.	Not Effective for DAPL	Implementable	Medium	No	Not effective for DAPL. May be effective for NDMA, but not the other constituents of DAPL.
	Air Sparging/Soil Vapor Extraction	Air is injected into the subsurface to evaporate COCs into vapor. A vacuum source is used to pull the contaminated vapor from the subsurface. Vapors are then treated as needed.	Not Effective for DAPL; may remove some volatile COCs in the DAPL.	Implementable	Medium-High	No	Not effective for DAPL. Not effective for NDMA or metals, two the main types of COCs in DAPL. Air sparging would convectively mix the DAPL with overlying groundwater and transfer COCs to groundwater. Would result in extensive precipitation of metal hydroxy-oxides and soil pore clogging.
	Chemical Reduction/Oxidation	Reducing compounds or oxidizing chemicals are injected into the subsurface to enhance reduction/degradation or immobilization of contaminants.	Not Effective for DAPL	Difficult to Implement	Medium	No	Not effective for DAPL. Not effective for NDMA, chromium, or ammonia, the main COCs in DAPL. Oxidation would produce hexavalent chromium (which is currently not a COC), increasing overall toxicity and mobility.
	Adsorption	Move DAPL through columns or tanks filled with sorbent materials such as activated carbon, coconut shell, or anionic resins to remove COCs.	Not Effective for DAPL	Difficult to Implement	High	No	Not effective for DAPL. Not effective for NDMA, but somewhat effective for chromium and ammonia, the main COCs in DAPL. Will likely clog and foul equipment due to the iron content of DAPL.
	Precipitation	Metals are removed in a treatment system by addition of lime of other additives to increase the pH, forming insoluble metal precipitates.	Potentially effective for removal of metals from DAPL	Implementable	Medium	Yes	Effective for removal of the metals that form insoluble precipitates as pH is increased. Will produce sludge that requires management and disposal.
	Air Stripping	Extracted fluids are pumped through air stripper or aeration tank to evaporate COCs.	Potentially effective for removal of VOCs and ammonia from DAPL	Implementable	Medium	Yes	Effective for removal of VOCs and ammonia, which are two of the main types of contaminants in the DAPL.
	UV oxidation	NDMA in water is degraded using UV light in a treatment system	Potentially effective for removal of NDMA from DAPL	Implementable	Medium	Yes	Effective for photolytic degradation of NDMA, which is one of the primary organic COCs in the DAPL.

Table 2.3-2
Screening of DAPL Remedial Technologies
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

General Response Action	Remediation Technology and Process Option	Description of Process Option	Effectiveness	Implementability	Cost	Retained	Screening Comments
Treatment (continued)	Evaporation	Evaporation is used to reduce the volume of the treated water. Water is evaporated by input of thermal energy, leaving a concentrated residue of residual salts.	Effective for volume reduction of treated DAPL	Implementable	High	Yes	To be used after DAPL treatment using unit operations that eliminate COCs to reduce the volume of treated DAPL that requires off-site disposal.
	Permeable Reactive Barrier	A barrier created of reactive materials is placed downgradient of contamination to treat COCs as groundwater flows through the barrier.	Not Effective for DAPL	Not Implementable for DAPL	Medium	No	Not effective for DAPL or NDMA, a primary COC in DAPL.DAPL pools are contained by the natural bedrock surface and would not flow through a barrier wall.
	Co-solvent Flooding	Involves injection and extraction of co-solvents to solubilize and/or mobilize COCs.	Not Effective for DAPL	Implementable	Medium	No	Not effective for DAPL. Not effective for NDMA, chromium, or ammonia, the main COCs in DAPL.
	Ultraviolet (UV) Oxidation	Strong oxidizers are added and medium is irradiated by UV light to destroy organic compounds.	Not Effective for DAPL, but effective for NDMA	Not Implementable for DAPL	Medium-High	No	Requires very low dissolved solids and turbidity that otherwise would absorb or limit UV light transmission and affect long-term performance.
	Break Point Chlorination	Addition of chlorine to oxidize COCs.	Not Effective for DAPL	Not Implementable for DAPL	Medium	No	Requires low dissolved solids and low turbidity; therefore, not effective for DAPL. Not effective for COC concentrations present in DAPL.
	Thermal Conductive Heating	Apply conductive heat through the subsurface to evaporate COCs into vapors for extraction.	Not Effective for DAPL	Difficult to Implement. Not feasible over large areas.	High	No	Not effective for DAPL. Not effective for NDMA, chromium, or ammonia, the main COCs in DAPL.
	Concentration (DAPL Evaporation)	Use heat/pressure to evaporate water and concentrate DAPL prior to disposal. Reduces disposal volume and, therefore, cost.	Effective	Implementable	Low	Yes	Retained for use with extracted DAPL.
Removal	DAPL Extraction	Use extraction wells to remove DAPL at a rate less than gravity drainage of DAPL. Horizontal and conventional vertical wells may be used for extraction of fluids from the subsurface.	Effective	Implementable The vertical extraction well (EW-1) in the off-PWD has proven successful at extracting DAPL from the low point in the bedrock depression. Horizontal wells would be difficult to install in the low points of the bedrock depressions due to site-specific geologic conditions.	High	Yes	Used in conjunction with treatment/disposal technologies. Site investigations indicate the overburden/bedrock interface is characterized as an uneven bedrock surface with the presence of boulders and dense basil till. Without a geologically homogeneous bottom surface, it would be difficult to install horizontal wells that could achieve consistent and predictable hydraulic contact in a DAPL pool. Therefore, horizontal wells were eliminated from further consideration for DAPL extraction. Remedial alternatives will be developed based on vertical extraction wells, which have proven effective at targeting the low point in the bedrock depression based on the ongoing DAPL extraction from the off-PDW DAPL Pool.

Table 2.3-2
Screening of DAPL Remedial Technologies
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

General Response Action	Remediation Technology and Process Option	Description of Process Option	Effectiveness	Implementability	Cost	Retained	Screening Comments
Disposal	Discharge						
	Permitted discharge	Water is discharged via RGP, NPDES, or other permit after treatment.	Effective	Implementable	Low	No	Would require NPDES Permit for discharge of treated groundwater to a surface water body. Would be used in conjunction with hydraulic containment by groundwater extraction, which was not retained. Therefore, permitted discharge is also not retained.
	Off-Site Disposal						
	Deep well injection	Extracted DAPL is shipped off-site for disposal by deep well injection	Effective	Implementable	Medium-High	Yes	DAPL extracted from the off-PWD DAPL pool is currently being shipped to a permitted commercial hazardous waste deep well injection facility.
	Treatment Facility	Extracted DAPL is shipped off-site to a permitted commercial wastewater treatment facility where waste streams are treated and blended prior to permitted discharge	Effective	Implementable	Medium-High	Yes	DAPL extracted from the off-PWD DAPL pool is currently being shipped to a permitted commercial wastewater treatment facility where it is treated and blended with other waste streams prior to permitted discharge.

Prepared by: APP 01/29/2019
Checked by: MCM 3/16/2020

Notes:
COC = Chemical of Concern
DAPL= Dense Aqueous Phase Liquid
IAFS = Interim Action Feasibility Study
NDMA = n-Nitrosodimethylamine
NPDES = National Pollutant Discharge Elimination System
Off-PWD = Off-Property West Ditch
RGP = Remediation General Permit
UV = ultraviolet

Table 2.3-3
Screening of Groundwater Remedial Technologies
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

General Response Action	Remediation Technology and Process Option	Description of Process Option	Effectiveness	Implementability	Cost	Retained	Screening Comments
No Action	None	No action taken	Not effective	Implementable	No Cost	Yes	Required for baseline comparison
Institutional Controls	Access and Use Restrictions						
	Notice of Activity and Use Limitation	Prohibit groundwater use, ground disturbance, and development of site through restrictive language in deeds and other instruments of property transfer.	Effective	Implementable	Low	Yes	Modify or verify presence of existing deed covenants to restrict future use and activities including ground disturbance, groundwater use, and pumping of DAPL.
	Alternate Water Source						
	Bottled Water	Provide bottled potable water to residents.	Effective	Implementable	Moderate	Yes	Could be used as a temporary measure in conjunction with other technologies.
	Environmental Monitoring						
	Sampling and Analysis	Collection and analysis of groundwater and/or DAPL samples.	Effective	Implementable	Low	Yes	May be used in conjunction with other technologies and to assess remedy effectiveness.
Natural Recovery	Monitored Natural Attenuation						
	Monitored Natural Attenuation	Relies on naturally occurring processes such as advection and biological degradation to reduce COC concentrations. Includes monitoring to evaluate progress and protectiveness.	Effective	Implementable	Low	No	May be used in conjunction with other technologies.
Treatment	Enhanced Biodegradation	Amendments and nutrients are injected into the aquifer to enhance/accelerate natural degradation processes.	Effective	Implementable	Medium	Yes	NDMA is potentially subject to oxidation through co-metabolic biodegradation, but has not been proven at field scale at this time. Would require treatability and/or pilot scale testing prior to implementation.
	Air Stripping	Extracted groundwater is pumped through air stripper or aeration tank to evaporate COCs.	Effective for removing volatile contaminants	Implementable	Medium	Yes	Not effective for NDMA, ammonia, chromium, or the other metals which are the primary COCs in groundwater. Effective for removing volatile COCs from groundwater. Retained as a potential unit operation that could be used to treat groundwater with volatile contaminants.
	Air Sparging/Soil Vapor Extraction	Air is injected into the subsurface to evaporate COCs into vapor. A vacuum source is used to pull the contaminated vapor from the subsurface. Vapors are then treated as needed.	Not Effective	Implementable	Medium-High	No	Not effective for NDMA, chromium, or ammonia, the primary COCs in groundwater. Air sparging would convectively mix the DAPL with overlying groundwater and transfer COCs to groundwater. Would result in extensive precipitation of metal hydroxy-oxides and soil pore clogging.

Table 2.3-3
Screening of Groundwater Remedial Technologies
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

General Response Action	Remediation Technology and Process Option	Description of Process Option	Effectiveness	Implementability	Cost	Retained	Screening Comments
Treatment (continued)	Chemical Reduction/Oxidation	Reducing compounds or oxidizing chemicals are used to enhance reduction/degradation or immobilization of contaminants.	Effective	Difficult to Implement. Not feasible over large areas.	Medium	No	Not effective for NDMA., chromium, or ammonia. Addition of potassium permanganate would be effective to remove iron and manganese. Oxidation would produce hexavalent chromium (which is currently not a COC), increasing overall toxicity and mobility.
	Adsorption	Move groundwater through columns or tanks filled with sorbent materials such as activated carbon, coconut shell, or anionic resins to remove COCs.	Somewhat Effective	Implementable	Medium-High	Yes	Not effective for NDMA, but somewhat effective for chromium and ammonia, some of the primary COCs in groundwater. Granular activated carbon (GAC) is part of the Wilmington Water Treatment Plant. May clog and foul equipment due to iron content.
	Permeable Reactive Barrier	A barrier created of reactive materials is placed downgradient of contamination to treat COCs as groundwater flows through the barrier.	Somewhat Effective	Difficult to Implement	Medium	No	Not effective for NDMA, a primary COC in groundwater. Effective for chromium and ammonia. Groundwater that flows through the barrier would still require extraction and treatment for NDMA, the primary COC in groundwater.
	Co-solvent Flooding	Involves injection and extraction of co-solvents to solubilize and/or mobilize COCs.	Not Effective	Implementable	Medium	No	Not effective for NDMA, chromium, or ammonia, the primary COCs in groundwater.
	Ultraviolet (UV) Oxidation	Strong oxidizers are added and medium is irradiated by UV light to destroy organic compounds.	Effective	Implementable	Medium-High	Yes	Effective for NDMA. Requires very low dissolved solids and turbidity that otherwise would absorb or limit UV light transmission and affect long-term performance.
	Break Point Chlorination	Addition of chlorine to oxidize COCs.	Somewhat Effective	Implementable	Medium	No	Effective for ammonia in dilute solutions. Not effective for NDMA and chromium, the other primary COCs present in groundwater. Requires low dissolved solids and low turbidity.
	Thermal Conductive Heating	Apply conductive heat through the subsurface to evaporate COCs into vapors for extraction.	Not Effective	Difficult to Implement. Not feasible over large areas.	Medium-High	No	Not effective for NDMA, chromium, or ammonia, the primary COCs in groundwater.
	Existing Municipal Water Treatment Plant	Re-activate Town of Wilmington Water Treatment Plant to treat extracted groundwater.	Effective	Implementable	Medium	Yes	Re-activate Town of Wilmington Water Treatment Plant to treat extracted groundwater. Treatment Plant would be effective at treating the COCs, with the addition of UV/Oxidation to treat NDMA. Could be used in conjunction with new extraction wells, but not with re-activation of the Town MWSWs because MWSWs are not located in groundwater hots spots.

Table 2.3-3
Screening of Groundwater Remedial Technologies
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

General Response Action	Remediation Technology and Process Option	Description of Process Option	Effectiveness	Implementability	Cost	Retained	Screening Comments
Containment/Removal	Groundwater Extraction	Use extraction wells to remove groundwater for ex-situ treatment.	Effective	Implementable	Medium	Yes	Used in conjunction with treatment/disposal technologies.
	Municipal Water Supply Wells	Use existing Town of Wilmington Municipal Water Supply Wells (MWSWs) at Butters Row to extract groundwater for ex-situ treatment.	Not Effective	Implementable	Medium	No	Used in conjunction with treatment/disposal technologies, such as re-activation of the Town of Wilmington Water Treatment Plant. The MWSWs are not near the groundwater hot spots; thus, these municipal wells will not effectively extract groundwater hot spots.
Disposal	Discharge						
	Permitted discharge	Water is discharged via RGP, NPDES, or other permit after treatment.	Effective	Implementable	Low	Yes	Would require NPDES Permit for discharge of treated groundwater to a surface water body. Would be used in conjunction with groundwater extraction and ex-situ treatment.

Prepared by: APP 01/30/2019
Checked by: PHT 04/10/2019

Notes:
COC = Chemical of Concern
DAPL= Dense Aqueous Phase Liquid
GAC = Granular Activated Carbon
MWSW = Municipal Water Supply Well
NDMA = n-Nitrosodimethylamine
NPDES = National Pollutant Discharge Elimination System
RGP = Remediation General Permit
UV = ultraviolet

Table 2.3-4
Screening of Containment Area Remedial Technologies
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

General Response Action	Remediation Technology and Process Option	Description of Process Option	Effectiveness	Implementability	Cost	Retained	Screening Comments
No Action	None	No action taken	Not effective	Implementable	No Cost	Yes	Required for baseline comparison
Institutional Controls	Access and Use Restrictions						
	Notice of Activity and Use Limitation	Prohibit residential use and development of site through restrictive language in deeds and other instruments of property transfer.	Effective	Implementable	Low	Yes	Modify existing deed covenants, which currently provide restrictions on future use and activities, to include language to restrict future subsurface activities within the Containment Area.
	Environmental Monitoring						
	Soil and groundwater sampling	Collection and analysis of soil and groundwater samples.	Effective	Implementable	Low	Yes	May be used in conjunction with other technologies and to assess remedy effectiveness.
Containment	Capping						
	Soil cap	Install a soil cover to reduce weathering and erosion. Provides limited reduction in infiltration and limited ability to minimize leaching.	Would reduce but would not be effective to control precipitation entering the Slurry Wall Containment Area.	Implementable	Medium-Low	No	Would reduce, but not minimize infiltration as effectively as other types of cap scenarios.
	RCRA Subtitle D Cap	Install a cover system meeting RCRA Subtitle D requirements to reduce weathering and erosion, and provide a significant reduction in infiltration and leaching of contaminants.	Effective	Implementable	Medium-High	Yes	Retained as a possible technology/process option for the Slurry Wall Containment Area.
	RCRA Subtitle C Cap	Install a cover system meeting RCRA Subtitle C requirements to reduce weathering and erosion, and provide a significant reduction in infiltration and leaching of contaminants.	Effective	Implementable	High	Yes	Retained as a possible technology/process option for the Slurry Wall Containment Area.
	Asphalt Cap	Install asphalt pavement to reduce weathering and erosion, and provide a significant reduction in infiltration.	Effective	Implementable	Medium-Low	No	Would reduce, but not minimize infiltration as effectively as other types of cap scenarios.
	Stabilization						
	Ex-situ stabilization	Excavated soil is mixed with stabilizing agent (e.g., Portland cement, fly ash, lime). Resulting soil mixture would be chemically and physical stable for off-site disposal as non-hazardous waste.	Effective	Implementable	Medium	Yes	Retained as a possible technology/process option for treating soil, if necessary, prior to off-site disposal.

Table 2.3-4
Screening of Containment Area Remedial Technologies
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

General Response Action	Remediation Technology and Process Option	Description of Process Option	Effectiveness	Implementability	Cost	Retained	Screening Comments
Containment (continued)	In-situ stabilization	A stabilizing agent (e.g., Portland cement, fly ash, lime) would be applied to in place, contaminated soil using large diameter augers, backhoes, or similar mixing equipment. Resulting soil mixture may be chemically and physical stable with lower leaching potential.	Possibly Effective	Implementable	High	No	Relatively high cost method that does not eliminate contaminants. Would require extensive testing to verify effectiveness and construction QA/QC to ensure proper application.
Removal	Mechanical excavation	Excavation using conventional earthmoving equipment.	Effective. Interrupts direct exposure pathway and reduces erosion and leaching if combined with protective disposal option.	Implementable. Need to protect workers with HASP. Need to identify suitable disposal method.	Medium	Yes	If soils within the Containment Area are identified for removal, this technology would be used in conjunction with disposal technologies.
Disposal	On-site Disposal						
	Consolidate on-site and cap	Excavated material would be consolidated on site under a capping system.	Effective. Would require appropriate design to ensure cap stability and minimize future erosion. Capping interrupts direct exposure pathway and can be designed to prevent leaching and migration of contaminants.	Implementable; however, requires administrative controls and deed restrictions on future land use at site. Requires long-term monitoring and maintenance.	Medium-High	No	The relatively small volume of contaminated soil that might require remediation would result in significantly higher costs to construct and maintain an on-site disposal area than to dispose of the material off-site. Additionally, removing soil from within the Containment Area, which currently has a temporary cap and has been proposed for a more permanent cap, and disposing of this soil at another location on-site is not considered a viable option.
	Off-Site Disposal	Permitted landfill	Effective	Implementable	Moderate	Yes	More cost-effective than on-site disposal, due to relatively small volume of material, and design, construction, and maintenance of an on-site disposal area.

Prepared by: APP 03/18/2019
Checked by: PHT 04/10/2019

Notes:
HASP = Health and Safety Plan
RCRA = Resource Conservation and Recovery Act

Table 4.2-1
Cost Estimate for Alternative LNAPL 2:
Manual Recovery
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

NOTES

This cost estimate includes maintenance of Institution Controls and manual recovery of LNAPL as is currently performed and with the addition of absorbent socks in additional wells where LNAPL is observed. The extracted LNAPL would be stored onsite and disposed of in accordance with RCRA regulations.

Base Year (Year 0) = 2020

CAPITAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Institutional Controls	1	LS	$0	$0	Performed Internally to Olin - Incremental Costs Only
LNAPL Recovery Work Plan Update	1	LS	$5,000	$5,000	Based on Similar Projects
		TOTAL CAPITAL COSTS		$5,000	

ANNUAL COSTS YEARS 1 - 15

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Monthly LNAPL Thickness Monitoring and Recovery	0	Labor Hours	$100	$0	Performed Internally to Olin - Incremental Costs Only
Monitoring and Performance Reports	0	LS	$20,000	$0	Performed Internally to Olin - Incremental Costs Only
Absorbent Socks	1	LS	$500	$500	Based on Similar Projects
LNAPL Disposal	0.01	55-gal drum	$500	$4	Based on Similar Projects - Assume 0.4 gal per year
		TOTAL ANNUAL COSTS		$504	

ANNUAL COSTS YEARS 16 PLUS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Quarterly LNAPL Thickness Monitoring	0	Labor Hours	$100	$0.00	Incremental Costs Only NA
Monitoring and Performance Reports	0	LS	$20,000	$0	Incremental Costs Only NA
		TOTAL ANNUAL COSTS		$0	

5-YEAR PERIODIC COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
5-Year Review Report	1	LS	$5,000	$5,000	Incremental Costs Only; Will be performed site-wide
Institutional Controls Verification and Maintenance	0	LS	$5,000	$0	Performed Internally to Olin - Incremental Costs Only

PRESENT VALUE ANALYSIS

Cost Type	Year	Total Cost	Discount Factor	Present Value	Note
Capital Costs	0	$5,000	1.0000	$5,000	
Annual Costs	1	$504	0.9346	$471	
Annual Costs	2	$504	0.8734	$440	
Annual Costs	3	$504	0.8163	$411	
Annual Costs	4	$504	0.7629	$384	
Annual Costs	5	$504	0.7130	$359	
5-Year Review Report and IC Maintenance	5	$5,000	0.7130	$3,565	
Annual Costs	6	$504	0.6663	$336	
Annual Costs	7	$504	0.6227	$314	
Annual Costs	8	$504	0.5820	$293	
Annual Costs	9	$504	0.5439	$274	
Annual Costs	10	$504	0.5083	$256	
5-Year Review Report and IC Maintenance	10	$5,000	0.5083	$2,542	
Annual Costs	11	$504	0.4751	$239	
Annual Costs	12	$504	0.4440	$224	
Annual Costs	13	$504	0.4150	$209	
Annual Costs	14	$504	0.3878	$195	
Annual Costs	15	$504	0.3624	$183	
5-Year Review Report and IC Maintenance	15	$5,000	0.3624	$1,812	
Annual Costs	16	$0	0.3387	$0	
Annual Costs	17	$0	0.3166	$0	
Annual Costs	18	$0	0.2959	$0	
Annual Costs	19	$0	0.2765	$0	
Annual Costs	20	$0	0.2584	$0	
5-Year Review Report and IC Maintenance	20	$5,000	0.2584	$1,292	
Annual Costs	21	$0	0.2415	$0	
Annual Costs	22	$0	0.2257	$0	
Annual Costs	23	$0	0.2109	$0	
Annual Costs	24	$0	0.1971	$0	
Annual Costs	25	$0	0.1842	$0	
5-Year Review Report and IC Maintenance	25	$5,000	0.1842	$921	
Annual Costs	26	$0	0.1722	$0	
Annual Costs	27	$0	0.1609	$0	
Annual Costs	28	$0	0.1504	$0	
Annual Costs	29	$0	0.1406	$0	
Annual Costs	30	$0	0.1314	$0	
5-Year Review Report and IC Maintenance	30	$5,000	0.1314	$657	
		$42,555		$20,376	

TOTAL COST OF ALTERNATIVE	**$43,000**
TOTAL PRESENT WORTH OF ALTERNATIVE	**$20,000**
PROJECT DURATION	**30 Years**

Table 4.2-2
Cost Estimate for Alternative LNAPL 3:
Continuous Mechanical Recovery
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

NOTES

This cost estimate includes maintenance of Institution Controls, installation of three additional wells, and installation of a controller and three skimmers. The recovered LNAPL would be stored onsite and disposed of in accordance with RCRA regulations.

Base Year (Year 0) = 2020

CAPITAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Institutional Controls	0	LS	$12,400	$0	Performed Interanally to Olin - Incremental Costs Only
Remedial Design/ Workplan Adendum	80	Labor Hours	$100	$8,000	Based on similar projects
Pre-Design Investigation	1	LS	$15,000	$15,000	Limited Direct Push Drilling - 3 days assumed
Continuos Skimmer System Installation					
2" Wells	3	LS	$12,000	$36,000	Based on Similar Projects
3 Skimmers, 1 controller, tubing, parts	1	LS	$20,000	$20,000	Estimate from Environmental Remediation Contractor
Contingency	1	LS	20%	$15,800	Based on Similar Projects
			TOTAL CAPITAL COSTS	$94,800	

ANNUAL COSTS YEARS 1 - 10

Description	Quantity	Units	Unit Cost	Extended Cost	Note
System O&M / Monitoring	12	Labor Hours	$100	$1,200	Based on Similar Projects
Annual Electricity Costs	12	months	$300	$3,600	Based on Similar Projects
LNAPL Disposal	0.02	drums	$500	$8	Based on Similar Projects - Assume 0.9 gallons per year
Monitoring and Performance Reports	0	LS	$20,000	$0	Performed Internally to Olin - Incremental Costs Only
			TOTAL ANNUAL COSTS	$4,808	

ANNUAL COSTS YEARS 10 PLUS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Quarterly LNAPL Thickness Monitoring	0	T&M	$100	$0	Performed Internally to Olin - Incremental Costs Only
Monitoring and Performance Reports	0	LS	$20,000	$0	Performed Internally to Olin - Incremental Costs Only
			TOTAL ANNUAL COSTS	$0	

5-YEAR PERIODIC COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Subsequent 5-Year Review Report	1	LS	$5,000	$5,000	Incremental Costs Only; Will be performed site-wide
Institutional Controls Verification and Maintenance	1	LS	$0	$0	Performed Internally to Olin - Incremental Costs Only
			TOTAL 5-YEAR PERIODIC COSTS	$5,000	

PRESENT VALUE ANALYSIS

Cost Type	Year	Total Cost	Discount Factor	Present Value	Note
					Assumes 20% reduction in monitoring duration
Capital Costs	0	$94,800	1.0000	$94,800	
Annual Costs	1	$4,808	0.9346	$4,494	
Annual Costs	2	$4,808	0.8734	$4,200	
Annual Costs	3	$4,808	0.8163	$3,925	
Annual Costs	4	$4,808	0.7629	$3,668	
Annual Costs	5	$4,808	0.7130	$3,428	
5-Year Review Report and IC Maintenance	5	$5,000	0.7130	$3,565	
Annual Costs	6	$4,808	0.6663	$3,204	
Annual Costs	7	$4,808	0.6227	$2,994	
Annual Costs	8	$4,808	0.5820	$2,798	
Annual Costs	9	$4,808	0.5439	$2,615	
Annual Costs	10	$4,808	0.5083	$2,444	
5-Year Review Report and IC Maintenance	10	$5,000	0.5083	$2,542	
Annual Costs	11	$0	0.4751	$0	
Annual Costs	12	$0	0.4440	$0	
Annual Costs	13	$0	0.4150	$0	
Annual Costs	14	$0	0.3878	$0	
Annual Costs	15	$0	0.3624	$0	
5-Year Review Report and IC Maintenance	15	$5,000	0.3624	$1,812	
Annual Costs	16	$0	0.3387	$0	
Annual Costs	17	$0	0.3166	$0	
Annual Costs	18	$0	0.2959	$0	
Annual Costs	19	$0	0.2765	$0	
Annual Costs	20	$0	0.2584	$0	
5-Year Review Report and IC Maintenance	20	$5,000	0.2584	$1,292	
Annual Costs	21	$0	0.2415	$0	
Annual Costs	22	$0	0.2257	$0	
Annual Costs	23	$0	0.2109	$0	
Annual Costs	24	$0	0.1971	$0	
Annual Costs	25	$0	0.1842	$0	
5-Year Review Report and IC Maintenance	25	$5,000	0.1842	$921	
Annual Costs	26	$0	0.1722	$0	
Annual Costs	27	$0	0.1609	$0	
Annual Costs	28	$0	0.1504	$0	
Annual Costs	29	$0	0.1406	$0	
Annual Costs	30	$0	0.1314	$0	
5-Year Review Report and IC Maintenance	30	$5,000	0.1314	$657	
		$172,882		$139,360	

TOTAL COST OF ALTERNATIVE **$173,000**
TOTAL PRESENT WORTH OF ALTERNATIVE **$139,000**
PROJECT DURATION **30 Years**

Table 4.2-3
Cost Estimate for Alternative LNAPL 4:
Multi-Phase Extraction
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

NOTES

This cost estimate includes maintenance of Institution Controls, installation of one multi-phase extraction well, and rental of a multi-phase extraction system for 12 months. The extracted streams would be separated, treated, and discharged under the RGP for Plant B.

Base Year (Year 0) = 2020

CAPITAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Institutional Controls	0	LS	$12,400	$0	Performed Internally to Olin - Incremental Costs Only
Remedial Design / Workplan Addenedum	120	Labor Hours	$100	$12,000	Based on similar projects
Pre-Design Investigation	1	LS	$15,000	$15,000	Limited Direct Push Drilling - 3 days assumed
Multi-Phase Extraction System Installation					
4" Extraction Wells	1	LS	$18,000	$18,000	Based on Similar Projects
Piping and installation / Field labor	1	LS	$10,000	$10,000	Estimate from Environmental Remediation Contractor
MPE System Rental	12	Months	$5,000	$60,000	Estimate from Environmental Remediation Contractor
RGP Updates	80	Labor Hours	$100	$8,000	Based on Similar Projects
LNAPL Disposal	2	Drums	$500	$1,000	Based on Similar Projects
System Monitoring / O&M	260	Labor Hours	$100	$26,000	Based on Similar Projects
Contingency	1	LS	20%	$30,000	Based on Similar Projects
			TOTAL CAPITAL COSTS	$180,000	

ANNUAL COSTS YEAR 1

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Verification Sampling	1	LS	$8,000	$8,000	Based on Similar Projects
Monitoring and Performance/Remedial Action Report	1	LS	$10,000	$10,000	Based on Similar Projects
			TOTAL ANNUAL COSTS	$18,000	

ANNUAL COSTS YEARS 2-30

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Quarterly LNAPL Thickness Monitoring and Reporting	0	Labor Hours	$100	$0	Performed Internally to Olin - Incremental Costs Only
			TOTAL ANNUAL COSTS	$0	

5-YEAR PERIODIC COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
5-Year Review Report	1	LS	$5,000	$5,000	Incremental Costs Only - Will be performed site-wide
Institutional Controls Verification and Maintenance	0	LS	$5,000	$0	Performed Internally to Olin - Incremental Costs Only
			TOTAL 5-YEAR PERIODIC COSTS	$5,000	

PRESENT VALUE ANALYSIS

Cost Type	Year	Total Cost	Discount Factor	Present Value	Note
Capital Costs	0	$180,000	1.0000	$180,000	
Annual Costs	1	$18,000	0.9346	$16,822	
Annual Costs	2	$0	0.8734	$0	
Annual Costs	3	$0	0.8163	$0	
Annual Costs	4	$0	0.7629	$0	
Annual Costs	5	$0	0.7130	$0	
5-Year Review Report and IC Maintenance	5	$5,000	0.7130	$3,565	
Annual Costs	6	$0	0.6663	$0	
Annual Costs	7	$0	0.6227	$0	
Annual Costs	8	$0	0.5820	$0	
Annual Costs	9	$0	0.5439	$0	
Annual Costs	10	$0	0.5083	$0	
5-Year Review Report and IC Maintenance	10	$5,000	0.5083	$2,542	
Annual Costs	11	$0	0.4751	$0	
Annual Costs	12	$0	0.4440	$0	
Annual Costs	13	$0	0.4150	$0	
Annual Costs	14	$0	0.3878	$0	
Annual Costs	15	$0	0.3624	$0	
5-Year Review Report and IC Maintenance	15	$5,000	0.3624	$1,812	
Annual Costs	16	$0	0.3387	$0	
Annual Costs	17	$0	0.3166	$0	
Annual Costs	18	$0	0.2959	$0	
Annual Costs	19	$0	0.2765	$0	
Annual Costs	20	$0	0.2584	$0	
5-Year Review Report and IC Maintenance	20	$5,000	0.2584	$1,292	
Annual Costs	21	$0	0.2415	$0	
Annual Costs	22	$0	0.2257	$0	
Annual Costs	23	$0	0.2109	$0	
Annual Costs	24	$0	0.1971	$0	
Annual Costs	25	$0	0.1842	$0	
5-Year Review Report and IC Maintenance	25	$5,000	0.1842	$921	
Annual Costs	26	$0	0.1722	$0	
Annual Costs	27	$0	0.1609	$0	
Annual Costs	28	$0	0.1504	$0	
Annual Costs	29	$0	0.1406	$0	
Annual Costs	30	$0	0.1314	$0	
5-Year Review Report and IC Maintenance	30	$5,000	0.1314	$657	
		$228,000		$207,612	
TOTAL COST OF ALTERNATIVE			**$228,000**		
TOTAL PRESENT WORTH OF ALTERNATIVE			**$208,000**		
PROJECT DURATION			**30 Years**		

Table 4.2-4
Cost Estimate for Alternative LNAPL 5:
Continued Operation of Plant B and Expanded Multi-Phase Extraction
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

NOTES

Plant B would continue to operate until the Groundwater Hot Spot treatment system has been constructed and is operational. Current extraction wells will then be rerouted to the new groundwater treatment system, and Plant B will then be decommissioned and demolished. A predesign investigation would then be performed, and, based on the results, an estimated 5 multi-phase extraction wells would then be installed within the footprint of the LNAPL plume. Groundwater, LNAPL, and soil vapor would be extracted through MPE with LNAPL removal and soil vapor treatment using skid-mounted systems provided by the MPE contractor and groundwater being treated at the new Groundwater Hot Spot treatment system. The MPE component of this alternative is expected to operate for 12 months.

Base Year (Year 0) = 2020

CAPITAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Institutional Controls	0	LS	$12,400	$0	Performed Interanally to Olin - Incremental Costs Only
Reroute Current Extraction Wells to New GW Hot Spot Treatment System	150	Feet	$128	$19,200	Estimate from Environmental Remediation Contractor
Plant B Decommission/Demolition					
Mobilization	1	LS	$46,679	$46,679	Estimate from Environmental Remediation Contractor
Site Prep/Erosion Control	1	LS	$45,385	$45,385	Estimate from Environmental Remediation Contractor
Decommissioning/Demolition	1	LS	$131,284	$131,284	Estimate from Environmental Remediation Contractor
Demobilization	1	LS	$46,679	$46,679	Estimate from Environmental Remediation Contractor
Pre-Design Investigation					
Pre-Design Investigation	1	LS	$25,000	$25,000	5 days Assumed for Investigation
Laser Induced Fluorescence/UV Optical Screening Tool	1	LS	$9,000	$9,000	Estimate from Envrionmental Remediation Contractor
Remedial Design / Workplan Addendum	120	Labor Hours	$100	$12,000	Based on similar projects
Multi-Phase Extraction System Installation					
4" Extraction Wells	5	per Well	$18,000	$90,000	Based on Similar Projects
Piping and installation / Field labor	1	LS	$30,000	$30,000	Estimate from Environmental Remediation Contractor
MPE System Rental (Oil/water Separator and Vapor-phase GAC Treatment)	12	Months	$5,000	$60,000	Estimate from Environmental Remediation Contractor
RGP Updates	80	Labor Hours	$100	$8,000	Based on Similar Projects
O&M/Oversight	624	Labor Hours	$100	$62,400	Based on Similar Projects
LNAPL Disposal	1	LS	$1,100	$1,100	Estimate from Environmental Remediation Contractor
Contingency	1	LS	20%	$117,345.40	Based on Similar Projects
			TOTAL CAPITAL COSTS	$704,072	

ANNUAL COSTS YEAR 1

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Verification Sampling	1	LS	$10,000	$10,000	Based on Similar Projects
O&M on Wells Routed to GW Hot Spot Treatment System	624	Labor Hours	$100	$62,400	Based on Similar Projects
Monitoring and Performance/Remedial Action Report	1	LS	$15,000	$15,000	Based on Similar Projects
			TOTAL ANNUAL COSTS	$87,400	

ANNUAL COSTS YEARS 2-30

Description	Quantity	Units	Unit Cost	Extended Cost	Note
O&M on Wells Routed to GW Hot Spot Treatment System	624	Labor Hours	$100	$62,400	Based on Similar Projects
Monitoring and Performance Report	1	LS	$10,000	$10,000	Based on Similar Projects
			TOTAL ANNUAL COSTS	$72,400	

5-YEAR PERIODIC COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
5-Year Review Report	1	LS	$5,000	$5,000	Incremental Costs Only - Will be performed site-wide
Institutional Controls Verification and Maintenance	0	LS	$5,000	$0	Performed Internally to Olin - Incremental Costs Only
			TOTAL 5-YEAR PERIODIC COSTS	$5,000	

Table 4.2-4
Cost Estimate for Alternative LNAPL 5:
Continued Operation of Plant B and Expanded Multi-Phase Extraction
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

PRESENT VALUE ANALYSIS					
Cost Type	**Year**	**Total Cost**	**Discount Factor**	**Present Value**	**Note**
Capital Costs	0	$704,072	1.0000	$704,072	
Annual Costs	1	$87,400	0.9346	$81,682	
Annual Costs	2	$72,400	0.8734	$63,237	
Annual Costs	3	$72,400	0.8163	$59,100	
Annual Costs	4	$72,400	0.7629	$55,234	
Annual Costs	5	$72,400	0.7130	$51,620	
5-Year Review Report and IC Maintenance	5	$5,000	0.7130	$3,565	
Annual Costs	6	$72,400	0.6663	$48,243	
Annual Costs	7	$72,400	0.6227	$45,087	
Annual Costs	8	$72,400	0.5820	$42,137	
Annual Costs	9	$72,400	0.5439	$39,381	
Annual Costs	10	$72,400	0.5083	$36,804	
5-Year Review Report and IC Maintenance	10	$5,000	0.5083	$2,542	
Annual Costs	11	$72,400	0.4751	$34,397	
Annual Costs	12	$72,400	0.4440	$32,146	
Annual Costs	13	$72,400	0.4150	$30,043	
Annual Costs	14	$72,400	0.3878	$28,078	
Annual Costs	15	$72,400	0.3624	$26,241	
5-Year Review Report and IC Maintenance	15	$5,000	0.3624	$1,812	
Annual Costs	16	$72,400	0.3387	$24,524	
Annual Costs	17	$72,400	0.3166	$22,920	
Annual Costs	18	$72,400	0.2959	$21,421	
Annual Costs	19	$72,400	0.2765	$20,019	
Annual Costs	20	$72,400	0.2584	$18,710	
5-Year Review Report and IC Maintenance	20	$5,000	0.2584	$1,292	
Annual Costs	21	$72,400	0.2415	$17,486	
Annual Costs	22	$72,400	0.2257	$16,342	
Annual Costs	23	$72,400	0.2109	$15,273	
Annual Costs	24	$72,400	0.1971	$14,273	
Annual Costs	25	$72,400	0.1842	$13,340	
5-Year Review Report and IC Maintenance	25	$5,000	0.1842	$921	
Annual Costs	26	$72,400	0.1722	$12,467	
Annual Costs	27	$72,400	0.1609	$11,651	
Annual Costs	28	$72,400	0.1504	$10,889	
Annual Costs	29	$72,400	0.1406	$10,177	
Annual Costs	30	$72,400	0.1314	$9,511	
5-Year Review Report and IC Maintenance	30	$5,000	0.1314	$657	
		$2,921,072		$1,627,295	
		TOTAL COST OF ALTERNATIVE		**$2,921,000**	
		TOTAL PRESENT WORTH OF ALTERNATIVE		**$1,627,000**	
		PROJECT DURATION		**30 Years**	

Table 4.2-5
Cost Estimate for Alternative LNAPL 6:
Continued Operation of Plant B Followed by Excavation
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

NOTES

Plant B would continue to operate until the Groundwater Hot Spot treatment system has been constructed and is operational. Current extraction wells will then be rerouted to the new groundwater treatment system. Next, Plant B will be decommissioned and demolished. A predesign investigation would then be performed to determine the aerial extent of LNAPL and the depth of the smear zone. Based on the results of the investigation, LNAPL-impacted soil would be excavated to bottom of the smear zone. The actual depth of excavation would be determined during remedy design; however, at this time, the smear zone is estimated to span 3 feet above and below the water level elevation. The estimated depth of excavation is approximately 14 ft bgs. This alternative also includes a contingency action in the event that additional LNAPL-impacted soil is encountered during the initial excavation activities.

Base Year (Year 0) = 2020

CAPITAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Institutional Controls	0	LS	$12,400	$0	Performed Internally to Olin - Incremental Costs Only
Reroute Current Extraction Wells to New GW Hot Spot Treatment System	150	Feet	$128	$19,200	Estimate from Environmental Remediation Contractor
Pre-Design Investigation					
Pre-Design Investigation	1	LS	$25,000	$25,000	5 days Assumed for Investigation
Laser Induced Fluorescence/UV Optical Screening Tool	1	LS	$9,000	$9,000	Estimate from Envrionmental Remediation Contractor
Pre-Excavation Wetland Survey	1	LS	$1,000	$1,000	Wetland Scientist; 1 day field effort
Wetland Restoration Plan	1	LS	$5,000	$5,000	Based on cost for similar effort
Remedial Design / Workplan Addendum	120	Labor Hours	$100	$12,000	Based on similar projects
Plant B Decommission/Demolition					
Mobilization	1	LS	$46,679	$46,679	Estimate from Environmental Remediation Contractor
Site Prep/Erosion Control	1	LS	$45,385	$45,385	Estimate from Environmental Remediation Contractor
Includes temporary staging area for dewatering and erosion & sediment control					
Decommissioning/Demolition	1	LS	$131,284	$131,284	Estimate from Environmental Remediation Contractor
Excavation	830	CY	$62	$51,643	Estimate from Environmental Remediation Contractor
Excavation Dewatering	1	LS	$157,179	$157,179	Estimate from Environmental Remediation Contractor
Soil Dewatering/Stabilization	1	LS	$34,921	$34,921	Estimate from Environmental Remediation Contractor
Transportation and Disposal (Hazardous)	1	LS	$134,750	$134,750	Estimate from Environmental Remediation Contractor
LNAPL Disposal	1	LS	$1,100	$1,100	Estimate from Environmental Remediation Contractor
Backfill and Restoration	830	CY	$58	$48,140	Estimate from Environmental Remediation Contractor
Demobilization	1	LS	$46,679	$46,679	Estimate from Environmental Remediation Contractor
Excavation Verification Sampling & Analysis	1	LS	$15,000	$15,000	4 bottom & 16 sidewall samples w/ QC (25 total)
Remedial Action Oversight	100	Days	$1,000	$100,000	3.5 months on-site activities
Excavation Area Monthly Inspections	4	LS	$800	$3,200	Monthly for 4 months
Remedial Action Report	1	LS	$10,000	$10,000	Based on Similar Projects
Contingency Action to Expand Excavation, if necessary					
Sheet Pile Wall (Install & Remove)	2000	SF	$75	$150,000	Estimate from Environmental Remediation Contractor
Excavation	520	CY	$62	$32,354	Estimate from Environmental Remediation Contractor
Excavation Dewatering	1	LS	$94,307	$94,307	Estimate from Environmental Remediation Contractor
Soil Dewatering/Stabilization	1	LS	$20,953	$20,953	Estimate from Environmental Remediation Contractor
Transportation and Disposal (Hazardous)	1	LS	$87,500	$87,500	Estimate from Environmental Remediation Contractor
Backfill and Restoration	520	CY	$58	$30,160	Estimate from Environmental Remediation Contractor
Excavation Verification Sampling & Analysis	1	LS	$9,000	$9,000	2 bottom & 12 sidewall samples w/ QC (16 total)
Remedial Action Oversight	5	Days	$1,000	$5,000	5 days for additional on-site activities
Contingency	1	LS	20%	$265,287	Based on Similar Projects
			TOTAL CAPITAL COSTS	$1,591,721	

ANNUAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
O&M on Wells Routed to GW Hot Spot Treatment System	624	Labor Hours	$100	$62,400	Based on Similar Projects
Monitoring and Performance Report	1	LS	$10,000	$10,000	Based on Similar Projects
			TOTAL ANNUAL COSTS	$72,400	

5-YEAR PERIODIC COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
5-Year Review Report	1	LS	$5,000	$5,000	Incremental Costs Only - Will be performed site-wide
Institutional Controls Verification and Maintenance	0	LS	$5,000	$0	Performed Internally to Olin - Incremental Costs Only
			TOTAL 5-YEAR PERIODIC COSTS	$5,000	

Table 4.2-5
Cost Estimate for Alternative LNAPL 6:
Continued Operation of Plant B Followed by Excavation
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

PRESENT VALUE ANALYSIS					
Cost Type	**Year**	**Total Cost**	**Discount Factor**	**Present Value**	**Note**
Capital Costs	0	$1,591,721	1.0000	$1,591,721	
Annual Costs	1	$72,400	0.9346	$67,664	
Annual Costs	2	$72,400	0.8734	$63,237	
Annual Costs	3	$72,400	0.8163	$59,100	
Annual Costs	4	$72,400	0.7629	$55,234	
Annual Costs	5	$72,400	0.7130	$51,620	
5-Year Review Report and IC Maintenance	5	$5,000	0.7130	$3,565	
Annual Costs	6	$72,400	0.6663	$48,243	
Annual Costs	7	$72,400	0.6227	$45,087	
Annual Costs	8	$72,400	0.5820	$42,137	
Annual Costs	9	$72,400	0.5439	$39,381	
Annual Costs	10	$72,400	0.5083	$36,804	
5-Year Review Report and IC Maintenance	10	$5,000	0.5083	$2,542	
Annual Costs	11	$72,400	0.4751	$34,397	
Annual Costs	12	$72,400	0.4440	$32,146	
Annual Costs	13	$72,400	0.4150	$30,043	
Annual Costs	14	$72,400	0.3878	$28,078	
Annual Costs	15	$72,400	0.3624	$26,241	
5-Year Review Report and IC Maintenance	15	$5,000	0.3624	$1,812	
Annual Costs	16	$72,400	0.3387	$24,524	
Annual Costs	17	$72,400	0.3166	$22,920	
Annual Costs	18	$72,400	0.2959	$21,421	
Annual Costs	19	$72,400	0.2765	$20,019	
Annual Costs	20	$72,400	0.2584	$18,710	
5-Year Review Report and IC Maintenance	20	$5,000	0.2584	$1,292	
Annual Costs	21	$72,400	0.2415	$17,486	
Annual Costs	22	$72,400	0.2257	$16,342	
Annual Costs	23	$72,400	0.2109	$15,273	
Annual Costs	24	$72,400	0.1971	$14,273	
Annual Costs	25	$72,400	0.1842	$13,340	
5-Year Review Report and IC Maintenance	25	$5,000	0.1842	$921	
Annual Costs	26	$72,400	0.1722	$12,467	
Annual Costs	27	$72,400	0.1609	$11,651	
Annual Costs	28	$72,400	0.1504	$10,889	
Annual Costs	29	$72,400	0.1406	$10,177	
Annual Costs	30	$72,400	0.1314	$9,511	
5-Year Review Report and IC Maintenance	30	$5,000	0.1314	$657	
		$3,793,721		$2,500,924	
	TOTAL COST OF ALTERNATIVE		**$3,794,000**		
	TOTAL PRESENT WORTH OF ALTERNATIVE		**$2,501,000**		
	PROJECT DURATION		**30 Years**		

Table 4.3-1
DAPL Pool Summary
Interim Action Feasibility Studay
Olin Chemical Superfund Site
Wilmington, Massachusetts

Alternative ID	Description	Estimated DAPL Volume[1] (gal)	Assumed Per-Well Pumping Rate (gpm)	Assumed Number of Extraction Wells	Total Pumping Rate (gpm)	Operational Time	Total Pumping Rate (gal/year)	Estimated Extraction Duration[2] (years)	Treatment Residual - sludge volume[3] (gal)	Treatment Residual - sludge volume (tons)
DAPL 2A	OPWD (Jewel Drive) DAPL Pool	1,235,000	0.25	1	0.25	80%	105,120	11.7	247,000	1,376
DAPL 2B	OPWD (Jewel Drive) DAPL Pool	1,300,000	0.25	4	1	80%	420,480	3.1	260,000	1,448
DAPL 3A	Containment Area DAPL Pool	228,000	0.25	1	0.25	80%	105,120	2.2	45,600	254
DAPL 3B	Containment Area DAPL Pool	240,000	0.25	4	1	80%	420,480	0.6	48,000	267
DAPL 4A	Main Street DAPL Pool	12,635,000	0.5	3	1.5	80%	630,720	20.0	2,527,000	14,075
DAPL 4B	Main Street DAPL Pool	13,300,000	0.5	12	6	80%	2,522,880	5.3	2,660,000	14,816

Notes:

1. Volume estimate based on 1/15/20 Geomega values (Table 4). "A" alternatives assumed to address 95% of the DAPL volume of associated "B" alternatives. Estimate to be refined during planned investigations.
2. Estimated duration rounded to the nearest half year.
3. Residual sludge volume assumed to be 20% of the original extracted DAPL volume.
4. gal = gallons, gpm = gallons per minute

Table 4.3-2
Cost Estimate for Alternative DAPL 2A: OPWD (Jewel Drive) DAPL Pool
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Description	Unit Cost	Units	Quantity	Extended Cost
Capital Costs				
Limited Action - Deed Restriction Notification	$12,400	LS	0	$0
Replacement DAPL Extraction Well	$45,000	LS	1	$45,000
Geophysical Investigation	$15,000	LS	1	$15,000
Additional DAPL Extraction Well(s)				
Mobilization	$16,000	LS	1	$16,000
Temporary Facilities and Controls	$13,500	LS	1	$13,500
Pump Enclosure Vault	$31,000	LS	1	$31,000
Extraction Pump, Controls and Pump Enclosure Piping	$31,000	LS	1	$31,000
Underground DAPL Discharge Piping	$168	LF	200	$33,600
Electrical and Instrumentation Systems	$175,000	LS	0.25	$43,750
Multi-Port Monitoring Wells	$35,000	LS	1	$35,000
Induction Logging Wells	$8,000	LS	1	$8,000
System Start-up and Prove-Out	$15,000	LS	1	$15,000
Subtotal				$226,850
Contingency			20%	$45,370
Total Capital Costs				$332,220
Annual Costs				
Electricity	$900	month	12	$10,800
O&M Labor	$30,000	LS	0	$0
DAPL on-site treatment: capital, O&M and solids disposal	$1.31	gallons	105,120	$137,707
System Performance Monitoring	$1,440	event	12	$17,280
Monitoring and Performance Reports	$20,000	LS	1	$20,000
Total Annual Costs				$185,787
5-Year Periodic Costs				
5-Year Review Report	$20,000	LS	1	$20,000
Deed Restriction Verification and Maintenance	$5,000	LS	0	$0

Table 4.3-2
Cost Estimate for Alternative DAPL 2A: OPWD (Jewel Drive) DAPL Pool
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Present Value Analysis				
Cost Type	**Year**	**Total Cost**	**Discount Factor**	**Present Value**
Capital Costs - Year 0	0	$332,220	1.0000	$ 332,220
Annual Costs - Year 1	1	$185,787	0.9346	$ 173,633
Annual Costs - Year 2	2	$185,787	0.8734	$ 162,274
Annual Costs - Year 3	3	$185,787	0.8163	$ 151,658
Annual Costs - Year 4	4	$185,787	0.7629	$ 141,736
5-Year Periodic Costs - Year 5	5	$20,000	0.7130	$ 14,260
Annual Costs - Year 5	5	$185,787	0.7130	$ 132,464
Annual Costs - Year 6	6	$185,787	0.6663	$ 123,798
Annual Costs - Year 7	7	$185,787	0.6227	$ 115,699
Annual Costs - Year 8	8	$185,787	0.5820	$ 108,130
Annual Costs - Year 9	9	$185,787	0.5439	$ 101,056
Annual Costs - Year 10	10	$185,787	0.5083	$ 94,445
5-Year Periodic Costs - Year 10	10	$10,000	0.5083	$ 5,083
Annual Costs - Year 11	11	$185,787	0.4751	$ 88,266
Annual Costs - Year 12	12	$185,787	0.4440	$ 82,492
Annual Costs - Year 13	13	$0	0.4150	$ -
Annual Costs - Year 14	14	$0	0.3878	$ -
Annual Costs - Year 15	15	$0	0.3624	$ -
5-Year Periodic Costs - Year 15	15	$10,000	0.3624	$ 3,624
Total:		$2,220,092		$1,656,455

Notes:

1. See IAFS (Wood, 2019) for unit cost assumption details.
2. Annual pumping rate based on pumping rate provided (GPM) at an operating time of 80%.
3. Years of operation rounded up to nearest half year for annual costs.
4. Present value based on a 7% discount rate.
5. DAPL per-gallon treatment cost provided by Olin is assumed to include all construction, infrastructure, and O&M associated with design and implementation of on-site treatment.

Table 4.3-3
Cost Estimate for Alternative DAPL 2B: OPWD (Jewel Drive) DAPL Pool
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Description	Unit Cost	Units	Quantity	Extended Cost
Capital Costs				
Limited Action - Deed Restriction Notification	$12,400	LS	0	$0
Replacement DAPL Extraction Well	$45,000	LS	1	$45,000
Geophysical Investigation	$15,000	LS	1	$15,000
Additional DAPL Extraction Well(s)				
Mobilization	$16,000	LS	1	$16,000
Temporary Facilities and Controls	$13,500	LS	1	$13,500
Pump Enclosure Vault	$31,000	LS	3	$93,000
Extraction Pump, Controls and Pump Enclosure Piping	$31,000	LS	3	$93,000
Underground DAPL Discharge Piping	$168	LF	300	$50,400
Electrical and Instrumentation Systems	$175,000	LS	0.5	$87,500
Multi-Port Monitoring Wells	$35,000	LS	6	$210,000
Induction Logging Wells	$8,000	LS	6	$48,000
System Start-up and Prove-Out	$15,000	LS	1	$15,000
Subtotal				$626,400
Contingency			20%	$125,280
Total Capital Costs				$811,680
Annual Costs				
Electricity	$1,800	month	12	$21,600
O&M Labor	$30,000	LS	0	$0
DAPL on-site treatment: capital, O&M and solids disposal	$1.31	gallons	420,480	$550,829
System Performance Monitoring	$2,880	event	12	$34,560
Monitoring and Performance Reports	$20,000	LS	1	$20,000
Total Annual Costs				$626,989
5-Year Periodic Costs				
5-Year Review Report	$20,000	LS	1	$20,000
Deed Restriction Verification and Maintenance	$5,000	LS	0	$0

Table 4.3-3
Cost Estimate for Alternative DAPL 2B: OPWD (Jewel Drive) DAPL Pool
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Present Value Analysis				
Cost Type	**Year**	**Total Cost**	**Discount Factor**	**Present Value**
Capital Costs - Year 0	0	$811,680	1.0000	$ 811,680
Annual Costs - Year 1	1	$626,989	0.9346	$ 585,971
Annual Costs - Year 2	2	$626,989	0.8734	$ 547,636
Annual Costs - Year 3	3	$313,494	0.8163	$ 255,905
Annual Costs - Year 4	4	$0	0.7629	$ -
5-Year Periodic Costs - Year 5	5	$20,000	0.7130	$ 14,260
Annual Costs - Year 5	5	$0	0.7130	$ -
Annual Costs - Year 6	6	$0	0.6663	$ -
Annual Costs - Year 7	7	$0	0.6227	$ -
Annual Costs - Year 8	8	$0	0.5820	$ -
Annual Costs - Year 9	9	$0	0.5439	$ -
Annual Costs - Year 10	10	$0	0.5083	$ -
5-Year Periodic Costs - Year 10	10	$0	0.5083	$ -
Annual Costs - Year 11	11	$0	0.4751	$ -
Annual Costs - Year 12	12	$0	0.4440	$ -
Annual Costs - Year 13	13	$0	0.4150	$ -
Annual Costs - Year 14	14	$0	0.3878	$ -
Annual Costs - Year 15	15	$0	0.3624	$ -
5-Year Periodic Costs - Year 15	15	$0	0.3624	$ -
Total:		$2,399,152		$2,215,452

Notes:

1. See IAFS (Wood, 2019) for unit cost assumption details. Annual electricity, monitoring costs (red) assumed to double for additional pumping well scenario.
2. Annual pumping rate based on pumping rate provided (GPM) at an operating time of 80%. Calculated pumping rate shown below.
3. Years of operation rounded up to nearest half year for annual costs.
4. Present value based on a 7% discount rate.
5. DAPL per-gallon treatment cost provided by Olin is assumed to include all construction, infrastructure, and O&M associated with design and implementation of on-site treatment.

target pumping rate:	1	gpm
operating time:	80%	
planned pumping rate:	420,480	gal/year

Table 4.3-4
Cost Estimate for Alternative DAPL 3A: Containment Area DAPL Pool
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Description	Unit Cost	Units	Quantity	Extended Cost
Capital Costs				
Limited Action - Deed Restriction Notification	$12,400	LS	0	$0
Remedial Design	$40,000	LS	1	$40,000
DAPL Extraction System Installation				
Mobilization	$15,000	LS	1	$15,000
Temporary Facilities and Controls	$16,000	LS	1	$16,000
Pump Enclosure Vault	$13,500	LS	1	$13,500
Extraction Pump, Controls and Pump Enclosure Piping	$31,000	LS	1	$31,000
Underground DAPL Discharge Piping	$140	LF	0	$0
Above Grade DAPL Discharge Piping - Field Fabricated	$168	LF	350	$58,800
Above Grade DAPL Discharge Piping - Prefabricated	$215	LF	0	$0
DAPL Storage Tank	$72,000	LS	1	$72,000
Inspection/Cleanout Structures	$6,125	each	1	$6,125
Leak Detection Manhole	$5,800	LS	1	$5,800
Tank Unloading Piping	$7,500	LS	0	$0
Above Grade Pipe Support Systems	$38,750	LS	0.5	$19,375
Railroad Crossing	$12,000	LS	0	$0
Chain Link Fence Single (Man) Gates	$750	each	0	$0
Electrical and Instrumentation Systems	$175,000	LS	0.25	$43,750
Multi-Port Monitoring Wells	$35,000	LS	2	$70,000
Induction Logging Wells	$8,000	LS	2	$16,000
System Start-up and Prove-Out	$15,000	LS	1	$15,000
Subtotal				$382,350
Contingency			20%	$76,470
Total Capital Costs				$498,820
Annual Costs				
Electricity	$900	month	12	$10,800
O&M Labor	$30,000	LS	0	$0
DAPL on-site treatment: capital, O&M and solids disposal	$1.31	gallons	105,120	$137,707
System Performance Monitoring	$1,440	event	12	$17,280
Monitoring and Performance Reports	$20,000	LS	1	$20,000
Total Annual Costs				$185,787
5-Year Periodic Costs				
5-Year Review Report	$20,000	LS	1	$20,000
Deed Restriction Verification and Maintenance	$5,000	LS	0	$0

Table 4.3-4
Cost Estimate for Alternative DAPL 3A: Containment Area DAPL Pool
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Present Value Analysis				
Cost Type	**Year**	**Total Cost**	**Discount Factor**	**Present Value**
Capital Costs - Year 0	0	$498,820	1.0000	$ 498,820
Annual Costs - Year 1	1	$185,787	0.9346	$ 173,633
Annual Costs - Year 2	2	$185,787	0.8734	$ 162,274
Annual Costs - Year 3	3	$92,894	0.8163	$ 75,829
Annual Costs - Year 4	4	$0	0.7629	$ -
Annual Costs - Year 5	5	$0	0.7130	$ -
5-Year Periodic Costs - Year 5	5	$20,000	0.7130	$ 14,260
Total:		$983,288		$924,815

Notes:

1. See IAFS (Wood, 2019) for unit cost assumption details.
2. Annual pumping rate based on pumping rate provided (GPM) at an operating time of 80%.
3. Years of operation rounded up to nearest half year for annual costs.
4. Present value based on a 7% discount rate.
5. DAPL per-gallon treatment cost provided by Olin is assumed to include all construction, infrastructure, and O&M associated with design and implementation of on-site treatment.

Table 4.3-5
Cost Estimate for Alternative DAPL 3B: Containment Area DAPL Pool
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Description	Unit Cost	Units	Quantity	Extended Cost
Capital Costs				
Limited Action - Deed Restriction Notification	$12,400	LS	0	$0
Remedial Design	$40,000	LS	1	$40,000
DAPL Extraction System Installation				
Mobilization	$15,000	LS	1	$15,000
Temporary Facilities and Controls	$16,000	LS	1	$16,000
Pump Enclosure Vault	$13,500	LS	4	$54,000
Extraction Pump, Controls and Pump Enclosure Piping	$31,000	LS	4	$124,000
Underground DAPL Discharge Piping	$140	LF	0	$0
Above Grade DAPL Discharge Piping - Field Fabricated	$168	LF	600	$100,800
Above Grade DAPL Discharge Piping - Prefabricated	$215	LF	0	$0
DAPL Storage Tank	$72,000	LS	1	$72,000
Inspection/Cleanout Structures	$6,125	each	1	$6,125
Leak Detection Manhole	$5,800	LS	1	$5,800
Tank Unloading Piping	$7,500	LS	0	$0
Above Grade Pipe Support Systems	$38,750	LS	0.5	$19,375
Railroad Crossing	$12,000	LS	0	$0
Chain Link Fence Single (Man) Gates	$750	each	0	$0
Electrical and Instrumentation Systems	$175,000	LS	0.25	$43,750
Multi-Port Monitoring Wells	$35,000	LS	7	$245,000
Induction Logging Wells	$8,000	LS	7	$56,000
System Start-up and Prove-Out	$15,000	LS	1	$15,000
Subtotal				$772,850
Contingency			20%	$154,570
Total Capital Costs				$967,420
Annual Costs				
Electricity	$1,800	month	12	$21,600
O&M Labor	$30,000	LS	0	$0
DAPL on-site treatment: capital, O&M and solids disposal	$1.31	gallons	420,480	$550,829
System Performance Monitoring	$2,880	event	12	$34,560
Monitoring and Performance Reports	$20,000	LS	1	$20,000
Total Annual Costs				$626,989
5-Year Periodic Costs				
5-Year Review Report	$20,000	LS	1	$20,000
Deed Restriction Verification and Maintenance	$5,000	LS	0	$0

Table 4.3-5
Cost Estimate for Alternative DAPL 3B: Containment Area DAPL Pool
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Present Value Analysis				
Cost Type	**Year**	**Total Cost**	**Discount Factor**	**Present Value**
Capital Costs - Year 0	0	$967,420	1.0000	$ 967,420
Annual Costs - Year 1	1	$626,989	0.9346	$ 585,971
Annual Costs - Year 2	2	$0	0.8734	$ -
Annual Costs - Year 3	3	$0	0.8163	$ -
Annual Costs - Year 4	4	$0	0.7629	$ -
Annual Costs - Year 5	5	$0	0.7130	$ -
5-Year Periodic Costs - Year 5	10	$20,000	0.5083	$ 10,167
Total:		$1,614,409		$1,563,558

Notes:

1. See IAFS (Wood, 2019) for unit cost assumption details. Annual electricity, monitoring costs (red) assumed to double for additional pumping well scenario.
2. Annual pumping rate based on pumping rate provided (GPM) at an operating time of 80%. Calculated pumping rate shown below.
3. Years of operation rounded up to nearest half year for annual costs.
4. Present value based on a 7% discount rate.
5. DAPL per-gallon treatment cost provided by Olin is assumed to include all construction, infrastructure, and O&M associated with design and implementation of on-site treatment.

target pumping rate:	1	gpm
operating time:	80%	
planned pumping rate:	420,480	gal/year

Table 4.3-6
Cost Estimate for Alternative DAPL 4A: Main Street DAPL Pool
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Description	Unit Cost	Units	Quantity	Extended Cost
Capital Costs				
Limited Action - Deed Restriction Notification	$12,400	LS	0	$0
Geophysical Investigation	$30,000	LS	1	$30,000
Remedial Design	$60,000	LS	1	$60,000
Additional DAPL Extraction Well(s)				
Mobilization	$20,000	LS	1	$20,000
Temporary Facilities and Controls	$16,000	LS	1	$16,000
Pump Enclosure Vault	$13,500	LS	3	$40,500
Extraction Pump, Controls and Pump Enclosure Piping	$31,000	LS	3	$93,000
Underground DAPL Discharge Piping	$140	LF	2000	$280,000
Above Grade DAPL Discharge Piping	$200	LF	550	$110,000
DAPL Storage Tank	$72,000	LS	2	$144,000
Inspection/Cleanout Structures	$6,125	each	8	$49,000
Leak Detection Manhole	$5,800	LS	1	$5,800
Tank Unloading Piping	$7,500	LS	2	$15,000
Above Grade Pipe Support Systems	$38,750	LS	1	$38,750
Railroad Crossing	$12,000	LS	1	$12,000
Chain Link Fence Single (Man) Gates	$750	each	0	$0
Electrical and Instrumentation Systems	$262,500	LS	1	$262,500
Multi-Port Monitoring Wells	$35,000	LS	3	$105,000
Induction Logging Wells	$8,000	LS	3	$24,000
System Start-up and Prove-Out	$15,000	LS	1	$15,000
Subtotal				$1,230,550
Contingency			20%	$246,110
Total Capital Costs				$1,566,660
Annual Costs				
Electricity	$900	month	12	$10,800
O&M Labor	$30,000	LS	0	$0
DAPL on-site treatment: capital, O&M and solids disposal	$1.31	gallons	630,720	$826,243
System Performance Monitoring	$4,320	event	12	$51,840
Monitoring and Performance Reports	$20,000	LS	1	$20,000
Total Annual Costs				$908,883
5-Year Periodic Costs				
5-Year Review Report	$20,000	LS	1	$20,000
Deed Restriction Verification and Maintenance	$5,000	LS	0	$0

Table 4.3-6
Cost Estimate for Alternative DAPL 4A: Main Street DAPL Pool
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Present Value Analysis				
Cost Type	**Year**	**Total Cost**	**Discount Factor**	**Present Value**
Capital Costs - Year 0	0	$1,566,660	1.0000	$ 1,566,660
Annual Costs - Year 1	1	$908,883	0.9346	$ 849,424
Annual Costs - Year 2	2	$908,883	0.8734	$ 793,854
Annual Costs - Year 3	3	$908,883	0.8163	$ 741,919
Annual Costs - Year 4	4	$908,883	0.7629	$ 693,383
5-Year Periodic Costs - Year 5	5	$20,000	0.7130	$ 14,260
Annual Costs - Year 5	5	$908,883	0.7130	$ 648,021
Annual Costs - Year 6	6	$908,883	0.6663	$ 605,627
Annual Costs - Year 7	7	$908,883	0.6227	$ 566,007
Annual Costs - Year 8	8	$908,883	0.5820	$ 528,978
Annual Costs - Year 9	9	$908,883	0.5439	$ 494,372
Annual Costs - Year 10	10	$908,883	0.5083	$ 462,030
5-Year Periodic Costs - Year 10	10	$20,000	0.5083	$ 10,167
Annual Costs - Year 11	11	$908,883	0.4751	$ 431,804
Annual Costs - Year 12	12	$908,883	0.4440	$ 403,555
Annual Costs - Year 13	13	$908,883	0.4150	$ 377,154
Annual Costs - Year 14	14	$908,883	0.3878	$ 352,481
Annual Costs - Year 15	15	$908,883	0.3624	$ 329,421
5-Year Periodic Costs - Year 15	15	$20,000	0.3624	$ 7,249
Annual Costs - Year 16	16	$908,883	0.3387	$ 307,870
Annual Costs - Year 17	17	$908,883	0.3166	$ 287,729
Annual Costs - Year 18	18	$908,883	0.2959	$ 268,906
Annual Costs - Year 19	19	$908,883	0.2765	$ 251,314
Annual Costs - Year 20	20	$908,883	0.2584	$ 234,873
5-Year Periodic Costs - Year 20	20	$20,000	0.2584	$ 5,168
Total:		$19,824,324		$11,232,226

Notes:

1. See IAFS (Wood, 2019) for unit cost assumption details.
2. Annual pumping rate based on pumping rate provided (GPM) at an operating time of 80%.
3. Years of operation rounded up to nearest half year for annual costs.
4. Present value based on a 7% discount rate.
5. DAPL per-gallon treatment cost provided by Olin is assumed to include all construction, infrastructure, and O&M associated with design and implementation of on-site treatment.

target pumping rate:	1.5	gpm
operating time:	80%	
planned pumping rate:	630,720	gal/year

Table 4.3-7
Cost Estimate for Alternative DAPL 4B: Main Street DAPL Pool
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Description	Unit Cost	Units	Quantity	Extended Cost
Capital Costs				
Limited Action - Deed Restriction Notification	$12,400	LS	0	$0
Geophysical Investigation	$30,000	LS	1	$30,000
Remedial Design	$60,000	LS	1	$60,000
Additional DAPL Extraction Well(s)				
Mobilization	$20,000	LS	1	$20,000
Temporary Facilities and Controls	$16,000	LS	1	$16,000
Pump Enclosure Vault	$13,500	LS	12	$162,000
Extraction Pump, Controls and Pump Enclosure Piping	$31,000	LS	12	$372,000
Underground DAPL Discharge Piping	$140	LF	3000	$420,000
Above Grade DAPL Discharge Piping	$200	LF	550	$110,000
DAPL Storage Tank	$72,000	LS	2	$144,000
Inspection/Cleanout Structures	$6,125	each	8	$49,000
Leak Detection Manhole	$5,800	LS	1	$5,800
Tank Unloading Piping	$7,500	LS	2	$15,000
Above Grade Pipe Support Systems	$38,750	LS	1	$38,750
Railroad Crossing	$12,000	LS	1	$12,000
Chain Link Fence Single (Man) Gates	$750	each	0	$0
Electrical and Instrumentation Systems	$262,500	LS	1	$262,500
Multi-Port Monitoring Wells	$35,000	LS	24	$840,000
Induction Logging Wells	$8,000	LS	24	$192,000
System Start-up and Prove-Out	$15,000	LS	1	$15,000
Subtotal				$2,674,050
Contingency			20%	$534,810
Total Capital Costs				$3,298,860
Annual Costs				
Electricity	$1,800	month	12	$21,600
O&M Labor	$30,000	LS	0	$0
DAPL on-site treatment: capital, O&M and solids disposal	$1.31	gallons	2,522,880	$3,304,973
System Performance Monitoring	$8,640	event	12	$103,680
Monitoring and Performance Reports	$20,000	LS	1	$20,000
Total Annual Costs				$3,450,253
5-Year Periodic Costs				
5-Year Review Report	$20,000	LS	1	$20,000
Deed Restriction Verification and Maintenance	$5,000	LS	0	$0

Table 4.3-7
Cost Estimate for Alternative DAPL 4B: Main Street DAPL Pool
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Present Value Analysis				
Cost Type	**Year**	**Total Cost**	**Discount Factor**	**Present Value**
Capital Costs - Year 0	0	$3,298,860	1.0000	$ 3,298,860
Annual Costs - Year 1	1	$3,450,253	0.9346	$ 3,224,535
Annual Costs - Year 2	2	$3,450,253	0.8734	$ 3,013,584
Annual Costs - Year 3	3	$3,450,253	0.8163	$ 2,816,434
Annual Costs - Year 4	4	$3,450,253	0.7629	$ 2,632,181
5-Year Periodic Costs - Year 5	5	$20,000	0.7130	$ 14,260
Annual Costs - Year 5	5	$3,450,253	0.7130	$ 2,459,983
Annual Costs - Year 6	6	$1,725,126	0.6663	$ 1,149,525
Annual Costs - Year 7	7	$0	0.6227	$ -
Annual Costs - Year 8	8	$0	0.5820	$ -
Annual Costs - Year 9	9	$0	0.5439	$ -
Annual Costs - Year 10	10	$0	0.5083	$ -
5-Year Periodic Costs - Year 10	10	$10,000	0.5083	$ 5,083
Annual Costs - Year 11	11	$0	0.4751	$ -
Annual Costs - Year 12	12	$0	0.4440	$ -
Annual Costs - Year 13	13	$0	0.4150	$ -
Annual Costs - Year 14	14	$0	0.3878	$ -
Annual Costs - Year 15	15	$0	0.3624	$ -
5-Year Periodic Costs - Year 15	15	$0	0.3624	$ -
Total:		$22,305,250		$18,614,445

Notes:

1. See IAFS (Wood, 2019) for unit cost assumption details. Annual electricity, monitoring costs (red) assumed to double for additional pumping well scenario.
2. Annual pumping rate based on pumping rate provided (GPM) at an operating time of 80%. Calculated pumping rate shown below.
3. Years of operation rounded up to nearest half year for annual costs.
4. Present value based on a 7% discount rate.
5. DAPL per-gallon treatment cost provided by Olin is assumed to include all construction, infrastructure, and O&M associated with design and implementation of on-site treatment.

target pumping rate:	6	gpm
operating time:	80%	
planned pumping rate:	2,522,880	gal/year

Table 4.4-1
Cost Estimate for Groundwater Hot Spot Alternative GW 2
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

NOTES

Groundwater Alternative 2 (GW 2) consists of Institutional Controls; groundwater extraction via 2 new groundwater hot spot extraction wells within the 11,000 ng/L NDMA contour; conveyance of extracted groundwater; treatment via new water treatment plant; discharge to surface water; groundwater monitoring; and Five-Year Reviews.

CAPITAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Deed Restriction Modification and Notice of Activity and Use Limitations	1	LS	$12,400	$12,400	Assumes 24 hours staff effort, and $10,000 for legal fees
New Groundwater Extraction Wells Installation and Piping					
Mobilization	1	LS	$20,000	$20,000	Estimate from Environmental Remediation Contractor
Temporary Facilities and Controls	1	LS	$16,000	$16,000	Estimate from Environmental Remediation Contractor
Access/clearing - Public Roads to MMB Edge	1	LS	$280,000	$280,000	Estimate from Environmental Remediation Contractor
Gravel road from Public Road to MMB Edge	14760	SF	$6	$88,560	Estimate from Environmental Remediation Contractor
Pond Board Road into Maple Meadow Brook	0.2	1,000 LF	$1,214,000	$242,800	Estimate from Environmental Remediation Contractor
Wetland Restoration	1	AC	$20,000	$20,000	NOAA Cost for Northeastern US Wetlands Restoration
Extraction Well Drilling and Construction (wells located within MMB)	2	LS	$120,000	$240,000	Estimate based on similar projects
Pre-Cast Pump Enclosure Vaults for Wells in MMB	2	LS	$45,000	$90,000	Estimate
Power Drop & Electrical	1	LS	$250,000	$250,000	Estimate
Extraction Pump, Controls and Pump Enclosure Piping	2	LS	$31,000	$62,000	Estimate from Environmental Remediation Contractor
Purchase and Installation of Dual-Walled Conveyance Piping (Outside MMB)	4500	LF	$215	$967,500	Excavate to 5 ft. depth, import granular material for bedding and backfill, and backfill to replace excavated material without compaction
Purchase and Installation of Dual-Walled Conveyance Piping (Within MMB)	200	LF	$538	$107,500	Contractor estimate plus escalation factor for working within MMB
Trenching (outside MMB)	4500	LF	$70	$315,000	Estimate from Environmental Remediation Contractor
Trenching (within MMB)	200	LF	$175	$35,000	Estimate from Environmental Remediation Contractor
Purchase of Single-Walled Discharge Pipe	4240	LF	$40	$169,600	Estimate assumes effluent discharge piping will share main trunk line trench for conveyance piping
New Water Treatment Plant					
Building Housing New Water Treatment Plant	1	LS	$360,000	$360,000	Gen. Req., BMPs, Site Prep., Building
Civil Design / Site Work	1	LS	$280,000	$280,000	
Pretreatment & Breakpoint Chlorination Systems	1	each	$320,000	$320,000	Budgetary Price from Treatment System Sales Reps
Solids Handling System	1	each	$80,000	$80,000	
UV Oxidation Units	1	each	$152,800	$152,800	Budgetary Price from UV System Sales Engineer
GAC Unit for High UV Transmittance	1	each	$33,600	$33,600	Budgetary Price from GAC Industrial Process Rep
Installation of Treatment Equipment and Interconnecting Piping	1	each	$180,000	$180,000	
Connection and Installation of Single-Walled Discharge Pipe from New Treatment Plant to Surface Water /Diffusers	4240	linear feet	$150	$636,000	Estimate from Environmental Remediation Contractor
Electrical and Instrumentation Systems	1	LS	$140,000	$140,000	Estimate from Environmental Remediation Contractor
System Startup and Prove Out	1	LS	$36,000	$36,000	Estimate from Environmental Remediation Contractor
NPDES Surface Water Discharge					
NPDES Permitting Support	220	T&M	$100	$22,000	Based on similar projects
Contingency	1	LS	20%	$1,031,000	
Remedial Design (10% of Capital)	1	LS	$618,000	$618,000	Based on similar projects and design of existing system
Pre-Design Investigation	1	LS	$40,000	$40,000	Based on similar projects
Construction Oversight (10% of Capital)	1	LS	$618,000	$618,000	
Remedial Action Report	1	LS	$10,000	$10,000	Based on similar projects
		TOTAL CAPITAL COSTS		$7,474,000	

ANNUAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Annual Extraction Well Operation Costs					
Annual Electricity Costs	261293	kWhr	$0.21	$54,872	
Annual Solids Removal Costs and Breakpoint Chlorination					
Chemicals	1	LS	$20,000	$20,000	
Solids Disposal	1	LS	$20,000	$20,000	
Annual GAC	1	Event	$24,000	$24,000	
UV Oxidation System Annual Operation Costs					
Annual Electricity Costs	12	months	$6,876	$82,515	Estimate from UV vendor, assuming $0.21/kWh
Lamp Replacement Costs	12	months	$830	$9,959	Estimate from UV unit vendor
System Performance Monitoring	12	event	$1,152	$13,824	
Misc. Equipment Maintenance	1	YR	$17,747.20	$17,747	1% of Treatment Equipment/Plant Capital
O&M Labor	1	YR	$120,000	$120,000	1-Full Time Operator, 2nd person for some O&M activities
Monitoring and Performance Reports	1	LS	$20,000	$20,000	Based on costs for similar sites and reporting
		TOTAL ANNUAL COSTS		$382,917	

Table 4.4-1
Cost Estimate for Groundwater Hot Spot Alternative GW 2
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

5-YEAR PERIODIC COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
5-Year Review Report	1	LS	$35,000	$35,000	Incremental Costs Only - Will be performed site-wide
Verification and Maintenance of Deed Restriction and Notice of Activity and Use Limitations	0	LS	$5,000	$0	Performed Internally to Olin - Incremental Costs Only
			TOTAL 5-YEAR PERIODIC COSTS	$35,000	

Cost Type	Year	Total Cost	Discount Factor	Present Value	Note
Capital Costs	0	$7,474,000	1.0000	$7,474,000	
Annual Costs	1	$382,917	0.9346	$357,867	
Annual Costs	2	$382,917	0.8734	$334,455	
Annual Costs	2.5	$191,459	0.8444	$161,665	
Annual Costs	4	$0	0.7629	$0	
Annual Costs	5	$0	0.7130	$0	
5-Year Review Report and IC Maintenance	5	$35,000	0.7130	$24,955	
Annual Costs	6	$0	0.6663	$0	
Annual Costs	7	$0	0.6227	$0	
Annual Costs	8	$0	0.5820	$0	
Annual Costs	9	$0	0.5439	$0	
Annual Costs	10	$0	0.5083	$0	
5-Year Review Report and IC Maintenance	10	$35,000	0.5083	$17,792	
Annual Costs	11	$0	0.4751	$0	
Annual Costs	12	$0	0.4440	$0	
Annual Costs	13	$0	0.4150	$0	
Annual Costs	14	$0	0.3878	$0	
Annual Costs	15	$0	0.3624	$0	
5-Year Review Report and IC Maintenance	15	$35,000	0.3624	$12,686	
Annual Costs	16	$0	0.3387	$0	
Annual Costs	17	$0	0.3166	$0	
Annual Costs	18	$0	0.2959	$0	
Annual Costs	19	$0	0.2765	$0	
Annual Costs	20	$0	0.2584	$0	
5-Year Review Report and IC Maintenance	20	$35,000	0.2584	$9,045	
Annual Costs	21	$0	0.2415	$0	
Annual Costs	22	$0	0.2257	$0	
Annual Costs	23	$0	0.2109	$0	
Annual Costs	24	$0	0.1971	$0	
Annual Costs	25	$0	0.1842	$0	
5-Year Review Report and IC Maintenance	25	$35,000	0.1842	$6,449	
Annual Costs	26	$0	0.1722	$0	
Annual Costs	27	$0	0.1609	$0	
Annual Costs	28	$0	0.1504	$0	
Annual Costs	29	$0	0.1406	$0	
Annual Costs	30	$0	0.1314	$0	
5-Year Review Report and IC Maintenance	30	$35,000	0.1314	$4,598	
		$8,641,293		$8,403,510	

TOTAL COST OF ALTERNATIVE	**$8,641,000 ***
TOTAL PRESENT WORTH OF ALTERNATIVE	**$8,404,000 ***
PROJECT TREATMENT DURATION	**2.5 Years**
OVERALL PROJECT DURATION	**30 Years**

* Total Cost and Total Present Worth are rounded to the nearest $1000

Prepared/Date: BLR 1/14/20
Checked/Date: MCM 4/29/20

Table 4.4-2
Cost Estimate for Groundwater Hot Spot Alternative GW 3
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

NOTES

Groundwater Alternative 3 (GW 3) consists of Institutional Controls, groundwater extraction via 3 new groundwater hot spot extraction wells, treatment via new water treatment plant, discharge to surface water, groundwater monitoring, and five-year site reviews.

CAPITAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Deed Restriction Modification and Notice of Activity and Use Limitations	1	LS	$12,400	$12,400	Assumes 24 hours staff effort, and $10,000 for legal fees
New Groundwater Extraction Wells Installation and Piping					
Mobilization	1	LS	$20,000	$20,000	Estimate from Environmental Remediation Contractor
Temporary Facilities and Controls	1	LS	$16,000	$16,000	Estimate from Environmental Remediation Contractor
Access/clearing - Public Roads to MMB Edge	1	LS	$280,000	$280,000	Estimate from Environmental Remediation Contractor
Gravel road from Public Road to MMB Edge	14760	SF	$6	$88,560	Estimate from Environmental Remediation Contractor
Pond Board Road into Maple Meadow Brook	0.3	1,000 LF	$1,214,000	$364,200	Estimate from Environmental Remediation Contractor
Wetland Restoration	1	AC	$20,000	$20,000	NOAA Cost for Northeastern US Wetlands Restoration
Extraction Well Drilling and Construction (wells within MMB)	3	LS	$120,000	$360,000	Estimate based on similar projects
Pre-Cast Pump Enclosure Vaults for Wells in MMB	3	LS	$45,000	$135,000	Estimate
Power Drop & Electrical	1	LS	$250,000	$250,000	Estimate
Extraction Pump, Controls and Pump Enclosure Piping	3	LS	$31,000	$93,000	Estimate from Environmental Remediation Contractor
Purchase and Installation of Dual-Walled Conveyance Piping (Outside MMB)	5,000	LF	$215	$1,075,000	Excavate to 5 ft. depth, import granular material for bedding and backfill, and backfill to replace excavated material without compaction
Purchase and Installation of Dual-Walled Conveyance Piping (Within MMB)	300	LF	$538	$161,250	Contractor estimate plus escalation factor for working within MMB
Trenching (outside MMB)	5,000	LF	$70	$350,000	Estimate from Environmental Remediation Contractor
Trenching (within MMB)	300	LF	$175	$52,500	Estimate from Environmental Remediation Contractor
Purchase of Single-Walled Discharge Pipe	4240	LF	$40	$169,600	Estimate assumes effluent discharge piping will share main trunk line trench for conveyance piping
New Water Treatment Plant					
Building Housing New Water Treatment Plant	1	LS	$360,000	$360,000	Gen. Req., BMPs, Site Prep., Building
Civil Design / Site Work	1	LS	$280,000	$280,000	
Pretreatment & Breakpoint Chlorination Systems	1	each	$320,000	$320,000	Budgetary Price from Treatment System Sales Reps
Solids Handling System	1	each	$80,000	$80,000	
UV Oxidation Units	1	each	$152,800	$152,800	Budgetary Price from UV System Sales Engineer
GAC Unit for High UV Transmittance	1	each	$33,600	$33,600	Budgetary Price from GAC Industrial Process Rep
Installation of Equipment and Interconnecting Piping	1	each	$180,000	$180,000	
Connection and Installation of Single-Walled Discharge Pipe from New Treatment Plant to Surface Water /Diffusers	4240	linear feet	$150	$636,000	Estimate from Environmental Remediation Contractor
Electrical and Instrumentation Systems	1	LS	$140,000	$140,000	Estimate from Environmental Remediation Contractor
System Startup and Prove Out	1	LS	$36,000	$36,000	Estimate from Environmental Remediation Contractor
NPDES Surface Water Discharge					
NPDES Permitting Support	220	T&M	$100	$22,000	Based on similar projects
Contingency	1	LS	20%	$1,137,582	
Remedial Design (10% of Capital)	1	LS	$681,309	$681,309	Based on similar projects and design of existing system
Pre-Design Investigation	1	LS	$40,000	$40,000	Based on similar projects
Construction Oversight (10% of Capital)	1	LS	$681,309	$681,309	
Remedial Action Report	1	LS	$10,000	$10,000	Based on similar projects
		TOTAL CAPITAL COSTS		$8,238,110	

ANNUAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Annual Extraction Well Operation Costs					
Annual Electricity Costs	261293	kWhr	$0.21	$54,871.59	
Annual Solids Removal Costs and Breakpoint Chlorination					
Chemicals	1	LS	$20,000	$20,000	
Solids Disposal	1	LS	$20,000	$20,000	
Annual GAC	1	Event	$24,000	$24,000	
UV Oxidation System Annual Operation Costs					
Annual Electricity Costs	12	months	$6,876	$82,515.30	Estimate from UV vendor, assuming $0.21/kWh
Lamp Replacement Costs	12	months	$830	$9,959	Estimate from UV unit vendor
System Performance Monitoring	12	event	$1,152	$13,824	
Misc. Equipment Maintenance	1	YR	$17,747.20	$17,747	1% of Treatment Equipment/Plant Capital
O&M Labor	1	YR	$120,000	$120,000	1-Full Time Operator, 2nd person for some O&M activities.
Monitoring and Performance Reports	1	LS	$20,000	$20,000	Based on costs for similar sites and reporting
		TOTAL ANNUAL COSTS		$382,917	

Table 4.4-2
Cost Estimate for Groundwater Hot Spot Alternative GW 3
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Description	Quantity	Units	Unit Cost	Extended Cost	Note
5-Year Review Report	1	LS	$35,000	$35,000	Incremental Costs Only - Will be performed site-wide
Verification and Maintenance of Deed Restriction and Notice of Activity and Use Limitations	0	LS	$5,000	$0	Performed Internally to Olin - Incremental Costs Only
			TOTAL 5-YEAR PERIODIC COSTS	$35,000	

Cost Type	Year	Total Cost	Discount Factor	Present Value	Note
Capital Costs	0	$8,238,110	1.0000	$8,238,110	
Annual Costs	1	$382,917	0.9346	$357,867	
Annual Costs	2	$382,917	0.8734	$334,455	
Annual Costs	3	$0	0.8163	$0	
Annual Costs	4	$0	0.7629	$0	
Annual Costs	5	$0	0.7130	$0	
5-Year Review Report and IC Maintenance	5	$35,000	0.7130	$24,955	
Annual Costs	6	$0	0.6663	$0	
Annual Costs	7	$0	0.6227	$0	
Annual Costs	8	$0	0.5820	$0	
Annual Costs	9	$0	0.5439	$0	
Annual Costs	10	$0	0.5083	$0	
5-Year Review Report and IC Maintenance	10	$35,000	0.5083	$17,792	
Annual Costs	11	$0	0.4751	$0	
Annual Costs	12	$0	0.4440	$0	
Annual Costs	13	$0	0.4150	$0	
Annual Costs	14	$0	0.3878	$0	
Annual Costs	15	$0	0.3624	$0	
5-Year Review Report and IC Maintenance	15	$35,000	0.3624	$12,686	
Annual Costs	16	$0	0.3387	$0	
Annual Costs	17	$0	0.3166	$0	
Annual Costs	18	$0	0.2959	$0	
Annual Costs	19	$0	0.2765	$0	
Annual Costs	20	$0	0.2584	$0	
5-Year Review Report and IC Maintenance	20	$35,000	0.2584	$9,045	
Annual Costs	21	$0	0.2415	$0	
Annual Costs	22	$0	0.2257	$0	
Annual Costs	23	$0	0.2109	$0	
Annual Costs	24	$0	0.1971	$0	
Annual Costs	25	$0	0.1842	$0	
5-Year Review Report and IC Maintenance	25	$35,000	0.1842	$6,449	
Annual Costs	26	$0	0.1722	$0	
Annual Costs	27	$0	0.1609	$0	
Annual Costs	28	$0	0.1504	$0	
Annual Costs	29	$0	0.1406	$0	
Annual Costs	30	$0	0.1314	$0	
5-Year Review Report and IC Maintenance	30	$35,000	0.1314	$4,598	
		$9,213,945		$9,005,955	

TOTAL COST OF ALTERNATIVE	**$9,214,000** *
TOTAL PRESENT WORTH OF ALTERNATIVE	**$9,006,000** *
PROJECT TREATMENT DURATION	**1.6 Years**
OVERALL PROJECT DURATION	**30 Years**

* Total Cost and Total Present Worth are rounded to the nearest $1000

Prepared/Date: BLR 1/14/20
Checked/Date: MCM 4/29/20

Table 4.4-3
Cost Estimate for Groundwater Hot Spot Alternative GW 4
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

NOTES

Groundwater Alternative 4 (GW 4) consists of Institutional Controls, groundwater extraction via 6 new groundwater hot spot extraction wells, treatment via new water treatment plant, discharge to surface water, groundwater monitoring, and five-year site reviews.

CAPITAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Deed Restriction Modification and Notice of Activity and Use Limitations	1	LS	$12,400	$12,400	Assumes 24 hours staff effort, and $10,000 for legal fees
New Groundwater Extraction Wells Installation and Piping					
Mobilization	1	LS	$20,000	$20,000	Estimate from Environmental Remediation Contractor
Temporary Facilities and Controls	1	LS	$16,000	$16,000	Estimate from Environmental Remediation Contractor
Access/clearing - Public Roads to MMB Edge	1	LS	$280,000	$280,000	Estimate from Environmental Remediation Contractor
Gravel road from Public Road to MMB Edge	14760	SF	$6	$88,560	Estimate from Environmental Remediation Contractor
Pond Board Road into Maple Meadow Brook	0.7	1,000 LF	$1,214,000	$849,800	Estimate from Environmental Remediation Contractor
Wetland Restoration	1	AC	$20,000	$20,000	NOAA Cost for Northeastern US Wetlands Restoration
Extraction Well Drilling and Construction	2	LS	$60,000	$120,000	Estimate based on similar projects
Extraction Well Drilling and Construction (wells located within MMB)	4	LS	$120,000	$480,000	Estimate based on similar projects
Pump Enclosure Vault	3	LS	$13,500	$40,500	Estimate from Environmental Remediation Contractor
Pre-Cast Pump Enclosure Vaults for Wells in MMB	3	LS	$45,000	$135,000	Estimate
Power Drop & Electrical	1	LS	$250,000	$250,000	Estimate
Extraction Pump, Controls and Pump Enclosure Piping	6	LS	$31,000	$186,000	Estimate from Environmental Remediation Contractor
Purchase and Installation of Dual-Walled Conveyance Piping (Outside MMB)	5,200	LF	$215	$1,118,000	Excavate to 5 ft. depth, import granular material for bedding and backfill, and backfill to replace excavated material without compaction
Purchase and Installation of Dual-Walled Conveyance Piping (Within MMB)	700	LF	$538	$376,250	Contractor estimate plus escalation factor for working within MMB
Trenching (outside MMB)	5,200	LF	$70	$364,000	Estimate from Environmental Remediation Contractor
Trenching (within MMB)	700	LF	$175	$122,500	Estimate from Environmental Remediation Contractor
Connection and Installation of Single-Walled Discharge Pipe from New Treatment Plant to Surface Water /Diffusers	4240	LF	$40	$169,600	Estimate - assumes piping is installed in trench for conveyance piping.
New Water Treatment Plant					
Building Housing New Water Treatment Plant	1	LS	$450,000	$450,000	Gen. Req., BMPs, Site Prep., Building
Civil Design / Site Work	1	LS	$350,000	$350,000	
Pretreatment & Breakpoint Chlorination Systems	1	each	$400,000	$400,000	Budgetary Price from Treatment System Sales Reps
Solids Handling System	1	each	$100,000	$100,000	
UV Oxidation Units	1	each	$191,000	$191,000	Budgetary Price from UV System Sales Engineer
GAC Unit for High UV Transmittance	1	each	$42,000	$42,000	Budgetary Price from GAC Industrial Process Rep
Installation of Equipment and Interconnecting Piping	1	each	$225,000	$225,000	
Connection and Installation of Single-Walled Discharge Pipe from New Treatment Plant to Surface Water /Diffusers	4240	linear feet	$150	$636,000	Estimate from Environmental Remediation Contractor
Electrical and Instrumentation Systems	1	LS	$175,000	$175,000	Estimate from Environmental Remediation Contractor
System Startup and Prove Out	1	LS	$45,000	$45,000	Estimate from Environmental Remediation Contractor
NPDES Surface Water Discharge					
NPDES Permitting Support	220	T&M	$100	$22,000	Based on similar projects
Contingency	1	LS	20%	$1,456,922	
Remedial Design (10% of Capital)	1	LS	$872,913	$872,913	Based on similar projects and design of existing system
Pre-Design Investigation	1	LS	$50,000	$50,000	Based on similar projects
Construction Oversight (10% of Capital)	1	LS	$872,913	$872,913	
Remedial Action Report	1	LS	$10,000	$10,000	Based on similar projects
		TOTAL CAPITAL COSTS		$10,547,358	

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Annual Extraction Well Operation Costs					
Annual Electricity Costs	326617	kWhr	$0.21	$68,589.49	
Annual Solids Removal Costs and Breakpoint Chlorination					
Chemicals	1	LS	$25,000	$25,000	
Solids Disposal	1	LS	$25,000	$25,000	
Annual GAC	1	Event	$30,000	$30,000	
UV Oxidation System Annual Operation Costs					
Annual Electricity Costs	12	months	$8,595	$103,144.13	Estimate from UV vendor, assuming $0.21/kWh
Lamp Replacement Costs	12	months	$1,037	$12,449	Estimate from UV unit vendor
System Performance Monitoring	12	event	$1,440	$17,280	
Misc. Equipment Maintenance	1	YR	$26,140.00	$26,140	1% of Treatment Equipment/Plant Capital
O&M Labor	1	YR	$160,000	$160,000	1-Full Time Operator, 2nd person for some O&M activities.
Monitoring and Performance Reports	1	LS	$20,000	$20,000	Based on costs for similar sites and reporting
		TOTAL ANNUAL COSTS		$487,603	

Table 4.4-3
Cost Estimate for Groundwater Hot Spot Alternative GW 4
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Description	Quantity	Units	Unit Cost	Extended Cost	Note
5-Year Review Report	1	LS	$35,000	$35,000	Incremental Costs Only - Will be performed site-wide
Verification and Maintenance of Deed Restriction and Notice of Activity and Use Limitations	0	LS	$5,000	$0	Performed Internally to Olin - Incremental Costs Only
			TOTAL 5-YEAR PERIODIC COSTS	$35,000	

Cost Type	Year	Total Cost	Discount Factor	Present Value	Note
Capital Costs	0	$10,547,358	1.0000	$10,547,358	
Annual Costs	1	$487,603	0.9346	$455,703	
Annual Costs	2	$487,603	0.8734	$425,891	
Annual Costs	3	$487,603	0.8163	$398,029	
Annual Costs	4	$487,603	0.7629	$371,990	
Annual Costs	5	$487,603	0.7130	$347,654	
5-Year Review Report and IC Maintenance	5	$35,000	0.7130	$24,955	
Annual Costs	6	$487,603	0.6663	$324,910	
Annual Costs	6.5	$243,801	0.6442	$157,051	
Annual Costs	8	$0	0.5820	$0	
Annual Costs	9	$0	0.5439	$0	
Annual Costs	10	$0	0.5083	$0	
5-Year Review Report and IC Maintenance	10	$35,000	0.5083	$17,792	
Annual Costs	11	$0	0.4751	$0	
Annual Costs	12	$0	0.4440	$0	
Annual Costs	13	$0	0.4150	$0	
Annual Costs	14	$0	0.3878	$0	
Annual Costs	15	$0	0.3624	$0	
5-Year Review Report and IC Maintenance	15	$35,000	0.3624	$12,686	
Annual Costs	16	$0	0.3387	$0	
Annual Costs	17	$0	0.3166	$0	
Annual Costs	18	$0	0.2959	$0	
Annual Costs	19	$0	0.2765	$0	
Annual Costs	20	$0	0.2584	$0	
5-Year Review Report and IC Maintenance	20	$35,000	0.2584	$9,045	
Annual Costs	21	$0	0.2415	$0	
Annual Costs	22	$0	0.2257	$0	
Annual Costs	23	$0	0.2109	$0	
Annual Costs	24	$0	0.1971	$0	
Annual Costs	25	$0	0.1842	$0	
5-Year Review Report and IC Maintenance	25	$35,000	0.1842	$6,449	
Annual Costs	26	$0	0.1722	$0	
Annual Costs	27	$0	0.1609	$0	
Annual Costs	28	$0	0.1504	$0	
Annual Costs	29	$0	0.1406	$0	
Annual Costs	30	$0	0.1314	$0	
5-Year Review Report and IC Maintenance	30	$35,000	0.1314	$4,598	
		$13,926,775		$13,104,110	

TOTAL COST OF ALTERNATIVE	**$13,927,000** *
TOTAL PRESENT WORTH OF ALTERNATIVE	**$13,104,000** *
PROJECT TREATMENT DURATION	**6.5 Years**
OVERALL PROJECT DURATION	**30 Years**

* Total Cost and Total Present Worth are rounded to the nearest $1000

Prepared/Date: BLR 1/14/20
Checked/Date: MCM 4/29/20

Table 4.4-4
Cost Estimate for Groundwater Hot Spot Alternative GW 5
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

NOTES

Groundwater Alternative 5 (GW 5) consists of Institutional Controls, groundwater extraction via 12 new groundwater hot spot extraction wells, treatment via new water treatment plant, discharge to surface water, groundwater monitoring, and five-year site reviews.

CAPITAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Deed Restriction Modification and Notice of Activity and Use Limitations	1	LS	$16,120	$16,120	Assumes 24 hours staff effort, and $10,000 for legal fees
New Groundwater Extraction Wells Installation and Piping					
Mobilization	1	LS	$26,000	$26,000	Estimate from Environmental Remediation Contractor
Temporary Facilities and Controls	1	LS	$20,800	$20,800	Estimate from Environmental Remediation Contractor
Access/clearing - Public Roads to MMB Edge	1	LS	$280,000	$280,000	Estimate from Environmental Remediation Contractor
Gravel road from Public Road to MMB Edge	14760	SF	$6	$88,560	Estimate from Environmental Remediation Contractor
Pond Board Road into Maple Meadow Brook	1	1,000 LF	$1,214,000	$1,214,000	Estimate from Environmental Remediation Contractor
Wetland Restoration	1	AC	$20,000	$20,000	NOAA Cost for Northeastern US Wetlands Restoration
Extraction Well Drilling and Construction	8	LS	$60,000	$480,000	Estimate based on similar projects
Extraction Well Drilling and Construction (wells within MMB)	4	LS	$120,000	$480,000	Estimate based on similar projects
Pump Enclosure Vault	8	LS	$13,500	$108,000	Estimate from Environmental Remediation Contractor
Pre-Cast Pump Enclosure Vaults for 3 Wells in MMB and 1 at GW-55D	4	LS	$45,000	$180,000	Estimate
Power Drop & Electrical	1	LS	$250,000	$250,000	Estimate
Extraction Pump, Controls and Pump Enclosure Piping	12	LS	$31,000	$372,000	Estimate from Environmental Remediation Contractor
Purchase and Installation of Dual-Walled Conveyance Piping (Outside MMB)	7,600	LF	$215	$1,634,000	Excavate to 5 ft. depth, import granular material for bedding and backfill, and backfill to replace excavated material without compaction
Purchase and Installation of Dual-Walled Conveyance Piping (Within MMB)	1,000	LF	$538	$537,500	Contractor estimate plus escalation factor for working within MMB
Trenching (outside MMB)	7,600	LF	$70	$532,000	Estimate from Environmental Remediation Contractor
Trenching (within MMB)	1,000	LF	$175	$175,000	Estimate from Environmental Remediation Contractor
Connection and Installation of Single-Walled Discharge Pipe from New Treatment Plant to Surface Water /Diffusers	4240	LF	$40	$169,600	Estimate - assumes piping is installed in trench for conveyance piping.
New Water Treatment Plant					
Building Housing New Water Treatment Plant	1	LS	$585,000	$585,000	Gen. Req., BMPs, Site Prep., Building
Civil Design / Site Work	1	LS	$455,000	$455,000	
Pretreatment & Breakpoint Chlorination Systems	1	each	$520,000	$520,000	Budgetary Price from Treatment System Sales Reps
Solids Handling System	1	each	$130,000	$130,000	
UV Oxidation Units	1	each	$248,300	$248,300	Budgetary Price from UV System Sales Engineer
GAC Unit for High UV Transmittance	1	each	$54,600	$54,600	Budgetary Price from GAC Industrial Process Rep
Installation of Equipment and Interconnecting Piping	1	each	$292,500	$292,500	
Connection and Installation of Single-Walled Discharge Pipe from New Treatment Plant to Surface Water /Diffusers	4240	linear feet	$150	$636,000	Estimate from Environmental Remediation Contractor
Electrical and Instrumentation Systems	1	LS	$227,500	$227,500	Estimate from Environmental Remediation Contractor
System Startup and Prove Out	1	LS	$58,500	$58,500	Estimate from Environmental Remediation Contractor
NPDES Surface Water Discharge					
NPDES Permitting Support	286	T&M	$100	$28,600	Based on similar projects
Contingency	1	LS	20%	$1,963,916	
Remedial Design (10% of Capital)	1	LS	$1,176,738	$1,176,738	Based on similar projects and design of existing system
Pre-Design Investigation	1	LS	$65,000	$65,000	Based on similar projects
Construction Oversight (10% of Capital)	1	LS	$1,176,738	$1,176,738	
Remedial Action Report	1	LS	$10,000	$10,000	Based on similar projects
		TOTAL CAPITAL COSTS		$14,211,971	

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Annual Extraction Well Operation Costs					
Annual Electricity Costs	424602	kWhr	$0.21	$89,166.33	
Annual Solids Removal Costs and Breakpoint Chlorination					
Chemicals	1	LS	$32,500	$32,500	
Solids Disposal	1	LS	$32,500	$32,500	
Annual GAC	1	Event	$39,000	$39,000	
UV Oxidation System Annual Operation Costs					
Annual Electricity Costs	12	months	$11,174	$134,087.36	Estimate from UV vendor, assuming $0.21/kWh
Lamp Replacement Costs	12	months	$1,349	$16,184	Estimate from UV unit vendor
System Performance Monitoring	12	event	$1,872	$22,464	
Misc. Equipment Maintenance	1	YR	$41,696.20	$41,696	1% of Treatment Equipment/Plant Capital
O&M Labor	1	YR	$200,000	$200,000	1-Full Time Operator, 2nd person for some O&M activities
Monitoring and Performance Reports	1	LS	$26,000	$26,000	Based on costs for similar sites and reporting
		TOTAL ANNUAL COSTS		$633,598	

Table 4.4-4
Cost Estimate for Groundwater Hot Spot Alternative GW 5
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

Description	Quantity	Units	Unit Cost	Extended Cost	Note
5-Year Review Report	1	LS	$35,000	$35,000	Incremental Costs Only - Will be performed site-wide
Verification and Maintenance of Deed Restriction and Notice of Activity and Use Limitations	0	LS	$5,000	$0	Performed Internally to Olin - Incremental Costs Only
		TOTAL 5-YEAR PERIODIC COSTS		$35,000	

Cost Type	Year	Total Cost	Discount Factor	Present Value	Note
Capital Costs	0	$14,211,971	1.0000	$14,211,971	
Annual Costs	1	$633,598	0.9346	$592,147	
Annual Costs	2	$633,598	0.8734	$553,409	
Annual Costs	3	$633,598	0.8163	$517,204	
Annual Costs	4	$633,598	0.7629	$483,369	
Annual Costs	5	$633,598	0.7130	$451,746	
5-Year Review Report and IC Maintenance	5	$35,000	0.7130	$24,955	
Annual Costs	6	$633,598	0.6663	$422,193	
Annual Costs	7	$633,598	0.6227	$394,573	
Annual Costs	8	$633,598	0.5820	$368,760	
Annual Costs	9	$0	0.5439	$0	
Annual Costs	10	$0	0.5083	$0	
5-Year Review Report and IC Maintenance	10	$35,000	0.5083	$17,792	
Annual Costs	11	$0	0.4751	$0	
Annual Costs	12	$0	0.4440	$0	
Annual Costs	13	$0	0.4150	$0	
Annual Costs	14	$0	0.3878	$0	
Annual Costs	15	$0	0.3624	$0	
5-Year Review Report and IC Maintenance	15	$35,000	0.3624	$12,686	
Annual Costs	16	$0	0.3387	$0	
Annual Costs	17	$0	0.3166	$0	
Annual Costs	18	$0	0.2959	$0	
Annual Costs	19	$0	0.2765	$0	
Annual Costs	20	$0	0.2584	$0	
5-Year Review Report and IC Maintenance	20	$35,000	0.2584	$9,045	
Annual Costs	21	$0	0.2415	$0	
Annual Costs	22	$0	0.2257	$0	
Annual Costs	23	$0	0.2109	$0	
Annual Costs	24	$0	0.1971	$0	
Annual Costs	25	$0	0.1842	$0	
5-Year Review Report and IC Maintenance	25	$35,000	0.1842	$6,449	
Annual Costs	26	$0	0.1722	$0	
Annual Costs	27	$0	0.1609	$0	
Annual Costs	28	$0	0.1504	$0	
Annual Costs	29	$0	0.1406	$0	
Annual Costs	30	$0	0.1314	$0	
5-Year Review Report and IC Maintenance	30	$35,000	0.1314	$4,598	
		$19,490,752		$18,070,895	

TOTAL COST OF ALTERNATIVE	**$19,491,000** *
TOTAL PRESENT WORTH OF ALTERNATIVE	**$18,071,000** *
PROJECT TREATMENT DURATION	**7.9 Years**
OVERALL PROJECT DURATION	**30 Years**

* Total Cost and Total Present Worth are rounded to the nearest $1000

Prepared/Date: BLR 1/14/20
Checked/Date: MCM 4/29/20

Table 4.5-1
Cost Estimate for Alternative CA 2:
Capping, Equalization Window Closure, and Institutional Controls
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

NOTES

This cost estimate includes Institutional Controls, closure of the Equalization Window, and installation of a RCRA Subtitle D Cap Over the Containment Area.

Base Year (Year 0) = 2020

CAPITAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Institutional Controls					
Deed Restriction Modification	1	LS	$12,400	$12,400	Assume 24 hours staff effort, and $10,000 for legal fees
Pre-Design Investigation	1	LS	$25,000	$25,000	5 days assumed for investigation
Site Preparation					
Mobilization	1	LS	$10,200	$10,200	Estimate from Environmental Remediation Contractor
Site Staging and Prep	1	LS	$73,600	$73,600	Estimate from Environmental Remediation Contractor
Includes temporary staging area for dewatering, silt fencing, tree removal, and matting for access					
Demobilization	1	LS	$29,400	$29,400	Estimate from Environmental Remediation Contractor
Closure of Equalization Window	50	CY	$600	$30,000	Backfill ~10'x40'x3' w/ AquaBlok; installed cost, similar project
Permanent Cap - RCRA Subtitle D (Non-Hazardous Waste) Composite Soil Cover System					
General Requirements	1	LS	$40,000	$40,000	Assume 2% of construction cost (rounded)
Erosion and Sediment Control Measures	1	LS	$20,000	$20,000	Assume 1% of construction cost (rounded)
Demolition					
Remove and dispose of existing geomembrane cover and miscellaneous materials	1	LS	$10,000	$10,000	Assumed
In-place abandonment of existing stormwater drainage system	1	LS	$10,000	$10,000	Assumed
Subgrade Soil Fill Under Cover System					
Furnish, haul, place and compact subgrade soil fill	18,750	CY	$20.00	$375,000	RSMeans. Based on average depth of 2.5 ft. and max. depth of 7.5 ft. to achieve 3% min. cover slope
Stormwater Drainage System					
Excavate, grade and stabilize perimeter drainage ditch	2,000	LF	$20.00	$40,000	RSMeans. Assuming 4 ft. average depth, 2 ft. bottom width, trapezoidal shape, 2:1 side slopes
Miscellaneous additional stormwater system components	1	LS	$5,000	$5,000	Assumed
Select Soil Layer (12" thickness)					
Furnish, haul, place and compact select soil layer	7,500	CY	$24.50	$183,750	Previous project cost estimating (updated to 2017 costs)
Geosynthetic Clay Liner (GCL)					
Furnish and install GCL	202,500	SF	$1.00	$202,500	Manufacturer's budgetary price plus markup (for material) and estimated installation cost from local liner installation contractor
Geomembrane, 40 mil LLDPE					
Furnish and install geomembrane	202,500	SF	$1.20	$243,000	Manufacturer's budgetary price plus markup (for material); and RSMeans for installation costs.
Drainage Geocomposite (synthetic drainage layer)					
Furnish and install drainage geocomposite	202,500	SF	$1.50	$303,750	Manufacturer's budgetary price plus markup (for material) and estimated installation cost from previous projects
Select Vegetative Soil Layer (18" thickness)					
Furnish, haul, place and compact select vegetative soil layer	11,250	CY	$24.50	$275,625	Previous project cost estimating (updated to 2017 costs)
Topsoil (6" thickness)					
Furnish, haul, and place topsoil layer	3,750	CY	$33.00	$123,750	RSMeans.
Establishment of Vegetative Cover					
Soil preparation	22,500	SY	$0.60	$13,500	RSMeans.
Application of fertilizer, grass seed and mulch	22,500	SY	$0.90	$20,250	RSMeans.
Remedial Action Oversight	120	Days	1000	$120,000	6 months on-site activities
Remedial Action Report	1	LS	$ 15,000	$15,000	Based on cost for similar effort
Contingency	0	%	20%	$436,300	
			TOTAL CAPITAL COSTS	$2,618,025	

Table 4.5-1
Cost Estimate for Alternative CA 2:
Capping, Equalization Window Closure, and Institutional Controls
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

ANNUAL COSTS YEAR 1					
Description	**Quantity**	**Units**	**Unit Cost**	**Extended Cost**	**Note**
RCRA Subtitle D (Non-Hazardous Waste) Composite Soil Cover System Maintenance					
Routine Inspections					
Inspection of remedy components (including soil cover, stormwater management structures, and erosion control measures)	4	Each	$700	$2,800	Labor @ $75 per hour plus estimated travel expenses. Estimate based on assumed 8 manhours labor per inspection, quarterly routine inspections for first 3 years
Maintenance of Vegetative Cover: Mowing					
Mowing of vegetated soil cover and adjacent vegetated areas	5	Acres	$400	$2,000	RSMeans. Assume mowing twice per year using large riding mower
Repair of Vegetative Cover: Repair of Erosion					
Furnish, place and grade imported soil fill (including purchase and haul)	100	CY	$33	$3,300	RSMeans. Assume 3" average depth of topsoil required to be replaced in eroded areas. Assume 100 cubic yards needed annually for first 3 years
Fertilization, seeding and mulching	0.25	Acres	$4,000	$1,000	RSMeans. Assume 0.25 acre annually for first 3 years
General Site Maintenance and Repairs	1	LS	$5,000	$5,000	Based on costs for similar sites
Reporting/Evaluation	1	LS	$500	$500	Based on costs for similar sites
Annual Monitoring Report	1	LS	$15,000	$15,000	Based on costs for similar sites and reporting
		TOTAL ANNUAL COSTS		$29,600	Per year, YEARS 1 - 2

ANNUAL COSTS YEARS 2 THROUGH 30					
Description	**Quantity**	**Units**	**Unit Cost**	**Extended Cost**	**Note**
RCRA Subtitle D (Non-Hazardous Waste) Composite Soil Cover System Maintenance					
Routine Inspections					
Inspection of remedy components (including soil cover, stormwater management structures, and erosion control measures)	1	Each	$700	$700	Labor @ $75 per hour plus estimated travel expenses. Estimate based on assumed 8 manhours labor per inspection, one inspection per year as annual routine inspection in the fourth year and Onward
Maintenance of Vegetative Cover: Mowing					
Mowing of vegetated soil cover and adjacent vegetated areas	5	Acres	$400	$2,000	RSMeans. Assume mowing twice per year using large riding mower.
Repair of Vegetative Cover: Repair of Erosion					Assume a total area of 5 acres; approximately 2% of total area requires repair each year (after first 3 years)
Furnish, place and grade imported soil fill (including purchase and haul)	40	CY	$20	$800	Wood construction estimate. Assume 3" average depth of topsoil required to be replaced in eroded areas. Assume 40 cubic yards needed annually (after first 3 years)
Fertilization, seeding and mulching	0.10	Acres	$4,000	$400	RSMeans. Assume 0.1 acre for Year 4 and Onward
General Site Maintenance and Repairs	1	LS	$5,000	$5,000	Estimated
Reporting/Evaluation	1	LS	$500	$500	Assumed
Annual Monitoring Report	1	LS	$15,000	$15,000	Based on costs for similar sites and reporting
		TOTAL ANNUAL COSTS		$24,400	Per year, YEARS 4 - 30

Table 4.5-1
Cost Estimate for Alternative CA 2:
Capping, Equalization Window Closure, and Institutional Controls
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

5-YEAR PERIODIC COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
5-Year Review Report	1	LS	$5,000	$5,000	Incremental Costs Only; Will be performed site-wide
Deed Restrictions Verification and Maintenance	1	LS	$0	$0	Incrmental Cost Only; NA
		TOTAL PERIODIC COSTS		$5,000	

PRESENT VALUE ANALYSIS

Cost Type	Year	Total Cost	Discount Factor	Present Value	Note
Capital Costs	0	$2,618,025	1.0000	$2,618,025	
Annual Costs	1	$29,600	0.9346	$27,664	
Annual Costs	2	$24,400	0.8734	$21,312	
Annual Costs	3	$24,400	0.8163	$19,918	
Annual Costs	4	$24,400	0.7629	$18,615	
Annual Costs	5	$24,400	0.7130	$17,397	
5-Year Review Report and IC Maintenance	5	$5,000	0.7130	$3,565	
Annual Costs	6	$24,400	0.6663	$16,259	
Annual Costs	7	$24,400	0.6227	$15,195	
Annual Costs	8	$24,400	0.5820	$14,201	
Annual Costs	9	$24,400	0.5439	$13,272	
Annual Costs	10	$24,400	0.5083	$12,404	
5-Year Review Report and IC Maintenance	10	$5,000	0.5083	$2,542	
Annual Costs	11	$24,400	0.4751	$11,592	
Annual Costs	12	$24,400	0.4440	$10,834	
Annual Costs	13	$24,400	0.4150	$10,125	
Annual Costs	14	$24,400	0.3878	$9,463	
Annual Costs	15	$24,400	0.3624	$8,844	
5-Year Review Report and IC Maintenance	15	$5,000	0.3624	$1,812	
Annual Costs	16	$24,400	0.3387	$8,265	
Annual Costs	17	$24,400	0.3166	$7,724	
Annual Costs	18	$24,400	0.2959	$7,219	
Annual Costs	19	$24,400	0.2765	$6,747	
Annual Costs	20	$24,400	0.2584	$6,305	
5-Year Review Report and IC Maintenance	20	$5,000	0.2584	$1,292	
Annual Costs	21	$24,400	0.2415	$5,893	
Annual Costs	22	$24,400	0.2257	$5,507	
Annual Costs	23	$24,400	0.2109	$5,147	
Annual Costs	24	$24,400	0.1971	$4,810	
Annual Costs	25	$24,400	0.1842	$4,496	
5-Year Review Report and IC Maintenance	25	$5,000	0.1842	$921	
Annual Costs	26	$24,400	0.1722	$4,202	
Annual Costs	27	$24,400	0.1609	$3,927	
Annual Costs	28	$24,400	0.1504	$3,670	
Annual Costs	29	$24,400	0.1406	$3,430	
Annual Costs	30	$24,400	0.1314	$3,205	
5-Year Review Report and IC Maintenance	30	$5,000	0.1314	$657	
		$3,385,225		$2,936,455	

TOTAL COST OF ALTERNATIVE	**$3,385,000**
TOTAL PRESENT WORTH OF ALTERNATIVE	**$2,936,000**
PROJECT DURATION	**30 Years**

Prepared/Date: APP 11/13/2019
Revised/Date: KPW 01/21/2020

Table 4.5-2
Cost Estimate for Alternative CA 3
Interim Action Feasibility Study
Olin Chemical Superfund Site
Wilmington, Massachusetts

NOTES

Cost estimate for Alternative CA 3: Targeted Soil Removal
- Excavate six sub-areas; depths vary, but excavation to approximately half-way between water table and bedrock
- Sheet pile wall needed at some locations to protect structural integrity of existing slurry wall
  - Stabilization of excavated soil as necessary due to elevated chromium concentrations and/or high soil water content
- Excavation dewatering; temporary water treatment unit; on-site discharge to surface water
- Backfill to grade
- Estimated 6 months on-site activities

CAPITAL COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Institutional Controls					
Deed Restriction Modification	0	LS	$10,000	$0	Performed internally by Olin
Excavation and Off-Site Disposal					
Pre-Design Investigation	1	LS	$20,000	$20,000	drilling program; additional soil characterization data
Pre-Excavation Wetland Survey	1	LS	$1,000	$1,000	Wetland Scientist; 1 day field effort
Wetland Restoration Plan	1	LS	$5,000	$5,000	Based on cost for similar effort
Mobilization	1	LS	$64,875	$64,875	Estimate from Environmental Remediation Contractor
Site Staging and Prep *Includes temporary staging area for dewatering, erosion & sediment control, and access improvements*	1	LS	$62,955	$62,955	Estimate from Environmental Remediation Contractor
Sheet Pile Wall	17925	SF	$50	$896,250	Estimate from Environmental Remediation Contractor
Excavation	44261	CY	$11.87	$525,359	Estimate from Environmental Remediation Contractor
Excavation Dewatering	1	LS	$131,674	$131,674	Estimate from Environmental Remediation Contractor
Soil Dewatering/Stabilization	1	LS	$640,306	$640,306	Estimate from Environmental Remediation Contractor
Transportation and Disposal (Non-hazardous)	80000	Tons	$90.16	$7,213,073	Estimate from Environmental Remediation Contractor
Backfill and Restoration	44261	CY	$49.63	$2,196,539	Estimate from Environmental Remediation Contractor
Demobilization	1	LS	$64,750	$64,750	Estimate from Environmental Remediation Contractor
Excavation Verification Sampling & Analysis	1	LS	$11,600	$11,600	~50ft intervals around excavations; 2 depths; ~100 samples
Remedial Action Oversight	180	Days	$1,000	$180,000	6 months on-site activities
Excavation Area Monthly Inspections	6	LS	$800	$4,800	Monthly for 6 months
Remedial Action Report	1	LS	$10,000	$10,000	Based on cost for similar effort
Contingency	0	%	20%	$2,405,600	
			TOTAL CAPITAL COSTS	$14,433,780	

5-YEAR PERIODIC COSTS

Description	Quantity	Units	Unit Cost	Extended Cost	Note
Reporting					
5-Year Review Report and IC Maintenance	1	LS	$5,000	$5,000	Incremental cost only; will be performed site-wide
			TOTAL 5-YEAR COSTS	$5,000	

PRESENT VALUE ANALYSIS

Cost Type	Year	Total Cost	Discount Factor	Present Value	Note
Capital Costs	0	$14,433,780	1.0000	$14,433,780	
5-Year Review Report and IC Maintenance	5	$5,000	0.7130	$3,565	
5-Year Review Report and IC Maintenance	10	$5,000	0.5083	$2,542	
5-Year Review Report and IC Maintenance	15	$5,000	0.3624	$1,812	
5-Year Review Report and IC Maintenance	20	$5,000	0.2584	$1,292	
5-Year Review Report and IC Maintenance	25	$5,000	0.1842	$921	
5-Year Review Report and IC Maintenance	30	$5,000	0.1314	$657	
		$14,463,780		$14,444,569	
		TOTAL COST OF ALTERNATIVE	**$14,464,000**		
		TOTAL PRESENT WORTH OF ALTERNATIVE	**$14,445,000**		
		PROJECT DURATION	**30 Years**		

Prepared/Date: APP 11/13/2019
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APPENDIX A
CONTAINMENT AREA SOIL DATA

Appendix A

Supporting Documentation for Characterization Activities conducted in the Containment Area

Appendix A

Supporting Documentation for Characterization Activities conducted in the Containment Area

Introduction

Tables

Table 1	Summary of Soil-related Investigations and Release Abatement Measures
Table 2	Temporary Cap Surface Soil Analytical Results (0-1 ft bgs)
Table 3	Selection of COPCs for Shallow Subsurface Soil (1-10 ft bgs) Within Containment Area - Excluding Samples Flagged as "Excavated" in the Project Database
Table 4	Summary of Samples within Containment Area Soil (1-10 ft bgs)

Figures

Figure 4.1-1a	Surface Soil (0-1 feet) Sample Locations
Figure 4.1-1b	Shallow Subsurface Soil (1-10 feet) Sample Locations

Attachments

Attachment A-1	Text from: Drum Removal Release Abatement Measure Status Report No. 1, Olin Property, Wilmington MA, RTN 3-0471, prepared by GEI Consultants, Inc., December 22, 2000.
Attachment A-2	Table D-1. Drum Area A Confirmatory Soil Sample Results
Attachment A-3	Table D-2. Reuse Testing Results – Drum Area A Stockpile Samples
Attachment A-4	Table E-1. Drum Area B Confirmatory Soil Sample Results
Attachment A-5	Table E-2. Reuse Testing Results – Drum Area B Stockpile Samples
Attachment A-6	Text from: Construction-Related Release Abatement Measure Status Report No. 2, Olin Property, Wilmington MA, RTN 3-0471, prepared by GEI Consultants, Inc., August 28, 2001.
Attachment A-7	Figure: General Excavation and Backfill Locations [Containment Area] (from RAM Status Report No. 2, August 2001)
Attachment A-8	Table G-2. Chemical Testing Results – Buried Debris Area Confirmatory Samples
Attachment A-9	Table A-1. Stockpile [Topsoil] Soil Data

Appendix A – Containment Area Soil Data

Table 1. Summary of Soil-related Investigations and Release Abatement Measures			
Activity	Date	Notes	Backfill Notes
Soil sampling MCP and CERCLA investigations BH1-BH9, RSO-xx, SS-429-SS-431(beneath temporary cap)	1991-2000 – MCP 2010 - CERCLA	NA	NA
Approximately 3,000 cy topsoil stripped from Containment Area and stockpiled – evaluated for on-site re-use	August 2000	Stockpiled soil upland re-use approved by MassDEP. Stockpiled soils still remain at the site.	NA
Drum Area A excavation (approximately 3200 cy soil) confirmatory samples (34 samples) [DA-Cxx]	2000	163 overpacks (drums, drum parts, drum contents) disposed off-site	NA
Drum Area A soil characterization off-site disposal	2000	Approximately 200 cy excavated soil disposed off-site.	NA
Drum Area A stockpile soil characterization to evaluate on-site re-use	2000	Stockpiled soil upland re-use approved by MassDEP. Stockpiled soils still remain at the site.	Stockpiled excavated soil used as backfill for Drum Area A (primarily) and Drum Area B (lesser amount). Excavation filled with 3 layers: blast rock from Detention Basin; stockpiled soil from Drum Area A; and borrow soil from adjacent to excavation.
Drum Area B excavation confirmatory samples (16 samples) [DB-Cxx]	2000		NA
Drum Area B soil characterization off-site disposal	None	None	NA
Drum Area B stockpile soil characterization to evaluate on-site re-use	2000	All Drum Area B stockpile soil determined to be suitable for on-site re-use	Backfill in three layers with Drum Area B stockpile soil, Drum Area A stockpile soil, borrow soil from adjacent to excavation
Buried Debris Area excavation (2,315 cy) confirmatory samples (40 samples in two rounds) [BD-Cxx]	2000	See figure for locations.	NA
Buried Debris Area soil characterization off-site disposal	2000	All excavated soil was disposed off-site in 2001. In addition, 1,075 cy of peat was excavated from area south of the Buried Debris Area and was disposed off-site (structural reasons for future parking lot).	Large boulders were paced in the excavation and the area was restored in 2001.
On-Site West Ditch excavation soil confirmatory samples [WD-Cxx]	2000	Excavated sediments and soil brought to Biocell and subsequently disposed off-site in 2001. All sediments removed to native soil bottom and sidewalls.	West Ditch excavation was backfilled with on-property granular fill borrow from the roadbed that formerly ran parallel to the On-Property West Ditch.
On-Site West Ditch Wetland soil confirmatory samples (outside Containment Area) [WDW-Cxx]	2000		NA
Central Drainage area confirmatory soil samples (sidewall and bottom samples) [CP-Cxx]		Soils in Central Drainage area excavated, brought to Biocell, and disposed off-site in 2001	Central Drainage area backfilled with clean off-property granular fill in preparation for Containment Wall construction.
Containment Wall construction			After completion of the wall, the top two feet of the wall was removed and it was stabilized with geotextile geogrid and compacted granular soil. Excess soil and slurry was stabilized with cement and used as backfill within the Containment Area

Table 2
Temporary Cap Surface Soil Analytical Results (0-1 ft bgs)
Preliminary Remedial Investigation Report
Operable Unit 1 for the Olin Property
Wilmington, Massachusetts

Cas Number	Parameter	OC-SS-419-0_0/1_0-XXX SS-419 9/15/2009 0-1 ft	OC-SS-420-0_0/1_0-XXX SS-420 9/15/2009 0-1 ft	OC-SS-421-0_0/1_0-XXX SS-421 9/15/2009 0-1 ft	OC-SS-422-0_0/1_0-XXX SS-422 9/15/2009 0-1 ft	OC-SS-423-0_0/1_0-XXX SS-423 9/15/2009 0-1 ft	OC-SS-424-0_0/1_0-XXX SS-424 9/15/2009 0-1 ft	OC-SS-425-0_0/1_0-XXX SS-425 9/15/2009 0-1 ft	OC-SS-426-0_0/1_0-XXX SS-426 9/16/2009 0-1 ft	OC-SS-428-0_0/1_0-XXX SS-428 9/16/2009 0-1 ft	OC-SS-429-0_0/1_0-XXX SS-429 9/16/2009 0-1 ft	OC-SS-430-0_0/1_0-XXX SS-430 9/16/2009 0-1 ft	OC-SS-431-0_0/1_0-XXX SS-431 9/16/2009 0-1 ft
	Volatile Organics (mg/kg)												
50-00-0	Formaldehyde		0.11 U		0.096 J		0.11 U				0.17		0.1 J
	Semivolatile Organics (mg/kg)												
100-52-7	Benzaldehyde	0.036 U	0.015 J	0.042 U	0.039 U	0.017 J	0.038 U	0.04 U	0.036 U	0.027 J	0.039 U	0.06	0.038 U
56-55-3	Benzo(a)anthracene	0.033 J	0.037 U	0.042 U	0.039 U	0.039 U	0.038 U	0.04 U	0.036 U	0.039 U	0.019 J	0.017 J	0.038 U
50-32-8	Benzo(a)pyrene	0.038	0.011 J	0.042 U	0.039 U	0.039 U	0.038 U	0.04 U	0.036 U	0.012 J	0.014 J	0.017 J	0.038 U
205-99-2	Benzo(b)fluoranthene	0.062	0.037 U	0.042 U	0.039 U	0.039 U	0.038 U	0.04 U	0.036 U	0.021 J	0.023 J	0.027 J	0.014 J
191-24-2	Benzo(ghi)perylene	0.024 J	0.037 U	0.042 U	0.039 U	0.039 U	0.038 U	0.04 U	0.036 U	0.039 U	0.039 U	0.044 U	0.038 U
207-08-9	Benzo(k)fluoranthene	0.019 J	0.037 U	0.042 U	0.039 U	0.039 U	0.038 U	0.04 U	0.036 U	0.039 U	0.039 U	0.044 U	0.038 U
117-81-7	Bis(2-Ethylhexyl)phthalate	0.21 EB	0.52 EB	1.6 EB	0.41 EB	0.45 EB	0.38 EB	0.66 EB	0.62 EB	0.39 EB	0.33 EB	0.4 EB	1.5 EB
218-01-9	Chrysene	0.047	0.037 U	0.042 U	0.012 J	0.039 U	0.038 U	0.04 U	0.036 U	0.018 J	0.021 J	0.021 J	0.038 U
101-84-8	Diphenyl ether	0.036 U	0.037 U	0.015 J	0.039 U	0.039 U	0.038 U	0.015 J	0.036 U	0.026 J	0.039 U	0.044 U	0.038 U
122-39-4	Diphenylamine		0.014 J		0.039 U		0.038 U				0.039 U		0.02 J
206-44-0	Fluoranthene	0.09	0.012 J	0.02 J	0.016 J	0.039 U	0.038 U	0.04 U	0.012 J	0.027 J	0.042	0.041 J	0.012 J
86-73-7	Fluorene	0.022 J	0.037 U	0.042 U	0.039 U	0.039 U	0.038 U	0.04 U	0.02 J	0.039 U	0.039 U	0.044 U	0.022 J
193-39-5	Indeno(1,2,3-cd)pyrene	0.023 J	0.037 U	0.042 U	0.039 U	0.039 U	0.038 U	0.04 U	0.036 U	0.039 U	0.039 U	0.044 U	0.038 U
91-20-3	Naphthalene	0.013 J	0.089 U	0.1 U	0.093 U	0.094 U	0.091 U	0.095 U	0.086 U	0.094 U	0.095 U	0.11 U	0.091 U
86-30-6	N-Nitrosodiphenylamine	0.036 U	0.013 JEB	0.033 JEB	0.039 U	0.021 JEB	0.038 U	0.036 JEB	0.014 JEB	0.037 JEB	0.012 JEB	0.055 EB	0.036 JEB
85-01-8	Phenanthrene	0.034 J	0.044 U	0.05 U	0.047 U	0.047 U	0.046 U	0.048 U	0.043 U	0.012 J	0.047 U	0.015 J	0.046 U
129-00-0	Pyrene	0.073	0.013 J	0.016 J	0.014 J	0.039 U	0.038 U	0.04 U	0.036 U	0.026 J	0.047	0.032 J	0.038 U
	Inorganics (mg/kg)												
7429-90-5	Aluminum	7200	6600	6800	7400	7800	6200	7500	7100	6200	8000	8000	7800
7440-38-2	Arsenic	13	9.5	8.4	5.6	12	7.5	8.4	3.8	21	8.5	23	8.4
7440-39-3	Barium	18	43	52	81	42	34	51	29	17	80	56	42
7440-41-7	Beryllium	0.3	0.24	0.25 J	0.27 J	0.29 J	0.33	0.29	0.29	0.29	0.28 J	0.31 J	0.29
7440-43-9	Cadmium	0.3	0.33	0.34	0.26 J	0.51	0.26	0.42	0.41	0.29	0.41	0.92	0.79
7440-70-2	Calcium	1400	12000	29000	33000	12000	14000	35000	12000	2200	33000	15000	13000
7440-47-3	Chromium	59	48	52	36	60	55	75	28	25	87	66	59
7440-48-4	Cobalt	3.3	3.5	3.5	3.5	4.6	3.8	4.1	5.3	3.1	4.1	5.6	4.2
7440-50-8	Copper	9.2	7.7	7.7	7.8	8.2	7.9	8.3	7.4	6.3	8.4	8.4	9.3
7439-89-6	Iron	12000	9300	9000	8800	13000	9100	10000	13000	12000	10000	20000	10000
7439-92-1	Lead	11	5.8	5.3	6	5.7	6.3	6.3	4.5	7.7	5.4	8.2	7.1
7439-95-4	Magnesium	2100	2200	2400	2600	2700	1900	2500	3900	1300	2700	2100	2700
7439-96-5	Manganese	120	110	110	120	160	100	140	250	77	130	370	140
7439-97-6	Mercury	0.053 J	0.14 U	0.2 U	0.16 U	0.21 U	0.21 U	0.15 U	0.18 U	0.18 U	0.21 U	0.21 U	0.031 J
7440-02-0	Nickel	8.7	7.9	8	7.9	9.6	10	8.7	7.5	7	8.8	9.8	10
7440-09-7	Potassium	750	1900	1400	1500	1100	1100	1400	1600	630	1500	1000	1100
7440-22-4	Silver	0.65	0.42 J	0.61 J	0.35 J	0.63 J	0.76	1	0.13 J	0.11 J	1.2	0.67 J	0.7
7440-23-5	Sodium	18 J	79 J	200	440	46 J	62 J	96 J	74 J	120 U	250	77 J	63 J
7440-31-5	Tin	24 J	18 J	20 J	14 J	24 J	22 J	30 J	10 J	9.3 J	36 J	26 J	24 J
7440-62-2	Vanadium	15	12	13	12	15	12	15	18	12	14	17	14
7440-66-6	Zinc	20	18	18	17	19	20	20	23	14	18	19	21
16887-00-6	Chloride	21 U	22 U	25 U	44	18 U	22 U	21 U	17 U	17 U	19 U	20 U	15 U
HLA0043	Nitrogen, as Ammonia	62	7.5 U	7.4 U	7.3 U	8.4 U	24	18	6.5 U	33	8.2 U	39	20
14808-79-8	Sulfate	43 U	1100	2300	620	57	8100	13000	1000	33 U	920	2400	5100
	Specialty Compounds (mg/kg)												
302-01-2	Hydrazine		0.0023 U		0.0041		0.002 J				0.00062 J		0.0016 J

Notes:
mg/kg - milligrams per kilogram
COPC - Chemical of potential concern
J - Value is estimated.
EB - Compound detected in the associated equipment rinsate blank.

Table 3
Selection of COPCs for Shallow Subsurface Soil (1-10 ft bgs) Within Containment Area - Excluding Samples Flagged as "Excavated" in the Project Database
Olin Chemical Superfund Site
Wilmington, Massachusetts

CAS Number	Chemical	Minimum (1) Concentration (Qualifier)	Maximum (1) Concentration (Qualifier)	Units	Frequency of Detection	Range of Reporting Limits for Non Detects	Concentration Used for Screening (2)	Screening Toxicity Value (4)	Retain as COPC? (6)	Rationale for Contaminant Deletion or Selection
	Volatile Organics (mg/kg)									
71-55-6	1,1,1-Trichloroethane	0.087	0.087	MG/KG	1 / 67	0.0055 : 0.74	0.087	3600 ns	No	BSL
87-61-6	1,2,3-Trichlorobenzene	0.15	0.16	MG/KG	2 / 57	0.039 : 0.74	0.16	93 n	No	BSL
120-82-1	1,2,4-Trichlorobenzene	0.071	0.79	MG/KG	3 / 57	0.039 : 0.74	0.79	26 n	No	BSL
95-63-6	1,2,4-Trimethylbenzene	0.13	4.6	MG/KG	4 / 57	0.039 : 0.74	4.6	180 n	No	BSL
108-67-8	1,3,5-Trimethylbenzene	0.085	2.9	MG/KG	4 / 57	0.039 : 0.74	2.9	150 n	No	BSL
107-39-1	2,4,4-Trimethyl-1-pentene	0.002	68	MG/KG	16 / 56	0.0000013 : 0.2	68	1200 ns	No	BSL
107-40-4	2,4,4-Trimethyl-2-pentene	0.001	27	MG/KG	10 / 54	0.0000013 : 0.2	27	1200 ns	No	BSL
78-93-3	2-Butanone	0.001	0.49	MG/KG	4 / 67	0.016 : 15	0.49	19000 n	No	BSL
591-78-6	2-Hexanone	0.061	0.061	MG/KG	1 / 67	0.016 : 3	0.061	130 n	No	BSL
99-87-6	4-iso-Propyltoluene	0.16	18	MG/KG	7 / 57	0.039 : 0.2	18		Yes	NSL
67-64-1	Acetone	0.13	17	MG/KG	4 / 67	0.016 : 15	17	67000 n	No	BSL
71-43-2	Benzene	0.1	0.1	MG/KG	1 / 67	0.0055 : 0.74	0.1	5.1 c**	No	BSL
67-66-3	Chloroform	0.002	0.002	MG/KG	1 / 67	0.0055 : 0.74	0.002	1.4 c*	No	BSL
100-41-4	Ethyl benzene	0.12	0.62	MG/KG	3 / 67	0.0055 : 0.74	0.62	25 c*	No	BSL
98-82-8	Isopropylbenzene	0.22	0.65	MG/KG	4 / 57	0.039 : 0.74	0.65	990 ns	No	BSL
75-09-2	Methylene chloride	0.15	2	MG/KG	39 / 67	0.009 : 0.74	2	320 n	No	BSL
91-20-3	Naphthalene	0.62	0.62	MG/KG	1 / 57	0.077 : 7.4	0.62	17 c**	No	BSL
103-65-1	Propylbenzene	0.56	0.59	MG/KG	2 / 57	0.039 : 0.74	0.59	2400 ns	No	BSL
135-98-8	sec-Butylbenzene	0.15	0.21	MG/KG	2 / 57	0.039 : 0.74	0.21	12000 ns	No	BSL
100-42-5	Styrene	0.29	0.43	MG/KG	2 / 67	0.0055 : 0.74	0.43	3500 ns	No	BSL
127-18-4	Tetrachloroethene	0.001	0.001	MG/KG	1 / 67	0.0055 : 0.74	0.001	39 n	No	BSL
108-88-3	Toluene	0.001	13	MG/KG	12 / 67	0.0055 : 0.2	13	4700 ns	No	BSL
79-01-6	Trichloroethene	0.08	0.08	MG/KG	1 / 67	0.0055 : 0.74	0.08	1.9 n	No	BSL
95-47-6	Xylene, o	0.042	0.53	MG/KG	3 / 57	0.039 : 0.74	0.53	280 n	No	BSL
179601-23-1	Xylenes (m&p)	0.096	0.35	MG/KG	3 / 57	0.039 : 0.74	0.35	240 n	No	BSL
1330-20-7	Xylenes, Total	0.042	0.88	MG/KG	4 / 67	0.0055 : 0.74	0.88	250 n	No	BSL
	Semivolatile Organics (mg/kg)									
120-82-1	1,2,4-Trichlorobenzene	0.075	0.27	MG/KG	3 / 112	0.2651 : 400	0.27	26 n	No	BSL
120-12-7	Anthracene	0.028	0.028	MG/KG	1 / 112	0.27 : 400	0.028	23000 n	No	BSL
56-55-3	Benzo(a)anthracene	0.08	0.08	MG/KG	1 / 112	0.27 : 400	0.08	21 c	No	BSL
50-32-8	Benzo(a)pyrene	0.055	0.055	MG/KG	1 / 112	0.27 : 400	0.055	2.1 c*	No	BSL
205-99-2	Benzo(b)fluoranthene	0.084	0.084	MG/KG	1 / 112	0.27 : 400	0.084	21 c	No	BSL
65-85-0	Benzoic Acid	0.38	1.1	MG/KG	3 / 112	0.53 : 2000	1.1	330000 nm	No	BSL
117-81-7	Bis(2-Ethylhexyl)phthalate	0.09	1590	MG/KG	86 / 112	0.27 : 1.4	1590	160 c*	Yes	ASL
85-68-7	Butylbenzylphthalate	0.035	0.035	MG/KG	1 / 112	0.27 : 400	0.035	1200 c*	No	BSL
218-01-9	Chrysene	0.086	0.086	MG/KG	1 / 112	0.27 : 400	0.086	2100 c	No	BSL
84-74-2	Di-n-butylphthalate	0.22	109	MG/KG	8 / 112	0.2651 : 400	109	8200 n	No	BSL
117-84-0	Di-n-octylphthalate	0.014	0.073	MG/KG	3 / 112	0.2651 : 400	0.073	820 n	No	BSL
206-44-0	Fluoranthene	0.16	0.16	MG/KG	1 / 112	0.2651 : 400	0.16	3000 n	No	BSL
91-20-3	Naphthalene	0.26	0.63	MG/KG	2 / 112	0.2651 : 400	0.63	17 c**	No	BSL
86-30-6	N-Nitrosodiphenylamine	0.12	54	MG/KG	36 / 112	0.2651 : 400	54	470 c	No	BSL
85-01-8	Phenanthrene	0.12	0.12	MG/KG	1 / 112	0.2651 : 400	0.12	2300 n	No	BSL
108-95-2	Phenol	0.075	0.1	MG/KG	2 / 112	0.2651 : 400	0.1	25000 n	No	BSL
129-00-0	Pyrene	0.13	0.13	MG/KG	1 / 112	0.2651 : 400	0.13	2300 n	No	BSL
	Pesticides/PCBs (mg/kg)									
309-00-2	Aldrin	0.014	0.015	MG/KG	2 / 66	0.0083 : 0.16	0.015	0.18 c*	No	BSL
319-85-7	Beta-BHC	0.063	0.063	MG/KG	1 / 66	0.0083 : 0.16	0.063	1.3 c	No	BSL
12789-03-6	Chlordane (technical)	0.02	0.042	MG/KG	2 / 22	0.0083 : 0.19	0.042	7.7 c**	No	BSL
72-20-8	Endrin	0.022	0.022	MG/KG	1 / 66	0.01 : 0.16	0.022	25 n	No	BSL
53494-70-5	Endrin ketone	0.045	0.045	MG/KG	1 / 22	0.017 : 0.038	0.045	25 n	No	BSL
58-89-9	Gamma-BHC/Lindane	0.02	0.69	MG/KG	14 / 66	0.0083 : 0.16	0.69	2.5 c*	No	BSL

Table 3
Selection of COPCs for Shallow Subsurface Soil (1-10 ft bgs) Within Containment Area - Excluding Samples Flagged as "Excavated" in the Project Database
Olin Chemical Superfund Site
Wilmington, Massachusetts

CAS Number	Chemical	Minimum (1) Concentration (Qualifier)	Maximum (1) Concentration (Qualifier)	Units	Frequency of Detection	Range of Reporting Limits for Non Detects	Concentration Used for Screening (2)	Screening Toxicity Value (4)	Retain as COPC? (6)	Rationale for Contaminant Deletion or Selection
	Inorganics (mg/kg)									
7429-90-5	Aluminum	460	10000	MG/KG	28 / 28		10000	110000 nm	No	BSL
7440-38-2	Arsenic	1.1	89	MG/KG	20 / 26	1 : 2	89	3 c*R	Yes	ASL
7440-39-3	Barium	6.6	39	MG/KG	11 / 11		39	22000 n	No	BSL
7440-41-7	Beryllium	0.12	0.21	MG/KG	2 / 11	1.5 : 1.5	0.21	230 n	No	BSL
7440-43-9	Cadmium	0.32	7.3	MG/KG	16 / 68	0.2 : 4.8	7.3	98 n	No	BSL
7440-70-2	Calcium	560	17000	MG/KG	11 / 11		17000		No	E
7440-47-3	Chromium	4	1600	MG/KG	113 / 113		1600	180000 nm	No	BSL
7440-48-4	Cobalt	1.7	7.2	MG/KG	10 / 11	1.5 : 1.5	7.2	35 n	No	BSL
7440-50-8	Copper	4	47	MG/KG	8 / 11	2.5 : 23	47	4700 n	No	BSL
7439-89-6	Iron	840	25000	MG/KG	28 / 28		25000	82000 n	No	BSL
7439-92-1	Lead	1.7	52	MG/KG	56 / 68	2 : 24	52	800 n	No	BSL
7439-95-4	Magnesium	150	4700	MG/KG	11 / 11		4700		No	E
7439-96-5	Manganese	7.6	320	MG/KG	11 / 11		320	2600 n	No	BSL
7439-97-6	Mercury	0.12	0.12	MG/KG	1 / 28	0.05 : 0.1	0.12	35 n	No	BSL
7440-02-0	Nickel	4.4	18	MG/KG	10 / 11	4 : 4	18	2200 n	No	BSL
7440-09-7	Potassium	160	2100	MG/KG	11 / 11		2100		No	E
7440-23-5	Sodium	67	240	MG/KG	11 / 11		240		No	E
7440-62-2	Vanadium	5.9	21	MG/KG	10 / 11	1.5 : 1.5	21	580 n	No	BSL
7440-66-6	Zinc	11	84	MG/KG	10 / 11	2.5 : 2.5	84	35000 n	No	BSL
16887-00-6	Chloride	57	100	MG/KG	5 / 9	40 : 40	100		Yes	NSL
HLA0043	Nitrogen, as Ammonia	8.4	210	MG/KG	9 / 9		210		Yes	NSL
14808-79-8	Sulfate	210	33000	MG/KG	9 / 9		33000		Yes	NSL

(1) Minimum or maximum concentration detected in data set. Samples included in data set are identified in Attachment 2.
(2) The concentration used for screening is the maximum detected concentration.
(3) Background value is the site specific background upper prediction limit concentration.
(4) Values are the Regional Screening Levels (RSLs) obtained from USEPA dated November 2018.
Values used for screening are the industrial soil RSLs for the lesser of cancer risks equal to 1E-06 or non-cancer risks equal to a hazard index of 0.1.
RSL for 2,4,4-trimethylpentene used for 2,4,4-trimethyl-1-pentene and 2,4,4-trimethyl-2-pentene.
RSL for pyrene used for phenanthrene.
RSL for endrin used for endrin ketone.
RSL for chromium (III) used for chromium.
RSL for mercuric chloride used for mercury.
RSL for vanadium and compounds used for vanadium.
c - RSL is based on an excess lifetime cancer risk of 1 in 1 million.
c* - where n RSL < 100X c RSL.
c** - where n RSL < 10X c RSL
n - RSL is based on a non-cancer hazard quotient of 0.1.
nm - RSL is based on a non-cancer hazard quotient of 0.1; concentration may exceed ceiling limit.
ns - RSL is based on a non-cancer hazard quotient of 0.1; concentration may exceed Csat.
R - Relative bioavailability factor applied.
(6) Analyte is selected as a COPC if the concentration used for screening exceeds the RSL or if no screening value is available.
ASL = Concentration used for screening is greater than the screening toxicity value; the analyte was selected as a COPC.
BSL = Concentration used for screening is less than the screening toxicity value; the analyte was not selected as a COPC.
NSL = No screening level available; the anlayte was selected as a COPC.
E = Compound is an essential nutrient.

mg/Kg - milligrams per kilogram.
COPC - Chemical of potential concern.

Table 4
Summary of Samples within Containment Area Soil (1-10 ft bgs)
Containment Area Subsurface Evaluation
Olin Chemical Superfund Site
Wilmington, Massachusetts

Sample ID	Location ID	Date Sampled	Depth
1120-BD-C1	BD-C1	10/10/2000	4.6-4.6 ft
1120-BD-C4	BD-C4	10/10/2000	7.5-7.5 ft
1120-BD-C7	BD-C7	10/12/2000	7.9-7.9 ft
1120-DA-C10	DA-C10	9/18/2000	-0.2-1.8 ft
1120-DA-C11	DA-C11	9/18/2000	0-3 ft
1120-DA-C12	DA-C12	9/18/2000	7-7 ft
1120-DA-C13	DA-C13	9/18/2000	7-7 ft
1120-DA-C14	DA-C14	9/18/2000	5.9-5.9 ft
1120-DA-C15	DA-C15	9/18/2000	1.2-4.2 ft
1120-DA-C16	DA-C16	9/18/2000	0.2-3.2 ft
1120-DA-C17	DA-C17	9/18/2000	6.2-6.2 ft
1120-DA-C18	DA-C18	9/18/2000	6.3-6.3 ft
1120-DA-C19	DA-C19	9/18/2000	1.3-4.3 ft
1120-DA-C2	DA-C2	9/18/2000	1.4-4.4 ft
1120-DA-C20	DA-C20	9/18/2000	0.3-3.3 ft
1120-DA-C21	DA-C21	9/18/2000	6.4-6.4 ft
1120-DA-C22	DA-C22	9/18/2000	6-6 ft
1120-DA-C23	DA-C23	9/18/2000	6.1-6.1 ft
1120-DA-C24	DA-C24	9/18/2000	5.7-5.7 ft
1120-DA-C27	DA-C27	9/29/2000	1.6-4.6 ft
1120-DA-C28	DA-C28	9/29/2000	2.7-5.7 ft
1120-DA-C29-RISK	DA-C29	9/29/2000	6.2-6.2 ft
1120-DA-C3	DA-C3	9/18/2000	1.6-4.6 ft
1120-DA-C30	DA-C30	9/29/2000	6.5-9.5 ft
1120-DA-C31	DA-C31	9/29/2000	4.9-7.9 ft
1120-DA-C32	DA-C32	9/29/2000	5-8 ft
1120-DA-C35	DA-C35	10/7/2000	7.9-7.9 ft
1120-DA-C4	DA-C4	9/18/2000	1.7-4.7 ft
1120-DA-C5	DA-C5	9/18/2000	0.3-2.3 ft
1120-DA-C6	DA-C6	9/18/2000	0.5-3.5 ft
1120-DA-C7	DA-C7	9/18/2000	7.2-7.2 ft
1120-DA-C8	DA-C8	9/18/2000	6.9-6.9 ft
1120-DA-C9	DA-C9	9/18/2000	0.3-0.3 ft
1120-DA-SP-3A	STOCKPILE	8/26/2000	
1120-DA-SP-3B	STOCKPILE	8/26/2000	
1120-DA-SP-3C	STOCKPILE	8/26/2000	
1120-DA-SP3D	STOCKPILE	9/14/2000	
1120-DA-SP3E	STOCKPILE	9/5/2000	
1120-DA-SP4	STOCKPILE	9/5/2000	
1120-DA-SP5A	STOCKPILE	9/14/2000	
1120-DA-SP5B	STOCKPILE	9/14/2000	
1120-DA-SP5C	STOCKPILE	9/14/2000	
1120-DA-SP6A	STOCKPILE	9/22/2000	
1120-DA-SP6B	STOCKPILE	9/22/2000	
1120-DA-SP6C	STOCKPILE	9/22/2000	
1120-DA-SP8A	STOCKPILE	9/26/2000	
1120-DA-SP8B	STOCKPILE	9/26/2000	
1120-DA-SP8C	STOCKPILE	9/26/2000	
1120-DA-SP8D	STOCKPILE	9/26/2000	
1120-DA-SP8E	STOCKPILE	9/26/2000	
1120-DA-SP8F	STOCKPILE	9/26/2000	
1120-DA-SP8G	STOCKPILE	9/26/2000	
1120-DA-SP8H	STOCKPILE	9/26/2000	
1130-OSFILL-450	OSFILL-450	10/13/2000	0.5-0.5 ft
1140-CP-C36	CP-C36	10/5/2000	5.4-5.4 ft
1140-CP-C38	CP-C38	10/5/2000	6.2-6.2 ft
1140-CP-C39	CP-C39	10/5/2000	6.7-6.7 ft
1140-CP-C41	CP-C41	10/5/2000	6.5-6.5 ft
1140-CP-C42	CP-C42	10/5/2000	6.3-6.3 ft
1140-CP-C43	CP-C43	10/5/2000	5-5 ft
1140-CP-C45	CP-C45	10/5/2000	6.6-6.6 ft
1140-CP-C46	CP-C46	10/5/2000	6.1-6.1 ft
1140-CP-C47	CP-C47	10/5/2000	5.4-5.4 ft

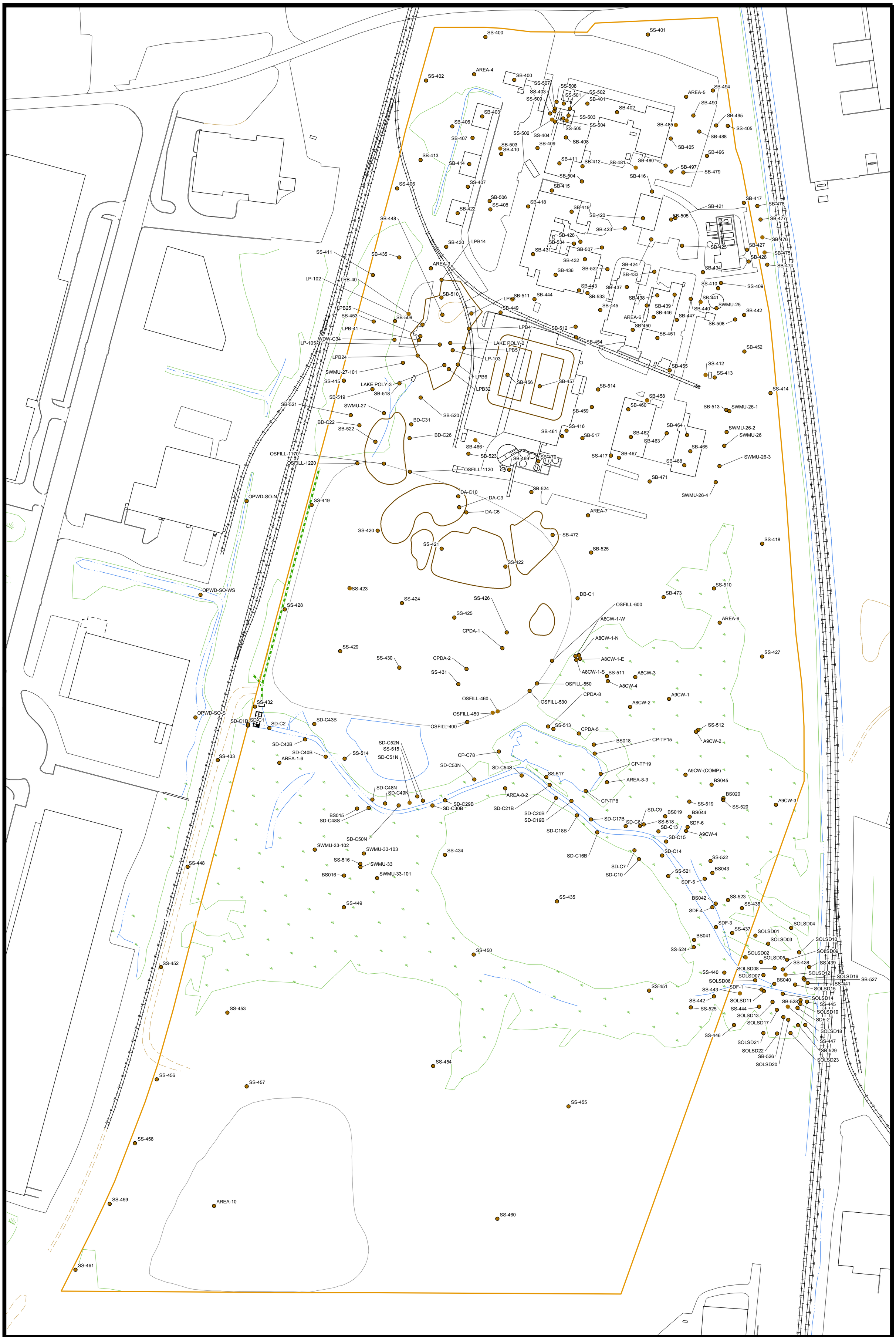
Table 4
Summary of Samples within Containment Area Soil (1-10 ft bgs)
Containment Area Subsurface Evaluation
Olin Chemical Superfund Site
Wilmington, Massachusetts

Sample ID	Location ID	Date Sampled	Depth
1140-CP-C49	CP-C49	10/5/2000	6.8-6.8 ft
1140-CP-C50	CP-C50	10/5/2000	4.8-4.8 ft
1140-CP-C52	CP-C52	10/9/2000	8.7-8.7 ft
1140-CP-C53	CP-C53	10/9/2000	8.5-8.5 ft
1140-CP-C54	CP-C54	10/10/2000	3.3-3.3 ft
1140-CP-C55	CP-C55	10/10/2000	4.1-4.1 ft
1140-CP-C56	CP-C56	10/10/2000	4.1-4.1 ft
1140-CP-C57	CP-C57	10/10/2000	4.4-4.4 ft
1140-CP-C58	CP-C58	10/10/2000	4.5-4.5 ft
1140-CP-C59	CP-C59	10/20/2000	4.9-4.9 ft
1140-CP-C60	CP-C60	10/20/2000	5.5-5.5 ft
1140-CP-C61	CP-C61	10/20/2000	5.4-5.4 ft
1140-CP-C62	CP-C62	10/20/2000	3.7-3.7 ft
1140-CP-C64	CP-C64	10/20/2000	5.2-5.2 ft
1140-CP-C65	CP-C65	10/20/2000	5.3-5.3 ft
1140-CP-C66	CP-C66	10/20/2000	5.1-5.1 ft
1140-CP-C67	CP-C67	10/20/2000	4.7-4.7 ft
1140-CP-C68	CP-C68	10/20/2000	4.1-4.1 ft
1140-CP-C69	CP-C69	10/20/2000	4.3-4.3 ft
1140-CP-C70	CP-C70	10/20/2000	4.2-4.2 ft
1140-SD-C24	SD-C24	10/18/2000	3-3 ft
1140-SD-C24B-RISK	SD-C24B	10/18/2000	2-2 ft
1140-WD-C1	WD-C1	9/19/2000	8.3-8.3 ft
1140-WD-C10	WD-C10	9/19/2000	6.6-6.6 ft
1140-WD-C10B	WD-C10B	9/21/2000	5.6-5.6 ft
1140-WD-C11	WD-C11	9/19/2000	5.6-5.6 ft
1140-WD-C11 (156878)	WD-C11	9/19/2000	5.6-5.6 ft
1140-WD-C11B	WD-C11B	9/21/2000	5.6-5.6 ft
1140-WD-C11B (157182)	WD-C11B	9/21/2000	5.6-5.6 ft
1140-WD-C12	WD-C12	10/4/2000	6.1-6.1 ft
1140-WD-C12B	WD-C12B	10/4/2000	5.2-5.2 ft
1140-WD-C13	WD-C13	10/4/2000	6.1-6.1 ft
1140-WD-C13B	WD-C13B	10/4/2000	5.2-5.2 ft
1140-WD-C14	WD-C14	10/4/2000	7.6-7.6 ft
1140-WD-C14B	WD-C14B	10/4/2000	6.9-6.9 ft
1140-WD-C15B	WD-C15B	10/4/2000	9.3-9.3 ft
1140-WD-C1B	WD-C1B	9/21/2000	7.3-7.3 ft
1140-WD-C2	WD-C2	9/19/2000	8-8 ft
1140-WD-C2B	WD-C2B	9/21/2000	7-7 ft
1140-WD-C3	WD-C3	9/19/2000	7.7-7.7 ft
1140-WD-C3B	WD-C3B	9/21/2000	6.7-6.7 ft
1140-WD-C4	WD-C4	9/19/2000	7.6-7.6 ft
1140-WD-C4B	WD-C4B	9/21/2000	6.6-6.6 ft
1140-WD-C5	WD-C5	9/19/2000	7.4-7.4 ft
1140-WD-C5B	WD-C5B	9/21/2000	6.5-6.5 ft
1140-WD-C6	WD-C6	9/19/2000	7.1-7.1 ft
1140-WD-C6B	WD-C6B	9/21/2000	6.2-6.2 ft
1140-WD-C7	WD-C7	9/19/2000	6.6-6.6 ft
1140-WD-C7B	WD-C7B	9/21/2000	5.6-5.6 ft
1140-WD-C8	WD-C8	9/19/2000	6.8-6.8 ft
1140-WD-C8B	WD-C8B	9/21/2000	5.8-5.8 ft
1140-WD-C9	WD-C9	9/19/2000	7-7 ft
1140-WD-C9B	WD-C9B	9/21/2000	6-6 ft
97598-BAY1-8/7	STOCKPILE	8/8/2000	
97598-BAY4-8/7	STOCKPILE	8/8/2000	
97598-DB-C10	DB-C10	8/10/2000	0.8-3.8 ft
97598-DB-C11	DB-C11	8/10/2000	6.2-6.2 ft
97598-DB-C12	DB-C12	8/10/2000	5.9-5.9 ft
97598-DB-C13	DB-C13	8/10/2000	1.9-4.9 ft
97598-DB-C14	DB-C14	8/10/2000	-1.3-1.7 ft
97598-DB-C15	DB-C15	8/10/2000	1.9-4.9 ft
97598-DB-C16	DB-C16	8/10/2000	5.3-5.3 ft
97598-DB-C3	DB-C3	8/10/2000	1.2-4.2 ft

Table 4
Summary of Samples within Containment Area Soil (1-10 ft bgs)
Containment Area Subsurface Evaluation
Olin Chemical Superfund Site
Wilmington, Massachusetts

Sample ID	Location ID	Date Sampled	Depth
97598-DB-C4	DB-C4	8/10/2000	6.8-6.8 ft
97598-DB-C5	DB-C5	8/10/2000	1.4-4.4 ft
97598-DB-C6	DB-C6	8/10/2000	1.4-4.4 ft
97598-DB-C7	DB-C7	8/10/2000	6-6 ft
97598-DB-C8	DB-C8	8/10/2000	5.7-5.7 ft
97598-DB-C9	DB-C9	8/10/2000	1.6-4.6 ft
97598-DB-SP-1	STOCKPILE	8/11/2000	
97598-DB-SP-2E	STOCKPILE	8/11/2000	
97598-DB-SP-2W	STOCKPILE	8/11/2000	
AREA 01	AREA-1	7/8/1991	0-1 ft
AREA 02	AREA-2	7/9/1991	0-1 ft
AREA 1(COMP)	AREA-1	12/15/1996	0-1 ft
AREA 1-1	AREA-1-1	12/15/1996	0-1 ft
AREA 1-2	AREA-1-2	12/15/1996	0-1 ft
AREA 1-4	AREA-1-4	12/15/1996	0-1 ft
AREA 1-5	AREA-1-5	12/15/1996	0-1 ft
BH01	BH1	6/5/1991	4.3-6.3 ft
BH02	BH2	6/5/1991	3.5-5.5 ft
BH03	BH3	6/5/1991	4.2-6.2 ft
BH04	BH4	6/5/1991	6.3-8.3 ft
BH06	BH6	6/6/1991	4.4-6.4 ft
BH07	BH7	6/6/1991	3-5 ft
BH08	BH8	6/7/1991	3-5 ft
BH09	BH9	6/7/1991	2.6-4.6 ft
BH10	BH10	6/7/1991	3.8-5.8 ft
BS017PND	BS017	1/21/1997	0-0 ft
CPD-1-A (0-3 FT)	CPDA-1-A	1/24/2000	2.09-5.09 ft
CPDA-1	CPDA-1	12/16/1996	0-1 ft
CPDA-2	CPDA-2	12/16/1996	0-1 ft
CPDA-3	CPDA-3	12/16/1996	0-1 ft
CPDA-4	CPDA-4	12/16/1996	0-1 ft
DRMA(COMP A)	DRMA-COMP-A	12/15/1996	0-1 ft
DRMA(COMP B)	DRMA-COMP-B	12/15/1996	0-1 ft
DRMB-(COMP)	DRMB-COMP	12/15/1996	0-1 ft
G1-DRMB	G1-DRMB	12/15/1996	0-1 ft
G2-DRMB	G2-DRMB	12/15/1996	0-1 ft
G3-DRMB	G3-DRMB	12/15/1996	0-1 ft
G4-DRMB	G4-DRMB	12/15/1996	0-1 ft
GA1-DRMA	GA1-DRMA	12/15/1996	0-1 ft
GA2-DRMA	GA2-DRMA	12/15/1996	0-1 ft
GA3-DRMA	GA3-DRMA	12/15/1996	0-1 ft
GA4-DRMA	GA4-DRMA	12/15/1996	0-1 ft
GB1-DRMA	GB1-DRMA	12/15/1996	0-1 ft
GB2-DRMA	GB2-DRMA	12/15/1996	0-1 ft
GB3-DRMA	GB3-DRMA	12/15/1996	0-1 ft
GB4-DRMA	GB4-DRMA	12/15/1996	0-1 ft
RSO-14-S1 (0-3 FT)	RSO-14	1/24/2000	-0.87-2.13 ft
RSO-14-S1 (0-3)	RSO-14	1/24/2000	-0.87-2.13 ft
RSO-15-S1 (0-3 FT)	RSO-15	1/24/2000	1.52-4.52 ft
RSO-15-S1 (0-3)	RSO-15	1/24/2000	1.52-4.52 ft
WD 1 (West Ditch 1)	WD-1	11/4/1999	0-0 ft
WD 2 (West Ditch 2)	WD-2	11/4/1999	0-0 ft

Prepared by / Date: KJC 10/07/13
Checked by / Date: BJR 10/14/13



Legend

- Soil Sample Location
- 51 Eames St. Property Boundary
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary
- Historic Disposal Feature (see Figure 1.3-1)

Note:
Historic Disposal Features are shown in Figure 1.3-1.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

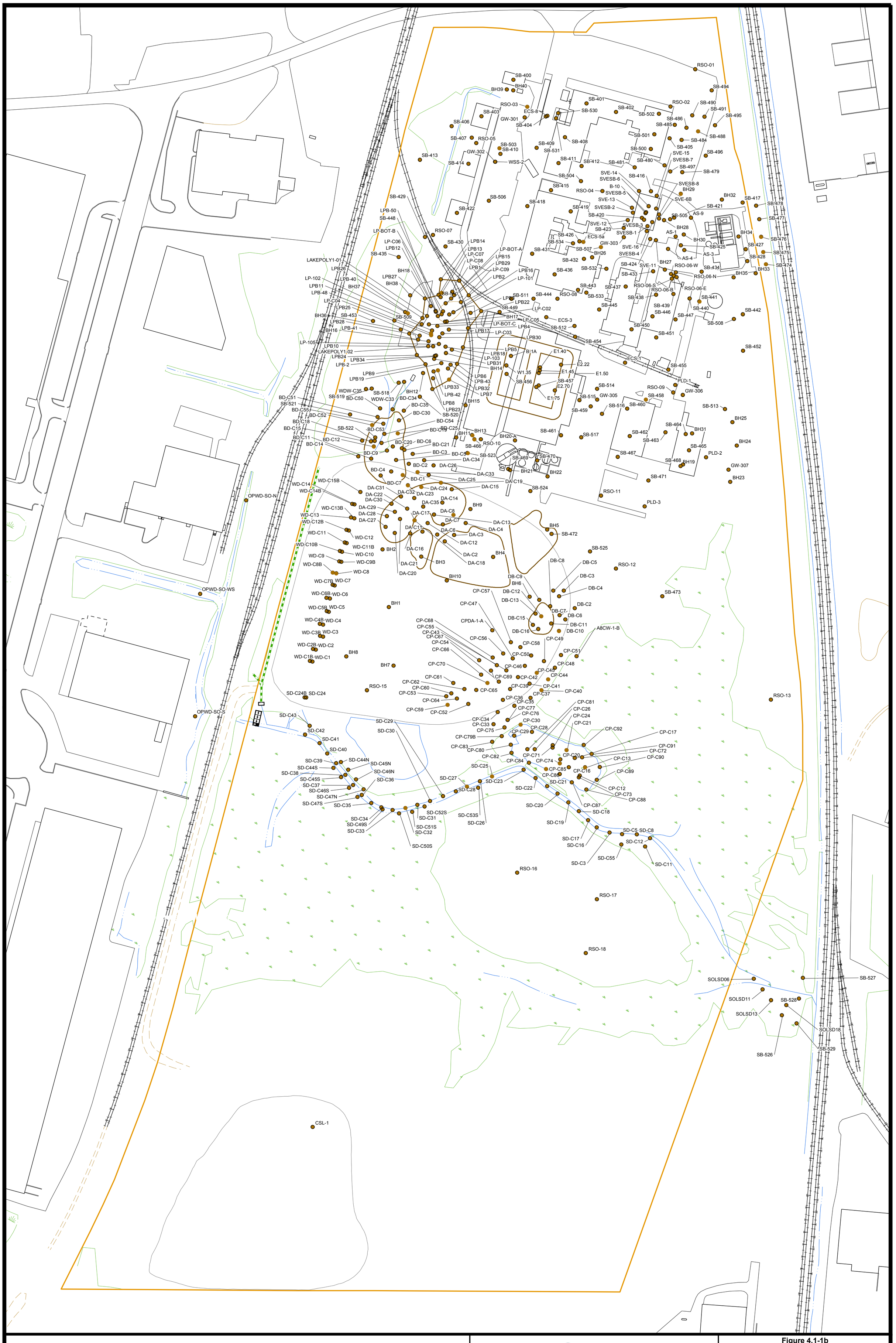
N

0 80 160 Feet

Figure 4.1-1a
Surface Soil (0-1 feet) Sample Locations
Remedial Investigation Report - OU1 and OU2
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 02/19/14 | Checked/Date: CTM 02/19/14

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\RI OU1 OU2\PreliminaryRI_22X34_P_rotated.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\2013 Remedial Investigation Report\Revised_OU1_OU2_RI\Figures\Figure 4.1-1a - Surface Soil (0-1 feet) Sample Locations.pdf 2/19/2014 9:57 PM brian.roden



Legend

- Soil Sample Location
- 51 Eames St. Property Boundary
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary
- Historic Disposal Feature (see Figure 1.3-1)

Note:
Historic Disposal Features are shown in Figure 1.3-1.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 80 160 Feet

Figure 4.1-1b
Shallow Subsurface Soil (1-10 feet)
Sample Locations
Remedial Investigation Report - OU1 and OU2
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 02/19/14 | Checked/Date: CTM 02/19/14

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\RI OU1 OU2\PreliminaryRI_22X34_P_rotated.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\2013 Remedial Investigation Report\Revised_OU1_OU2_RI\Figures\Figure 4.1-1b - Shallow Subsurface Soil (1-10 feet) Sample Locations.pdf 2/19/2014 9:59 PM brian.roden

Attachment A-1

Text from: Drum Removal Release Abatement Measure Status Report No. 1, Olin Property, Wilmington MA, RTN 3-0471, prepared by GEI Consultants, Inc., December 22, 2000.

Drum Removal Release Abatement Measure Status Report No. 1

Olin Property
Wilmington, MA
RTN 3-0471

GEI Consultants, Inc.

1021 Main Street
Winchester, MA 01890-1970
(781) 721-4000

SUBMITTED TO

Olin Environmental Management Inc.
1186 Lower River Road, NW
Charleston, TN 37310-0248

Margret Hanley, LSP
LSP of Record

December 22, 2000
Project Number 97598

3. Status of RAM Activities

3.1 Drum Area A

Drum Area A is located at the west-central part of the Property, as depicted in Figure 1.

Between August 15 and October 7, 2000, Drum Area A was excavated to an average depth of 8 feet below the ground surface (bgs). The total excavation volume in this area was approximately 3,200 cy. A comparison of the proposed and actual extent of the Drum Area A excavation is shown on Figure 1. Based on visual and jar headspace screening in the field with a photoionization detector (PID), excavated soil was segregated into three locations: visibly stained soil was placed in five 20-cy roll-off containers; moderately contaminated soil was placed on the lined pad east of the warehouses in 150-cy stockpiles; and soil with little or no evidence of contamination was placed in covered 250-cy stockpiles south of the excavation and within the Containment Area. The location of the Containment Area is shown on Figure 1.

All of the soil stockpiles were tested for SVOCs, VOCs, pesticides, cadmium, chromium, and lead to establish potential suitability for on-Property reuse. The results of the reuse testing are summarized in Appendix D. The SVOC, pesticide, cadmium, chromium, and lead analyses were performed on composite samples collected from three to six locations on each stockpile. The VOC analysis was performed on a grab sample collected from a single location on each stockpile. Each sample result is representative of a maximum of 250 cy of excavated soil.

Based on the results of the reuse testing, all of the stockpiled soil from Drum Area A was suitable for reuse. About 500 cy of soil stockpiled within the Containment Area was used to backfill in Drum Area B. The remainder of the soil stockpiled within the Containment Area and most of the soil stockpiled on the lined pad, a total of about 2,500 cy, was used as backfill in Drum Area A. However, about 200 cy of stockpiled soil on the lined pad was not used as backfill due to the presence of solid debris and pockets of visibly-stained soil. This stockpile is still on-Property and has been characterized for off-site disposal.

Intact drums, semi-intact drums, and spilled drum contents encountered during the excavation were placed in 85-gallon and 110-gallon overpack containers. A total of 160 overpacks from Drum Area A are currently stored in the West Warehouse. Approximately 34 tons of metal debris, primarily consisting of empty crushed drums and drum parts, were also removed from Drum Area A. Prior to removal from the excavation, the debris was cleaned of soil and residual liquids. The debris was removed from the Property as nonhazardous solid waste on November 6, 2000.

The limits of the excavation were confirmed by performing test pits and a metal detector survey along the excavation bottom and sides.

At the completion of excavation, confirmatory samples were collected at a grid spacing of approximately 25 feet along the bottom and sidewalls. A total of 34 confirmatory samples were collected from this area for laboratory testing. All of the samples were tested for SVOCs, VOCs, pesticides, cadmium, chromium, and lead. Selected samples were also tested for corrosivity (pH). The results of the laboratory testing and a figure showing the locations and approximate elevations of the samples are contained in Appendix D.

Based on the analysis of confirmatory samples, contaminant concentrations were reduced to below the established reuse criteria (UCLs). Therefore, the remedial objectives were met in this area.

Between September 29 and October 9, 2000, the excavation was backfilled in three layers, starting from bottom: blast rock from the Detention Pond; excavated soil from Drum Area A that met reuse criteria; and borrow soil from areas adjacent to the excavation.

3.2 Drum Area B

Drum Area B is located at the east central portion of the Property, as shown in Figure 1.

Between August 7 and 10, 2000, Drum Area B was excavated to an average depth of 6 feet bgs. The total excavation volume in this area was approximately 1,150 cy. A comparison of the proposed and actual area of the Drum Area B excavation is shown on Figure 1.

Based on visual and PID field screening, excavated soil was segregated as follows: moderately contaminated soil was placed on the lined pad east of the warehouses in 50-cy stockpiles; and soil with little or no evidence of contamination was placed in covered 250-cy stockpiles west of the excavation and within the Containment Area. All of the soil stockpiles were tested for SVOCs, VOCs, pesticides, cadmium, chromium, and lead to establish potential suitability for on-Property reuse. The results of the reuse testing are summarized in Appendix E. The SVOC, pesticide, cadmium, chromium, and lead analyses were performed on composite samples collected from three to six locations on each stockpile. The VOC analysis was performed on a grab sample collected from a single location on each stockpile. Each sample result is representative of a maximum of 250 cy of excavated soil.

Based on the results of the reuse testing, all of the stockpiled soil from Drum Area B was suitable for reuse. About 650 cy of the stockpiled soil was used as backfill in Drum Area B. The remainder of the soil, about 500 cy, was not structurally suitable for use as backfill due to high organic content (peat). The high organic content soil was stabilized with cement along with the calcium sulfate from the former berm near Drum Area B, and was used as shallow backfill within the Containment Area. The reuse of cement-stabilized soil is discussed in the Part 2 RAM Status Report No. 1.

No intact drums or spilled liquid drum contents were encountered during the excavation. However, the excavation generated 3 overpack containers of solid waste, primarily pieces of Kempore and resin. The overpacks are currently stored in the West Warehouse. Approximately 2 tons of metal debris, primarily consisting of empty crushed drums and drum

parts, were also removed from Drum Area B. The metal debris was sent for off-site disposal with the debris from Drum Area A on November 6, 2000.

The limits of the excavation were confirmed by overexcavation and by performing test pits along the east sidewall.

At the completion of excavation, confirmatory samples were collected at a grid spacing of approximately 25 feet along the bottom and sidewalls. A total of 16 confirmatory samples were collected from this area for laboratory testing. All of the samples were tested for SVOCs, VOCs, pesticides, cadmium, chromium, and lead. The results of the laboratory testing and a figure showing the locations and approximate elevations of the samples are contained in Appendix E.

Based on the results of the laboratory testing of the confirmatory soil samples, contaminant concentrations were reduced to below the established reuse criteria (UCL). Therefore, the remedial objectives were met for this area.

The excavation was backfilled in three layers, starting from bottom: excavated soil from Drum Area B that met reuse criteria; excavated soil from Drum Area A that met reuse criteria; and borrow soil from areas adjacent to the excavation.

4. Remediation Waste Management

4.1 Drum Area A

Based on disposal testing, five roll-offs containing about 76 tons of the most contaminated soil from Drum Area were sent for off-site disposal at Model City, New York, as nonhazardous solid waste on October 27 and 30, 2000. The results of the disposal testing and the disposal documents will be provided in the RAM Completion Report.

About 200 cy of soil excavated from Drum Area A was judged unsuitable for on-site reuse based on visual evidence of contamination. This soil has been characterized for off-site disposal, and will be removed from the Property in the first quarter of 2001. The results of the disposal testing and the disposal documents will be provided in the RAM Completion Report.

Dewatering effluent generated during excavation and backfilling was treated using a mobile treatment plant and discharged under an NPDES Permit Exclusion issued to Olin in August 2000. Monitoring data associates with the NPDES Permit Exclusion is presented in the Part 2 RAM Status Report No. 1.

4.2 Drum Area B Soil and Dewatering Effluent

No soil from Drum Area B required off-site disposal.

Dewatering effluent, which primarily consisted of a small volume of storm water, was recharged within the Containment Area just west of the Drum Area B excavation.

4.3 Overpacks

One-hundred sixty-three (163) overpacks containing intact drums, semi-intact drums, spilled drum contents, and solid waste from Drum Areas A and B are currently stored at the Property in the West Warehouse. The overpacks have been characterized for off-site disposal and will be removed from the Property in the first quarter of 2001. The results of the disposal testing and the disposal documents will be provided in the RAM Completion Report.

4.4 Metal Debris

Forty (40) tons of metal debris from Drum Areas A and B and other remedial activities at the Property performed as part of the Part 2 Ram were sent for off-site disposal at Model City, New York, a nonhazardous solid waste on November 6, 2000. The results of the disposal testing and the disposal documents will be provided in the RAM Completion Report.

Attachment A-2

Table D-1. Drum Area A Confirmatory Soil Sample Results

Table D-1.
Drum Area A Confirmatory Soil Sample Results
Olin Corporation Property
51 Eames St., Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	1120-DA-C2 9/18/00	1120-DA-C3 9/18/00	1120-DA-C4 9/18/00	1120-DA-C5 9/18/00	1120-DA-C6 9/18/00	1120-DA-C7 9/18/00
VOCs										
2,4,4-Trimethyl-1-pentene	8260B	mg/Kg			< 0.13	< 0.13	< 0.14	< 0.12	< 0.12	< 0.14
2,4,4-Trimethyl-2-pentene					< 0.13	< 0.13	< 0.14	< 0.12	< 0.12	< 0.14
Chloromethane					< 0.27	< 0.26	< 0.28	< 0.25	< 0.23	< 0.28
Ethylbenzene			500	10000	< 0.13	< 0.13	< 0.14	< 0.12	< 0.12	< 0.14
Isopropylbenzene					< 0.13	< 0.13	< 0.14	< 0.12	< 0.12	< 0.14
m+p- Xylene					< 0.13	< 0.13	< 0.14	< 0.12	< 0.12	< 0.14
Methylene chloride			700	7000	0.16 B	0.16 B	0.17 B	0.2 B	0.17 B	0.18 B
p-Isopropyltoluene					< 0.13	< 0.13	< 0.14	< 0.12	< 0.12	< 0.14
Toluene			2500	10000	< 0.13	< 0.13	< 0.14	< 0.12	< 0.12	< 0.14
SVOCs										
bis(2-Ethylhexyl)phthalate	8270C	mg/Kg	500	10000	8.5	9.6	3.9	1.7	19	7.6
Di-n-butyl phthalate					0.39	< 0.77	1.6	< 0.36	< 3.5	< 0.43
N-Nitrosodiphenylamine					1.2	0.48	< 0.38	< 0.36	< 3.5	< 0.43
Pesticides										
Aldrin	8081A	mg/Kg	0.1	1	< 0.11	< 0.011	< 0.011	< 0.011	< 0.01	< 0.013
Endrin			1	100	< 0.11	< 0.011	< 0.011	< 0.011	< 0.01	< 0.013
gamma-BHC (Lindane)			0.5	20	0.69 F	0.027	< 0.011	< 0.011	0.074	0.02
Metals										
Cadmium			80	800	1.4	7.3	0.32	< 0.3	< 0.3	0.35
Chromium			5000	10000	94	42	43	52	60	73
Lead			600	6000	3.9	4.3	10	7.1	4.4	2.5
Solids, percent	EPA 160.3	%			91.6	86.9	88.1	91.5	94.5	77.4
Corrosivity	9040	pH unit								

General Notes:

1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the lab data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. S1/GW3) and Upper Concentration Limits (UCL), where identified, are cited from the MCP. October 1999.
4. Date shown with sample ID is collection date.

Qualifying Notes:

B The reported result is attributed to laboratory contamination due to the presence of the chemical in the associated blank.
C The result is estimated due to surrogate recovery outside of control limits.
F The result is estimated due to matrix spike recovery outside of control limits.

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Drum Area A Confirmatory Soil Sample Results
Olin Corporation Property
51 Eames St., Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	1120-DA-C8 9/18/00	1120-DA-C9 9/18/00	1120-DA-C10 9/18/00	1120-DA-C11 9/18/00	1120-DA-C12 9/18/00
VOCs									
2,4,4-Trimethyl-1-pentene	8260B	mg/Kg			0.67	< 0.12	< 0.13	< 0.12	< 0.15
2,4,4-Trimethyl-2-pentene					0.18	< 0.12	< 0.13	< 0.12	< 0.15
Chloromethane					< 0.28	< 0.24	< 0.26	< 0.24	< 0.3
Ethylbenzene			500	10000	< 0.14	< 0.12	< 0.13	< 0.12	< 0.15
Isopropylbenzene					< 0.14	< 0.12	< 0.13	< 0.12	< 0.15
m+p- Xylene					< 0.14	< 0.12	< 0.13	< 0.12	< 0.15
Methylene chloride			700	7000	0.24 B	0.17 B	0.21 B	0.17 B	0.15 B
p-Isopropyltoluene					< 0.14	< 0.12	< 0.13	< 0.12	< 0.15
Toluene			2500	10000	1.5	< 0.12	< 0.13	< 0.12	0.14
SVOCs									
bis(2-Ethylhexyl)phthalate	8270C	mg/Kg	500	10000	0.98	2.3	3.8	5.8	8.2
Di-n-butyl phthalate					< 0.84	< 0.35	< 0.35	< 0.35	< 0.42
N-Nitrosodiphenylamine					< 0.84	< 0.35	0.24	0.32	6
Pesticides									
Aldrin	8081A	mg/Kg	0.1	1	< 0.013	< 0.011	< 0.011	< 0.011	< 0.012
Endrin			1	100	< 0.013	< 0.011	< 0.011	< 0.011	< 0.012
gamma-BHC (Lindane)			0.5	20	< 0.013	< 0.011	< 0.011	< 0.011	< 0.012
Metals									
Cadmium			80	800	< 0.3	0.71	< 0.3	< 0.3	< 0.3
Chromium			5000	10000	5.1	4.5	27	10	30
Lead			600	6000	2.1	1.5	2	3	4.2
Solids, percent	EPA 160.3	%			79.3	93.8	94.1	94.1	80.1
Corrosivity	9040	pH unit							

General Notes:

1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the lab data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. S1/GW3) and Upper Concentration Limits (UCL), where identified, are cited from the MCP. October 1999.
4. Date shown with sample ID is collection date.

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F The result is estimated due to matrix spike recovery outside of control limits.

Table D-1.
Drum Area A Confirmatory Soil Sample Results
Olin Corporation Property
51 Eames St., Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	1120-DA-C13 9/18/00	1120-DA-C14 9/18/00	1120-DA-C15 9/18/00	1120-DA-C16 9/18/00	1120-DA-C17 9/18/00
VOCs									
2,4,4-Trimethyl-1-pentene	8260B	mg/Kg			68	7.1	< 0.13	< 0.12	0.44
2,4,4-Trimethyl-2-pentene					27	2.6	< 0.13	< 0.12	< 0.14
Chloromethane					< 1.5	< 0.25	< 0.26	< 0.23	< 0.27
Ethylbenzene			500	10000	< 0.74	< 0.13	< 0.13	< 0.12	< 0.14
Isopropylbenzene					< 0.74	< 0.13	< 0.13	< 0.12	0.22
m+p- Xylene					< 0.74	< 0.13	< 0.13	< 0.12	< 0.14
Methylene chloride			700	7000	< 0.74	< 0.13	0.18 B	0.16 B	< 0.14
p-Isopropyltoluene					3.2	1.7	< 0.13	< 0.12	9.2
Toluene			2500	10000	7.5	< 0.13	< 0.13	< 0.12	< 0.14
SVOCs									
bis(2-Ethylhexyl)phthalate	8270C	mg/Kg	500	10000	448 C	1582	1.2	0.42	381
Di-n-butyl phthalate					98 C	109	< 0.35	< 0.34	< 19
N-Nitrosodiphenylamine					< 40	49	< 0.35	< 0.34	< 19
Pesticides									
Aldrin	8081A	mg/Kg	0.1	1	< 0.012	< 0.011	< 0.01	< 0.01 C	< 0.012
Endrin			1	100	< 0.012	< 0.011	< 0.01	< 0.01 C	< 0.012
gamma-BHC (Lindane)			0.5	20	< 0.012	< 0.011	< 0.01	< 0.01 C	< 0.012
Metals									
Cadmium			80	800	0.56	< 0.3	< 0.3	< 0.3	1.4
Chromium			5000	10000	10	18	7.8	23	20
Lead			600	6000	2.4	3	2	6.1	3.4
Solids, percent	EPA 160.3	%			84	88.3	95.3	97.5	85.5
Corrosivity	9040	pH unit							

General Notes:
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2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
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F The result is estimated due to matrix spike recovery outside of control limits.

Table D-1.
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Olin Corporation Property
51 Eames St., Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	1120-DA-C18 9/18/00	1120-DA-C19 9/18/00	1120-DA-C20 9/18/00	1120-DA-C21 9/18/00	1120-DA-C22 9/18/00
VOCs									
2,4,4-Trimethyl-1-pentene	8260B	mg/Kg			< 0.14	< 0.13	< 0.13	0.42	1
2,4,4-Trimethyl-2-pentene					< 0.14	< 0.13	< 0.13	< 0.15	0.35
Chloromethane					< 0.29	< 0.26	< 0.26	< 0.3	< 0.27
Ethylbenzene			500	10000	< 0.14	< 0.13	< 0.13	< 0.15	< 0.13
Isopropylbenzene					< 0.14	< 0.13	< 0.13	< 0.15	< 0.13
m+p- Xylene					< 0.14	< 0.13	< 0.13	< 0.15	< 0.13
Methylene chloride			700	7000	0.19 B	0.18 B	0.17 B	0.23 B	0.18 B
p-Isopropyltoluene					< 0.14	< 0.13	< 0.13	< 0.15	< 0.13
Toluene			2500	10000	< 0.14	< 0.13	< 0.13	< 0.15	< 0.13
SVOCs									
bis(2-Ethylhexyl)phthalate	8270C	mg/Kg	500	10000	370	1.1	< 0.34	73	94
Di-n-butyl phthalate					< 20	< 0.34	< 0.34	< 4.1	< 3.8
N-Nitrosodiphenylamine					< 20	< 0.34	< 0.34	< 4.1	2.8
Pesticides									
Aldrin	8081A	mg/Kg	0.1	1	< 0.012	< 0.01	< 0.01	< 0.012	< 0.012
Endrin			1	100	< 0.012	< 0.01	< 0.01	< 0.012	< 0.012
gamma-BHC (Lindane)			0.5	20	< 0.012	< 0.01	< 0.01	0.2	< 0.012
Metals									
Cadmium			80	800	1.4	< 0.3	< 0.3	< 0.3	< 0.3
Chromium			5000	10000	15	41	23	6.8	5.7
Lead			600	6000	2.6	2.8	6.1	2	2.5
Solids, percent	EPA 160.3	%			84.7	97	97.2	80.7	86.3
Corrosivity	9040	pH unit							

General Notes:
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F The result is estimated due to matrix spike recovery outside of control limits.

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Drum Area A Confirmatory Soil Sample Results
Olin Corporation Property
51 Eames St., Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	1120-DA-C23 9/18/00	1120-DA-C24 9/18/00	1120-DA-C25 9/29/00	1120-DA-C26 9/29/00	1120-DA-C27 9/29/00
VOCs									
2,4,4-Trimethyl-1-pentene	8260B	mg/Kg			< 0.16	< 0.15	< 0.15	< 0.13	< 0.13
2,4,4-Trimethyl-2-pentene					< 0.16	< 0.15	< 0.15	< 0.13	< 0.13
Chloromethane					< 0.31	< 0.3	0.28	< 0.25	< 0.26
Ethylbenzene			500	10000	< 0.16	< 0.15	< 0.15	< 0.13	< 0.13
Isopropylbenzene					< 0.16	< 0.15	< 0.15	< 0.13	< 0.13
m+p- Xylene					< 0.16	< 0.15	< 0.15	< 0.13	< 0.13
Methylene chloride			700	7000	0.21 B	0.19 B	< 0.15	< 0.13	< 0.13
p-Isopropyltoluene					< 0.16	< 0.15	< 0.15	< 0.13	< 0.13
Toluene			2500	10000	0.51	< 0.15	< 0.15	< 0.13	< 0.13
SVOCs									
bis(2-Ethylhexyl)phthalate	8270C	mg/Kg	500	10000	1590	16	2.4	1.6	7.2
Di-n-butyl phthalate					< 400	< 1.9	< 0.36	< 0.34	< 0.71
N-Nitrosodiphenylamine					< 400	< 1.9	2.4	< 0.34	< 0.71
Pesticides									
Aldrin	8081A	mg/Kg	0.1	1	< 0.012	< 0.012	< 0.011	< 0.01	< 0.01
Endrin			1	100	< 0.012	< 0.012	< 0.011	< 0.01	< 0.01
gamma-BHC (Lindane)			0.5	20	< 0.012	< 0.012	< 0.011	< 0.01	0.17
Metals									
Cadmium			80	800	2.3	< 0.3	< 0.3	< 0.3	< 0.3
Chromium			5000	10000	8.4	5.8	14	14	13
Lead			600	6000	2.8	2	4	3.9	1.7
Solids, percent	EPA 160.3	%			83.4	85.8	91.2	97.2	93.3
Corrosivity	9040	pH unit					6.44	6.31	6.36

General Notes:

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Table D-1.
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Olin Corporation Property
51 Eames St., Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	1120-DA-C28 9/29/00	1120-DA-C29 9/29/00	1120-DA-C29-D 9/29/00	1120-DA-C30 9/29/00	1120-DA-C31 9/29/00
VOCs									
2,4,4-Trimethyl-1-pentene	8260B	mg/Kg			< 0.14	5.7	3.6	0.37	< 0.12
2,4,4-Trimethyl-2-pentene					< 0.14	2.2	1.4	< 0.13	< 0.12
Chloromethane					< 0.28	< 0.3	< 0.32	< 0.26	< 0.25
Ethylbenzene			500	10000	< 0.14	< 0.15	< 0.16	< 0.13	< 0.12
Isopropylbenzene					< 0.14	< 0.15	< 0.16	< 0.13	< 0.12
m+p- Xylene					< 0.14	< 0.15	< 0.16	0.096 B	< 0.12
Methylene chloride			700	7000	< 0.14	< 0.15	< 0.16	< 0.13	< 0.12
p-Isopropyltoluene					< 0.14	0.75	0.24	< 0.13	< 0.12
Toluene			2500	10000	< 0.14	< 0.15	< 0.16	0.45	< 0.12
SVOCs									
bis(2-Ethylhexyl)phthalate	8270C	mg/Kg	500	10000	6.2	122 C	116 C	3.4	12
Di-n-butyl phthalate					< 0.37	< 41	< 8.3	< 0.37	< 1.8
N-Nitrosodiphenylamine					0.8	< 41	6.5 C	0.48	< 1.8
Pesticides									
Aldrin	8081A	mg/Kg	0.1	1	< 0.011	0.014		0.015	< 0.01
Endrin			1	100	< 0.011	< 0.012		0.022	< 0.01
gamma-BHC (Lindane)			0.5	20	0.047	< 0.012		0.028	< 0.01
Metals									
Cadmium			80	800	0.82	< 0.3		< 0.3	< 0.3
Chromium			5000	10000	22	50		27	34
Lead			600	6000	3.6	2.6		3	1.8
Solids, percent	EPA 160.3	%			89	80.9	79.8	90.8	92.1
Corrosivity	9040	pH unit			6.7	7.55	7.13	6.85	7.06

General Notes:
1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the lab data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. S1/GW3) and Upper Concentration Limits (UCL), where identified, are cited from the MCP. October 1999.
4. Date shown with sample ID is collection date.

Qualifying Notes:
B The reported result is attributed to laboratory contamination due to the presence of the chemical in the associated blank.
C The result is estimated due to surrogate recovery outside of control limits.
F The result is estimated due to matrix spike recovery outside of control limits.

Table D-1.
Drum Area A Confirmatory Soil Sample Results
Olin Corporation Property
51 Eames St., Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	1120-DA-C32 9/29/00	1120-DA-C33 9/29/00	1120-DA-C34 9/29/00	1120-DA-C35 10/7/00
VOCs								
2,4,4-Trimethyl-1-pentene	8260B	mg/Kg			< 0.13	2.3	< 0.13	2.6
2,4,4-Trimethyl-2-pentene					< 0.13	< 0.16	< 0.13	7.3
Chloromethane					< 0.26	< 0.32	< 0.26	< 0.3
Ethylbenzene			500	10000	< 0.13	< 0.16	< 0.13	0.62
Isopropylbenzene					< 0.13	< 0.16	< 0.13	0.37
m+p- Xylene					< 0.13	< 0.16	< 0.13	< 0.15
Methylene chloride			700	7000	< 0.13	< 0.16	< 0.13	< 0.15
p-Isopropyltoluene					< 0.13	< 0.16	< 0.13	18
Toluene			2500	10000	< 0.13	< 0.16	< 0.13	13
SVOCs								
bis(2-Ethylhexyl)phthalate	8270C	mg/Kg	500	10000	0.86	< 0.43	0.45	7.9
Di-n-butyl phthalate					< 0.37	< 0.43	< 0.36	< 0.41
N-Nitrosodiphenylamine					< 0.37	< 0.43	0.27	< 0.41
Pesticides								
Aldrin	8081A	mg/Kg	0.1	1	< 0.01	< 0.012	< 0.01	< 0.012
Endrin			1	100	< 0.01	< 0.012	< 0.01	< 0.012
gamma-BHC (Lindane)			0.5	20	< 0.01	< 0.012	< 0.01	< 0.012
Metals								
Cadmium			80	800	< 0.3	< 0.3	< 0.3	< 0.4
Chromium			5000	10000	5.8	4.3	4.8	7.7
Lead			600	6000	2.4	1.7	1.7	2.5
Solids, percent	EPA 160.3	%			90.4	77.5	93.6	79.5
Corrosivity	9040	pH unit			4.75	4.94	4.7	7.66

General Notes:

1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the lab data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. S1/GW3) and Upper Concentration Limits (UCL), where identified, are cited from the MCP. October 1999.
4. Date shown with sample ID is collection date.

Qualifying Notes:

B The reported result is attributed to laboratory contamination due to the presence of the chemical in the associated blank.
C The result is estimated due to surrogate recovery outside of control limits.
F The result is estimated due to matrix spike recovery outside of control limits.

Attachment A-3

Table D-2. Reuse Testing Results – Drum Area A Stockpile Samples

Table D-2.
Reuse Testing Results
Drum Area A Stockpile Samples
Olin Corporation Property
51 Eames Street, Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	1120-DA-SP-3A 8/26/00	1120-DA-SP-3B 8/26/00	1120-DA-SP-3C 8/26/00	1120-DA-SP3D 9/14/00
VOCs	8260B	mg/Kg						
1,2,4-Trimethylbenzene					< 0.045	< 0.034	< 0.031	< 0.14
1,3,5-Trimethylbenzene					< 0.045	< 0.034	< 0.031	< 0.14
2,4,4-Trimethyl-1-pentene					ND [a]	ND [a]	ND [a]	< 0.14
2,4,4-Trimethyl-2-pentene					ND [a]	ND [a]	ND [a]	< 0.14
Ethylbenzene			500	10000	< 0.045	< 0.034	< 0.031	< 0.14
m+p- Xylene			2500	10000				< 0.14
Methylene chloride			700	7000	< 0.089	< 0.068	< 0.0625	< 0.14
o-Xylene			2500	10000	< 0.045	< 0.034	< 0.031	< 0.14
p-Isopropyltoluene								< 0.14
Styrene			100	1000	< 0.045	< 0.034	< 0.031	< 0.14
Toluene			2500	10000	< 0.045	0.11	< 0.031	< 0.14
SVOCs	8270C	mg/Kg						
Bis(2-ethylhexyl)phthalate			500	10000	1.8	3.9	2	17
Di-n-butyl phthalate				10000	< 0.32	< 0.27	< 0.25	< 2.2
N-Nitrosodiphenylamine				10000	< 0.32	< 0.27	< 0.25	< 2.2
Phenanthrene			100	10000	< 0.32	< 0.27	< 0.25	< 2.2
Pesticides	8081A	mg/Kg						
Aldrin			0.1	1	< 0.01	< 0.009	< 0.008	< 0.013
alpha-BHC					0.24	0.43	0.015	< 0.013
beta-BHC					0.13	0.15	0.0083	< 0.013
gamma-BHC (Lindane)			0.5	20	< 0.01	0.011	< 0.008	< 0.013
Metals	6010B	mg/Kg						
Cadmium			80	800	< 0.772	< 0.670	< 0.650	0.35
Chromium			5000	10000	37	21	11	39
Lead			600	6000	14	7.1	5.8	6.3
Solids, percent	EPA 160.3	%			76.2	91.4	95.5	77.3

General Notes:

[a] = These compounds were reported as tentatively-identified compounds

1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the lab data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. S1/GW3) and Upper Concentration Limits, where identified, are cited from the MCP, October 1999.
4. Date shown with sample ID is sample collection date.

Qualifying Note:

C The result is estimated due to surrogate recovery outside of control limits.

Table D-2.
Reuse Testing Results
Drum Area A Stockpile Samples
Olin Corporation Property
51 Eames Street, Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	1120-DA-SP3E 9/5/00	1120-DA-SP4 9/5/00	1120-DA-SP5A 9/14/00	1120-DA-SP5B 9/14/00
VOCs	8260B	mg/Kg						
1,2,4-Trimethylbenzene					< 0.13	< 0.12	0.16	< 0.15
1,3,5-Trimethylbenzene					< 0.13	< 0.12	0.16	< 0.15
2,4,4-Trimethyl-1-pentene					14	0.64	< 0.14	1.2 C
2,4,4-Trimethyl-2-pentene					5.7	< 0.12	< 0.14	0.52 C
Ethylbenzene			500	10000	< 0.13	< 0.12	< 0.14	< 0.15
m+p- Xylene			2500	10000	< 0.13	< 0.12	< 0.14	< 0.15
Methylene chloride			700	7000	< 0.13	< 0.12	< 0.14	< 0.15
o-Xylene			2500	10000	< 0.13	< 0.12	< 0.14	< 0.15
p-Isopropyltoluene					< 0.13	< 0.12	< 0.14	< 0.15
Styrene			100	1000	< 0.13	< 0.12	< 0.14	< 0.15
Toluene			2500	10000	< 0.13	< 0.12	0.14	1.1 C
SVOCs	8270C	mg/Kg						
Bis(2-ethylhexyl)phthalate			500	10000	23	5.8	31	287
Di-n-butyl phthalate				10000	< 1.8	< 0.74	< 2.1	< 21
N-Nitrosodiphenylamine				10000	< 1.8	1.1	3.2	19
Phenanthrene			100	10000	< 1.8	< 0.74	< 2.1	< 21
Pesticides	8081A	mg/Kg						
Aldrin			0.1	1	< 0.0099	< 0.0099	< 0.013	< 0.012
alpha-BHC					< 0.0099	0.014	< 0.013	0.024
beta-BHC					< 0.0099	< 0.011	< 0.013	< 0.012
gamma-BHC (Lindane)			0.5	20	< 0.0099	< 0.011	0.024	0.021
Metals	6010B	mg/Kg						
Cadmium			80	800	< 0.3	< 0.3	0.74	3
Chromium			5000	10000	24	11	38	37
Lead			600	6000	6	3.6	6.2	5.4
Solids, percent	EPA 160.3	%			94.1	89.2	78.4	79.3

General Notes:

[a] = These compounds were reported as tentatively-identified compounds

1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the lab data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. S1/GW3) and Upper Concentration Limits, where identified, are cited from the MCP, October 1999.
4. Date shown with sample ID is sample collection date.

Qualifying Note:

C The result is estimated due to surrogate recovery outside of control limits.

Table D-2.
Reuse Testing Results
Drum Area A Stockpile Samples
Olin Corporation Property
51 Eames Street, Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	1120-DA-SP5C 9/14/00	1120-DA-SP6A 9/22/00	1120-DA-SP6B 9/22/00	1120-DA-SP6C 9/22/00
VOCs	8260B	mg/Kg						
1,2,4-Trimethylbenzene					< 1.3	< 0.13	< 0.13	< 0.13
1,3,5-Trimethylbenzene					< 1.3	< 0.13	< 0.13	< 0.13
2,4,4-Trimethyl-1-pentene					43	< 0.13	< 0.13	0.57
2,4,4-Trimethyl-2-pentene					16	< 0.13	< 0.13	< 0.13
Ethylbenzene			500	10000	< 1.3	< 0.13	< 0.13	< 0.13
m+p- Xylene			2500	10000	< 1.3	< 0.13	< 0.13	< 0.13
Methylene chloride			700	7000	< 1.3	0.15	< 0.13	0.15
o-Xylene			2500	10000	< 1.3	< 0.13	< 0.13	< 0.13
p-Isopropyltoluene					3.3	< 0.13	< 0.13	< 0.13
Styrene			100	1000	< 1.3	< 0.13	< 0.13	< 0.13
Toluene			2500	10000	14	< 0.13	< 0.13	< 0.13
SVOCs	8270C	mg/Kg						
Bis(2-ethylhexyl)phthalate			500	10000	856 C	622	511	1.3
Di-n-butyl phthalate				10000	103 C	< 36	32	< 0.37
N-Nitrosodiphenylamine				10000	< 44	37	61	< 0.37
Phenanthrene			100	10000	< 44	< 36	< 36	0.28
Pesticides	8081A	mg/Kg						
Aldrin			0.1	1	< 0.013	< 0.01	< 0.011	< 0.011
alpha-BHC					< 0.013	< 0.01	< 0.011	< 0.011
beta-BHC					< 0.013	< 0.01	< 0.011	< 0.011
gamma-BHC (Lindane)			0.5	20	< 0.013	< 0.01	< 0.011	< 0.011
Metals	6010B	mg/Kg						
Cadmium			80	800	3.2	0.79	0.46	< 0.3
Chromium			5000	10000	25	68	20	10
Lead			600	6000	3.7	5.6	4.2	6.6
Solids, percent	EPA 160.3	%			75.4	92.1	91.7	90.7

General Notes:

[a] = These compounds were reported as tentatively-identified compounds

1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the lab data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. S1/GW3) and Upper Concentration Limits, where identified, are cited from the MCP, October 1999.
4. Date shown with sample ID is sample collection date.

Qualifying Note:

C The result is estimated due to surrogate recovery outside of control limits.

Table D-2.
Reuse Testing Results
Drum Area A Stockpile Samples
Olin Corporation Property
51 Eames Street, Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	1120-DA-SP8A 9/26/00	1120-DA-SP8B 9/26/00	1120-DA-SP8C 9/26/00	1120-DA-SP8D 9/26/00
VOCs	8260B	mg/Kg						
1,2,4-Trimethylbenzene					< 0.13	< 1.2	< 0.13	< 0.13
1,3,5-Trimethylbenzene					< 0.13	< 1.2	< 0.13	< 0.13
2,4,4-Trimethyl-1-pentene					< 0.13	140	1.8	14
2,4,4-Trimethyl-2-pentene					< 0.13	106	0.67	5.1
Ethylbenzene			500	10000	< 0.13	< 1.2	< 0.13	0.39
m+p- Xylene			2500	10000	< 0.13	< 1.2	< 0.13	1.4
Methylene chloride			700	7000	< 0.13	< 1.2	< 0.13	< 0.13
o-Xylene			2500	10000	< 0.13	< 1.2	< 0.13	0.4
p-Isopropyltoluene					< 0.13	27	1.5	< 0.13
Styrene			100	1000	< 0.13	< 1.2	< 0.13	< 0.13
Toluene			2500	10000	< 0.13	< 1.2	0.29	7.1
SVOCs	8270C	mg/Kg						
Bis(2-ethylhexyl)phthalate			500	10000	244 C	1087 C	2356 C	26 C
Di-n-butyl phthalate				10000	< 36	87 C	< 180	< 3.6
N-Nitrosodiphenylamine				10000	< 36	86 C	< 180	< 3.6
Phenanthrene			100	10000	< 36	< 72	< 180	< 3.6
Pesticides	8081A	mg/Kg						
Aldrin			0.1	1	0.014 C	< 0.011	< 0.01 C	< 0.011
alpha-BHC					0.025 C	< 0.011	0.048 C	< 0.011
beta-BHC					< 0.011 C	< 0.011	< 0.01 C	< 0.011
gamma-BHC (Lindane)			0.5	20	< 0.011 C	0.18	0.02 C	< 0.011 C
Metals	6010B	mg/Kg						
Cadmium			80	800	1	0.85	54	0.34
Chromium			5000	10000	36	20	27	24
Lead			600	6000	4.7	4.3	4.6	6.3
Solids, percent	EPA 160.3	%			91.8	91.8	90.5	89.7

General Notes:

[a] = These compounds were reported as tentatively-identified compounds

1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the lab data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. S1/GW3) and Upper Concentration Limits, where identified, are cited from the MCP, October 1999.
4. Date shown with sample ID is sample collection date.

Qualifying Note:

C The result is estimated due to surrogate recovery outside of control limits.

Table D-2.
Reuse Testing Results
Drum Area A Stockpile Samples
Olin Corporation Property
51 Eames Street, Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	1120-DA-SP8E 9/26/00	1120-DA-SP8F 9/26/00	1120-DA-SP8G 9/26/00	1120-DA-SP8H 9/26/00	1120-DA-SP8H-D 9/26/00
VOCs	8260B	mg/Kg							
1,2,4-Trimethylbenzene					< 0.13	< 0.65	< 0.12	< 0.13	< 0.12
1,3,5-Trimethylbenzene					< 0.13	< 0.65	< 0.12	< 0.13	< 0.12
2,4,4-Trimethyl-1-pentene					21	27	< 0.12	0.65	0.52
2,4,4-Trimethyl-2-pentene					8.3	12	< 0.12	0.19	0.14
Ethylbenzene			500	10000	0.11	< 0.65	< 0.12	< 0.13	< 0.12
m+p- Xylene			2500	10000	0.12	< 0.65	< 0.12	< 0.13	< 0.12
Methylene chloride			700	7000	< 0.13	< 0.65	< 0.12	< 0.13	< 0.12
o-Xylene			2500	10000	< 0.13	< 0.65	< 0.12	< 0.13	< 0.12
p-Isopropyltoluene					0.22	2.3	< 0.12	< 0.13	< 0.12
Styrene			100	1000	0.81	< 0.65	< 0.12	< 0.13	< 0.12
Toluene			2500	10000	5.3	< 0.65	< 0.12	0.68	0.46
SVOCs	8270C	mg/Kg							
Bis(2-ethylhexyl)phthalate			500	10000	365 C	501 C	679 C	676 C	522
Di-n-butyl phthalate				10000	< 35	< 36	< 36	< 36	< 36
N-Nitrosodiphenylamine				10000	24	< 36	473 C	< 36	< 36
Phenanthrene			100	10000	< 35	< 36	< 36	< 36	< 36
Pesticides	8081A	mg/Kg							
Aldrin			0.1	1	< 0.011	< 0.054 C	< 0.011	0.059 C	0.063 C
alpha-BHC					< 0.011	< 0.054 C	< 0.011	0.1 C	0.16 C
beta-BHC					< 0.011	< 0.054 C	< 0.011	0.033 C	0.05 C
gamma-BHC (Lindane)			0.5	20	< 0.011	0.18 C	0.063	0.031 C	0.078 C
Metals	6010B	mg/Kg							
Cadmium			80	800	3.3	1.8	14	7.3	5.9
Chromium			5000	10000	84	650	200	41	40
Lead			600	6000	3.5	4.1	3	4	4.4
Solids, percent	EPA 160.3	%			92.9	91.5	92.2	90.5	90.2

General Notes:

[a] = These compounds were reported as tentatively-identified compounds

1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the lab data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. S1/GW3) and Upper Concentration Limits, where identified, are cited from the MCP, October 1999.
4. Date shown with sample ID is sample collection date.

Qualifying Note:

C The result is estimated due to surrogate recovery outside of control limits.

Attachment A-4

Table E-1. Drum Area B Confirmatory Soil Sample Results

Table E-1.
Drum Area B Confirmatory Soil Sample Results
Olin Corporation Property
51 Eames St, Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	DB-C1 8/10/00	DB-C2 8/10/00	DB-C3 8/10/00	DB-C4 8/10/00	DB-C5 8/10/00	DB-C6 8/10/00	DB-C7 8/10/00	DB-C8 8/10/00
VOCs	8260B	mg/Kg										
1,1,1-Trichloroethane			500	5000	< 0.068	< 0.042	< 0.074	< 0.042	< 0.049	< 0.068	< 0.059	< 0.05
1,2,3-Trichlorobenzene					< 0.068	0.24	< 0.074	< 0.042	< 0.049	0.15	< 0.059	< 0.05
1,2,4-Trichlorobenzene			800	10000	0.098	1.2	< 0.074	< 0.042	< 0.049	0.69	< 0.059	< 0.05
1,2,4-Trimethylbenzene					0.21	3	< 0.074	< 0.042	0.13	4.6	< 0.059	< 0.05
1,3,5-Trimethylbenzene					0.13	2.1	< 0.074	< 0.042	0.085	2.9	< 0.059	< 0.05
1,4-Dichlorobenzene			200	2000	< 0.068	0.054	< 0.074	< 0.042	< 0.049	< 0.068	< 0.059	< 0.05
2,4,4-Trimethyl-1-pentene [a]					ND	0.41	ND	ND	ND	0.37	ND	ND
2,4,4-Trimethyl-2-pentene [a]					ND	ND	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene					< 0.068	0.12	< 0.074	< 0.042	< 0.049	0.37	< 0.059	< 0.05
Ethylbenzene			500	10000	< 0.068	0.069	< 0.074	< 0.042	< 0.049	0.16	< 0.059	< 0.05
Isopropylbenzene					< 0.068	0.39	< 0.074	< 0.042	< 0.049	0.65	< 0.059	< 0.05
m,p-Xylene			2500	10000	< 0.068	0.18	< 0.074	< 0.042	< 0.049	0.35	< 0.059	< 0.05
Methylene chloride			700	7000	0.44 B	0.29 B	0.32 B	0.4 B	0.5 B	0.3 B	0.15 B	0.29 B
Naphthalene			1000	10000	< 0.14	0.051	< 0.15	< 0.085	< 0.099	< 0.14	< 0.12	< 0.099
n-Propylbenzene					< 0.068	0.34	< 0.074	< 0.042	< 0.049	0.59	< 0.059	< 0.05
o-Xylene					< 0.068	0.31	< 0.074	< 0.042	< 0.049	0.53	< 0.059	< 0.05
sec-Butylbenzene					< 0.068	0.14	< 0.074	< 0.042	< 0.049	0.21	< 0.059	< 0.05
Styrene			100	1000	< 0.068	0.24	< 0.074	< 0.042	< 0.049	0.43	< 0.059	< 0.05
Toluene			2500	10000	< 0.068	0.052	< 0.074	< 0.042	< 0.049	0.094	< 0.059	< 0.05
SVOCs	8270C	mg/Kg										
1,2,4-Trichlorobenzene			800	10000	< 0.31	0.9 CF	< 0.31	< 0.30	0.27 F	< 0.28	< 0.29	< 0.29
1,4-Dichlorobenzene			200	2000	< 0.31	< 0.27 CF	< 0.31	< 0.30	< 0.27 F	< 0.28	< 0.29	< 0.29
Benzoic acid					< 0.63	2 CF	< 0.62	< 0.60	0.77 F	1.1 B	< 0.57	< 0.58
Bis(2-ethylhexyl)phthalate			500	10000	2.4 B	14 CF	0.86 B	0.81 B	10 F	8.6	< 0.29	< 0.29
Di-n-butyl phthalate					< 0.31	2.6 CF	< 0.31	< 0.30	0.48 F	0.99	< 0.29	< 0.29
Naphthalene			1000	10000	< 0.31	< 0.27 CF	< 0.31	< 0.30	< 0.27 F	< 0.28	< 0.29	< 0.29
N-Nitrosodiphenylamine					< 0.31	1.1 CF	< 0.31	0.12	1.4 F	0.7	< 0.29	< 0.29
Phenol			500	10000	< 0.31	0.32 CF	< 0.31	< 0.30	< 0.27 F	< 0.28	< 0.29	< 0.29
Pesticides	8081A	mg/Kg										
alpha-Chlordane					< 0.0099	0.078 C	< 0.0098	< 0.0093	< 0.0086	< 0.0088	< 0.0092	< 0.009
beta-BHC					< 0.0099	0.32 C	< 0.0098	< 0.0093	< 0.0086	< 0.0088	< 0.0092	< 0.009
delta-BHC					0.031	< 0.0083 C	< 0.0098	< 0.0093	< 0.0086	< 0.0088	< 0.0092	< 0.009
gamma-BHC			0.5	20	0.13 F	1.6 C	< 0.0098	0.028	0.23	0.66	< 0.0092	< 0.009
gamma-Chlordane					0.036	0.031 C	< 0.0098	< 0.0093	< 0.0086	0.042	< 0.0092	< 0.009
Metals												
Cadmium (All samples non-detect)	6010B	mg/Kg	80	800	< 1.5	< 0.67	< 0.7331	< 0.76	< 0.67	< 0.7	< 0.69	< 0.67
Chromium			5000	10000	27	62	4	27	88	240	6.8	5
Lead			600	6000	< 7.6	< 3.3	3.9	< 3.8	3.6	4.2	< 3.5	1.8
Percent Moisture	D2216	wt%			22.6	7.4	19.2	18.1	8.1	13.6	15	14.8

General Notes:

[a] = These compounds were reported as tentatively-identified compounds

1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the lab data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. S1/GW3) and Upper Concentration Limits (UCL), where identified, are cited from the Massachusetts Contingency Plan
4. ND = not detected
5. Date shown with sample ID is date collected

Qualifying Notes:

B The reported result is attributed to laboratory contamination due to the presence of the chemical in the associated blank.
C The result is estimated due to surrogate recovery outside of control limits.
F The result is estimated due to matrix spike recovery outside of control limits.

Table E-1.
Drum Area B Confirmatory Soil Sample Results
Olin Corporation Property
51 Eames St, Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	DB-C9 8/10/00	DB-C10 8/10/00	DB-C11 8/10/00	DB-C12 8/10/00	DB-C13 8/10/00	DB-C14 8/10/00	DB-C15 8/10/00	DB-C16 8/10/00
VOCs	8260B	mg/Kg										
1,1,1-Trichloroethane			500	5000	< 0.059	< 0.087	< 0.058	< 0.052	0.087	< 0.056	< 0.073	< 0.039
1,2,3-Trichlorobenzene					< 0.059	< 0.087	< 0.058	< 0.052	0.16	< 0.056	< 0.073	< 0.039
1,2,4-Trichlorobenzene			800	10000	< 0.059	< 0.087	< 0.058	< 0.052	0.79	< 0.056	0.071	< 0.039
1,2,4-Trimethylbenzene					< 0.059	< 0.087	< 0.058	< 0.052	3.9	0.13	0.37	< 0.039
1,3,5-Trimethylbenzene					< 0.059	< 0.087	< 0.058	< 0.052	2.6	0.06	0.25	< 0.039
1,4-Dichlorobenzene			200	2000	< 0.059	< 0.087	< 0.058	< 0.052	< 0.062	< 0.056	< 0.073	< 0.039
2,4,4-Trimethyl-1-pentene [a]					ND	ND	ND	ND	0.55	ND	ND	ND
2,4,4-Trimethyl-2-pentene [a]					ND	ND	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene					< 0.059	< 0.087	< 0.058	< 0.052	0.16	< 0.056	< 0.073	< 0.039
Ethylbenzene			500	10000	< 0.059	< 0.087	< 0.058	< 0.052	0.12	< 0.056	< 0.073	< 0.039
Isopropylbenzene					< 0.059	< 0.087	< 0.058	< 0.052	0.47	< 0.056	< 0.073	< 0.039
m,p-Xylene			2500	10000	< 0.059	< 0.087	< 0.058	< 0.052	0.29	< 0.056	< 0.073	< 0.039
Methylene chloride			700	7000	0.42 B	0.58 B	0.64 B	0.31 B	0.88 B	0.12 B	0.37 B	0.2 B
Naphthalene			1000	10000	< 0.12	< 0.17	< 0.12	< 0.10	0.62	< 0.11	< 0.15	< 0.077
n-Propylbenzene					< 0.059	< 0.087	< 0.058	< 0.052	0.56	< 0.056	< 0.073	< 0.039
o-Xylene					< 0.059	< 0.087	< 0.058	< 0.052	0.45	< 0.056	0.042	< 0.039
sec-Butylbenzene					< 0.059	< 0.087	< 0.058	< 0.052	0.15	< 0.056	< 0.073	< 0.039
Styrene			100	1000	< 0.059	< 0.087	< 0.058	< 0.052	0.29	< 0.056	< 0.073	< 0.039
Toluene			2500	10000	< 0.059	< 0.087	< 0.058	< 0.052	< 0.062	< 0.056	< 0.073	< 0.039
SVOCs	8270C	mg/Kg										
1,2,4-Trichlorobenzene			800	10000	< 0.27	< 0.40	< 0.30	< 0.29	< 0.27	< 0.27	< 0.30	< 0.29
1,4-Dichlorobenzene			200	2000	< 0.27	< 0.40	< 0.30	< 0.29	< 0.27	< 0.27	< 0.30	< 0.29
Benzoic acid					< 0.53	< 0.81	< 0.59	< 0.57	< 0.55	< 0.53	0.38	< 0.59
Bis(2-ethylhexyl)phthalate			500	10000	< 0.27	1.1 B	< 0.30	< 0.29	16	1.4 B	3.5 B	0.09 B
Di-n-butyl phthalate					< 0.27	< 0.40	< 0.30	< 0.29	0.22	< 0.27	< 0.30	< 0.29
Naphthalene			1000	10000	< 0.27	< 0.40	< 0.30	< 0.29	0.26	< 0.27	< 0.30	< 0.29
N-Nitrosodiphenylamine					< 0.27	< 0.40	< 0.30	< 0.29	1.6	< 0.27	0.33	< 0.29
Phenol			500	10000	< 0.27	< 0.40	< 0.30	< 0.29	< 0.27	< 0.27	< 0.30	< 0.29
Pesticides	8081A	mg/Kg										
alpha-Chlordane					< 0.0082	< 0.013	< 0.0091	< 0.0092	< 0.0086	< 0.0083	< 0.0095	< 0.0092
beta-BHC					< 0.0082	0.063	< 0.0091	< 0.0092	< 0.0086	< 0.0083	< 0.0095	< 0.0092
delta-BHC					< 0.0082	< 0.013	< 0.0091	< 0.0092	< 0.0086	< 0.0083	< 0.0095	< 0.0092
gamma-BHC			0.5	20	< 0.0082	< 0.013	< 0.0091	< 0.0092	0.12	0.02	0.13	< 0.0092
gamma-Chlordane					< 0.0082	0.02	< 0.0091	< 0.0092	< 0.0086	< 0.0083	< 0.0095	< 0.0092
Metals												
Cadmium (All samples non-detect)	6010B	mg/Kg	80	800	< 0.62	< 4.8	< 0.73	< 0.71	< 0.63	< 0.68	< 0.71	< 0.71
Chromium			5000	10000	15	25	8.7	7.1	39	21	79	9.8
Lead			600	6000	3.5	< 24	< 3.6	2.1	4.2	4	5.5	3.6
Percent Moisture	D2216	wt%			6.4	39	16.2	14.8	9.7	7.8	16.4	15.7

General Notes:

[a] = These compounds were reported as tentatively-identified compounds

1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the lab data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. S1/GW3) and Upper Concentration Limits (UCL), where identified, are cited from the Massachusetts Contingency Plan
4. ND = not detected
5. Date shown with sample ID is date collected

Qualifying Notes:

B The reported result is attributed to laboratory contamination due to the presence of the chemical in the associated blank.
C The result is estimated due to surrogate recovery outside of control limits.
F The result is estimated due to matrix spike recovery outside of control limits.

Attachment A-5

Table E-2. Reuse Testing Results – Drum Area B Stockpile Samples

Table E-2.
Reuse Testing Results
Drum Area B Stockpile Samples
Olin Corporation Property
51 Eames Street, Wilmington, MA

Parameter	Method	Units	S3/GW3 mg/Kg	Soil UCLs mg/Kg	BAY1-8/7 8/8/00	BAY4-8/7 8/8/00	DB-SP-1 8/11/00	DB-SP-2E 8/11/00	DB-SP-2W 8/11/00
VOCs	8260B	mg/Kg							
1,2,3-Trichlorobenzene					< 0.045	< 0.034	0.13	0.09	< 0.042
1,2,4-Trichlorobenzene			800	10000	0.13	0.045	0.72	0.49	0.079
1,2,4-Trimethylbenzene					0.17	0.061	1.3	0.85	0.11.
1,3,5-Trimethylbenzene					0.13	0.051	0.91	0.61	0.069
4-Isopropyltoluene					< 0.045	< 0.034	0.051	< 0.043	< 0.042
Isopropylbenzene					< 0.045	< 0.034	0.17	0.1	< 0.042
m,p-Xylene			2500	10000	< 0.045	< 0.034	0.1	0.069	< 0.042
n-Propylbenzene					< 0.045	< 0.034	0.15	0.099	< 0.042
o-Xylene					< 0.045	< 0.034	0.14	0.1	< 0.042
Styrene			100	1000	< 0.045	< 0.034	0.13	0.096	< 0.042
Toluene			2500	10000	< 0.045	< 0.034	0.083	0.028	< 0.042
SVOCs	8270C	mg/Kg							
1,2,4-Trichlorobenzene			800	10000	0.063	0.099	0.61 F	0.45	0.39
Benzo(g,h,i)perylene			2500	10000	< 0.28	< 0.28	< 0.29 F	0.097	< 0.29
Benzoic acid					< 0.57	0.63	1.4 F	0.94	1.1
Bis(2-ethylhexyl)phthalate			500	10000	6.7	6.9	9.1 BF	43	29
Dibenz(a,h)anthracene			0.8	100	< 0.28	< 0.28	< 0.29 F	0.096	< 0.29
Di-n-butyl phthalate					< 0.28	< 0.28	1.8 F	0.91	0.58
N-Nitrosodiphenylamine					3.5	1.7	0.99 F	4.5	3.4
Phenol			500	10000	< 0.28	< 0.28	< 0.29 F	0.098	0.36
Pesticides	8081A	mg/Kg							
4,4´-DDE			9	90	0.0069	0.0049	< 0.0017	< 0.0018	< 0.0019
alpha-Chlordane					< 0.0008	0.003	< 0.0008	< 0.0009	< 0.0009
Dieldrin			0.1	2	< 0.0017	0.0031	0.0033 C	0.0053	0.0045
Endrin aldehyde					0.013	0.0066	< 0.0017	< 0.0018	< 0.0019
Endrin ketone					< 0.0017	< 0.0017	< 0.0017	0.014	< 0.0019
gamma-BHC			0.5	20	0.18	0.25	1.2 C	0.37	0.42
Metals									
Chromium	6010B	mg/Kg	5000	10000	47	70	54	75	46
Lead			600	6000	7.2	8.2	6.8	7.9	5.6
Percent Moisture	D2216	wt%			13.5	11.5	13.7	15.8	17.2

General Notes:

1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the lab data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. S1/GW3) and Upper Concentration Limits, where identified, are cited from the MCP, October 1999
4. Date shown with sample ID is collection date
5. Cadmium tested for all samples, but not detected in any samples

Qualifying Notes:

C The result is estimated due to surrogate recovery outside of control limits.
F The result is estimated due to matrix spike recovery outside of control limits.

Attachment A-6

Text from: Construction-Related Release Abatement Measure Status Report No. 2, Olin Property, Wilmington MA, RTN 3-0471, prepared by GEI Consultants, Inc., August 28, 2001.

DEP AUG 2 9 2001

Part 2
Construction-Related Release Abatement Measure Status Report No. 2

Olin Property, Wilmington, MA
RTN 3-0471
(Volume 1 of 2)

GEI Consultants, Inc.

1021 Main Street
Winchester, MA 01890
(781) 721-4000

SUBMITTED TO

Olin Environmental Management Inc.
1186 Lower River Road, NW
Charleston, TN 37310-0248

M. Margret Hanley, LSP
LSP of Record

August 28, 2001
Project Number 97598

are compared to the previously reported mean concentrations in soil at the Property, which are referred to herein as site "background" concentrations.

3.3.2 On-Property West Ditch Wetland

In September 2000, areas of contaminated sediment and peat were excavated from the On-Property West Ditch Wetland to depths of up to 3 feet. The total excavation volume in this area was approximately 425 cy. All of the excavated soil was transported to the Biocell and, in May 2001, shipped off-Property for disposal, as described in Section 4.3 of this Status Report. The bottom of the sediment or peat layer was not encountered in the excavation. Confirmatory sidewall samples were collected from the organic surface soil layer, approximately six to twelve inches below ground surface. A total of 25 confirmatory samples were collected from this area in October and November 2000, and submitted for laboratory testing.

Results of the Fall 2000 confirmatory samples indicated isolated areas of residual chromium and phthalate contamination, represented by four confirmatory samples (WDW-C10, C21, C22, and C23). Between May 15 and May 21, 2001, approximately 85 cy of additional soil was excavated from these locations, along with the temporary berm separating the West Ditch Wetland from the Buried Debris Area. The bank excavations extended up to six feet horizontally and up to a depth of four feet. The area of sample WDW-C23 was not entirely excavated. Three new confirmatory sidewall samples were collected from the organic surface soil layer, approximately two feet below ground surface, and submitted for chromium, VOC, or SVOC analysis. The excavated soil was stockpiled on the lined Soil Storage Pad and in July 2001 shipped off-Property for disposal, as described in Section 4.4 of this Status Report. A summary of laboratory testing results and sample locations for all confirmatory samples are presented in Appendix G (Table G-1 and Figure G-1). The extents of the additional excavations conducted in 2001 are also shown. Confirmatory samples superseded by the May 2001 excavations are noted in Appendix G.

Based on the final results of the confirmatory sampling, a comparison of the minimum, maximum, and mean concentrations of site related COCs to the corresponding UCLs and site background levels are presented in Table 1a. As shown in Table 1a, chromium and phthalate concentrations were reduced to below the UCLs, and mean concentrations of site related COCs approach previously reported site background concentrations for soil. Therefore, the remedial objectives were met in this area. The area was restored in 2001, as described in Section 3.5 of this Status Report.

3.3.3 Buried Debris Area

In September and October 2000, areas of contaminated peat and organic sediments were excavated from the Buried Debris Area. The total excavation volume in this area was approximately 2,065 cy. About 1,000 cy of this material was transported to the Biocell and in May 2001 shipped off-Property for disposal, as described in Section 4.3 of this Status Report. The remainder of the soil was stockpiled on the Property and in April 2001 shipped off-Property for disposal, as described in Section 4.1 of this Status Report. Confirmatory

bottom samples were collected from either the peat layer or exposed underlying sand. The sand underlying the peat layer was encountered at the south end of the excavation, which was backfilled above the water table with clean off-Property granular fill in preparation for Containment Wall construction. Sidewall confirmatory samples were collected from the peat or organic sediment layers, generally at a depth of about one foot below ground surface. A total of 34 confirmatory samples were collected from this area in October 2000 and submitted for laboratory testing. Due to the presence of debris in the excavated soil and the close proximity to Drum Area A, all confirmatory samples were tested for VOCs, SVOCs, pesticides, and metals.

Results of the Fall 2000 confirmatory samples indicated an area of residual chromium and phthalate contamination, represented by five contiguous confirmatory samples (BD-C18, C19, C23, C28, and C33). On May 19, 2001, approximately 250 cy of additional peat and organic soil were excavated from this area. The excavation extended to depths of up to four feet, until the underlying sand layer was encountered. The area of sample BD-C18 was not entirely excavated. Six new confirmatory samples were collected from the exposed sand layer and analyzed for VOCs, SVOCs, and chromium. The excavated soil was stockpiled on the lined Soil Storage Pad and in July 2001 shipped off-Property for disposal, as described in Section 4.4 of this Status Report. A summary of laboratory testing results and sample locations for all confirmatory samples are presented in Appendix G (Table G-2 and Figure G-1). The extents of the additional excavations conducted in 2001 are also shown. Confirmatory samples superseded by the additional excavations in May 2001 are noted in Appendix G.

Based on the results of the final confirmatory sampling, a comparison of the minimum, maximum, and mean concentrations of site related COCs to the corresponding UCLs and background levels are presented in Table 1b. As shown in Table 1b, chromium and phthalate concentrations were reduced to below the UCLs, and the mean concentrations of site related COCs approach site background concentrations. Therefore, the remedial objectives of the RAM were met in this area. The area was restored between May and July 2001, as described in Section 3.5.

In addition to the remedial excavation described above, approximately 1,750 cy of peat with low contaminant concentrations was excavated from an area south of the Buried Debris Area. This peat was excavated to remove materials not suitable to support the parking lot that is planned to be located above the Containment Area. This peat was stockpiled on the Property and tested for potential reuse or off-Property disposal. For structural reasons, the peat was determined to be unsuitable for non-aquatic fill, and, due to contaminant concentrations, it was determined unsuitable for use as aquatic sediment. This peat was shipped off-Property for disposal in April and May 2001, as described in Section 4.2 of this Status Report.

3.3.4 On-Property West Ditch

In September and October 2000, contaminated organic sediment was excavated from the On-Property West Ditch to depths of up to 4 feet below ground surface. The total excavation volume in this area was approximately 275 cy. The excavated soil was transported to the

3.7.3 Topsoil

Prior to general construction within the Containment Area, in August and September 2000, topsoil outside of the sediment excavation areas was stripped and stockpiled. The total volume of stockpiled topsoil is about 3,000 cy. Samples of the Olin topsoil were submitted for laboratory analysis to evaluate the potential to reuse the topsoil at the Property. All Olin topsoil excavated during response actions remains stockpiled at the Property, pending MADEP's Office of Research and Standards review of Olin's justification for reuse of the material as upland fill at the Property.

4. Remediation Waste Management

Reuse or disposal of remediation waste that was concluded before December 2000 was described in Status Report No. 1.

4.1 Buried Debris Area, Drum Area A, and Hot Spot Soil Stockpiles

Approximately 1,000 cy of sediment excavated from the Buried Debris Area was determined to be unsuitable for placement in the Biocell, due to the presence of debris and solid waste. This soil was stockpiled adjacent to the West Warehouse and sampled for disposal characterization in September and October 2000. A summary of the analytical results is presented in Appendix J, Table J-1.

As reported in the Drum Removal RAM Status Report No. 2 (GEI 2001), approximately 200 cy of soil excavated from Drum Area A was judged unsuitable for on-Property reuse based on visual evidence of contamination. The soil was stockpiled on the Soil Storage Pad and sampled for disposal parameters in October 2000. A summary of the analytical results is presented in Appendix J, Table J-1. The stockpile was moved from the Lined Storage Pad in April 2001 and placed adjacent to the West Warehouse pending off-Property disposal.

Approximately 140 cy of soil excavated from the three hot spots (A8CW-1, RSO-6, and Lake Poly-1) and from the Central Pond excavations of November and December 2000 was stockpiled west of Plant B. The stockpiles were sampled for disposal characterization in December 2000. A summary of the analytical results is presented in Appendix J, Table J-1. In April 2001, the stockpiles from A8CW-1, RSO-6, and Central Pond (about 100 cy) were moved and placed adjacent to the West Warehouse pending off-Property disposal. Stockpiled soil excavated from the Lake Poly-1 hot spot (approximately 40 cy) was left in place near Plant B, pending additional investigations in the Former Lake Poly area.

During the period from April 10 to April 24, 2001, the soil stockpiles from the Buried Debris Area, Drum Area A, A8CW-1, RSO-6, and Central Pond were shipped off-Property for disposal at CWM Chemical Services, L.L.C., in Model City, New York. Copies of the Non-Hazardous waste Manifests are presented in Appendix K.

4.2 Peat Stockpile

Approximately 1,750 cy of peat was excavated from areas adjacent to the On-Property West Ditch and Buried Debris Area and stockpiled adjacent to the On-Property West Ditch Wetland. This peat was excavated to prevent future settlement of the parking lot that is planned to be located above the Containment Area. For structural reasons, the peat was

determined to be unsuitable for on-site non-aquatic fill, and, due to the presence of low contaminant concentrations, it was judged unsuitable for use as aquatic sediment. The peat was sampled for disposal characterization in October and November 2000. A summary of the analytical results is presented in Appendix J, Tables J-2 and J-3.

During the period from April 30 to May 3, 2001, the peat stockpiles were shipped off-Property for disposal at MWNH Turnkey Landfill in Rochester, New Hampshire. Copies of the Non-Hazardous Waste Manifests are presented in Appendix K.

4.3 Biocell Sediment

Approximately 3,460 cubic yards of contaminated sediment excavated from aquatic areas of the property in September and October 2000 were loaded into the Biocell in preparation for proposed bioremediation of organics in 2001. After sampling for reuse and disposal characterization in November 2000, the stockpiled soil was covered with plastic sheeting for the winter. A summary of the analytical results is presented in Appendix J, Tables J-4 and J-5.

As described in Section 3.2 of this Status Report, it was determined that off-Property disposal of the untreated sediment would be more cost-effective than bioremediation followed by off-Property reuse or disposal. During the period from May 8 to May 16, 2001, the sediment was removed from the Biocell and shipped off-Property for disposal at MWNH Turnkey Landfill in Rochester, New Hampshire. Copies of the Non-Hazardous Waste Manifests are presented in Appendix K.

4.4 Soil Storage Pad Stockpiles, 2001

As described in Section 3.3 of this Status Report, approximately 650 cy of additional soil was excavated from wetland areas in May 2001, including the On-property West Ditch, Buried Debris Area, South Ditch, and Central Pond/Central Drainage areas. The soil was placed in three stockpiles on the Soil Storage Pad and sampled for disposal characterization in May 2001. A summary of the analytical results is presented in Appendix J, Table J-6.

Approximately 15 cy of mud and sludge generated during the cleaning of the Water Treatment System fractionation tanks in April 2001 was sampled for disposal characterization on April 6, 2001. The sludge was temporarily stored in 20 steel drums in the East Warehouse before being removed and added to the soil stockpiles on the Soil Storage Pad. A summary of the analytical results is presented in Appendix J, Table J-6.

On July 9 and July 10, 2001, the soil stockpiled on the Soil Storage Pad was shipped off-Property for disposal at MWNH Turnkey Landfill in Rochester, New Hampshire. Copies of the Non-Hazardous Waste Manifests are presented in Appendix K.

4.5 Soil Pending Off-Property Disposal: Lake Poly Stockpile

Approximately 40 cy of soil excavated from the Lake Poly-1 hot spot excavation is stockpiled west of Plant B, covered with plastic sheeting and sandbags. Off-Property disposal is pending additional investigations and assessments of the Former Lake Poly area. Disposal management of the Lake Poly-1 hot spot soil will be presented in the next Status Report.

4.6 Soil Pending On-site Reuse

4.6.1 Olin Topsoil

Approximately 3,000 cy of topsoil stripped from the Containment Area in August and September 2000, remain stockpiled at the Property, northeast of the Containment Area. In October and December 2000 and April 2001, the topsoil was sampled for reuse and disposal parameters.

Harding ESE evaluated the October and December 2000 analytical results of the Olin topsoil and concluded that 2,750 cy of topsoil was suitable for reuse in upland areas, and that 2,000 cy was suitable for use in aquatic environments. The results of the 250 cy of topsoil sampled on April 23, 2001 were not available at the time of Harding ESE's assessment but contaminant concentrations for this stockpile are within the range of other topsoil approved for reuse. A copy of the Harding ESE memorandum is included in RAM Modification No. 4 (Appendix C). A summary table with all Olin topsoil analytical results is presented in Appendix L, Table L-1.

The reuse of the Olin topsoil is pending discussions between the MADEP's Office of Research and Standards and Olin.

4.6.2 Biocell Drainage Sand

Approximately 2,000 cy of imported drainage sand remains stockpiled in the Biocell. In June 2001, the sand was sampled for reuse and disposal characterization. A summary of the analytical results is presented in Appendix L, Table L-2. Based on a pending evaluation of the analytical results, the drainage sand will remain in place adjacent to the Calcium Sulfate Landfill, be reused elsewhere on the Property, or be shipped off-Property for reuse or disposal. The fate of the drainage sand will be presented in a future Status Report.

4.6.3 Other Soil Stockpiles

Approximately 450 cy of soil, blast rock, and wood chips was stockpiled adjacent to the West Warehouse and then moved in June 2001 to a location northeast of the Containment Area. The stockpile consists of blast rock, wood chips, and soil resulting from the May 2001

removal of the temporary access roads along the South Ditch. Also, on June 1, 2001, the temporary backfill placed between the Containment Area and the South Ditch (West of the Detention Pond) that was used for a working pad during the slurry wall construction was excavated and added to the stockpile. Samples from the stockpile were collected in May and June 2001, and submitted for reuse characterization. A summary of the analytical results is presented in Appendix L, Table L-3. Reuse of the material has not been yet been proposed.

4.7 Boulders

Approximately 400 cy of excavated boulders that were stockpiled at the Property were used to stabilize the bank between the Containment Area and Central Pond and to backfill deep portions of the Buried Debris Area.

4.8 Organic Debris

In April 2001, a stockpile of approximately 700 cy of organic debris, primarily consisting of tree stumps, was sieved and ground into chips. The soil sieved from the stockpile was used to chink the boulders placed on the upland slope between Central Pond and the Containment Area. The stockpile of chipped, organic debris remains northeast of the Containment Area.

4.9 Dewatering Effluent

Between December 1, 2000 and July 11, 2001, approximately 816,000 gallons of dewatering effluent were treated using the mobile Water Treatment Plant operated under NPDES Exclusion Permit Reference No. 00-177. The system configuration consisted of multiple bag filters and granular activated carbon units in series. In May and June 2001, the system was upgraded with the addition of a pH adjustment system to improve removal of dissolved metals by increasing the pH of the system influent with the injection of a magnesium hydroxide solution. Copies of the monthly monitoring reports and summary tables of analytical results for the period from December 2000 through June 2001 are contained in Appendix D.

Dewatering effluent was generated in 2001 during soil excavations in the Buried Debris Area, South Ditch, and Central Pond, as well as during the installation of the concrete Weir. From May 4 through early June 2001, the Biocell was used as a storage reservoir for untreated dewatering effluent, pending treatment by the Water Treatment System. The total volume of treated water includes precipitation that accumulated in the Biocell after the winter cover was removed in April 2001.

Attachment A-7

Figure: General Excavation and Backfill Locations [Containment Area] (from RAM Status Report No. 2, August 2001)

CENTRAL WETLAND

PROPOSED ± 350,000 SF
WAREHOUSE/DISTRIBUTION FACILITY
(BY OTHERS)

PLANT B
GROUNDWATER
TREATMENT BLDG
(Former Plant B Tank Farm)

INTERCEPTOR
SYSTEM

PLANT C2, C3

PLANT C1

PLANT A

FORMER
LAB

NPDES OUTFALL FOR
PLANT B DISCHARGE

DRUM AREA B
4' - 6' OF EXCAVATION
AND BACKFILL

1' - 3'
CUT

3' - 5'
OF
FILL

MIDDLE AREA
VEGETATION AND TOPSOIL STRIPPED
PLACED A LAYER OF SLURRY WALL
SPOILS AND CALCIUM SULPHATE
SPOILS TREATED WITH CEMENT

DRUM AREA A and
BURIED DEBRIS AREA
5' - 7' OF EXCAVATION
AND BACKFILL

1' - 5'
CUT

4' - 3'
OF
FILL

DETENTION
POND

LEGEND:

- EXISTING CONTOURS (FT., NGVD)
- APPROXIMATE EXISTING WETLANDS BOUNDARY
- STREAM
- APPROXIMATE AREAS OF DEEP EXCAVATION AND BACKFILL
- BOLLARD
- APPROXIMATE AREAS OF MINOR EXCAVATION TO REACH INTERIM GRADE FOR SLURRY CONSTRUCTION AND TEMPORARY SITE DRAINAGE
- APPROXIMATE AREAS OF SURFICIAL STRIPPING OF TOP SOIL AND ORGANIC SEDIMENTS FOLLOWED BY FILL PLACEMENT FOR SLURRY WALL WORKING PAD

0 50 100
SCALE, FEET

NOTES:

1.BASE PLAN PROVIDED BY DANA F. PERKINS, INC

NO.	DATE	DESCRIPTION	DES	DR	CH	APP
.	8/22/01	AS-BUILT INFORMATION	SJS	DJM	LW	MDB

DESIGNED BY
DRAWN BY DJM
CHECKED BY
APPROVED BY
DATE 8/22/01

Olin Corporation
Charleston, Tennessee

GEI Consultants, Inc.
WINCHESTER · MASSACHUSETTS

Part 2 Construction-Related RAM Status Report No. 2
51 Eames Street Wilmington, MA

GENERAL
EXCAVATION AND BACKFILL
LOCATIONS

DWG. NO. 2

GEI PROJECT 97598 | SHEET NO. 2 of 8 | ISSUE .

97598-AB-202 08/28/01 djm/ptc

Attachment A-8

Table G-2. Chemical Testing Results – Buried Debris Area Confirmatory Samples

Table G-2.
Chemical Testing Results
Buried Debris Area Confirmatory Samples
Olin Corporation Property
51 Eames Street, Wilmington, Massachusetts

Parameter	Method	Units	RCS1 mg/kg	Soil UCLs mg/kg	1120-BD-C1 10/10/00	1120-BD-C2 10/10/00	1120-BD-C3 10/10/00	1120-BD-C4 10/10/00	1120-BD-C5 10/10/00	1120-BD-C6 10/10/00	1120-BD-C7 10/12/00	1120-BD-C8 10/11/00
Volatile Organic Compounds (VOCs)	8260B	mg/kg										
2,4,4-Trimethyl-1-pentene			100	NS	< 0.12	< 0.14	< 0.14	< 0.15	< 0.14	< 0.15	< 0.16	< 0.15
2,4,4-Trimethyl-2-pentene			100	NS	< 0.12	< 0.14	< 0.14	< 0.15	< 0.14	< 0.15	< 0.16	< 0.15
Ethylbenzene			80	10,000	< 0.12	< 0.14	< 0.14	< 0.15	< 0.14	< 0.15	< 0.16	< 0.15
Fluorotrichloromethane			100	NS	< 0.12	< 0.14	< 0.14	< 0.15	< 0.14	< 0.15	< 0.16	< 0.15
o-Xylene			500	10,000	< 0.12	< 0.14	< 0.14	< 0.15	< 0.14	< 0.15	< 0.16	< 0.15
m+p-Xylene			500	1,000	< 0.12	< 0.14	< 0.14	< 0.15	< 0.14	< 0.15	< 0.16	< 0.15
Methylene chloride			0.1	7,000	< 0.12	< 0.14	< 0.14	< 0.15	< 0.14	< 0.15	< 0.16	< 0.15
p-Isopropyltoluene			NS	NS	< 0.12	< 0.14	< 0.14	< 0.15	< 0.14	< 0.15	< 0.16	< 0.15
Toluene			90	10,000	< 0.12	< 0.14	< 0.14	< 0.15	< 0.14	< 0.15	< 0.16	< 0.15
Trichloroethene			0.4	5,000	< 0.12	< 0.14	< 0.14	< 0.15	< 0.14	< 0.15	< 0.16	< 0.15
Semivolatile Organic Compounds (SVOCs)	8270C	mg/kg										
2,4-Dimethylphenol			0.7	10,000	< 0.4	< 0.39	< 0.37	< 0.41	1.8	< 0.42	< 0.4	< 0.42
bis(2-Ethylhexyl)phthalate			100	10,000	< 0.4	0.22 J	1.1	3.9	2.2	< 0.42	< 0.4	< 0.42
Di-n-butyl phthalate			50	NS	< 0.4	< 0.39	< 0.37	< 0.41	< 0.4	< 0.42	< 0.4	< 0.42
N-Nitrosodiphenylamine			100	NS	< 0.4	< 0.39	< 0.37	< 0.41	< 0.4	< 0.42	< 0.4	< 0.42
Pesticides	8081A	mg/kg										
alpha-BHC			10	NS	< 0.012	< 0.011	< 0.011	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
Metals	6010B	mg/kg										
Aluminum			NS	NS	3400	3600	4900	3700	2900	1300	4200	3100
Arsenic			30	300	< 2	< 2	< 2	< 1	< 2	< 1	2	< 1
Cadmium			30	800	< 0.3	< 0.3	< 0.3	< 0.3	< 0.4	< 0.3	< 0.3	< 0.3
Chromium			1,000	10,000	5.3	6.1	7	4.9	4.5	< 1	6.2	5.3
Iron			NS	NS	2700	3300	3300	2100	1900	160	2900	2500
Lead			300	6,000	1.8	2.1	1.8	2.1	2.1	< 1	1.9	1.9
Mercury	7471A		20	600	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.06	< 0.06	< 0.05
Selenium			400	10,000	<2	<2	<2	<1	<2	<1	<2	<1
Solids, percent	EPA 160.3	%	NS	NS	82.4	84.6	87.3	80.1	81.6	80	81.3	79.2

General Notes:
1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the laboratory data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Reportable Concentrations (e.g. RCS1) and Upper Concentration Limits (UCLS), where identified, are cited from the Massachusetts Contingency Plan, October 1999.
4. NS = No applicable Massachusetts Contingency Plan Standard.
5. Date shown with sample ID is collection date.
6. NT = Sample not tested for this analyte.
7. mg/kg = Milligrams per kilogram.
8. Sample IDs for field duplicate samples end with "-D".

Footnote:
1. Analytical results for this sample were superceded by subsequent soil excavation from the sample location area.

Qualifying Notes:
C The result is estimated due to surrogate recovery outside of control limits.
F The result is below the laboratory reporting limit and is therefore estimated.
J The result is below the laboratory reporting limit and is therefore estimated.
K The result is estimated due to blank spike compound recovery outside of control limits.

Table G-2.
Chemical Testing Results
Buried Debris Area Confirmatory Samples
Olin Corporation Property
51 Eames Street, Wilmington, Massachusetts

Parameter	Method	Units	RCS1 mg/kg	Soil UCLs mg/kg	1120-BD-C9 10/11/00	1120-BD-C10 10/12/00	1120-BD-C11 10/11/00	1120-BD-C12 10/11/00	1120-BD-C13 10/12/00	1120-BD-C14 10/11/00	1120-BD-C14-D 10/11/00	1120-BD-C15 10/11/00
Volatile Organic Compounds (VOCs)	8260B	mg/kg										
2,4,4-Trimethyl-1-pentene			100	NS	< 0.14	< 0.15	< 0.16	< 0.17	< 0.15	< 0.17	< 0.15	< 0.16
2,4,4-Trimethyl-2-pentene			100	NS	< 0.14	< 0.15	< 0.16	< 0.17	< 0.15	< 0.17	< 0.15	< 0.16
Ethylbenzene			80	10,000	< 0.14	< 0.15	< 0.16	< 0.17	< 0.15	< 0.17	< 0.15	< 0.16
Fluorotrichloromethane			100	NS	< 0.14	< 0.15	< 0.16	< 0.17	< 0.15	< 0.17	< 0.15	< 0.16
o-Xylene			500	10,000	< 0.14	< 0.15	< 0.16	< 0.17	< 0.15	< 0.17	< 0.15	< 0.16
m+p-Xylene			500	1,000	< 0.14	< 0.15	< 0.16	< 0.17	< 0.15	< 0.17	< 0.15	< 0.16
Methylene chloride			0.1	7,000	< 0.14	< 0.15	< 0.16	< 0.17	< 0.15	< 0.17	< 0.15	< 0.16
p-Isopropyltoluene			NS	NS	< 0.14	< 0.15	< 0.16	< 0.17	< 0.15	< 0.17	< 0.15	< 0.16
Toluene			90	10,000	< 0.14	< 0.15	< 0.16	< 0.17	< 0.15	< 0.17	< 0.15	< 0.16
Trichloroethene			0.4	5,000	< 0.14	< 0.15	< 0.16	< 0.17	< 0.15	< 0.17	< 0.15	< 0.16
Semivolatile Organic Compounds (SVOCs)	8270C	mg/kg										
2,4-Dimethylphenol			0.7	10,000	< 0.42	< 0.41	< 0.42	< 0.44	< 0.42	< 0.43	< 0.42	< 0.42
bis(2-Ethylhexyl)phthalate			100	10,000	0.74	< 0.41	< 0.42	0.79	< 0.42	< 0.43	< 0.42	< 0.42
Di-n-butyl phthalate			50	NS	< 0.42	< 0.41	< 0.42	< 0.44	< 0.42	< 0.43	< 0.42	< 0.42
N-Nitrosodiphenylamine			100	NS	< 0.42	< 0.41	< 0.42	< 0.44	< 0.42	< 0.43	< 0.42	< 0.42
Pesticides	8081A	mg/kg										
alpha-BHC			10	NS	< 0.012	< 0.012	< 0.012	< 0.013	< 0.012	< 0.013	< 0.012	< 0.013
Metals	6010B	mg/kg										
Aluminum			NS	NS	3400	2600	2600	3100	2600	3300	3600	3200
Arsenic			30	300	< 1	< 2	< 2	< 2	< 1	< 2	< 2	< 2
Cadmium			30	800	< 0.3	< 0.3	< 0.4	< 0.3	< 0.3	< 0.4	< 0.3	< 0.3
Chromium			1,000	10,000	6.7	4.8	5.2	5.3	5	4.5	5.1	5
Iron			NS	NS	2800	2300	2100	2800	2500	1600	2000	2100
Lead			300	6,000	2.2	2	< 2	1.9	1.8	< 2	1.8	1.7
Mercury	7471A		20	600	< 0.06	< 0.05	< 0.06	< 0.06	< 0.05	< 0.06	< 0.05	< 0.06
Selenium			400	10,000	<1	<2	<2	<2	<1	<2	<2	<2
Solids, percent	EPA 160.3	%	NS	NS	78.6	80.3	78	74.8	78.6	76.2	78.2	77.3

General Notes:
1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the laboratory data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Reportable Concentrations (e.g. RCS1) and Upper Concentration Limits (UCLS), where identified, are cited from the Massachusetts Contingency Plan, October 1999.
4. NS = No applicable Massachusetts Contingency Plan Standard.
5. Date shown with sample ID is collection date.
6. NT = Sample not tested for this analyte.
7. mg/kg = Milligrams per kilogram.
8. Sample IDs for field duplicate samples end with "-D".

Footnote:
1. Analytical results for this sample were superceded by subsequent soil excavation from the sample location area.

Qualifying Notes:
C The result is estimated due to surrogate recovery outside of control limits.
F The result is below the laboratory reporting limit and is therefore estimated.
J The result is below the laboratory reporting limit and is therefore estimated.
K The result is estimated due to blank spike compound recovery outside of control limits.

Table G-2.
Chemical Testing Results
Buried Debris Area Confirmatory Samples
Olin Corporation Property
51 Eames Street, Wilmington, Massachusetts

Parameter	Method	Units	RCS1 mg/kg	Soil UCLs mg/kg	1120-BD-C17 10/27/00	1120-BD-C18 10/27/00	1120-BD-C19 10/27/00	1120-BD-C20 10/27/00	1120-BD-C21 10/27/00	1120-BD-C22 10/27/00	1120-BD-C23[1] 10/27/00	1120-BD-C24[1] 10/27/00
Volatile Organic Compounds (VOCs)	8260B	mg/kg										
2,4,4-Trimethyl-1-pentene			100	NS	< 0.98	17	1.2	6.7	< 0.15	< 0.49	5.9	12
2,4,4-Trimethyl-2-pentene			100	NS	< 0.98	6.8	0.31	2.2	< 0.15	< 0.49	2.3	4.2
Ethylbenzene			80	10,000	< 0.98	4.7	0.34	0.88	< 0.15	< 0.49	0.91	3
Fluorotrichloromethane			100	NS	< 0.98	< 0.49	< 0.19	< 0.17	< 0.15	< 0.49	< 0.41	< 0.54
o-Xylene			500	10,000	< 0.98	< 0.49	< 0.19	0.15 J	< 0.15	< 0.49	< 0.41	< 0.54
m+p-Xylene			500	1,000	< 0.98	< 0.49	< 0.19	0.5	< 0.15	< 0.49	0.98 K	< 0.54
Methylene chloride			0.1	7,000	< 0.98	< 0.99	< 0.37	< 0.34	< 0.3	< 2	< 0.41	< 0.54
p-Isopropyltoluene			NS	NS	< 0.98	1.1	< 0.19	0.57	< 0.15	< 0.49	< 0.41	0.76
Toluene			90	10,000	< 0.98	4.4	< 0.19	0.25	< 0.15	< 0.49	1.4	2.1
Trichloroethene			0.4	5,000	< 0.98	< 0.49	< 0.19	< 0.17	< 0.15	< 0.49	< 0.41	< 0.54
Semivolatile Organic Compounds (SVOCs)	8270C	mg/kg										
2,4-Dimethylphenol			0.7	10,000	< 21	< 290	< 110	< 48	< 8	< 5.5	< 240	< 14
bis(2-Ethylhexyl)phthalate			100	10,000	244 C	5568 C	1611 C	359 C	101 C	10	3955 C	175 C
Di-n-butyl phthalate			50	NS	< 21	507 C	102 C,J	33 C,J	< 8	< 5.5	218 C,J	14 C,J
N-Nitrosodiphenylamine			100	NS	< 21	339 C	68 C,J	< 48	4.7 C,J	< 5.5	276 C	21 C
Pesticides	8081A	mg/kg										
alpha-BHC			10	NS	< 0.31	< 0.21	< 0.077	< 0.015	< 0.012	< 0.21	< 0.17	< 0.2
Metals	6010B	mg/kg										
Aluminum			NS	NS	1400 F	3300	4700	3900	4600	1200	1500	5600
Arsenic			30	300	< 7	< 5	3.8	< 2	< 1	< 5	< 4	< 4
Cadmium			30	800	< 1	< 1	2.5	< 0.3	0.65	< 0.9	< 0.8	< 0.9
Chromium			1,000	10,000	36	790	840	250	320	< 5	12	94
Iron			NS	NS	840 F	3500	6500	3300	2400	710	870	1000
Lead			300	6,000	< 7	5.9	16	3.4	7	< 5	< 4	20
Mercury	7471A		20	600	< 0.3	0.27	0.22	< 0.06	< 0.05	< 0.2	0.19	< 0.2
Selenium			400	10,000	<7	<5	<2	<2	<1	<5	<4	<4
Solids, percent	EPA 160.3	%	NS	NS	16	22.9	62.6	68.2	82.1	24	27.6	23.5

General Notes:
1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the laboratory data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Reportable Concentrations (e.g. RCS1) and Upper Concentration Limits (UCLS), where identified, are cited from the Massachusetts Contingency Plan, October 1999.
4. NS = No applicable Massachusetts Contingency Plan Standard.
5. Date shown with sample ID is collection date.
6. NT = Sample not tested for this analyte.
7. mg/kg = Milligrams per kilogram.
8. Sample IDs for field duplicate samples end with "-D".

Footnote:
1. Analytical results for this sample were superceded by subsequent soil excavation from the sample location area.

Qualifying Notes:
C The result is estimated due to surrogate recovery outside of control limits.
F The result is below the laboratory reporting limit and is therefore estimated.
J The result is below the laboratory reporting limit and is therefore estimated.
K The result is estimated due to blank spike compound recovery outside of control limits.

Table G-2.
Chemical Testing Results
Buried Debris Area Confirmatory Samples
Olin Corporation Property
51 Eames Street, Wilmington, Massachusetts

Parameter	Method	Units	RCS1 mg/kg	Soil UCLs mg/kg	1120-BD-C25 10/27/00	1120-BD-C26 10/27/00	1120-BD-C27 10/27/00	1120-BD-C28[1] 10/27/00	1120-BD-C29[1] 10/27/00	1120-BD-C30 10/27/00	1120-BD-C31 10/27/00	1120-BD-C32 10/27/00	1120-BD-C33[1] 10/27/00
Volatile Organic Compounds (VOCs)	8260B	mg/kg											
2,4,4-Trimethyl-1-pentene			100	NS	< 0.16	< 0.13	< 0.88	8	< 0.15	< 0.15	< 0.13	< 0.77	1.4
2,4,4-Trimethyl-2-pentene			100	NS	< 0.16	< 0.13	< 0.88	3.3	< 0.15	< 0.15	< 0.13	< 0.77	0.42
Ethylbenzene			80	10,000	< 0.16	< 0.13	< 0.88	0.51	< 0.15	< 0.15	< 0.13	< 0.77	0.88
Fluorotrichloromethane			100	NS	< 0.16	< 0.13	< 0.88	< 0.075	< 0.15	< 0.15	< 0.13	< 0.77	< 0.14
o-Xylene			500	10,000	< 0.16	< 0.13	< 0.88	< 0.075	< 0.15	< 0.15	< 0.13	< 0.77	< 0.14
m+p-Xylene			500	1,000	< 0.16	< 0.13	< 0.88	< 0.075	< 0.15	< 0.15	< 0.13	< 0.77	< 0.14
Methylene chloride			0.1	7,000	< 0.32	< 0.26	< 1.8	< 0.15	< 0.31	< 0.3	< 0.27	< 1.5	< 0.28
p-Isopropyltoluene			NS	NS	< 0.16	< 0.13	< 0.88	0.29	< 0.15	< 0.15	< 0.13	< 0.77	< 0.14
Toluene			90	10,000	< 0.16	< 0.13	< 0.88	1	< 0.15	< 0.15	< 0.13	< 0.77	< 0.14
Trichloroethene			0.4	5,000	< 0.16	< 0.13	< 0.88	0.06 J	< 0.15	< 0.15	< 0.13	< 0.77	< 0.14
Semivolatile Organic Compounds (SVOCs)	8270C	mg/kg											
2,4-Dimethylphenol			0.7	10,000	< 21	< 0.73	< 12	< 980	< 0.84	< 0.41	< 36	< 10	< 200
bis(2-Ethylhexyl)phthalate			100	10,000	137 C	2.9	8.9 J	6087 C	1	2.9	375 C	12	3060 C
Di-n-butyl phthalate			50	NS	< 21	0.43 J	< 12	< 980	< 0.84	< 0.41	< 36	< 10	461 C
N-Nitrosodiphenylamine			100	NS	< 21	< 0.73	< 12	1052 C	< 0.84	< 0.41	< 36	< 10	272 C
Pesticides	8081A	mg/kg											
alpha-BHC			10	NS	< 0.012	< 0.011	< 0.074	< 0.29	< 0.026	< 0.012	< 0.01	< 0.06	0.14
Metals	6010B	mg/kg											
Aluminum			NS	NS	3600	6800	1200	1300	4400	4200	5800	1100	4900
Arsenic			30	300	< 1	4.7	< 8	< 6	< 1	< 1	4	< 7	2.7
Cadmium			30	800	< 0.3	< 0.2	< 2	< 1	< 0.3	< 0.3	0.35	< 1	< 0.3
Chromium			1,000	10,000	18	36	< 8	1700	9.2	5.1	38	< 7	82
Iron			NS	NS	2700	5900	430	1300	1000	2100	4900	600	4900
Lead			300	6,000	2.2	6.2	< 8	6.5	2.7	2.1	6.6	< 7	3.6
Mercury	7471A		20	600	< 0.06	< 0.05	< 0.3	< 0.3	< 0.06	< 0.06	< 0.05	< 0.3	0.053
Selenium			400	10,000	<1	<1	<8	<6	<1	<1	<1	<7	<1
Solids, percent	EPA 160.3	%	NS	NS	80.7	91	13.3	16.8	77.2	80.2	91.7	15.8	84

General Notes:
1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the laboratory data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Reportable Concentrations (e.g. RCS1) and Upper Concentration Limits (UCLS), where identified, are cited from the Massachusetts Contingency Plan, October 1999.
4. NS = No applicable Massachusetts Contingency Plan Standard.
5. Date shown with sample ID is collection date.
6. NT = Sample not tested for this analyte.
7. mg/kg = Milligrams per kilogram.
8. Sample IDs for field duplicate samples end with "-D".

Footnote:
1. Analytical results for this sample were superceded by subsequent soil excavation from the sample location area.

Qualifying Notes:
C The result is estimated due to surrogate recovery outside of control limits.
F The result is below the laboratory reporting limit and is therefore estimated.
J The result is below the laboratory reporting limit and is therefore estimated.
K The result is estimated due to blank spike compound recovery outside of control limits.

Table G-2.
Chemical Testing Results
Buried Debris Area Confirmatory Samples
Olin Corporation Property
51 Eames Street, Wilmington, Massachusetts

Parameter	Method	Units	RCS1 mg/kg	Soil UCLs mg/kg	1120-BD-C34 10/27/00	1120-BD-C35 10/27/00	1140-BD-C50 5/19/01	1140-BD-C51 5/19/01	1140-BD-C52 5/19/01	1140-BD-C53 5/19/01	1140-BD-C54 5/19/01	1140-BD-C55 5/19/01	1140-BD-C55-D 5/19/01
Volatile Organic Compounds (VOCs)	8260B	mg/kg											
2,4,4-Trimethyl-1-pentene			100	NS	< 0.17	< 0.19							
2,4,4-Trimethyl-2-pentene			100	NS	< 0.17	< 0.19							
Ethylbenzene			80	10,000	< 0.17	< 0.19	< 0.045	< 0.043	< 0.041	< 0.043	< 0.047	< 0.046	< 0.049
Fluorotrichloromethane			100	NS	0.17 J	< 0.19	< 0.091	< 0.086	< 0.083	< 0.086	< 0.095	< 0.092	< 0.098
o-Xylene			500	10,000	< 0.17	< 0.19	< 0.045	< 0.043	< 0.041	< 0.043	< 0.047	< 0.046	< 0.049
m+p-Xylene			500	1,000	< 0.17	< 0.19	< 0.045	< 0.043	< 0.041	< 0.043	< 0.047	< 0.046	< 0.049
Methylene chloride			0.1	7,000	< 0.33	< 0.39	< 0.091	< 0.086	< 0.083	< 0.086	0.1	< 0.092	< 0.098
p-Isopropyltoluene			NS	NS	< 0.17	< 0.19	< 0.045	< 0.043	< 0.041	< 0.043	< 0.047	< 0.046	< 0.049
Toluene			90	10,000	0.21	< 0.19	< 0.045	< 0.043	< 0.041	< 0.043	< 0.047	< 0.046	< 0.049
Trichloroethene			0.4	5,000	< 0.17	< 0.19	< 0.045	< 0.043	< 0.041	< 0.043	< 0.047	< 0.046	< 0.049
Semivolatile Organic Compounds (SVOCs)	8270C	mg/kg											
2,4-Dimethylphenol			0.7	10,000	< 0.42	< 5.3	< 0.34	< 0.32	< 0.33	< 0.33	< 0.34	< 0.33	< 0.32
bis(2-Ethylhexyl)phthalate			100	10,000	4.6	32 C	< 0.34	< 0.32	< 0.33	< 0.33	0.36	< 0.33	< 0.32
Di-n-butyl phthalate			50	NS	0.27 J	3.2 C J	< 0.34	< 0.32	< 0.33	< 0.33	< 0.34	< 0.33	< 0.32
N-Nitrosodiphenylamine			100	NS	< 0.42	< 5.3	< 0.34	< 0.32	< 0.33	< 0.33	< 0.34	< 0.33	< 0.32
Pesticides	8081A	mg/kg					NT	NT	NT	NT	NT	NT	NT
alpha-BHC			10	NS	< 0.013	< 0.016							
Metals	6010B	mg/kg											
Aluminum			NS	NS	2700	12000							
Arsenic			30	300	< 1	7.1							
Cadmium			30	800	< 0.3	0.4							
Chromium			1,000	10,000	3.5	43	5.8	5	7.4	5.6	6.6	5.9	7.9
Iron			NS	NS	620	12000							
Lead			300	6,000	1.7	50							
Mercury	7471A		20	600	< 0.06	0.17							
Selenium			400	10,000	<1	<2							
Solids, percent	EPA 160.3	%	NS	NS	76.3	61.8	27.8	22.6	23.9	25.9	26.6	23.8	23.1

General Notes:
1. Only analytes detected in at least one sample are reported here. For a complete list of analytes see the laboratory data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Reportable Concentrations (e.g. RCS1) and Upper Concentration Limits (UCLS), where identified, are cited from the Massachusetts Contingency Plan, October 1999.
4. NS = No applicable Massachusetts Contingency Plan Standard.
5. Date shown with sample ID is collection date.
6. NT = Sample not tested for this analyte.
7. mg/kg = Milligrams per kilogram.
8. Sample IDs for field duplicate samples end with "-D".

Footnote:
1. Analytical results for this sample were superceded by subsequent soil excavation from the sample location area.

Qualifying Notes:
C The result is estimated due to surrogate recovery outside of control limits.
F The result is below the laboratory reporting limit and is therefore estimated.
J The result is below the laboratory reporting limit and is therefore estimated.
K The result is estimated due to blank spike compound recovery outside of control limits.

Attachment A-9

Table A-1. Stockpile [Topsoil] Soil Data

Table A-1
Stockpile Soil Data

51 Eames Street Site
Wilmington, Massachusetts

Parameter	Method	Units	Minimum Detected Concentration	Maximum Detected Concentration	1130-SP10-A 10/7/00	1130-SP10-A 12/12/00	1130-SP10-B 10/7/00	1130-SP10-B 12/12/00	1130-SP10-C 10/7/00	1130-SP10-C 12/12/00
Volatile Organics (VOCs)										
Toluene			0.16	0.16	< 0.2		< 0.19		< 0.15	
Semivolatile Organics (SVOCs)										
bis(2-Ethylhexyl)phthalate	8270C	mg/Kg	2.8	61	7.8		5.6		2.9	
Fluoranthene			0.8	0.8	< 0.41		< 0.8		0.8	
N-Nitrosodiphenylamine			0.2	3.9	0.22		0.84		< 0.82	
Phenanthrene			0.57	0.57	< 0.41		< 0.8		0.57	
Pyrene			0.32	0.66	< 0.41		< 0.8		0.66	
Pesticides										
4,4`-DDT	8081A	mg/Kg	0.014	0.023	< 0.012		< 0.012		0.014	
gamma-BHC (Lindane)			0.023	0.1	< 0.012		< 0.012		< 0.012	
Total Metals										
Aluminum	6010B	mg/kg	4500	8400		7800		8400		8100
Arsenic			3.9	33		18		16		10
Barium			6.7	29		19		19		21
Cadmium			0.33	0.43	0.33		< 0.3		< 0.3	
Chromium			10	57	31		30		27	
Iron			4600	15000		13000		14000		11000
Lead			6.7	36	22		24		26	
Mercury	7471A	mg/kg	0.062	0.3		0.062		0.079		0.086

General Notes:

1. Only numerical results for analytes detected in at least one sample are reported here. For a complete list of analytes and laboratory reporting limits see the laboratory data sheets.
2. "<" = Analyte not detected at a concentration above the specified laboratory reporting limit.
3. Method 1 Standards (e.g. RCS1), where identified, are cited from the Massachusetts Contingency Plan.
4. Criteria for MA landfills, where identified, are cited from Reuse and Disposal of Contaminated Soil at MA Landfills, DEP, August 15, 1997.
5. Boxed results denotes result is above RCS-1 standard
6. PCB - Polychlorinated Biphenyls
7. Bold values denote results exceeding MA unlined landfill resuse and disposal criteria.
8. TCLP - Toxicity Characteristic Leaching Procedure
9. ND = not detected above the reporting limit

Table A-1
Stockpile Soil Data

51 Eames Street Site
Wilmington, Massachusetts

Parameter	1130-SP10-D 10/7/00	1130-SP10-D 12/12/00	1130-SP10-E 10/7/00	1130-SP10-E 12/12/00	1130-SP10-F 10/7/00	1130-SP10-F 12/12/00	1130-SP11-A 10/7/00	1130-SP11-A 12/12/00	1130-SP11-B 10/7/00	1130-SP11-B 12/12/00
Volatile Organics (VOCs)										
Toluene	< 0.13		< 0.14		0.16		0.16		< 0.14	
Semivolatile Organics (SVOCs)										
bis(2-Ethylhexyl)phthalate	2.8		3.1		6		5.2		4	
Fluoranthene	< 0.42		< 0.42		< 0.4 C		< 0.9		< 0.4	
N-Nitrosodiphenylamine	< 0.42		< 0.42		0.39		< 0.9		0.2	
Phenanthrene	< 0.42		< 0.42		< 0.4 C		< 0.9		< 0.4	
Pyrene	< 0.42		< 0.42		0.32		< 0.9		< 0.4	
Pesticides										
4,4`-DDT	0.023		< 0.012		0.02		< 0.013		< 0.012	
gamma-BHC (Lindane)	0.023		< 0.012		0.1		< 0.013		< 0.012	
Total Metals										
Aluminum		7400		7900		4900		6800		8400
Arsenic		13		33		3.9		18		23
Barium		21		19		13		18		29
Cadmium	0.43		< 0.3		< 0.3		< 0.4		< 0.3	
Chromium	38		28		35		57		34	
Iron		10000		15000		4600		13000		15000
Lead	24		36		21		21		16	
Mercury		0.078		0.075		0.3		< 0.05		< 0.06

eral Notes:

Only numerical results for analytes detected in at least one sample laboratory data sheets.

"<" = Analyte not detected at a concentration above the specifie

Method 1 Standards (e.g. RCS1), where identified, are cited from

Criteria for MA landfills, where identified, are cited from Reuse and Di

Boxed results denotes result is above RCS-1 standard

PCB - Polychlorinated Biphenyls

Bold values denote results exceeding MA unlined landfill resuse an

TCLP - Toxicity Characteristic Leaching Procedure

ND = not detected above the reporting limit

Table A-1
Stockpile Soil Data

51 Eames Street Site
Wilmington, Massachusetts

Parameter	1130-SP11-C 10/7/00	1130-SP11-C 12/12/00	1130-SP11-D 10/7/00	1130-SP11-D 12/12/00	1130-SP12-A 10/7/00	1130-SP12-A 12/12/00
Volatile Organics (VOCs)						
Toluene	< 0.14		< 0.15		< 0.16	
Semivolatile Organics (SVOCs)						
bis(2-Ethylhexyl)phthalate	3.9		3.1		61	
Fluoranthene	< 0.42		< 0.95		< 4.3 C	
N-Nitrosodiphenylamine	3.9		< 0.95		< 4.3 C	
Phenanthrene	< 0.42		< 0.95		< 4.3 C	
Pyrene	< 0.42		< 0.95		< 4.3 C	
Pesticides						
4,4`-DDT	< 0.012		< 0.014		< 0.012	
gamma-BHC (Lindane)	< 0.012		< 0.014		< 0.012	
Total Metals						
Aluminum		7600		4500		6100
Arsenic		31		10		12
Barium		20		9.9		6.7
Cadmium	< 0.3		< 0.4		< 0.4	
Chromium	54		21		10	
Iron		15000		5200		4600
Lead	14		19		6.7	
Mercury		< 0.06		< 0.06		< 0.06

eral Notes:

Only numerical results for analytes detected in at least one sample laboratory data sheets.

"<" = Analyte not detected at a concentration above the specifie

Method 1 Standards (e.g. RCS1), where identified, are cited from

Criteria for MA landfills, where identified, are cited from Reuse and Di

Boxed results denotes result is above RCS-1 standard

PCB - Polychlorinated Biphenyls

Bold values denote results exceeding MA unlined landfill resuse an

TCLP - Toxicity Characteristic Leaching Procedure

ND = not detected above the reporting limit

APPENDIX B
SUPPLEMENTAL CHARACTERIZATION OF SOIL WITHIN THE CONTAINMENT AREA (WOOD, 2020)

Environmental Remediation Group

Olin Corporation
3855 North Ocoee Street, Suite 200
Cleveland, TN 37312
(423) 336-4600
JMCashwell@olin.com

SENT VIA ELECTRONIC MAIL

March 20, 2020

Ms. Lynne Jennings and Ms. Melanie Morash
U. S. Environmental Protection Agency (USEPA), Region 1
5 Post Office Square, Suite 100,
Mail Stop OSRR07-4, Boston, MA 02109-3912

RE: Summary of Data and Results
Supplemental Characterization of Containment Area Soil – November 2019
Olin Chemical Superfund Site (OCSS; "Site") – Wilmington, MA

Dear Ms. Jennings and Ms. Morash:

Transmitted herewith, summarizes the results of the soil investigation conducted within the Containment Area in November 2019.

Let us know if you have any questions.

Sincerely,
OLIN CORPORATION

James M. Cashwell
Director, Environmental Remediation

Enclosure

cc: Chinny Esakkiperumal (Olin)
Libby Bowen (Wood)

Wood Environment & Infrastructure Solutions, Inc.
511 Congress Street
Portland, Maine
USA

T: 207-775-5401

www.woodplc.com

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Table 1 - RCRA Samples
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-701		SB-702		SB-703		SB-704		SB-705		SB-706		SB-707	
		Sample Date	11/11/2019		11/8/2019		11/5/2019		11/7/2019		11/8/2019		11/6/2019		11/7/2019	
		Sample ID	OC-SB-701-0.0/10-XXX		OC-SB-702-0.0/10-XXX		OC-SB-703-0.0/10-XXX		OC-SB-704-0.0/10-XXX		OC-SB-705-0.0/10-XXX		OC-SB-706-0.0/10-XXX		OC-SB-707-0.0/10-XXX	
		Sample Depth (ft bgs)	0-10		0-10		0-10		0-10		0-10		0-10		0-10	
		Qc Code	FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
TCLP Metals																
SW6010C	Arsenic	mg/l	0.0097	J	0.0077	J	0.015	U	0.011	J	0.017		0.015	U	0.035	J+
SW6010C	Barium	mg/l	0.21	J	0.2	J	0.2	J	0.18	J	0.15	J	0.19	J	0.15	J
SW6010C	Cadmium	mg/l	0.0011	J	0.002	U	0.00061	J	0.0014	J	0.0047		0.0028		0.0018	J
SW6010C	Chromium	mg/l	0.13		0.017	J	0.095		0.24		0.19		0.18		0.057	
SW6010C	Lead	mg/l	0.011	J	0.012	J	0.012	J	0.012	J	0.0097	J	0.014	J	0.027	
SW7470A	Mercury	mg/l	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.0002	UJ	0.0002	U
SW6010C	Selenium	mg/l	0.025	U	0.025	U	0.025	U	0.025	U	0.025	U	0.025	U	0.025	U
SW6010C	Silver	mg/l	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Inorganics and Waste Characterization																
SW1030	Burn Rate	mm/sec	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U
SW9012	Cyanide, Reactive	mg/kg	10	U	10	U	10	U	10	U	10	U	10	U	10	U
SW9034	Sulfide, Reactive	mg/kg	10	UJ	10	U	10	UJ	10	UJ	10	U	10	U	10	UJ
SW9045D	pH	pH Units	8.4	J	7.4	J	5.4	J	7.7	J	7.6	J	6.1	J	7.4	J
SW9045D	Temperature	Deg C	19.6	HF	18.9	HF	19.1	HF	18.9	HF	18.8	HF	19.3	HF	19.4	HF

Notes

Units:

Deg C = Degrees Celcius
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
mm/sec = millimeters per second

Lab Qualifiers:

HF = field parameter with a holding time of 15 minutes; test performed by laboratory at client's request
J = concentration is an approximate value
U = not detected

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 1 - RCRA Samples
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-708		SB-709		SB-710		SB-711		SB-712		SB-712	
		Sample Date	11/4/2019		11/6/2019		11/4/2019		11/12/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-708-0.0/10-XXX		OC-SB-709-0.0/10-XXX		OC-SB-710-0.0/10XXX		OC-SB-711-0.0/10-XXX		OC-SB-712-0.0/10-XXX		OC-SB-712-0.0/10-DUP	
		Sample Depth (ft bgs)	0-10		0-10		0-10		0-10		0-10		0-10	
		Qc Code	FS		FS		FS		FS		FS		FD	
Method	**Parameter**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
TCLP Metals														
SW6010C	Arsenic	mg/l	0.015	U	0.015	U	0.015		0.012	J	0.013	J	0.011	J
SW6010C	Barium	mg/l	0.45	J	0.27	J	0.23	J	0.28	J	0.29	J	0.26	J
SW6010C	Cadmium	mg/l	0.002	U	0.0037		0.0016	J	0.0025		0.0012	J	0.0015	J
SW6010C	Chromium	mg/l	0.035		0.056		0.045		0.1		0.12		0.15	
SW6010C	Lead	mg/l	0.02	U	0.015	J	0.0068	J	0.011	J	0.059	J	0.022	J
SW7470A	Mercury	mg/l	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U
SW6010C	Selenium	mg/l	0.025	U	0.025	U	0.025	U	0.025	U	0.025	U	0.025	U
SW6010C	Silver	mg/l	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Inorganics and Waste Characterization														
SW1030	Burn Rate	mm/sec	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U
SW9012	Cyanide, Reactive	mg/kg	10	U	10	U	10	U	10	U	10	U	10	U
SW9034	Sulfide, Reactive	mg/kg	10	UJ	10	U	10	UJ	10	U	10	UJ	10	UJ
SW9045D	pH	pH Units	5.8	J	6.3	J	5.5	J	8.5	J	8.9	J	8.9	J
SW9045D	Temperature	Deg C	19.3	HF	19.3	HF	18.9	HF	18.9	HF	18.9	HF	19.1	HF

Notes

Units:

Deg C = Degrees Celcius
mg/kg = milligrams per kilogram
mg/l = milligrams per liter
mm/sec = millimeters per second

Lab Qualifiers:

HF = field parameter with a holding time of 15 minutes; test performed by laboratory at client's request
J = concentration is an approximate value
U = not detected

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SB-701		SB-701		SB-701		SB-701		SB-701		SB-701		SB-701	
			Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
			Sample ID	OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX		OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX	
			Sample Depth (ft bgs)	0 - 2		0 - 2		8 - 10		6 - 8		4 - 6		2 - 4		31 - 32		20 - 21	
			Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs																			
SW8260C	1,1,1,2-Tetrachloroethane	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,1,1-Trichloroethane	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,1,2,2-Tetrachloroethane	ug/kg		5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,1,2-Trichloroethane	ug/kg		5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,1-Dichloroethane	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	0.7	J	4.6	U	4.1	U	5.2	U
SW8260C	1,1-Dichloroethene	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,1-Dichloropropene	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,2,3-Trichlorobenzene	ug/kg		5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,2,3-Trichloropropane	ug/kg		5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,2,4-Trichlorobenzene	ug/kg		5.8	UJ	4.3	UJ	5.2	U	4.3	U	0.54	J	1.9	J	4.1	U	5.2	U
SW8260C	1,2,4-Trimethylbenzene	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	16		3.8	J	4.1	U	5.2	U
SW8260C	1,2-Dibromo-3-chloropropane	ug/kg		29	UJ	22	UJ	26	U	21	U	26	U	23	U	20	U	26	U
SW8260C	1,2-Dibromoethane	ug/kg		5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,2-Dichlorobenzene	ug/kg		5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,2-Dichloroethane	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,2-Dichloropropane	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,3,5-Trimethylbenzene	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	0.79	J	0.82	J	4.1	U	5.2	U
SW8260C	1,3-Dichlorobenzene	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	0.32	J	4.1	U	5.2	U
SW8260C	1,3-Dichloropropane	ug/kg		5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,4-Dichlorobenzene	ug/kg		5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	1,4-Dioxane	ug/kg		290	UJ	220	UJ	260	U	210	U	260	U	230	U	200	U	260	U
SW8260C	2,2-Dichloropropane	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg		5.8	UJ	4.3	UJ	5.2	U	0.76	J	67		59		4.1	U	0.58	J
SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg		5.8	UJ	4.3	UJ	5.2	U	4.3	U	34		24		4.1	U	5.2	U
SW8260C	2-Butanone	ug/kg		29	U	22	U	26	U	21	U	23	J+	21	J+	20	U	26	U
SW8260C	2-Chlorotoluene	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	2-Hexanone	ug/kg		29	UJ	22	UJ	26	U	21	U	26	U	23	U	20	U	26	U
SW8260C	4-Chlorotoluene	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	4-iso-Propyltoluene	ug/kg		5.8	UJ	4.3	UJ	5.2	U	4.3	U	0.48	J	0.41	J	4.1	U	5.2	U
SW8260C	4-Methyl-2-pentanone	ug/kg		29	U	22	U	26	U	21	U	26	U	23	U	20	U	26	U
SW8260C	Acetic acid, methyl ester	ug/kg		58	UJ	43	UJ	52	U	43	U	52	U	46	U	41	U	52	U
SW8260C	Acetone	ug/kg		7.4	J-	14	J-	12	J	16	J	99	J	82	J	14	J	16	J
SW8260C	Benzene	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	0.82	J	4.6	U	4.1	U	5.2	U
SW8260C	Bromobenzene	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Bromochloromethane	ug/kg		5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-701		SB-701		SB-701		SB-701		SB-701		SB-701		SB-701	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX		OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX	
		Sample Depth (ft bgs)	0 - 2		0 - 2		8 - 10		6 - 8		4 - 6		2 - 4		31 - 32		20 - 21	
		Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	Bromochloromethane	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Bromodichloromethane	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Bromoform	ug/kg	5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Bromomethane	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Carbon disulfide	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	6.6		4.2	J	4.1	U	5.2	U
SW8260C	Carbon tetrachloride	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Chlorobenzene	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Chloroethane	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Chloroform	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Chloromethane	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	cis-1,2-Dichloroethene	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	cis-1,3-Dichloropropene	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Cyclohexane	ug/kg	29	U	22	U	26	U	21	U	26	U	23	U	20	U	26	U
SW8260C	Dibromochloromethane	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Dibromomethane	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Dichlorodifluoromethane	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Diethyl ether	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Ethyl-t-Butyl Ether	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Ethylbenzene	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	1.4	J	0.49	J	4.1	U	5.2	U
SW8260C	Hexachlorobutadiene	ug/kg	5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Isopropyl ether	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Isopropylbenzene	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	3.7	J	1.2	J	4.1	U	5.2	U
SW8260C	Methyl cyclohexane	ug/kg	5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Methyl Tertbutyl Ether	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Methylene chloride	ug/kg	18	U	19	U	26	U	25	U	17	U	26	U	15	U	26	U
SW8260C	n-Butylbenzene	ug/kg	5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Naphthalene	ug/kg	29	UJ	22	UJ	26	U	15	J	180		3	J	20	U	26	U
SW8260C	Propylbenzene	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	7		1.2	J	4.1	U	5.2	U
SW8260C	sec-Butylbenzene	ug/kg	5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Styrene	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	tert-Butylbenzene	ug/kg	5.8	UJ	4.3	UJ	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Tetrachloroethene	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Tetrahydrofuran	ug/kg	58	UJ	43	UJ	52	U	43	U	52	U	46	U	41	U	52	U
SW8260C	Toluene	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	0.43	J	4.1	U	5.2	U
SW8260C	trans-1,2-Dichloroethene	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	trans-1,3-Dichloropropene	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Trichloroethene	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Trichlorofluoromethane	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Vinyl chloride	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	5.2	U	4.6	U	4.1	U	5.2	U
SW8260C	Xylene, o	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	1.6	J	0.75	J	4.1	U	5.2	U
SW8260C	Xylenes (m&p)	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	0.98	J	4.6	U	4.1	U	5.2	U
SW8260C	Xylenes, Total	ug/kg	5.8	U	4.3	U	5.2	U	4.3	U	2.6	J	4.6	U	4.1	U	5.2	U

Notes

Units:
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Lab Qualifiers:
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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-701		SB-701		SB-701		SB-701		SB-701		SB-701		SB-701	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX		OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX	
		Sample Depth (ft bgs)	0 - 2		0 - 2		8 - 10		6 - 8		4 - 6		2 - 4		31 - 32		20 - 21	
		Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs																		
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	1-Methylnaphthalene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	2,4,5-Trichlorophenol	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	2,4,6-Trichlorophenol	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	2,4-Dichlorophenol	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	2,4-Dimethylphenol	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	2,4-Dinitrophenol	ug/kg	410	U	400	U	400	U	380	U	390	U	380	U	340	U	370	U
SW8270D	2,4-Dinitrotoluene	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	2,6-Dinitrotoluene	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	2-Chloronaphthalene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	2-Chlorophenol	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	2-Methylnaphthalene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	2-Methylphenol	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	2-Nitroaniline	ug/kg	210	U	210	U	200	U	200	U	200	U	200	U	180	U	190	U
SW8270D	2-Nitrophenol	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	3 & 4 Methylphenol	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	3,3'-Dichlorobenzidine	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	3-Nitroaniline	ug/kg	210	U	210	U	200	U	200	U	200	U	200	U	180	U	190	U
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg	210	U	210	U	200	U	200	U	200	U	200	U	180	U	190	U
SW8270D	4-Bromophenyl phenyl ether	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	4-Chloro-3-methylphenol	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	4-Chloroaniline	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	4-Chlorophenyl phenyl ether	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	4-Nitroaniline	ug/kg	210	U	210	U	200	U	200	U	200	U	200	U	180	U	190	U
SW8270D	4-Nitrophenol	ug/kg	210	U	210	U	200	U	200	U	200	U	200	U	180	U	190	U
SW8270D	Acenaphthene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	Acenaphthylene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	Acetophenone	ug/kg	2.2	J	82	U	81	U	78	U	79	U	77	U	70	U	75	U
SW8270D	Aniline	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	Anthracene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	2.1	J	7.7	U	7	U	7.5	U
SW8270D	Atrazine	ug/kg	83	U	82	U	81	U	78	U	79	U	77	U	70	U	75	U
SW8270D	Azobenzene	ug/kg	400	U	400	U	390	U	380	U	400	U	1900	U	350	U	62	J
SW8270D	Benzaldehyde	ug/kg	83	UJ	82	UJ	81	U	78	U	79	U	77	U	70	U	75	U
SW8270D	Benzo(a)anthracene	ug/kg	5.4	J	8.2	U	8.1	U	7.8	U	4.2	J	7.7	U	7	U	7.5	U
SW8270D	Benzo(a)pyrene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	Benzo(b)fluoranthene	ug/kg	5.7	J	8.2	U	8.1	U	7.8	U	3.2	J	7.7	U	7	U	7.5	U
SW8270D	Benzo(ghi)perylene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	Benzo(k)fluoranthene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	Benzoic Acid	ug/kg	210	UJ	210	UJ	200	U	200	U	200	U	200	U	180	U	190	U
SW8270D	Benzyl alcohol	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	Biphenyl	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	Bis(2-Chloroethyl)ether	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-701		SB-701		SB-701		SB-701		SB-701		SB-701		SB-701	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX		OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX	
		Sample Depth (ft bgs)	0 - 2		0 - 2		8 - 10		6 - 8		4 - 6		2 - 4		31 - 32		20 - 21	
		Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8270D	Bis(2-Ethylhexyl)phthalate	ug/kg	800		640		400	U	380	U	150	J	3900		340	U	370	U
SW8270D	Butylbenzylphthalate	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	Caprolactam	ug/kg	210	U	210	U	200	U	200	U	200	U	200	U	180	U	190	U
SW8270D	Carbazole	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	Chrysene	ug/kg	6	J	8.2	U	8.1	U	7.8	U	4.6	J	7.7	U	7	U	7.5	U
SW8270D	Di-n-butylphthalate	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	Di-n-octylphthalate	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	Dibenz(a,h)anthracene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	Dibenzofuran	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	Diethylphthalate	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	Dimethylphthalate	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	Fluoranthene	ug/kg	7.9	J	3.5	J	8.1	U	7.8	U	6.3	J	8.2		7	U	7.5	U
SW8270D	Fluorene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	Hexachlorobenzene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	Hexachlorocyclopentadiene	ug/kg	41	UJ	40	UJ	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	Hexachloroethane	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	Indeno(1,2,3-cd)pyrene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	Isophorone	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	N-Nitrosodi-n-propylamine	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SW8270D	N-Nitrosodimethylamine	ug/kg	41	U	40	U	40	U	38	U	39	U	38	U	34	U	37	U
SW8270D	N-Nitrosodiphenylamine	ug/kg	120		93		40	U	38	U	1500		430		34	U	37	U
SW8270D	Nitrobenzene	ug/kg	82	U	82	U	80	U	77	U	79	U	77	U	69	U	74	U
SW8270D	Pentachlorophenol	ug/kg	210	U	210	U	200	U	200	U	200	U	200	U	180	U	190	U
SW8270D	Phenanthrene	ug/kg	4.6	J	2.4	J	8.1	U	2.8	J	5.6	J	6.5	J	7	U	7.5	U
SW8270D	Phenol	ug/kg	41	U	40	U	40	U	38	U	39	U	23	J	34	U	37	U
SW8270D	Phthalic anhydride	ug/kg	12000	UJ	12000	UJ	12000	UJ	11000	UJ	12000	UJ	56000	UJ	11000	UJ	11000	UJ
SW8270D	Pyrene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.6	J	8.6		7	U	7.5	U
SW8270D	Pentachlorophenol	ug/kg	210	U	210	U	200	U	200	U	810	U	2000	U	180	U	190	U
SW8270D	Phenanthrene	ug/kg	4.6	J	2.4	J	8.1	U	2.8	J	5.6	U	77	U	7	U	7.5	U
SW8270D	Phenol	ug/kg	41	U	40	U	40	U	38	U	39	U	380	U	34	U	37	U
SW8270D	Phthalic anhydride	ug/kg	12000	U	12000	U	12000	U	11000	U	12000	U	56000	U	11000	U	11000	U
SW8270D	Pyrene	ug/kg	8.3	U	8.2	U	8.1	U	7.8	U	7.6	U	8.6	U	7	U	7.5	U

Notes

Units:
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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-702		SB-703	
			Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/5/2019	
			Sample ID	OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX		OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX	
			Sample Depth (ft bgs)	0 - 2		2 - 4		4 - 6		6 - 8		8 - 10		34 - 35		28 - 29		0 - 2	
			Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs																			
SW8260C	1,1,1,2-Tetrachloroethane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,1,1-Trichloroethane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,1,2,2-Tetrachloroethane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,1,2-Trichloroethane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,1-Dichloroethane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,1-Dichloroethene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,1-Dichloropropene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,2,3-Trichlorobenzene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,2,3-Trichloropropane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,2,4-Trichlorobenzene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,2,4-Trimethylbenzene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,2-Dibromo-3-chloropropane	ug/kg		23	U	21	U	25	U	21	U	23	U	54	U	21	U	24	U
SW8260C	1,2-Dibromoethane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,2-Dichlorobenzene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,2-Dichloroethane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,2-Dichloropropane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,3,5-Trimethylbenzene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,3-Dichlorobenzene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,3-Dichloropropane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,4-Dichlorobenzene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	1,4-Dioxane	ug/kg		230	U	210	U	250	U	210	U	230	U	540	U	210	U	240	U
SW8260C	2,2-Dichloropropane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg		4.7	U	2.4	J	1.2	J	13		16		11	U	4.2	U	0.9	J
SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg		4.7	U	0.84	J	4.9	U	4.4		3.1	J	11	U	4.2	U	4.7	U
SW8260C	2-Butanone	ug/kg		23	U	14	J+	29	J+	4.4	J+	23	U	54	U	21	U	6.6	J
SW8260C	2-Chlorotoluene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	2-Hexanone	ug/kg		23	U	21	U	25	U	21	U	23	U	54	U	21	U	24	U
SW8260C	4-Chlorotoluene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	4-iso-Propyltoluene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	4-Methyl-2-pentanone	ug/kg		23	U	21	U	25	U	21	U	23	U	54	U	21	U	24	U
SW8260C	Acetic acid, methyl ester	ug/kg		47	U	41	U	8.1	J	42	U	6.3	J	7.5	J	42	U	47	U
SW8260C	Acetone	ug/kg		23	J	54	J	54	J	20	J	5.6	J	12	J	5.1	J	30	J
SW8260C	Benzene	ug/kg		4.7	U	4.1	U	4.9	U	0.37	J	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Bromobenzene	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Bromochloromethane	ug/kg		4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U

Notes

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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-702		SB-703	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/5/2019	
		Sample ID	OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX		OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX	
		Sample Depth (ft bgs)	0 - 2		2 - 4		4 - 6		6 - 8		8 - 10		34 - 35		28 - 29		0 - 2	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	Bromochloromethane	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Bromodichloromethane	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Bromoform	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Bromomethane	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Carbon disulfide	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Carbon tetrachloride	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Chlorobenzene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Chloroethane	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Chloroform	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Chloromethane	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	cis-1,2-Dichloroethene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	cis-1,3-Dichloropropene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Cyclohexane	ug/kg	23	U	21	U	25	U	21	U	23	U	54	U	21	U	24	U
SW8260C	Dibromochloromethane	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Dibromomethane	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Dichlorodifluoromethane	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Diethyl ether	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Ethyl-t-Butyl Ether	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Ethylbenzene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Hexachlorobutadiene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Isopropyl ether	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Isopropylbenzene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Methyl cyclohexane	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Methyl Tertbutyl Ether	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Methylene chloride	ug/kg	6.5	U	5.6	U	8.4	U	4.5	U	20	U	57	U	21	U	4.7	U
SW8260C	n-Butylbenzene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Naphthalene	ug/kg	23	U	21	U	25	U	21	U	23	U	54	U	21	U	24	U
SW8260C	Propylbenzene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	sec-Butylbenzene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Styrene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	tert-Butylbenzene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Tetrachloroethene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Tetrahydrofuran	ug/kg	47	U	41	U	49	U	42	U	46	U	110	U	42	U	47	U
SW8260C	Toluene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	trans-1,2-Dichloroethene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	trans-1,3-Dichloropropene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Trichloroethene	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Trichlorofluoromethane	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Vinyl chloride	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Xylene, o	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Xylenes (m&p)	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
SW8260C	Xylenes, Total	ug/kg	4.7	U	4.1	U	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-702		SB-703	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/5/2019	
		Sample ID	OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX		OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX	
		Sample Depth (ft bgs)	0 - 2		2 - 4		4 - 6		6 - 8		8 - 10		34 - 35		28 - 29		0 - 2	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs																		
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	1-Methylnaphthalene	ug/kg	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U	7.7	U	8.7	U
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U	7.7	U	8.7	U
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	2,4,5-Trichlorophenol	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	2,4,6-Trichlorophenol	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	2,4-Dichlorophenol	ug/kg	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U	7.7	U	8.7	U
SW8270D	2,4-Dimethylphenol	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	2,4-Dinitrophenol	ug/kg	380	U	350	U	370	U	750	U	350	U	350	U	380	U	430	U
SW8270D	2,4-Dinitrotoluene	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	2,6-Dinitrotoluene	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	2-Chloronaphthalene	ug/kg	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U	7.7	U	8.7	U
SW8270D	2-Chlorophenol	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	2-Methylnaphthalene	ug/kg	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U	7.7	U	8.7	U
SW8270D	2-Methylphenol	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	2-Nitroaniline	ug/kg	200	U	180	U	190	U	390	U	180	U	180	U	190	U	220	U
SW8270D	2-Nitrophenol	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	3 & 4 Methylphenol	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	3,3'-Dichlorobenzidine	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	3-Nitroaniline	ug/kg	200	U	180	U	190	U	390	U	180	U	180	U	190	U	220	U
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg	200	U	180	U	190	U	390	U	180	U	180	U	190	U	220	U
SW8270D	4-Bromophenyl phenyl ether	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	4-Chloro-3-methylphenol	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	4-Chloroaniline	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	4-Chlorophenyl phenyl ether	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	4-Nitroaniline	ug/kg	200	U	180	U	190	U	390	U	180	U	180	U	190	U	220	U
SW8270D	4-Nitrophenol	ug/kg	200	U	180	U	190	U	390	U	180	U	180	U	190	U	220	U
SW8270D	Acenaphthene	ug/kg	7.7	U	7.1	U	7.5	U	5.5	J	7.1	U	7.2	U	7.7	U	8.7	U
SW8270D	Acenaphthylene	ug/kg	7.7	U	1.7	J	7.5	U	3.3	J	7.1	U	7.2	U	7.7	U	3	J
SW8270D	Acetophenone	ug/kg	77	U	71	U	75	U	150	U	71	U	72	U	77	U	87	U
SW8270D	Aniline	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	Anthracene	ug/kg	7.7	U	2.2	J	7.5	U	15		7.1	U	7.2	U	7.7	U	3.1	J
SW8270D	Atrazine	ug/kg	77	U	71	U	75	U	150	U	71	U	72	U	77	U	87	U
SW8270D	Azobenzene	ug/kg	380	U	350	U	370	U	360	U	350	U	350	U	370	U	430	U
SW8270D	Benzaldehyde	ug/kg	77	R	71	R	75	R	150	R	71	U	72	U	77	U	10	J
SW8270D	Benzo(a)anthracene	ug/kg	8.8		11		3.9	J	49		7.1	U	7.2	U	7.7	U	6.9	J
SW8270D	Benzo(a)pyrene	ug/kg	9.7		10		3.7	J	45		7.1	U	7.2	U	7.7	U	7.3	J
SW8270D	Benzo(b)fluoranthene	ug/kg	11		17		5.3	J	43		7.1	U	7.2	U	7.7	U	10	
SW8270D	Benzo(ghi)perylene	ug/kg	8.5		10		3.2	J	29		7.1	U	7.2	U	7.7	U	7.6	J
SW8270D	Benzo(k)fluoranthene	ug/kg	5.3	J	5.9	J	7.5	U	20		7.1	U	7.2	U	7.7	U	3.1	J
SW8270D	Benzoic Acid	ug/kg	200	U	180	U	190	U	390	U	180	U	180	U	190	U	220	U
SW8270D	Benzyl alcohol	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	Biphenyl	ug/kg	38	U	2	J	37	U	75	U	35	U	35	U	38	U	2.6	J
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	Bis(2-Chloroethyl)ether	ug/kg	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U	7.7	U	8.7	U

Notes

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Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-702		SB-703	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/5/2019	
		Sample ID	OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX		OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX	
		Sample Depth (ft bgs)	0 - 2		2 - 4		4 - 6		6 - 8		8 - 10		34 - 35		28 - 29		0 - 2	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8270D	Bis(2-Ethylhexyl)phthalate	ug/kg	230	J	270	J	3500		800		630		350	U	380	U	1600	
SW8270D	Butylbenzylphthalate	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	Caprolactam	ug/kg	200	U	180	U	190	U	390	U	180	U	180	U	190	U	220	U
SW8270D	Carbazole	ug/kg	7.7	U	1.8	J	7.5	U	3.7	J	7.1	U	7.2	U	7.7	U	8.7	U
SW8270D	Chrysene	ug/kg	10		14		4.5	J	46		7.1	U	7.2	U	7.7	U	9.3	
SW8270D	Di-n-butylphthalate	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	Di-n-octylphthalate	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	Dibenz(a,h)anthracene	ug/kg	3.4	J	2.7	J	7.5	U	9.6	J	7.1	U	7.2	U	7.7	U	2.4	J
SW8270D	Dibenzofuran	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	Diethylphthalate	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	Dimethylphthalate	ug/kg	38	U	35	U	2	J	75	U	35	U	35	U	38	U	43	U
SW8270D	Fluoranthene	ug/kg	14		15		5.9	J	81		3	J	7.2	U	7.7	U	14	
SW8270D	Fluorene	ug/kg	7.7	U	7.1	U	7.5	U	5.3	J	7.1	U	7.2	U	7.7	U	8.7	U
SW8270D	Hexachlorobenzene	ug/kg	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U	7.7	U	8.7	U
SW8270D	Hexachlorocyclopentadiene	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	Hexachloroethane	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	Indeno(1,2,3-cd)pyrene	ug/kg	7.3	J	8.7		2.8	J	25		7.1	U	7.2	U	7.7	U	6	J
SW8270D	Isophorone	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	N-Nitrosodi-n-propylamine	ug/kg	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U	7.7	U	8.7	U
SW8270D	N-Nitrosodimethylamine	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	N-Nitrosodiphenylamine	ug/kg	13	J	35	U	12	J	75	U	35	U	35	U	38	U	37	J
SW8270D	Nitrobenzene	ug/kg	77	U	70	U	75	U	150	U	71	U	71	U	76	U	86	U
SW8270D	Pentachlorophenol	ug/kg	200	U	180	U	190	U	390	U	180	U	180	U	190	U	220	U
SW8270D	Phenanthrene	ug/kg	6.4	J	9.4		4.5	J	48		7.1	U	7.2	U	7.7	U	8.1	J
SW8270D	Phenol	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	Phthalic anhydride	ug/kg	11000	UJ	10000	UJ	11000	UJ	11000	UJ	11000	UJ	11000	UJ	11000	UJ	13000	UJ
SW8270D	Pyrene	ug/kg	13		14		6.4	J	87		3	J	7.2	U	7.7	U	12	
SW8270D	Pentachlorophenol	ug/kg	200	U	180	U	950	U	390	U	180	U	180	U	190	U	220	U
SW8270D	Phenanthrene	ug/kg	6.4	J	9.4		4.5	U	48		7.1	U	7.2	U	7.7	U	8.1	J
SW8270D	Phenol	ug/kg	38	U	35	U	37	U	75	U	35	U	35	U	38	U	43	U
SW8270D	Phthalic anhydride	ug/kg	11000	U	10000	U	11000	U	11000	U	11000	U	11000	U	11000	U	13000	U
SW8270D	Pyrene	ug/kg	13		14		6.4	U	87		3	J	7.2	U	7.7	U	12	

Notes

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Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SB-703		SB-703		SB-703		SB-703		SB-703		SB-703		SB-704	
			Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/7/2019	
			Sample ID	OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX	
			Sample Depth (ft bgs)	2 - 4		2 - 4		4 - 6		6 - 8		8 - 10		17 - 18		30 - 32		0 - 2	
			Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs																			
SW8260C	1,1,1,2-Tetrachloroethane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,1,1-Trichloroethane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,1,2,2-Tetrachloroethane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,1,2-Trichloroethane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,1-Dichloroethane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,1-Dichloroethene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,1-Dichloropropene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,2,3-Trichlorobenzene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,2,3-Trichloropropane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,2,4-Trichlorobenzene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,2,4-Trimethylbenzene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	3	J
SW8260C	1,2-Dibromo-3-chloropropane	ug/kg		20	UJ	22	UJ	23	U	25	U	25	U	22	U	15	U	37	U
SW8260C	1,2-Dibromoethane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,2-Dichlorobenzene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,2-Dichloroethane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	1.1	J	7.3	U
SW8260C	1,2-Dichloropropane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,3,5-Trimethylbenzene	ug/kg		0.27	J-	0.37	J-	4.6	U	5	U	5	U	4.5	U	3	U	1.4	J
SW8260C	1,3-Dichlorobenzene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,3-Dichloropropane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,4-Dichlorobenzene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	1,4-Dioxane	ug/kg		200	UJ	220	UJ	230	U	250	U	250	U	220	U	150	U	370	U
SW8260C	2,2-Dichloropropane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg		1.4	J-	1.7	J-	4.6	U	5	U	5	U	4.5	U	3	U	5.1	J
SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg		0.46	J-	0.67	J-	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	2-Butanone	ug/kg		9.5	J-	10	J	23	U	25	U	25	U	22	U	15	U	17	J+
SW8260C	2-Chlorotoluene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	2-Hexanone	ug/kg		20	UJ	22	UJ	23	U	25	U	25	U	22	U	15	U	37	U
SW8260C	4-Chlorotoluene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	4-iso-Propyltoluene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	1.9	J
SW8260C	4-Methyl-2-pentanone	ug/kg		20	UJ	22	UJ	23	U	25	U	25	U	22	U	15	U	37	U
SW8260C	Acetic acid, methyl ester	ug/kg		40	UJ	44	UJ	46	U	50	U	50	U	45	U	30	U	73	U
SW8260C	Acetone	ug/kg		43	J-	37	J-	6.5	J	23	J	4.2	J	220	U	7.6	J	93	J
SW8260C	Benzene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Bromobenzene	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Bromochloromethane	ug/kg		4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	0.78	J	7.3	U

Notes

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Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-703		SB-703		SB-703		SB-703		SB-703		SB-703		SB-704	
		Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/7/2019	
		Sample ID	OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX	
		Sample Depth (ft bgs)	2 - 4		2 - 4		4 - 6		6 - 8		8 - 10		17 - 18		30 - 32		0 - 2	
		Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	Bromochloromethane	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	0.78	J	7.3	U
SW8260C	Bromodichloromethane	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Bromoform	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Bromomethane	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Carbon disulfide	ug/kg	6.5	J-	4.4	J-	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Carbon tetrachloride	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Chlorobenzene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Chloroethane	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Chloroform	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Chloromethane	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	cis-1,2-Dichloroethene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	cis-1,3-Dichloropropene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Cyclohexane	ug/kg	20	UJ	22	UJ	23	U	25	U	25	U	22	U	15	U	37	U
SW8260C	Dibromochloromethane	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Dibromomethane	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	4.6		7.3	U
SW8260C	Dichlorodifluoromethane	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Diethyl ether	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	3.4	J
SW8260C	Ethyl-t-Butyl Ether	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Ethylbenzene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Hexachlorobutadiene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Isopropyl ether	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Isopropylbenzene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Methyl cyclohexane	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Methyl Tertbutyl Ether	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Methylene chloride	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	14	U
SW8260C	n-Butylbenzene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Naphthalene	ug/kg	20	UJ	22	UJ	23	U	25	U	25	U	22	U	15	U	2.5	J
SW8260C	Propylbenzene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	sec-Butylbenzene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Styrene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	tert-Butylbenzene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Tetrachloroethene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Tetrahydrofuran	ug/kg	40	UJ	44	UJ	46	U	50	U	50	U	45	U	30	U	73	U
SW8260C	Toluene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	0.62	J	1.4	J
SW8260C	trans-1,2-Dichloroethene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	trans-1,3-Dichloropropene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Trichloroethene	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Trichlorofluoromethane	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Vinyl chloride	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Xylene, o	ug/kg	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Xylenes (m&p)	ug/kg	4	UJ	0.77	J-	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U
SW8260C	Xylenes, Total	ug/kg	4	UJ	0.77	J-	4.6	U	5	U	5	U	4.5	U	3	U	7.3	U

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Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-703		SB-703		SB-703		SB-703		SB-703		SB-703		SB-704	
		Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/7/2019	
		Sample ID	OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX	
		Sample Depth (ft bgs)	2 - 4		2 - 4		4 - 6		6 - 8		8 - 10		17 - 18		30 - 32		0 - 2	
		Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs																		
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg	38	U	39	U	40	U	41	U	36	UJ	37	U	36	U	84	U
SW8270D	1-Methylnaphthalene	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	23	
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	17	U
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	UJ
SW8270D	2,4,5-Trichlorophenol	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	2,4,6-Trichlorophenol	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	UJ
SW8270D	2,4-Dichlorophenol	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	17	U
SW8270D	2,4-Dimethylphenol	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	2,4-Dinitrophenol	ug/kg	380	UJ	390	UJ	400	U	410	U	360	UJ	370	U	360	U	840	U
SW8270D	2,4-Dinitrotoluene	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	2,6-Dinitrotoluene	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	2-Chloronaphthalene	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	17	U
SW8270D	2-Chlorophenol	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	2-Methylnaphthalene	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	37	
SW8270D	2-Methylphenol	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	2-Nitroaniline	ug/kg	200	U	200	U	210	U	210	U	180	U	190	U	180	U	430	U
SW8270D	2-Nitrophenol	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	3 & 4 Methylphenol	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	47	J
SW8270D	3,3'-Dichlorobenzidine	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	3-Nitroaniline	ug/kg	200	U	200	U	210	U	210	U	180	U	190	U	180	U	430	U
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg	200	R	200	R	210	U	210	U	180	U	190	U	180	U	430	UJ
SW8270D	4-Bromophenyl phenyl ether	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	4-Chloro-3-methylphenol	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	4-Chloroaniline	ug/kg	38	U	39	U	40	U	41	U	36	UJ	37	U	36	U	84	U
SW8270D	4-Chlorophenyl phenyl ether	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	31	J
SW8270D	4-Nitroaniline	ug/kg	200	U	200	U	210	U	210	U	180	U	190	U	180	U	430	U
SW8270D	4-Nitrophenol	ug/kg	200	U	200	U	210	U	210	U	180	U	190	U	180	U	430	UJ
SW8270D	Acenaphthene	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	16	J
SW8270D	Acenaphthylene	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	17	U
SW8270D	Acetophenone	ug/kg	2.4	J	79	U	82	U	84	U	73	UJ	74	U	72	U	170	U
SW8270D	Aniline	ug/kg	38	U	39	U	40	U	41	U	36	UJ	37	U	36	U	84	U
SW8270D	Anthracene	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	9.1	J
SW8270D	Atrazine	ug/kg	77	U	79	U	82	U	84	U	73	U	74	U	72	U	170	U
SW8270D	Azobenzene	ug/kg	370	U	400	U	410	U	410	U	360	U	360	U	360	U	410	U
SW8270D	Benzaldehyde	ug/kg	5.8	J-	79	R	82	U	84	U	73	R	74	U	72	U	170	R
SW8270D	Benzo(a)anthracene	ug/kg	4.3	J	3.5	J	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	13	J
SW8270D	Benzo(a)pyrene	ug/kg	4.3	J	3.4	J	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	10	J
SW8270D	Benzo(b)fluoranthene	ug/kg	6.8	J	4.1	J	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	14	J
SW8270D	Benzo(ghi)perylene	ug/kg	4.9	J	3.7	J	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	8.4	J
SW8270D	Benzo(k)fluoranthene	ug/kg	7.7	U	3	J	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	5.2	J
SW8270D	Benzoic Acid	ug/kg	50	J-	200	R	210	U	210	U	180	R	190	U	180	U	430	R
SW8270D	Benzyl alcohol	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	Biphenyl	ug/kg	4.3	J	3.2	J	40	U	41	U	36	U	37	U	36	U	24	J
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	Bis(2-Chloroethyl)ether	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	UJ	7.4	U	7.2	U	17	U

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November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-703		SB-703		SB-703		SB-703		SB-703		SB-703		SB-704	
		Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/7/2019	
		Sample ID	OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX	
		Sample Depth (ft bgs)	2 - 4		2 - 4		4 - 6		6 - 8		8 - 10		17 - 18		30 - 32		0 - 2	
		Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8270D	Bis(2-Ethylhexyl)phthalate	ug/kg	1400	J	650	J	400	U	410	U	60	J	370	U	360	U	7600	
SW8270D	Butylbenzylphthalate	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	Caprolactam	ug/kg	200	U	200	U	210	U	210	U	180	U	190	U	180	U	430	U
SW8270D	Carbazole	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	17	U
SW8270D	Chrysene	ug/kg	6.5	J	4.6	J	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	18	
SW8270D	Di-n-butylphthalate	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	Di-n-octylphthalate	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	Dibenz(a,h)anthracene	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	17	U
SW8270D	Dibenzofuran	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	8.8	J
SW8270D	Diethylphthalate	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	Dimethylphthalate	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	Fluoranthene	ug/kg	9		6.3	J	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	47	
SW8270D	Fluorene	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	21	
SW8270D	Hexachlorobenzene	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	17	U
SW8270D	Hexachlorocyclopentadiene	ug/kg	38	UJ	39	UJ	40	U	41	U	36	UJ	37	U	36	U	84	U
SW8270D	Hexachloroethane	ug/kg	38	U	39	U	40	U	41	U	36	UJ	37	U	36	U	84	U
SW8270D	Indeno(1,2,3-cd)pyrene	ug/kg	3.5	J	3	J	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	8.1	J
SW8270D	Isophorone	ug/kg	38	U	39	U	40	U	41	U	36	U	37	U	36	U	84	U
SW8270D	N-Nitrosodi-n-propylamine	ug/kg	7.7	U	7.9	U	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	17	U
SW8270D	N-Nitrosodimethylamine	ug/kg	38	U	39	U	40	U	41	U	36	UJ	37	U	36	U	84	U
SW8270D	N-Nitrosodiphenylamine	ug/kg	350	J	130	J	40	U	41	U	36	U	37	U	36	U	390	
SW8270D	Nitrobenzene	ug/kg	77	U	79	U	82	U	83	U	72	UJ	74	U	72	U	170	U
SW8270D	Pentachlorophenol	ug/kg	200	UJ	200	UJ	210	U	210	U	180	U	190	U	180	U	430	UJ
SW8270D	Phenanthrene	ug/kg	5.4	J	3.9	J	8.2	U	8.4	U	7.3	U	7.4	U	2	J	84	
SW8270D	Phenol	ug/kg	25	J	39	U	40	U	41	U	36	U	37	U	36	U	330	
SW8270D	Phthalic anhydride	ug/kg	11000	UJ	12000	UJ	12000	UJ	12000	UJ	11000	UJ	11000	UJ	11000	UJ	12000	UJ
SW8270D	Pyrene	ug/kg	7.5	J	5.6	J	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	42	
SW8270D	Pentachlorophenol	ug/kg	200	U	200	U F1 F2	210	U	210	U	180	U	190	U	180	U	430	U F1 F2
SW8270D	Phenanthrene	ug/kg	5.4	J	3.9	J	8.2	U	8.4	U	7.3	U	7.4	U	2	J	84	
SW8270D	Phenol	ug/kg	25	J	39	U	40	U	41	U	36	U F1	37	U	36	U	330	J
SW8270D	Phthalic anhydride	ug/kg	11000	U	12000	U	12000	U	12000	U	11000	U	11000	U	11000	U	12000	U
SW8270D	Pyrene	ug/kg	7.5	J	5.6	J	8.2	U	8.4	U	7.3	U	7.4	U	7.2	U	45	J F1

Notes

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J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SB-704		SB-704		SB-704		SB-704		SB-704		SB-704		SB-704		SB-705	
			Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/8/2019	
			Sample ID	OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX		OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX	
			Sample Depth (ft bgs)	2 - 4		4 - 6		6 - 8		8 - 10		12 - 13		33 - 34		19 - 20		0 - 2	
			Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs																			
SW8260C	1,1,1,2-Tetrachloroethane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,1,1-Trichloroethane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,1,2,2-Tetrachloroethane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,1,2-Trichloroethane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,1-Dichloroethane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,1-Dichloroethene	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,1-Dichloropropene	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,2,3-Trichlorobenzene	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,2,3-Trichloropropane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,2,4-Trichlorobenzene	ug/kg		0.58	J	0.36	J	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,2,4-Trimethylbenzene	ug/kg		2.7	J	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,2-Dibromo-3-chloropropane	ug/kg		27	U	20	U	19	U	23	U	24	U	22	U	21	U	21	U
SW8260C	1,2-Dibromoethane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,2-Dichlorobenzene	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,2-Dichloroethane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,2-Dichloropropane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,3,5-Trimethylbenzene	ug/kg		1.1	J	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,3-Dichlorobenzene	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,3-Dichloropropane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,4-Dichlorobenzene	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	1,4-Dioxane	ug/kg		270	U	200	U	190	U	230	U	240	U	220	U	210	U	210	U
SW8260C	2,2-Dichloropropane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg		6.2		1.3	J	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg		3	J	0.56	J	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	2-Butanone	ug/kg		23	J+	64	J+	9.6	J+	29	J+	24	U	22	U	21	U	21	U
SW8260C	2-Chlorotoluene	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	2-Hexanone	ug/kg		27	U	20	U	19	U	23	U	24	U	22	U	21	U	21	U
SW8260C	4-Chlorotoluene	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	4-iso-Propyltoluene	ug/kg		1.2	J	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	4-Methyl-2-pentanone	ug/kg		27	U	20	U	19	U	23	U	24	U	22	U	21	U	21	U
SW8260C	Acetic acid, methyl ester	ug/kg		54	U	41	U	37	U	45	U	48	U	43	U	43	U	42	U
SW8260C	Acetone	ug/kg		68	J	64	J	38	J	54	J	18	J	22	J	210	U	14	J
SW8260C	Benzene	ug/kg		0.41	J	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Bromobenzene	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Bromochloromethane	ug/kg		5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U

Notes

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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-704		SB-704		SB-704		SB-704		SB-704		SB-704		SB-704		SB-705	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/8/2019	
		Sample ID	OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX		OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX	
		Sample Depth (ft bgs)	2 - 4		4 - 6		6 - 8		8 - 10		12 - 13		33 - 34		19 - 20		0 - 2	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	Bromochloromethane	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Bromodichloromethane	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Bromoform	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Bromomethane	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Carbon disulfide	ug/kg	6		2.5	J	3.7	U	2.4	J	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Carbon tetrachloride	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Chlorobenzene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Chloroethane	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Chloroform	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Chloromethane	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	cis-1,2-Dichloroethene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	cis-1,3-Dichloropropene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Cyclohexane	ug/kg	27	U	20	U	19	U	23	U	24	U	22	U	21	U	21	U
SW8260C	Dibromochloromethane	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Dibromomethane	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Dichlorodifluoromethane	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Diethyl ether	ug/kg	2.8	J	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Ethyl-t-Butyl Ether	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Ethylbenzene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Hexachlorobutadiene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Isopropyl ether	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Isopropylbenzene	ug/kg	1.3	J	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Methyl cyclohexane	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Methyl Tertbutyl Ether	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Methylene chloride	ug/kg	11	U	6.1	U	4.7	U	8.8	U	7.8	U	7.2	U	6.7	U	9.7	U
SW8260C	n-Butylbenzene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Naphthalene	ug/kg	1.4	J	20	U	19	U	23	U	24	U	22	U	21	U	21	U
SW8260C	Propylbenzene	ug/kg	0.49	J	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	sec-Butylbenzene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Styrene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	tert-Butylbenzene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Tetrachloroethene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Tetrahydrofuran	ug/kg	54	U	41	U	37	U	45	U	48	U	43	U	43	U	42	U
SW8260C	Toluene	ug/kg	4.2	J	0.5	J	0.38	J	4.5	U	4.8	U	0.53	J	4.3	U	4.2	U
SW8260C	trans-1,2-Dichloroethene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	trans-1,3-Dichloropropene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Trichloroethene	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Trichlorofluoromethane	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Vinyl chloride	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Xylene, o	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Xylenes (m&p)	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U
SW8260C	Xylenes, Total	ug/kg	5.4	U	4.1	U	3.7	U	4.5	U	4.8	U	4.3	U	4.3	U	4.2	U

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November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-704		SB-704		SB-704		SB-704		SB-704		SB-704		SB-705	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/8/2019	
		Sample ID	OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX		OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX	
		Sample Depth (ft bgs)	2 - 4		4 - 6		6 - 8		8 - 10		12 - 13		33 - 34		19 - 20		0 - 2	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs																		
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	1-Methylnaphthalene	ug/kg	2	J	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg	38	U	36	U	35	U	36	U	36	U	36	UJ	37	U	39	U
SW8270D	2,4,5-Trichlorophenol	ug/kg	38	U	36	U	35	U	36	U	36	U	36	UJ	37	U	39	U
SW8270D	2,4,6-Trichlorophenol	ug/kg	38	U	36	U	35	U	36	U	36	U	36	UJ	37	U	39	U
SW8270D	2,4-Dichlorophenol	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	UJ	7.4	U	7.8	U
SW8270D	2,4-Dimethylphenol	ug/kg	38	U	36	U	35	U	36	U	36	U	36	UJ	37	U	39	U
SW8270D	2,4-Dinitrophenol	ug/kg	380	U	360	U	350	U	360	U	360	U	360	UJ	370	U	390	U
SW8270D	2,4-Dinitrotoluene	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	2,6-Dinitrotoluene	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	2-Chloronaphthalene	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SW8270D	2-Chlorophenol	ug/kg	38	U	36	U	35	U	36	U	36	U	36	UJ	37	U	39	U
SW8270D	2-Methylnaphthalene	ug/kg	1.9	J	7.3	U	2.3	J	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SW8270D	2-Methylphenol	ug/kg	38	U	36	U	35	U	36	U	36	U	36	UJ	37	U	39	U
SW8270D	2-Nitroaniline	ug/kg	190	U	190	U	180	U	190	U	190	U	190	U	190	U	200	U
SW8270D	2-Nitrophenol	ug/kg	38	U	36	U	35	U	36	U	36	U	36	UJ	37	U	39	U
SW8270D	3 & 4 Methylphenol	ug/kg	90		36	U	35	U	36	U	36	U	36	UJ	37	U	39	U
SW8270D	3,3'-Dichlorobenzidine	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	3-Nitroaniline	ug/kg	190	U	190	U	180	U	190	U	190	U	190	U	190	U	200	U
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg	190	U	190	U	180	U	190	U	190	U	190	UJ	190	U	200	U
SW8270D	4-Bromophenyl phenyl ether	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	4-Chloro-3-methylphenol	ug/kg	38	U	36	U	35	U	36	U	36	U	36	UJ	37	U	39	U
SW8270D	4-Chloroaniline	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	4-Chlorophenyl phenyl ether	ug/kg	6.4	J	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	4-Nitroaniline	ug/kg	190	U	190	U	180	U	190	U	190	U	190	U	190	U	200	U
SW8270D	4-Nitrophenol	ug/kg	190	U	190	U	180	U	190	U	190	U	190	UJ	190	U	200	U
SW8270D	Acenaphthene	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SW8270D	Acenaphthylene	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SW8270D	Acetophenone	ug/kg	5.7	J	73	U	72	U	74	U	74	U	74	U	74	U	78	U
SW8270D	Aniline	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	Anthracene	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SW8270D	Atrazine	ug/kg	76	U	73	U	72	U	74	U	74	U	74	U	74	U	78	U
SW8270D	Azobenzene	ug/kg	370	U	370	U	360	U	340	U	340	U	350	U	360	U	380	U
SW8270D	Benzaldehyde	ug/kg	10	J-	73	R	72	R	74	R	74	R	74	R	74	R	78	R
SW8270D	Benzo(a)anthracene	ug/kg	2.8	J	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	3	J
SW8270D	Benzo(a)pyrene	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	2.6	J
SW8270D	Benzo(b)fluoranthene	ug/kg	2.6	J	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	3.1	J
SW8270D	Benzo(ghi)perylene	ug/kg	1.8	J	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	1.8	J
SW8270D	Benzo(k)fluoranthene	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SW8270D	Benzoic Acid	ug/kg	190	U	190	U	180	U	190	U	190	U	190	UJ	190	U	200	U
SW8270D	Benzyl alcohol	ug/kg	38	U	36	U	35	U	36	U	36	U	36	UJ	37	U	39	U
SW8270D	Biphenyl	ug/kg	7.8	J	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	Bis(2-Chloroethyl)ether	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-704		SB-704		SB-704		SB-704		SB-704		SB-704		SB-704		SB-705	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/8/2019	
		Sample ID	OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX		OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX	
		Sample Depth (ft bgs)	2 - 4		4 - 6		6 - 8		8 - 10		12 - 13		33 - 34		19 - 20		0 - 2	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8270D	Bis(2-Ethylhexyl)phthalate	ug/kg	2400		360	U	350	U	360	U	360	U	360	U	370	U	110	J
SW8270D	Butylbenzylphthalate	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	Caprolactam	ug/kg	190	U	190	U	180	U	190	U	190	U	190	U	190	U	200	U
SW8270D	Carbazole	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SW8270D	Chrysene	ug/kg	3.7	J	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	2.8	J
SW8270D	Di-n-butylphthalate	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	Di-n-octylphthalate	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	Dibenz(a,h)anthracene	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	2.6	J
SW8270D	Dibenzofuran	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	Diethylphthalate	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	Dimethylphthalate	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	Fluoranthene	ug/kg	6.9	J	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	4.7	J
SW8270D	Fluorene	ug/kg	1.9	J	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SW8270D	Hexachlorobenzene	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SW8270D	Hexachlorocyclopentadiene	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	Hexachloroethane	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	Indeno(1,2,3-cd)pyrene	ug/kg	2	J	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	1.7	J
SW8270D	Isophorone	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	N-Nitrosodi-n-propylamine	ug/kg	7.6	U	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SW8270D	N-Nitrosodimethylamine	ug/kg	38	U	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	N-Nitrosodiphenylamine	ug/kg	26	J	36	U	35	U	36	U	36	U	36	U	37	U	39	U
SW8270D	Nitrobenzene	ug/kg	76	U	73	U	72	U	74	U	73	U	73	U	74	U	78	U
SW8270D	Pentachlorophenol	ug/kg	190	U	190	U	180	U	190	U	190	U	190	UJ	190	U	200	U
SW8270D	Phenanthrene	ug/kg	9.7		2.8	J	7.2	U	7.4	U	2.4	J	7.4	U	7.4	U	4.8	J
SW8270D	Phenol	ug/kg	68		42		14	J	36	U	36	U	36	UJ	37	U	39	U
SW8270D	Phthalic anhydride	ug/kg	11000	UJ	11000	UJ	11000	UJ	10000	UJ	10000	UJ	11000	UJ	11000	UJ	11000	UJ
SW8270D	Pyrene	ug/kg	6.3	J	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	4.2	J
SW8270D	Pentachlorophenol	ug/kg	770	U	190	U	180	U	190	U	190	U	190	U H	190	U	200	U
SW8270D	Phenanthrene	ug/kg	9.7	J	2.8	J	7.2	U	7.4	U	2.4	J	7.4	U H	7.4	U	4.8	J
SW8270D	Phenol	ug/kg	68	J	42		14	J	36	U	36	U	36	U H	37	U	39	U
SW8270D	Phthalic anhydride	ug/kg	11000	U	11000	U	11000	U	10000	U	10000	U	11000	U	11000	U	11000	U
SW8270D	Pyrene	ug/kg	7.6	J	7.3	U	7.2	U	7.4	U	7.4	U	7.4	U H	7.4	U	4.2	J

Notes

Units:
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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SB-705		SB-705		SB-705		SB-705		SB-705		SB-706		SB-706	
			Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/6/2019		11/6/2019	
			Sample ID	OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX	
			Sample Depth (ft bgs)	2 - 4		4 - 6		4 - 6		6 - 8		8 - 10		0 - 2		2 - 4	
			Qc Code	FS		FD		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs																	
SW8260C	1,1,1,2-Tetrachloroethane	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,1,1-Trichloroethane	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,1,2,2-Tetrachloroethane	ug/kg		4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,1,2-Trichloroethane	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,1-Dichloroethane	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,1-Dichloroethene	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,1-Dichloropropene	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,2,3-Trichlorobenzene	ug/kg		4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,2,3-Trichloropropane	ug/kg		4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,2,4-Trichlorobenzene	ug/kg		4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,2,4-Trimethylbenzene	ug/kg		4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,2-Dibromo-3-chloropropane	ug/kg		22	U	23	UJ	24	UJ	21	U	19	U	21	U	23	U	21	U
SW8260C	1,2-Dibromoethane	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,2-Dichlorobenzene	ug/kg		4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,2-Dichloroethane	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,2-Dichloropropane	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,3,5-Trimethylbenzene	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,3-Dichlorobenzene	ug/kg		4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,3-Dichloropropane	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,4-Dichlorobenzene	ug/kg		4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	1,4-Dioxane	ug/kg		220	U	230	U	240	U	210	U	190	U	210	U	230	U	210	U
SW8260C	2,2-Dichloropropane	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg		5.5		11	J-	7.4	J-	4.3	U	3.7	U	4.2	U	4.5	U	1.3	J
SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg		2.1	J	3.8	J-	2.3	J-	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	2-Butanone	ug/kg		14	J+	32	J+	20	J+	560	J+	19	U	21	U	23	U	15	J+
SW8260C	2-Chlorotoluene	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	2-Hexanone	ug/kg		22	U	23	UJ	24	UJ	21	U	19	U	21	U	23	U	21	U
SW8260C	4-Chlorotoluene	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	4-iso-Propyltoluene	ug/kg		4.3	U	4.7	UJ	0.52	J-	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	4-Methyl-2-pentanone	ug/kg		22	U	23	UJ	24	UJ	21	U	19	U	21	U	23	U	21	U
SW8260C	Acetic acid, methyl ester	ug/kg		43	U	150	J+	48	UJ	41	J	37	U	42	U	45	U	42	U
SW8260C	Acetone	ug/kg		46	J	69	J-	74	J-	18	J	190	U	19	J	230	U	210	U
SW8260C	Benzene	ug/kg		4.3	U	0.28	J	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Bromobenzene	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Bromochloromethane	ug/kg		4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U

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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-705		SB-705		SB-705		SB-705		SB-705		SB-706		SB-706	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX	
		Sample Depth (ft bgs)	2 - 4		4 - 6		4 - 6		6 - 8		8 - 10		0 - 2		2 - 4	
		Qc Code	FS		FD		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	Bromochloromethane	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Bromodichloromethane	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Bromoform	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Bromomethane	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Carbon disulfide	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Carbon tetrachloride	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Chlorobenzene	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Chloroethane	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Chloroform	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Chloromethane	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	cis-1,2-Dichloroethene	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	cis-1,3-Dichloropropene	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Cyclohexane	ug/kg	22	U	23	U	24	U	21	U	19	U	21	U	23	U	21	U
SW8260C	Dibromochloromethane	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Dibromomethane	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Dichlorodifluoromethane	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Diethyl ether	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Ethyl-t-Butyl Ether	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Ethylbenzene	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Hexachlorobutadiene	ug/kg	4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Isopropyl ether	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Isopropylbenzene	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Methyl cyclohexane	ug/kg	4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Methyl Tertbutyl Ether	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Methylene chloride	ug/kg	6.2	U	6.9	U	7.3	U	29	U	26	U	9.1	U	4.5	U	4.2	U
SW8260C	n-Butylbenzene	ug/kg	4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Naphthalene	ug/kg	22	U	23	UJ	24	UJ	21	U	19	U	21	U	23	U	21	U
SW8260C	Propylbenzene	ug/kg	4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	sec-Butylbenzene	ug/kg	4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Styrene	ug/kg	4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	tert-Butylbenzene	ug/kg	4.3	U	4.7	UJ	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Tetrachloroethene	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Tetrahydrofuran	ug/kg	43	U	47	UJ	48	UJ	43	U	37	U	42	U	45	U	42	U
SW8260C	Toluene	ug/kg	0.48	J	0.72	J	0.6	J	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	trans-1,2-Dichloroethene	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	trans-1,3-Dichloropropene	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Trichloroethene	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Trichlorofluoromethane	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Vinyl chloride	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Xylene, o	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Xylenes (m&p)	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
SW8260C	Xylenes, Total	ug/kg	4.3	U	4.7	U	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
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Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-705		SB-705		SB-705		SB-705		SB-705		SB-706		SB-706	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX		OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX	
		Sample Depth (ft bgs)	2 - 4		4 - 6		4 - 6		6 - 8		8 - 10		17 - 18		0 - 2		2 - 4	
		Qc Code	FS		FD		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs																		
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	1-Methylnaphthalene	ug/kg	23	U	200	U	60	J	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	2,4,5-Trichlorophenol	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	2,4,6-Trichlorophenol	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	2,4-Dichlorophenol	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	2,4-Dimethylphenol	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	2,4-Dinitrophenol	ug/kg	1100	U	10000	U	11000	U	370	U	350	U	350	U	720	U	3500	U
SW8270D	2,4-Dinitrotoluene	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	2,6-Dinitrotoluene	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	2-Chloronaphthalene	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	2-Chlorophenol	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	2-Methylnaphthalene	ug/kg	23	U	51	J	100	J	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	2-Methylphenol	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	2-Nitroaniline	ug/kg	590	U	5100	U	5400	U	190	U	180	U	180	U	370	U	1800	U
SW8270D	2-Nitrophenol	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	3 & 4 Methylphenol	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	3,3'-Dichlorobenzidine	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	3-Nitroaniline	ug/kg	590	U	5100	U	5400	U	190	U	180	U	180	U	370	U	1800	U
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg	590	U	5100	U	5400	U	190	U	180	U	180	U	370	U	1800	U
SW8270D	4-Bromophenyl phenyl ether	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	190	J
SW8270D	4-Chloro-3-methylphenol	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	4-Chloroaniline	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	4-Chlorophenyl phenyl ether	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	4-Nitroaniline	ug/kg	590	U	5100	U	5400	U	190	U	180	U	180	U	370	U	1800	U
SW8270D	4-Nitrophenol	ug/kg	590	U	5100	U	5400	U	190	U	180	U	180	U	370	U	1800	U
SW8270D	Acenaphthene	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	Acenaphthylene	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	Acetophenone	ug/kg	230	U	2000	U	2100	U	76	U	72	U	70	U	4.4	J	720	U
SW8270D	Aniline	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	Anthracene	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	Atrazine	ug/kg	230	U	2000	U	2100	U	76	U	72	U	70	U	150	U	720	U
SW8270D	Azobenzene	ug/kg	1800	U	2000	U	2100	U	370	U	360	U	350	U	360	U	3600	U
SW8270D	Benzaldehyde	ug/kg	230	J-	2000	U	2100	U	76	U	72	U	70	U	150	R	720	R
SW8270D	Benzo(a)anthracene	ug/kg	8.9	J	200	U	210	U	7.6	U	7.2	U	7	U	5.3	J	72	U
SW8270D	Benzo(a)pyrene	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	4.7	J	72	U
SW8270D	Benzo(b)fluoranthene	ug/kg	8.2	J	200	U	210	U	7.6	U	7.2	U	7	U	6.8	J	72	U
SW8270D	Benzo(ghi)perylene	ug/kg	5.4	J	200	U	210	U	7.6	U	7.2	U	7	U	3.8	J	72	U
SW8270D	Benzo(k)fluoranthene	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	Benzoic Acid	ug/kg	590	U	5100	U	5400	U	190	U	180	U	180	U	370	U	1800	U
SW8270D	Benzyl alcohol	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	Biphenyl	ug/kg	33	J	45	J	1100	U	37	U	35	U	35	U	5.3	J	5500	
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	Bis(2-Chloroethyl)ether	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	72	U

Notes

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		Location	SB-705		SB-705		SB-705		SB-705		SB-705		SB-706		SB-706	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX	
		Sample Depth (ft bgs)	2 - 4		4 - 6		4 - 6		6 - 8		8 - 10		17 - 18		0 - 2		2 - 4	
		Qc Code	FS		FD		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8270D	Bis(2-Ethylhexyl)phthalate	ug/kg	2400		2200	J	2100	J	370	U	350	U	350	U	770		370000	
SW8270D	Butylbenzylphthalate	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	Caprolactam	ug/kg	590	U	5100	U	5400	U	190	U	180	U	180	U	370	U	1800	U
SW8270D	Carbazole	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	55	J
SW8270D	Chrysene	ug/kg	7.6	J	200	U	210	U	7.6	U	7.2	U	7	U	5.6	J	72	U
SW8270D	Di-n-butylphthalate	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	2100	
SW8270D	Di-n-octylphthalate	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	Dibenz(a,h)anthracene	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	Dibenzofuran	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	29	J
SW8270D	Diethylphthalate	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	Dimethylphthalate	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	Fluoranthene	ug/kg	11	J	200	U	210	U	7.6	U	7.2	U	7	U	6.6	J	46	J
SW8270D	Fluorene	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	Hexachlorobenzene	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	Hexachlorocyclopentadiene	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	Hexachloroethane	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	Indeno(1,2,3-cd)pyrene	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	3.2	J	72	U
SW8270D	Isophorone	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	N-Nitrosodi-n-propylamine	ug/kg	23	U	200	U	210	U	7.6	U	7.2	U	7	U	15	U	72	U
SW8270D	N-Nitrosodimethylamine	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	N-Nitrosodiphenylamine	ug/kg	400		2500		2700		37	U	35	U	35	U	52	J	28000	J
SW8270D	Nitrobenzene	ug/kg	230	U	2000	U	2100	U	76	U	72	U	70	U	150	U	710	U
SW8270D	Pentachlorophenol	ug/kg	590	U	5100	U	5400	U	190	U	180	U	180	U	370	U	1800	U
SW8270D	Phenanthrene	ug/kg	7.8	J	200	U	210	U	7.6	U	7.2	U	7	U	4.5	J	150	
SW8270D	Phenol	ug/kg	110	U	1000	U	1100	U	37	U	35	U	35	U	72	U	350	U
SW8270D	Phthalic anhydride	ug/kg	56000	UJ	61000	UJ	65000	UJ	11000	UJ	11000	UJ	11000	UJ	11000	UJ	110000	UJ
SW8270D	Pyrene	ug/kg	12	J	200	U	210	U	7.6	U	7.2	U	7	U	6.9	J	68	J
SW8270D	Pentachlorophenol	ug/kg	590	U	5100	U	5400	U F1	190	U	180	U	180	U	370	U	180000	U
SW8270D	Phenanthrene	ug/kg	7.8	J	200	U	210	U	7.6	U	7.2	U	7	U	4.5	J	7200	U
SW8270D	Phenol	ug/kg	110	U	1000	U	1100	U F1	37	U	35	U	35	U	72	U	35000	U
SW8270D	Phthalic anhydride	ug/kg	56000	U	61000	U	65000	U	11000	U	11000	U	11000	U	11000	U	110000	U
SW8270D	Pyrene	ug/kg	12	J	200	U	210	U	7.6	U	7.2	U	7	U	6.9	J	7200	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
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Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-707		SB-707		SB-707	
			Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/7/2019		11/7/2019		11/7/2019	
			Sample ID	OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX		OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX		OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX	
			Sample Depth (ft bgs)	4 - 6		6 - 8		10 - 12		20 - 22		26 - 27		0 - 2		2 - 4		4 - 6	
			Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs																			
SW8260C	1,1,1,2-Tetrachloroethane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,1,1-Trichloroethane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,1,2,2-Tetrachloroethane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,1,2-Trichloroethane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,1-Dichloroethane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	0.83	J	4.2	U
SW8260C	1,1-Dichloroethene	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,1-Dichloropropene	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,2,3-Trichlorobenzene	ug/kg		3.9	U	3.7	U	0.85	J	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,2,3-Trichloropropane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,2,4-Trichlorobenzene	ug/kg		3.9	U	3.7	U	1.9	J	5	U	3.1	U	2.5	J	1.4	J	4.2	U
SW8260C	1,2,4-Trimethylbenzene	ug/kg		3.9	U	3.7	U	1.6	J	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,2-Dibromo-3-chloropropane	ug/kg		19	U	19	U	21	U	25	U	15	U	26	U	20	U	21	U
SW8260C	1,2-Dibromoethane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,2-Dichlorobenzene	ug/kg		3.9	U	3.7	U	0.5	J	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,2-Dichloroethane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,2-Dichloropropane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,3,5-Trimethylbenzene	ug/kg		3.9	U	3.7	U	1.5	J	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,3-Dichlorobenzene	ug/kg		3.9	U	3.7	U	1.2	J	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,3-Dichloropropane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,4-Dichlorobenzene	ug/kg		3.9	U	3.7	U	0.68	J	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	1,4-Dioxane	ug/kg		190	U	190	U	210	U	250	U	150	U	260	U	200	U	210	U
SW8260C	2,2-Dichloropropane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg		1.9	J	3.7	U	75		0.54	J	1.9	J	5.2	U	6.3		1	J
SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg		3.9	U	3.7	U	25		5	U	3.1	U	5.2	U	3.5	J	4.2	U
SW8260C	2-Butanone	ug/kg		8.2	J	19	U	17	J+	25	U	15	U	15	J	21	J+	21	U
SW8260C	2-Chlorotoluene	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	2-Hexanone	ug/kg		19	U	19	U	21	U	25	U	15	U	26	U	20	U	21	U
SW8260C	4-Chlorotoluene	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	4-iso-Propyltoluene	ug/kg		3.9	U	3.7	U	2	J	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	4-Methyl-2-pentanone	ug/kg		19	U	19	U	21	U	25	U	15	U	26	U	20	U	21	U
SW8260C	Acetic acid, methyl ester	ug/kg		39	U	37	U	42	U	50	U	31	U	52	U	39	U	42	U
SW8260C	Acetone	ug/kg		190	U	190	U	210	U	250	U	150	U	260	U	200	U	210	U
SW8260C	Benzene	ug/kg		3.9	U	3.7	U	2	J	5	U	3.1	U	5.2	U	0.2	J	4.2	U
SW8260C	Bromobenzene	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Bromochloromethane	ug/kg		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U

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Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-707		SB-707		SB-707	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX		OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX		OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX	
		Sample Depth (ft bgs)	4 - 6		6 - 8		10 - 12		20 - 22		26 - 27		0 - 2		2 - 4		4 - 6	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	Bromochloromethane	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Bromodichloromethane	ug/kg	3.9	U	3.7	U	2.6	J	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Bromoform	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Bromomethane	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Carbon disulfide	ug/kg	3.9	U	3.7	U	2.2	J	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Carbon tetrachloride	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Chlorobenzene	ug/kg	3.9	U	3.7	U	0.91	J	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Chloroethane	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Chloroform	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Chloromethane	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	cis-1,2-Dichloroethene	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	cis-1,3-Dichloropropene	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Cyclohexane	ug/kg	19	U	19	U	21	U	25	U	15	U	26	U	20	U	21	U
SW8260C	Dibromochloromethane	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Dibromomethane	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Dichlorodifluoromethane	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Diethyl ether	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Ethyl-t-Butyl Ether	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Ethylbenzene	ug/kg	3.9	U	3.7	U	5.6		5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Hexachlorobutadiene	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Isopropyl ether	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Isopropylbenzene	ug/kg	3.9	U	3.7	U	2.9	J	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Methyl cyclohexane	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Methyl Tertbutyl Ether	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Methylene chloride	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	n-Butylbenzene	ug/kg	3.9	U	3.7	U	0.94	J	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Naphthalene	ug/kg	19	U	19	U	21	U	25	U	15	U	26	U	20	U	21	U
SW8260C	Propylbenzene	ug/kg	3.9	U	3.7	U	6.1		5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	sec-Butylbenzene	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Styrene	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	tert-Butylbenzene	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Tetrachloroethene	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Tetrahydrofuran	ug/kg	39	U	37	U	42	U	50	U	31	U	52	U	39	U	42	U
SW8260C	Toluene	ug/kg	3.9	U	3.7	U	0.5	J	5	U	3.1	U	5.2	U	0.41	J	4.2	U
SW8260C	trans-1,2-Dichloroethene	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	trans-1,3-Dichloropropene	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Trichloroethene	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Trichlorofluoromethane	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Vinyl chloride	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Xylene, o	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Xylenes (m&p)	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U
SW8260C	Xylenes, Total	ug/kg	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U	3.9	U	4.2	U

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		Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-707		SB-707		SB-707	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX		OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX		OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX	
		Sample Depth (ft bgs)	4 - 6		6 - 8		10 - 12		20 - 22		26 - 27		0 - 2		2 - 4		4 - 6	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs																		
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	1-Methylnaphthalene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	8.4	J	7.3	U	7.2	U
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	33	U	7.3	U	7.2	U
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	2,4,5-Trichlorophenol	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	2,4,6-Trichlorophenol	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	2,4-Dichlorophenol	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	33	U	7.3	U	7.2	U
SW8270D	2,4-Dimethylphenol	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	2,4-Dinitrophenol	ug/kg	360	U	720	U	400	U	360	U	350	U	1600	U	360	U	350	U
SW8270D	2,4-Dinitrotoluene	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	2,6-Dinitrotoluene	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	2-Chloronaphthalene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	33	U	7.3	U	7.2	U
SW8270D	2-Chlorophenol	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	2-Methylnaphthalene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	10	J	7.3	U	7.2	U
SW8270D	2-Methylphenol	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	2-Nitroaniline	ug/kg	180	U	370	U	200	U	180	U	180	U	820	U	190	U	180	U
SW8270D	2-Nitrophenol	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	3 & 4 Methylphenol	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	3,3'-Dichlorobenzidine	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	3-Nitroaniline	ug/kg	180	U	370	U	200	U	180	U	180	U	820	U	190	U	180	U
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg	180	U	370	U	200	U	180	U	180	U	820	U	190	U	180	U
SW8270D	4-Bromophenyl phenyl ether	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	4-Chloro-3-methylphenol	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	4-Chloroaniline	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	4-Chlorophenyl phenyl ether	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	4-Nitroaniline	ug/kg	180	U	370	U	200	U	180	U	180	U	820	U	190	U	180	U
SW8270D	4-Nitrophenol	ug/kg	180	U	370	U	200	U	180	U	180	U	820	U	190	U	180	U
SW8270D	Acenaphthene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	33	U	7.3	U	7.2	U
SW8270D	Acenaphthylene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	33	U	7.3	U	7.2	U
SW8270D	Acetophenone	ug/kg	72	U	150	U	81	U	72	U	71	U	330	U	73	U	72	U
SW8270D	Aniline	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	Anthracene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	33	U	7.3	U	7.2	U
SW8270D	Atrazine	ug/kg	72	U	150	U	81	U	72	U	71	U	330	U	73	U	72	U
SW8270D	Azobenzene	ug/kg	360	U	350	U	2000	U	360	U	350	U	410	U	360	U	360	U
SW8270D	Benzaldehyde	ug/kg	72	R	150	R	81	R	72	R	71	R	330	R	73	R	72	R
SW8270D	Benzo(a)anthracene	ug/kg	7.2	U	15	U	3.6	J	7.2	U	7.1	U	17	J	1.4	J	7.2	U
SW8270D	Benzo(a)pyrene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	11	J	7.3	U	7.2	U
SW8270D	Benzo(b)fluoranthene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	22	J	7.3	U	7.2	U
SW8270D	Benzo(ghi)perylene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	16	J	7.3	U	7.2	U
SW8270D	Benzo(k)fluoranthene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	33	U	7.3	U	7.2	U
SW8270D	Benzoic Acid	ug/kg	180	U	370	U	200	U	180	U	180	U	820	U	190	U	180	U
SW8270D	Benzyl alcohol	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	Biphenyl	ug/kg	36	U	72	U	910		36	U	35	U	19	J	36	U	35	U
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	Bis(2-Chloroethyl)ether	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	33	U	7.3	U	7.2	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-707		SB-707		SB-707	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX		OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX		OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX	
		Sample Depth (ft bgs)	4 - 6		6 - 8		10 - 12		20 - 22		26 - 27		0 - 2		2 - 4		4 - 6	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8270D	Bis(2-Ethylhexyl)phthalate	ug/kg	170	J	210	J	120000		240	J	350	U	8100		500		2400	
SW8270D	Butylbenzylphthalate	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	Caprolactam	ug/kg	180	U	370	U	200	U	180	U	180	U	820	U	190	U	180	U
SW8270D	Carbazole	ug/kg	7.2	U	15	U	8.9		7.2	U	7.1	U	33	U	7.3	U	7.2	U
SW8270D	Chrysene	ug/kg	7.2	U	15	U	4	J	7.2	U	7.1	U	19	J	7.3	U	7.2	U
SW8270D	Di-n-butylphthalate	ug/kg	36	U	72	U	360		36	U	35	U	160	U	36	U	35	U
SW8270D	Di-n-octylphthalate	ug/kg	36	U	72	U	47		36	U	35	U	160	U	36	U	23	J
SW8270D	Dibenz(a,h)anthracene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	33	U	7.3	U	7.2	U
SW8270D	Dibenzofuran	ug/kg	36	U	72	U	4.6	J	36	U	35	U	160	U	36	U	35	U
SW8270D	Diethylphthalate	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	Dimethylphthalate	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	Fluoranthene	ug/kg	7.2	U	15	U	12		7.2	U	7.1	U	21	J	7.3	U	7.2	U
SW8270D	Fluorene	ug/kg	7.2	U	15	U	3.6	J	7.2	U	7.1	U	33	U	7.3	U	7.2	U
SW8270D	Hexachlorobenzene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	33	U	7.3	U	7.2	U
SW8270D	Hexachlorocyclopentadiene	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	Hexachloroethane	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	Indeno(1,2,3-cd)pyrene	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	17	J	7.3	U	7.2	U
SW8270D	Isophorone	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	N-Nitrosodi-n-propylamine	ug/kg	7.2	U	15	U	8.1	U	7.2	U	7.1	U	33	U	7.3	U	7.2	U
SW8270D	N-Nitrosodimethylamine	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	N-Nitrosodiphenylamine	ug/kg	36	U	25	J	6200	J	36	U	35	U	510		18	J	35	U
SW8270D	Nitrobenzene	ug/kg	72	U	150	U	80	U	72	U	71	U	320	U	73	U	72	U
SW8270D	Pentachlorophenol	ug/kg	180	U	370	U	200	U	180	U	180	U	820	U	190	U	180	U
SW8270D	Phenanthrene	ug/kg	4.5	J	4.5	J	28		2	J	7.1	U	16	J	3.3	J	2.6	J
SW8270D	Phenol	ug/kg	36	U	72	U	40	U	36	U	35	U	160	U	36	U	35	U
SW8270D	Phthalic anhydride	ug/kg	11000	UJ	11000	UJ	60000	UJ	11000	UJ	11000	UJ	12000	UJ	11000	UJ	11000	UJ
SW8270D	Pyrene	ug/kg	7.2	U	15	U	15		7.2	U	7.1	U	31	J	1.7	J	7.2	U
SW8270D	Pentachlorophenol	ug/kg	180	U	370	U	41000	U	180	U	180	U	820	U	190	U	730	U
SW8270D	Phenanthrene	ug/kg	4.5	J	4.5	J	28	U	2	J	7.1	U	81	U	3.3	J	29	U
SW8270D	Phenol	ug/kg	36	U	72	U	8000	U	36	U	35	U	400	U	36	U	35	U
SW8270D	Phthalic anhydride	ug/kg	11000	U	11000	U	60000	U	11000	U	11000	U	12000	U	11000	U	11000	U
SW8270D	Pyrene	ug/kg	7.2	U	15	U	1600	U	7.2	U	7.1	U	31	J *	1.7	J *	7.2	U *

Notes

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Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SB-707		SB-707		SB-707		SB-707		SB-707		SB-708		SB-708		SB-708	
			Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/4/2019		11/4/2019		11/4/2019	
			Sample ID	OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX	
			Sample Depth (ft bgs)	6 - 8		6 - 8		8 - 10		12 - 13		15 - 17		0 - 2		2 - 4		4 - 6	
			Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs																			
SW8260C	1,1,1,2-Tetrachloroethane	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,1,1-Trichloroethane	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,1,2,2-Tetrachloroethane	ug/kg		4.1	UJ	3.8	UJ	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,1,2-Trichloroethane	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,1-Dichloroethane	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,1-Dichloroethene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,1-Dichloropropene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,2,3-Trichlorobenzene	ug/kg		4.1	UJ	3.8	UJ	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,2,3-Trichloropropane	ug/kg		4.1	UJ	3.8	UJ	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,2,4-Trichlorobenzene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	0.37	J	4.4	U
SW8260C	1,2,4-Trimethylbenzene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,2-Dibromo-3-chloropropane	ug/kg		20	UJ	19	UJ	19	U	25	U	22	U	32	U	30	U	22	U
SW8260C	1,2-Dibromoethane	ug/kg		4.1	UJ	3.8	UJ	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,2-Dichlorobenzene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,2-Dichloroethane	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,2-Dichloropropane	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,3,5-Trimethylbenzene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	0.63	J	6	U	4.4	U
SW8260C	1,3-Dichlorobenzene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,3-Dichloropropane	ug/kg		4.1	UJ	3.8	UJ	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,4-Dichlorobenzene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	1,4-Dioxane	ug/kg		200	UJ	190	UJ	190	U	250	U	220	U	320	U	300	U	220	U
SW8260C	2,2-Dichloropropane	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	2.7	J	6	U	5.7	
SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	0.88	J	6	U	0.76	J
SW8260C	2-Butanone	ug/kg		3.9	J	19	U	19	U	25	U	22	U	32	U	11	J+	22	U
SW8260C	2-Chlorotoluene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	2-Hexanone	ug/kg		20	UJ	19	UJ	19	U	25	U	22	U	32	U	30	U	22	U
SW8260C	4-Chlorotoluene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	4-iso-Propyltoluene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	1.3	J	6	U	4.4	U
SW8260C	4-Methyl-2-pentanone	ug/kg		20	UJ	19	UJ	19	U	25	U	22	U	32	U	30	U	22	U
SW8260C	Acetic acid, methyl ester	ug/kg		41	UJ	38	UJ	39	U	50	U	44	U	64	U	60	U	44	U
SW8260C	Acetone	ug/kg		200	UJ	190	UJ	190	U	250	U	220	U	20	J	41	J	12	J
SW8260C	Benzene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Bromobenzene	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Bromochloromethane	ug/kg		4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U

Notes

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Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-707		SB-707		SB-707		SB-707		SB-707		SB-708		SB-708		SB-708	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX	
		Sample Depth (ft bgs)	6 - 8		6 - 8		8 - 10		12 - 13		15 - 17		0 - 2		2 - 4		4 - 6	
		Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	Bromochloromethane	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Bromodichloromethane	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Bromoform	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Bromomethane	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Carbon disulfide	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	3.9	J	6	U	4.4	U
SW8260C	Carbon tetrachloride	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Chlorobenzene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Chloroethane	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Chloroform	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Chloromethane	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	cis-1,2-Dichloroethene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	cis-1,3-Dichloropropene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Cyclohexane	ug/kg	20	U	19	U	19	U	25	U	22	U	32	U	30	U	22	U
SW8260C	Dibromochloromethane	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Dibromomethane	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Dichlorodifluoromethane	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Diethyl ether	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Ethyl-t-Butyl Ether	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Ethylbenzene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Hexachlorobutadiene	ug/kg	4.1	UJ	3.8	UJ	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Isopropyl ether	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Isopropylbenzene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Methyl cyclohexane	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Methyl Tertbutyl Ether	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Methylene chloride	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	n-Butylbenzene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Naphthalene	ug/kg	20	UJ	19	UJ	19	U	25	U	22	U	1.1	J	30	U	22	U
SW8260C	Propylbenzene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	sec-Butylbenzene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Styrene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	tert-Butylbenzene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Tetrachloroethene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Tetrahydrofuran	ug/kg	41	UJ	38	UJ	39	U	50	U	44	U	64	U	60	U	44	U
SW8260C	Toluene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	0.61	J	6	U	4.4	U
SW8260C	trans-1,2-Dichloroethene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	trans-1,3-Dichloropropene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Trichloroethene	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Trichlorofluoromethane	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Vinyl chloride	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Xylene, o	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Xylenes (m&p)	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U
SW8260C	Xylenes, Total	ug/kg	4.1	U	3.8	U	3.9	U	5	U	4.4	U	6.4	U	6	U	4.4	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-707		SB-707		SB-707		SB-707		SB-707		SB-708		SB-708		SB-708	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX	
		Sample Depth (ft bgs)	6 - 8		6 - 8		8 - 10		12 - 13		15 - 17		0 - 2		2 - 4		4 - 6	
		Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs																		
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	1-Methylnaphthalene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	2,4,5-Trichlorophenol	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	2,4,6-Trichlorophenol	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	2,4-Dichlorophenol	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SW8270D	2,4-Dimethylphenol	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	2,4-Dinitrophenol	ug/kg	350	U	340	U	360	U	370	U	350	U	360	U	380	U	360	U
SW8270D	2,4-Dinitrotoluene	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	2,6-Dinitrotoluene	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	2-Chloronaphthalene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SW8270D	2-Chlorophenol	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	2-Methylnaphthalene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SW8270D	2-Methylphenol	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	2-Nitroaniline	ug/kg	180	U	180	U	180	U	190	U	180	U	180	U	190	U	190	U
SW8270D	2-Nitrophenol	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	3 & 4 Methylphenol	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	3,3'-Dichlorobenzidine	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	3-Nitroaniline	ug/kg	180	U	180	U	180	U	190	U	180	U	180	U	190	U	190	U
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg	180	U	180	U	180	U	190	U	180	U	180	U	190	U	190	U
SW8270D	4-Bromophenyl phenyl ether	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	4-Chloro-3-methylphenol	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	4-Chloroaniline	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	4-Chlorophenyl phenyl ether	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	4-Nitroaniline	ug/kg	180	U	180	U	180	U	190	U	180	U	180	U	190	U	190	U
SW8270D	4-Nitrophenol	ug/kg	180	U	180	U	180	U	190	U	180	U	180	U	190	U	190	U
SW8270D	Acenaphthene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SW8270D	Acenaphthylene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	1.6	J	7.7	U	7.4	U
SW8270D	Acetophenone	ug/kg	71	U	69	U	72	U	75	U	71	U	3.4	J	77	U	74	U
SW8270D	Aniline	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	Anthracene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	2.6	J	7.7	U	7.4	U
SW8270D	Atrazine	ug/kg	71	U	69	U	72	U	75	U	71	U	72	U	77	U	74	U
SW8270D	Azobenzene	ug/kg	350	U	350	U	360	U	370	U	350	U	360	U	380	U	360	U
SW8270D	Benzaldehyde	ug/kg	71	R	69	R	72	R	75	R	71	R	72	R	77	R	74	R
SW8270D	Benzo(a)anthracene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	10		1.7	J	7.4	U
SW8270D	Benzo(a)pyrene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	8.5		7.7	U	7.4	U
SW8270D	Benzo(b)fluoranthene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	17		7.7	U	7.4	U
SW8270D	Benzo(ghi)perylene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	6.7	J	7.7	U	7.4	U
SW8270D	Benzo(k)fluoranthene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	4.5	J	7.7	U	7.4	U
SW8270D	Benzoic Acid	ug/kg	180	R	180	R	180	U	190	U	180	U	180	U	190	U	190	U
SW8270D	Benzyl alcohol	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	Biphenyl	ug/kg	35	U	34	U	36	U	37	U	35	U	3.5	J	38	U	36	U
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	Bis(2-Chloroethyl)ether	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U

Notes

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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-707		SB-707		SB-707		SB-707		SB-707		SB-708		SB-708		SB-708	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX	
		Sample Depth (ft bgs)	6 - 8		6 - 8		8 - 10		12 - 13		15 - 17		0 - 2		2 - 4		4 - 6	
		Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8270D	Bis(2-Ethylhexyl)phthalate	ug/kg	350	U	340	U	360	U	370	U	350	U	500		72	J	57	J
SW8270D	Butylbenzylphthalate	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	Caprolactam	ug/kg	180	U	180	U	180	U	190	U	180	U	180	U	190	U	190	U
SW8270D	Carbazole	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	1.9	J	7.7	U	7.4	U
SW8270D	Chrysene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	16		2.1	J	7.4	U
SW8270D	Di-n-butylphthalate	ug/kg	35	U	34	U	36	U	37	U	35	U	18	J	38	U	36	U
SW8270D	Di-n-octylphthalate	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	Dibenz(a,h)anthracene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	2.7	J	7.7	U	7.4	U
SW8270D	Dibenzofuran	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	Diethylphthalate	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	20	J	25	J
SW8270D	Dimethylphthalate	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	Fluoranthene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	9.8		2.8	J	7.4	U
SW8270D	Fluorene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SW8270D	Hexachlorobenzene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SW8270D	Hexachlorocyclopentadiene	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	Hexachloroethane	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	Indeno(1,2,3-cd)pyrene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	5.9	J	7.7	U	7.4	U
SW8270D	Isophorone	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	N-Nitrosodi-n-propylamine	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SW8270D	N-Nitrosodimethylamine	ug/kg	35	U	34	U	36	U	37	U	35	U	36	U	38	U	36	U
SW8270D	N-Nitrosodiphenylamine	ug/kg	35	U	34	U	36	U	37	U	35	U	100		38	U	36	U
SW8270D	Nitrobenzene	ug/kg	71	U	69	U	72	U	75	U	70	U	72	U	76	U	73	U
SW8270D	Pentachlorophenol	ug/kg	180	U	180	U	180	U	190	U	180	U	180	U	190	U	190	U
SW8270D	Phenanthrene	ug/kg	2.1	J	2.5	J	7.2	U	7.5	U	7.1	U	7.3		2.9	J	2.3	J
SW8270D	Phenol	ug/kg	35	U	34	U	36	U	37	U	35	U	13	J	38	U	36	U
SW8270D	Phthalic anhydride	ug/kg	10000	UJ	11000	UJ	11000	UJ	11000	UJ	11000	UJ	11000	UJ	12000	UJ	11000	UJ
SW8270D	Pyrene	ug/kg	7.1	U	6.9	U	7.2	U	7.5	U	7.1	U	10		2.9	J	7.4	U
SW8270D	Pentachlorophenol	ug/kg	180	U	180	U	180	U	190	U	180	U	180	U	190	U	190	U
SW8270D	Phenanthrene	ug/kg	2.1	J	2.5	J	7.2	U	7.5	U	7.1	U	7.3		2.9	J	2.3	J
SW8270D	Phenol	ug/kg	35	U	34	U	36	U	37	U	35	U	13	J	38	U	36	U
SW8270D	Phthalic anhydride	ug/kg	10000	U	11000	U	11000	U	11000	U	11000	U	11000	U	12000	U	11000	U
SW8270D	Pyrene	ug/kg	7.1	U *	6.9	U *	7.2	U	7.5	U *	7.1	U *	10		2.9	J	7.4	U

Notes

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Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-708		SB-708		SB-708		SB-708		SB-708		SB-709		SB-709	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX		OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX
		Sample Depth (ft bgs)	6 - 8		8 - 10		16 - 18		28 - 30		33 - 34		22 - 24		0 - 2		2 - 4
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs																		
SW8260C	1,1,1,2-Tetrachloroethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,1,1-Trichloroethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,1,2,2-Tetrachloroethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,1,2-Trichloroethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,1-Dichloroethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,1-Dichloroethene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,1-Dichloropropene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,2,3-Trichlorobenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,2,3-Trichloropropane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,2,4-Trichlorobenzene	ug/kg	0.43	J	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	0.52	J
SW8260C	1,2,4-Trimethylbenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,2-Dibromo-3-chloropropane	ug/kg	19	U	21	U	21	U	22	U	17	U	18	U	22	U	19	U
SW8260C	1,2-Dibromoethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,2-Dichlorobenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,2-Dichloroethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,2-Dichloropropane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,3,5-Trimethylbenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,3-Dichlorobenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,3-Dichloropropane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,4-Dichlorobenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	1,4-Dioxane	ug/kg	190	U	210	U	210	U	220	U	170	U	180	U	220	U	190	U
SW8260C	2,2-Dichloropropane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg	9.1		2.7	J	0.74	J	0.44	J	3.4	U	1	J	4.4	U	3	J
SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg	2.1	J	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	1.2	J
SW8260C	2-Butanone	ug/kg	19	U	21	U	4.1	J+	22	U	5.5	J+	18	U	22	U	9.5	J
SW8260C	2-Chlorotoluene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	2-Hexanone	ug/kg	19	U	21	U	21	U	22	U	17	U	18	U	22	U	19	U
SW8260C	4-Chlorotoluene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	4-iso-Propyltoluene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	4-Methyl-2-pentanone	ug/kg	19	U	21	U	21	U	22	U	17	U	18	U	22	U	19	U
SW8260C	Acetic acid, methyl ester	ug/kg	39	U	43	U	41	U	45	U	34	U	36	U	44	U	39	U
SW8260C	Acetone	ug/kg	11	J	5.3	J	13	J	15	J	24	J	4.4	J	5.8	J	33	J
SW8260C	Benzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	1.3	J	3.6	U	4.4	U	3.9	U
SW8260C	Bromobenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
SW8260C	Bromochloromethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-708		SB-708		SB-708		SB-708		SB-708		SB-709		SB-709	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX		OC-SB-709-0.0/2.0-XXX	
		Sample Depth (ft bgs)	6 - 8		8 - 10		16 - 18		28 - 30		33 - 34		22 - 24		0 - 2	
		Qc Code	FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	Bromochloromethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Bromodichloromethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Bromoform	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Bromomethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Carbon disulfide	ug/kg	3.9	U	4.3	U	2.9	J	4.5	U	3	J	3.6	U	4.4	U
SW8260C	Carbon tetrachloride	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Chlorobenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Chloroethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Chloroform	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Chloromethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	cis-1,2-Dichloroethene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	cis-1,3-Dichloropropene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Cyclohexane	ug/kg	19	U	21	U	21	U	22	U	17	U	18	U	22	U
SW8260C	Dibromochloromethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Dibromomethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	1	J	3.6	U	4.4	U
SW8260C	Dichlorodifluoromethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Diethyl ether	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Ethyl-t-Butyl Ether	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Ethylbenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	0.42	J
SW8260C	Hexachlorobutadiene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Isopropyl ether	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Isopropylbenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Methyl cyclohexane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Methyl Tertbutyl Ether	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Methylene chloride	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	n-Butylbenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Naphthalene	ug/kg	19	U	21	U	21	U	22	U	0.53	J	18	U	22	U
SW8260C	Propylbenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	sec-Butylbenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Styrene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	0.34	J	3.6	U	4.4	U
SW8260C	tert-Butylbenzene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Tetrachloroethene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Tetrahydrofuran	ug/kg	39	U	43	U	41	U	45	U	34	U	36	U	44	U
SW8260C	Toluene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	0.99	J	3.6	U	4.4	U
SW8260C	trans-1,2-Dichloroethene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	trans-1,3-Dichloropropene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Trichloroethene	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Trichlorofluoromethane	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Vinyl chloride	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Xylene, o	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U
SW8260C	Xylenes (m&p)	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	1.4	J
SW8260C	Xylenes, Total	ug/kg	3.9	U	4.3	U	4.1	U	4.5	U	3.4	U	3.6	U	1.4	J

		Location	SB-709		
		Sample Date	11/6/2019		
		Sample ID	OC-SB-709-2.0/4.0-XXX		
		Sample Depth (ft bgs)	2 - 4		
		Qc Code	FS		
Method	**Parameter**	**Units**	Result	Qualifier	
SW8260C	Bromochloromethane	ug/kg	3.9	U	
SW8260C	Bromodichloromethane	ug/kg	3.9	U	
SW8260C	Bromoform	ug/kg	3.9	U	
SW8260C	Bromomethane	ug/kg	3.9	U	
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	3.9	U	
SW8260C	Carbon disulfide	ug/kg	3.9	U	
SW8260C	Carbon tetrachloride	ug/kg	3.9	U	
SW8260C	Chlorobenzene	ug/kg	3.9	U	
SW8260C	Chloroethane	ug/kg	3.9	U	
SW8260C	Chloroform	ug/kg	3.9	U	
SW8260C	Chloromethane	ug/kg	3.9	U	
SW8260C	cis-1,2-Dichloroethene	ug/kg	3.9	U	
SW8260C	cis-1,3-Dichloropropene	ug/kg	3.9	U	
SW8260C	Cyclohexane	ug/kg	19	U	
SW8260C	Dibromochloromethane	ug/kg	3.9	U	
SW8260C	Dibromomethane	ug/kg	3.9	U	
SW8260C	Dichlorodifluoromethane	ug/kg	3.9	U	
SW8260C	Diethyl ether	ug/kg	3.9	U	
SW8260C	Ethyl-t-Butyl Ether	ug/kg	3.9	U	
SW8260C	Ethylbenzene	ug/kg	0.27	J	
SW8260C	Hexachlorobutadiene	ug/kg	3.9	U	
SW8260C	Isopropyl ether	ug/kg	3.9	U	
SW8260C	Isopropylbenzene	ug/kg	3.9	U	
SW8260C	Methyl cyclohexane	ug/kg	3.9	U	
SW8260C	Methyl Tertbutyl Ether	ug/kg	3.9	U	
SW8260C	Methylene chloride	ug/kg	3.9	U	
SW8260C	n-Butylbenzene	ug/kg	3.9	U	
SW8260C	Naphthalene	ug/kg	19	U	
SW8260C	Propylbenzene	ug/kg	3.9	U	
SW8260C	sec-Butylbenzene	ug/kg	3.9	U	
SW8260C	Styrene	ug/kg	3.9	U	
SW8260C	tert-Butylbenzene	ug/kg	3.9	U	
SW8260C	Tetrachloroethene	ug/kg	3.9	U	
SW8260C	Tetrahydrofuran	ug/kg	39	U	
SW8260C	Toluene	ug/kg	3.9	U	
SW8260C	trans-1,2-Dichloroethene	ug/kg	3.9	U	
SW8260C	trans-1,3-Dichloropropene	ug/kg	3.9	U	
SW8260C	Trichloroethene	ug/kg	3.9	U	
SW8260C	Trichlorofluoromethane	ug/kg	3.9	U	
SW8260C	Vinyl chloride	ug/kg	3.9	U	
SW8260C	Xylene, o	ug/kg	3.9	U	
SW8260C	Xylenes (m&p)	ug/kg	0.75	J	
SW8260C	Xylenes, Total	ug/kg	0.75	J	

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-708		SB-708		SB-708		SB-708		SB-708		SB-709		SB-709	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX		OC-SB-709-0.0/2.0-XXX	
		Sample Depth (ft bgs)	6 - 8		8 - 10		16 - 18		28 - 30		33 - 34		22 - 24		0 - 2	
		Qc Code	FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs																
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	1-Methylnaphthalene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	2,4,5-Trichlorophenol	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	2,4,6-Trichlorophenol	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	2,4-Dichlorophenol	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U
SW8270D	2,4-Dimethylphenol	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	2,4-Dinitrophenol	ug/kg	350	U	340	U	340	U	380	U	360	U	350	U	390	U
SW8270D	2,4-Dinitrotoluene	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	2,6-Dinitrotoluene	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	2-Chloronaphthalene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U
SW8270D	2-Chlorophenol	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	2-Methylnaphthalene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U
SW8270D	2-Methylphenol	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	2-Nitroaniline	ug/kg	180	U	180	U	180	UJ	200	U	180	UJ	180	UJ	200	U
SW8270D	2-Nitrophenol	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	3 & 4 Methylphenol	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	3,3'-Dichlorobenzidine	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	3-Nitroaniline	ug/kg	180	U	180	U	180	U	200	U	180	U	180	U	200	U
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg	180	U	180	U	180	U	200	U	180	U	180	U	200	U
SW8270D	4-Bromophenyl phenyl ether	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	4-Chloro-3-methylphenol	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	4-Chloroaniline	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	4-Chlorophenyl phenyl ether	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	4-Nitroaniline	ug/kg	180	U	180	U	180	U	200	U	180	U	180	U	200	U
SW8270D	4-Nitrophenol	ug/kg	180	U	180	U	180	UJ	200	UJ	180	UJ	180	UJ	200	U
SW8270D	Acenaphthene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U
SW8270D	Acenaphthylene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U
SW8270D	Acetophenone	ug/kg	71	U	70	U	69	U	78	U	72	U	72	U	4.1	J
SW8270D	Aniline	ug/kg	17	J	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	Anthracene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U
SW8270D	Atrazine	ug/kg	71	U	70	U	69	U	78	U	72	U	72	U	80	U
SW8270D	Azobenzene	ug/kg	340	U	330	U	350	U	380	U	350	U	360	U	390	U
SW8270D	Benzaldehyde	ug/kg	71	R	70	R	69	R	78	R	72	R	72	R	80	R
SW8270D	Benzo(a)anthracene	ug/kg	1.6	J	7	U	6.9	U	7.8	U	7.2	U	7.2	U	9.4	
SW8270D	Benzo(a)pyrene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8.9	
SW8270D	Benzo(b)fluoranthene	ug/kg	2.1	J	7	U	6.9	U	7.8	U	7.2	U	7.2	U	12	
SW8270D	Benzo(ghi)perylene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	7.4	J
SW8270D	Benzo(k)fluoranthene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	5.2	J
SW8270D	Benzoic Acid	ug/kg	180	U	180	U	180	U	200	U	180	U	180	U	200	U
SW8270D	Benzyl alcohol	ug/kg	35	U	34	U	34	U	38	U	2.9	J	35	U	39	U
SW8270D	Biphenyl	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	4.4	J
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U
SW8270D	Bis(2-Chloroethyl)ether	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U

		Location	SB-709		
		Sample Date	11/6/2019		
		Sample ID	OC-SB-709-2.0/4.0-XXX		
		Sample Depth (ft bgs)	2 - 4		
		Qc Code	FS		
Method	**Parameter**	**Units**	Result	Qualifier	
SVOCs					
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg	110	U	
SW8270D	1-Methylnaphthalene	ug/kg	23	U	
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg	23	U	
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg	110	U	
SW8270D	2,4,5-Trichlorophenol	ug/kg	110	U	
SW8270D	2,4,6-Trichlorophenol	ug/kg	110	U	
SW8270D	2,4-Dichlorophenol	ug/kg	23	U	
SW8270D	2,4-Dimethylphenol	ug/kg	110	U	
SW8270D	2,4-Dinitrophenol	ug/kg	1100	U	
SW8270D	2,4-Dinitrotoluene	ug/kg	110	U	
SW8270D	2,6-Dinitrotoluene	ug/kg	110	U	
SW8270D	2-Chloronaphthalene	ug/kg	23	U	
SW8270D	2-Chlorophenol	ug/kg	110	U	
SW8270D	2-Methylnaphthalene	ug/kg	23	U	
SW8270D	2-Methylphenol	ug/kg	110	U	
SW8270D	2-Nitroaniline	ug/kg	580	U	
SW8270D	2-Nitrophenol	ug/kg	110	U	
SW8270D	3 & 4 Methylphenol	ug/kg	110	U	
SW8270D	3,3'-Dichlorobenzidine	ug/kg	110	U	
SW8270D	3-Nitroaniline	ug/kg	580	U	
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg	580	U	
SW8270D	4-Bromophenyl phenyl ether	ug/kg	110	U	
SW8270D	4-Chloro-3-methylphenol	ug/kg	110	U	
SW8270D	4-Chloroaniline	ug/kg	110	U	
SW8270D	4-Chlorophenyl phenyl ether	ug/kg	110	U	
SW8270D	4-Nitroaniline	ug/kg	580	U	
SW8270D	4-Nitrophenol	ug/kg	580	U	
SW8270D	Acenaphthene	ug/kg	23	U	
SW8270D	Acenaphthylene	ug/kg	23	U	
SW8270D	Acetophenone	ug/kg	230	U	
SW8270D	Aniline	ug/kg	110	U	
SW8270D	Anthracene	ug/kg	23	U	
SW8270D	Atrazine	ug/kg	230	U	
SW8270D	Azobenzene	ug/kg	380	U	
SW8270D	Benzaldehyde	ug/kg	230	R	
SW8270D	Benzo(a)anthracene	ug/kg	26		
SW8270D	Benzo(a)pyrene	ug/kg	22	J	
SW8270D	Benzo(b)fluoranthene	ug/kg	28		
SW8270D	Benzo(ghi)perylene	ug/kg	13	J	
SW8270D	Benzo(k)fluoranthene	ug/kg	11	J	
SW8270D	Benzoic Acid	ug/kg	580	U	
SW8270D	Benzyl alcohol	ug/kg	110	U	
SW8270D	Biphenyl	ug/kg	10	J	
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg	110	U	
SW8270D	Bis(2-Chloroethyl)ether	ug/kg	23	U	

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-708		SB-708		SB-708		SB-708		SB-708		SB-709		SB-709	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX		OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX	
		Sample Depth (ft bgs)	6 - 8		8 - 10		16 - 18		28 - 30		33 - 34		22 - 24		0 - 2		2 - 4	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8270D	Bis(2-Ethylhexyl)phthalate	ug/kg	2900		340	U	340	U	380	U	360	U	350	U	940		6300	
SW8270D	Butylbenzylphthalate	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U	110	U
SW8270D	Caprolactam	ug/kg	180	U	180	U	180	U	200	U	180	U	180	U	200	U	580	U
SW8270D	Carbazole	ug/kg	2.2	J	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U	5.7	J
SW8270D	Chrysene	ug/kg	2.7	J	7	U	6.9	U	7.8	U	7.2	U	7.2	U	12		27	
SW8270D	Di-n-butylphthalate	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U	72	J
SW8270D	Di-n-octylphthalate	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	61		110	U
SW8270D	Dibenz(a,h)anthracene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	2.1	J	23	U
SW8270D	Dibenzofuran	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U	110	U
SW8270D	Diethylphthalate	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U	110	U
SW8270D	Dimethylphthalate	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U	110	U
SW8270D	Fluoranthene	ug/kg	3.1	J	7	U	6.9	U	7.8	U	7.2	U	7.2	U	14		35	
SW8270D	Fluorene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U	23	U
SW8270D	Hexachlorobenzene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U	23	U
SW8270D	Hexachlorocyclopentadiene	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U	110	U
SW8270D	Hexachloroethane	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U	110	U
SW8270D	Indeno(1,2,3-cd)pyrene	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	6.3	J	13	J
SW8270D	Isophorone	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U	110	U
SW8270D	N-Nitrosodi-n-propylamine	ug/kg	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	8	U	23	U
SW8270D	N-Nitrosodimethylamine	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	39	U	110	U
SW8270D	N-Nitrosodiphenylamine	ug/kg	280		34	U	34	U	38	U	36	U	35	U	49		1600	
SW8270D	Nitrobenzene	ug/kg	71	U	69	U	69	U	78	U	72	U	72	U	79	U	230	U
SW8270D	Pentachlorophenol	ug/kg	180	U	180	U	180	U	200	U	180	U	180	U	200	U	580	U
SW8270D	Phenanthrene	ug/kg	2.3	J	7	U	6.9	U	2.8	J	7.2	U	7.2	U	8.3		15	J
SW8270D	Phenol	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	80		53	J
SW8270D	Phthalic anhydride	ug/kg	10000	UJ	10000	UJ	11000	UJ	12000	UJ	11000	UJ	11000	UJ	12000	UJ	11000	UJ
SW8270D	Pyrene	ug/kg	4.1	J	7	U	6.9	U	7.8	U	7.2	U	7.2	U	14		34	
SW8270D	Pentachlorophenol	ug/kg	900	U	180	U	180	U	200	U	180	U	180	U	200	U	580	U
SW8270D	Phenanthrene	ug/kg	36	U	7	U	6.9	U	2.8	J	7.2	U	7.2	U	8.3		77	U
SW8270D	Phenol	ug/kg	35	U	34	U	34	U	38	U	36	U	35	U	80		53	U
SW8270D	Phthalic anhydride	ug/kg	10000	U	10000	U	11000	U	12000	U	11000	U	11000	U	12000	U	11000	U
SW8270D	Pyrene	ug/kg	4.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U	14		36	J

Notes

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Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-709		SB-710		SB-710	
			Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/4/2019		11/4/2019	
			Sample ID	OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX		OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX	
			Sample Depth (ft bgs)	4 - 6		6 - 8		8 - 10		8 - 10		16 - 17		32 - 33		2 - 4		4 - 6	
			Qc Code	FS		FS		FD		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs																			
SW8260C	1,1,1,2-Tetrachloroethane	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,1,1-Trichloroethane	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,1,2,2-Tetrachloroethane	ug/kg		4.4	U	4.5	U	4.9	UJ	3.7	UJ	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,1,2-Trichloroethane	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,1-Dichloroethane	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,1-Dichloroethene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,1-Dichloropropene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,2,3-Trichlorobenzene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,2,3-Trichloropropane	ug/kg		4.4	U	4.5	U	4.9	UJ	3.7	UJ	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,2,4-Trichlorobenzene	ug/kg		0.89	J	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,2,4-Trimethylbenzene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,2-Dibromo-3-chloropropane	ug/kg		22	U	23	U	25	UJ	18	UJ	22	U	21	U	24	U	18	U
SW8260C	1,2-Dibromoethane	ug/kg		4.4	U	4.5	U	4.9	UJ	3.7	UJ	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,2-Dichlorobenzene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,2-Dichloroethane	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,2-Dichloropropane	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,3,5-Trimethylbenzene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	0.28	J	4.2	U	4.8	U	3.7	U
SW8260C	1,3-Dichlorobenzene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	0.35	J
SW8260C	1,3-Dichloropropane	ug/kg		4.4	U	4.5	U	4.9	UJ	3.7	UJ	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,4-Dichlorobenzene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	1,4-Dioxane	ug/kg		220	U	230	U	250	UJ	180	UJ	220	U	210	U	240	U	180	U
SW8260C	2,2-Dichloropropane	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg		2.7	J	4.5	U	4.9	U	3.7	U	1.2	J	4.2	U	7.1		35	
SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg		0.77	J	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	1.4	J	18	
SW8260C	2-Butanone	ug/kg		16	J+	23	U	25	U	18	U	22	U	21	U	24	U	7	J+
SW8260C	2-Chlorotoluene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	2-Hexanone	ug/kg		22	U	23	U	25	UJ	18	UJ	22	U	21	U	24	U	18	U
SW8260C	4-Chlorotoluene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	4-iso-Propyltoluene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	4-Methyl-2-pentanone	ug/kg		22	U	23	U	25	UJ	18	UJ	22	U	21	U	24	U	18	U
SW8260C	Acetic acid, methyl ester	ug/kg		44	U	45	U	49	UJ	37	UJ	44	U	42	U	48	U	37	U
SW8260C	Acetone	ug/kg		77	J	22	J	10	J-	11	J-	17	J	9.7	J	15	J	30	J
SW8260C	Benzene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Bromobenzene	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Bromochloromethane	ug/kg		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U

Notes

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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-710		SB-710	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX		OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX	
		Sample Depth (ft bgs)	4 - 6		6 - 8		8 - 10		8 - 10		16 - 17		32 - 33		2 - 4		4 - 6	
		Qc Code	FS		FS		FD		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	Bromochloromethane	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Bromodichloromethane	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Bromoform	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Bromomethane	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Carbon disulfide	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	5.7	
SW8260C	Carbon tetrachloride	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Chlorobenzene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Chloroethane	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Chloroform	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Chloromethane	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	cis-1,2-Dichloroethene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	cis-1,3-Dichloropropene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Cyclohexane	ug/kg	22	U	23	U	25	U	18	U	22	U	21	U	24	U	18	U
SW8260C	Dibromochloromethane	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Dibromomethane	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Dichlorodifluoromethane	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Diethyl ether	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Ethyl-t-Butyl Ether	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Ethylbenzene	ug/kg	0.33	J	4.5	U	0.57	J	0.29	J	0.54	J	0.38	J	4.8	U	3.7	U
SW8260C	Hexachlorobutadiene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Isopropyl ether	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Isopropylbenzene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Methyl cyclohexane	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Methyl Tertbutyl Ether	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Methylene chloride	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	n-Butylbenzene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Naphthalene	ug/kg	22	U	23	U	25	UJ	18	UJ	22	U	21	U	24	U	18	U
SW8260C	Propylbenzene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	sec-Butylbenzene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Styrene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	tert-Butylbenzene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Tetrachloroethene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Tetrahydrofuran	ug/kg	44	U	45	U	49	UJ	37	UJ	44	U	42	U	48	U	37	U
SW8260C	Toluene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	0.29	J
SW8260C	trans-1,2-Dichloroethene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	trans-1,3-Dichloropropene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Trichloroethene	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Trichlorofluoromethane	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Vinyl chloride	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Xylene, o	ug/kg	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U	4.8	U	3.7	U
SW8260C	Xylenes (m&p)	ug/kg	1.1	J	0.76	J	1.7	J	0.88	J	1.9	J	1.3	J	4.8	U	3.7	U
SW8260C	Xylenes, Total	ug/kg	1.1	J	0.76	J	1.7	J	0.88	J	1.9	J	1.3	J	4.8	U	3.7	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
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Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-709		SB-710		SB-710	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX		OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX	
		Sample Depth (ft bgs)	4 - 6		6 - 8		8 - 10		8 - 10		16 - 17		32 - 33		2 - 4		4 - 6	
		Qc Code	FS		FS		FD		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs																		
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	1-Methylnaphthalene	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	2,4,5-Trichlorophenol	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	2,4,6-Trichlorophenol	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	2,4-Dichlorophenol	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	2,4-Dimethylphenol	ug/kg	3.9	J	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	2,4-Dinitrophenol	ug/kg	380	U	380	U	380	U	390	U	350	U	360	U	420	U	370	U
SW8270D	2,4-Dinitrotoluene	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	2,6-Dinitrotoluene	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	2-Chloronaphthalene	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	2-Chlorophenol	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	2-Methylnaphthalene	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	2-Methylphenol	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	2-Nitroaniline	ug/kg	200	U	190	U	200	U	200	U	180	U	180	U	220	UJ	190	UJ
SW8270D	2-Nitrophenol	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	3 & 4 Methylphenol	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	3,3'-Dichlorobenzidine	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	3-Nitroaniline	ug/kg	200	U	190	U	200	U	200	U	180	U	180	U	220	U	190	U
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg	200	U	190	U	200	U	200	U	180	U	180	U	220	U	190	U
SW8270D	4-Bromophenyl phenyl ether	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	4-Chloro-3-methylphenol	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	4-Chloroaniline	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	4-Chlorophenyl phenyl ether	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	4-Nitroaniline	ug/kg	200	U	190	U	200	U	200	U	180	U	180	U	220	U	190	U
SW8270D	4-Nitrophenol	ug/kg	200	U	190	U	200	U	200	U	180	U	180	U	220	UJ	190	UJ
SW8270D	Acenaphthene	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	Acenaphthylene	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	Acetophenone	ug/kg	8.3	J	77	U	77	U	78	U	72	U	72	U	85	U	75	U
SW8270D	Aniline	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	Anthracene	ug/kg	2.3	J	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	Atrazine	ug/kg	77	U	77	U	77	U	78	U	72	U	72	U	85	U	75	U
SW8270D	Azobenzene	ug/kg	380	U	380	U	380	U	380	U	360	U	350	U	420	U	370	U
SW8270D	Benzaldehyde	ug/kg	77	R	77	R	77	R	78	R	72	R	72	R	85	R	75	R
SW8270D	Benzo(a)anthracene	ug/kg	8.5		7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	3.8	J	5.7	J
SW8270D	Benzo(a)pyrene	ug/kg	7.5	J	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	4.4	J	4.7	J
SW8270D	Benzo(b)fluoranthene	ug/kg	13		7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	6.3	J	5.8	J
SW8270D	Benzo(ghi)perylene	ug/kg	6.5	J	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	4.1	J	3.2	J
SW8270D	Benzo(k)fluoranthene	ug/kg	4.3	J	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	Benzoic Acid	ug/kg	200	U	190	U	200	R	200	R	180	U	180	U	220	U	190	U
SW8270D	Benzyl alcohol	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	Biphenyl	ug/kg	7	J	3.4	J	38	U	39	U	35	U	36	U	42	U	4.4	J
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	Bis(2-Chloroethyl)ether	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U

Notes

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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-710		SB-710	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX		OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX	
		Sample Depth (ft bgs)	4 - 6		6 - 8		8 - 10		8 - 10		16 - 17		32 - 33		2 - 4		4 - 6	
		Qc Code	FS		FS		FD		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8270D	Bis(2-Ethylhexyl)phthalate	ug/kg	6900		6700		380	U	390	U	50	J	360	U	300	J	1000	
SW8270D	Butylbenzylphthalate	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	Caprolactam	ug/kg	200	U	190	U	200	U	200	U	180	U	180	U	220	U	190	U
SW8270D	Carbazole	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	Chrysene	ug/kg	12		7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	5.9	J	5.8	J
SW8270D	Di-n-butylphthalate	ug/kg	29	J	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	Di-n-octylphthalate	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	Dibenz(a,h)anthracene	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	Dibenzofuran	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	Diethylphthalate	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	Dimethylphthalate	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	Fluoranthene	ug/kg	16		7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	6.7	J	10	
SW8270D	Fluorene	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	Hexachlorobenzene	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	Hexachlorocyclopentadiene	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	Hexachloroethane	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	Indeno(1,2,3-cd)pyrene	ug/kg	6.5	J	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	3.8	J	2.9	J
SW8270D	Isophorone	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	N-Nitrosodi-n-propylamine	ug/kg	7.7	U	7.7	U	7.7	U	7.8	U	7.2	U	7.2	U	8.5	U	7.5	U
SW8270D	N-Nitrosodimethylamine	ug/kg	38	U	38	U	38	U	39	U	35	U	36	U	42	U	37	U
SW8270D	N-Nitrosodiphenylamine	ug/kg	450		27	J	38	U	39	U	35	U	36	U	35	J	62	
SW8270D	Nitrobenzene	ug/kg	77	U	76	U	77	U	78	U	72	U	72	U	84	U	75	U
SW8270D	Pentachlorophenol	ug/kg	200	U	190	U	200	U	200	U	180	U	180	U	220	U	190	U
SW8270D	Phenanthrene	ug/kg	9.3		2.5	J	2.1	J	3.6	J	7.2	U	7.2	U	3.9	J	7.9	
SW8270D	Phenol	ug/kg	340		38	U	38	U	39	U	35	U	36	U	42	U	11	J
SW8270D	Phthalic anhydride	ug/kg	12000	UJ	12000	UJ	11000	UJ	12000	UJ	11000	UJ	11000	UJ	13000	UJ	11000	UJ
SW8270D	Pyrene	ug/kg	16		1.8	J	7.7	U	7.8	U	7.2	U	7.2	U	6.6	J	8.9	
SW8270D	Pentachlorophenol	ug/kg	2000	U	1900	U	200	U	200	U	180	U	180	U	220	U	190	U
SW8270D	Phenanthrene	ug/kg	9.3	U	77	U	2.1	J	3.6	J	7.2	U	7.2	U	3.9	J	7.9	
SW8270D	Phenol	ug/kg	350	J	380	U	38	U	39	U	35	U	36	U	42	U	11	J
SW8270D	Phthalic anhydride	ug/kg	12000	U	12000	U	11000	U	12000	U	11000	U	11000	U	13000	U	11000	U
SW8270D	Pyrene	ug/kg	18	J	77	U	7.7	U	7.8	U	7.2	U	7.2	U	6.6	J	8.9	

Notes

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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SB-710		SB-710		SB-710		SB-710		SB-711		SB-711		SB-711		SB-711	
			Sample Date	11/4/2019		11/4/2019		11/5/2019		11/5/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
			Sample ID	OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX		OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX	
			Sample Depth (ft bgs)	6 - 8		8 - 10		23 - 24		36 - 37		0 - 2		4 - 6		2 - 4		6 - 8	
			Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs																			
SW8260C	1,1,1,2-Tetrachloroethane	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,1,1-Trichloroethane	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,1,2,2-Tetrachloroethane	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,1,2-Trichloroethane	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,1-Dichloroethane	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,1-Dichloroethene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,1-Dichloropropene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,2,3-Trichlorobenzene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,2,3-Trichloropropane	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,2,4-Trichlorobenzene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,2,4-Trimethylbenzene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,2-Dibromo-3-chloropropane	ug/kg		19	U	26	U	23	U	19	U	30	U	5200	U	9300	U	24	U
SW8260C	1,2-Dibromoethane	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,2-Dichlorobenzene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,2-Dichloroethane	ug/kg		3.7	U	5.2	U	4.6	U	0.47	J	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,2-Dichloropropane	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,3,5-Trimethylbenzene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,3-Dichlorobenzene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,3-Dichloropropane	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,4-Dichlorobenzene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	1,4-Dioxane	ug/kg		190	U	260	U	230	U	190	U	300	U	52000	U	93000	U	240	U
SW8260C	2,2-Dichloropropane	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg		3.9		0.81	J	4.6	U	3.7	U	1.7	J	8000		3200		4	J
SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg		1.8	J	5.2	U	4.6	U	3.7	U	1.3	J	6300		2600		2	J
SW8260C	2-Butanone	ug/kg		18	J+	26	U	23	U	19	U	30	U	5200	U	9300	U	5.7	J+
SW8260C	2-Chlorotoluene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	2-Hexanone	ug/kg		19	U	26	U	23	U	19	U	30	U	5200	U	9300	U	24	U
SW8260C	4-Chlorotoluene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	4-iso-Propyltoluene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	420	J	1900	U	4.7	U
SW8260C	4-Methyl-2-pentanone	ug/kg		19	U	26	U	23	U	19	U	30	U	5200	U	9300	U	24	U
SW8260C	Acetic acid, methyl ester	ug/kg		37	U	52	U	46	U	37	U	59	U	330	J	19000	U	47	U
SW8260C	Acetone	ug/kg		30	J	8.3	J	230	U	14	J	300	U	52000	U	93000	U	240	UJ
SW8260C	Benzene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Bromobenzene	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Bromochloromethane	ug/kg		3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U

Notes

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Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-710		SB-710		SB-710		SB-710		SB-711		SB-711		SB-711	
		Sample Date	11/4/2019		11/4/2019		11/5/2019		11/5/2019		11/12/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX		OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX
		Sample Depth (ft bgs)	6 - 8		8 - 10		23 - 24		36 - 37		0 - 2		4 - 6		2 - 4		6 - 8
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	Bromochloromethane	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Bromodichloromethane	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Bromoform	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Bromomethane	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	UJ	1900	UJ	4.7	U
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Carbon disulfide	ug/kg	2.7	J	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	3.3	J
SW8260C	Carbon tetrachloride	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Chlorobenzene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Chloroethane	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	UJ	1900	UJ	4.7	U
SW8260C	Chloroform	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Chloromethane	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	cis-1,2-Dichloroethene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	cis-1,3-Dichloropropene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Cyclohexane	ug/kg	19	U	26	U	23	U	19	U	30	U	5200	U	9300	U	24	U
SW8260C	Dibromochloromethane	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Dibromomethane	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Dichlorodifluoromethane	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	UJ
SW8260C	Diethyl ether	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Ethyl-t-Butyl Ether	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Ethylbenzene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	370	J	1900	U	4.7	U
SW8260C	Hexachlorobutadiene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Isopropyl ether	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Isopropylbenzene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	200	J	1900	U	4.7	U
SW8260C	Methyl cyclohexane	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Methyl Tertbutyl Ether	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Methylene chloride	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	26	U	1000	U	1900	U	10	U
SW8260C	n-Butylbenzene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Naphthalene	ug/kg	19	U	26	U	23	U	19	U	30	U	150	J	9300	U	24	U
SW8260C	Propylbenzene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	sec-Butylbenzene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Styrene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	tert-Butylbenzene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Tetrachloroethene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Tetrahydrofuran	ug/kg	37	U	52	U	46	U	37	U	59	U	10000	U	19000	U	47	U
SW8260C	Toluene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	trans-1,2-Dichloroethene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	trans-1,3-Dichloropropene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Trichloroethene	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Trichlorofluoromethane	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Vinyl chloride	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Xylene, o	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Xylenes (m&p)	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U
SW8260C	Xylenes, Total	ug/kg	3.7	U	5.2	U	4.6	U	3.7	U	5.9	U	1000	U	1900	U	4.7	U

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Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SB-710		SB-710		SB-710		SB-710		SB-711		SB-711		SB-711		SB-711	
			Sample Date	11/4/2019		11/4/2019		11/5/2019		11/5/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
			Sample ID	OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX		OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX	
			Sample Depth (ft bgs)	6 - 8		8 - 10		23 - 24		36 - 37		0 - 2		4 - 6		2 - 4		6 - 8	
			Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs																			
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	1-Methylnaphthalene	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	8	U	53	J	15	U	7.6	U
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	2,4,5-Trichlorophenol	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	2,4,6-Trichlorophenol	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	2,4-Dichlorophenol	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SW8270D	2,4-Dimethylphenol	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	12	J	38	U
SW8270D	2,4-Dinitrophenol	ug/kg		370	U	360	U	400	U	350	U	400	UJ	9200	U	710	U	380	U
SW8270D	2,4-Dinitrotoluene	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	2,6-Dinitrotoluene	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	2-Chloronaphthalene	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SW8270D	2-Chlorophenol	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	2-Methylnaphthalene	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SW8270D	2-Methylphenol	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	2-Nitroaniline	ug/kg		190	UJ	190	U	210	UJ	180	UJ	200	U	4700	U	370	U	190	U
SW8270D	2-Nitrophenol	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	3 & 4 Methylphenol	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	27	J	38	U
SW8270D	3,3'-Dichlorobenzidine	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	3-Nitroaniline	ug/kg		190	U	190	U	210	U	180	U	200	U	4700	U	370	U	190	U
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg		190	U	190	U	210	U	180	U	200	U	4700	U	370	U	190	U
SW8270D	4-Bromophenyl phenyl ether	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	4-Chloro-3-methylphenol	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	4-Chloroaniline	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	4-Chlorophenyl phenyl ether	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	4-Nitroaniline	ug/kg		190	U	190	U	210	U	180	U	200	U	4700	U	370	U	190	U
SW8270D	4-Nitrophenol	ug/kg		190	UJ	190	UJ	210	UJ	180	UJ	200	U	4700	U	370	U	190	U
SW8270D	Acenaphthene	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SW8270D	Acenaphthylene	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	1.8	J	190	U	15	U	7.6	U
SW8270D	Acetophenone	ug/kg		75	U	73	U	82	U	72	U	80	U	1900	U	150	U	76	U
SW8270D	Aniline	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	Anthracene	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	6.3	J	60	J	4.3	J	7.6	U
SW8270D	Atrazine	ug/kg		75	U	73	U	82	U	72	U	80	U	1900	U	150	U	76	U
SW8270D	Azobenzene	ug/kg		370	U	350	U	400	U	360	U	400	U	7500	U	1800	U	1900	U
SW8270D	Benzaldehyde	ug/kg		75	R	73	R	82	R	72	R	80	R	1900	U	150	U	76	U
SW8270D	Benzo(a)anthracene	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	22		190	U	9.9	J	7.6	U
SW8270D	Benzo(a)pyrene	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	17		190	U	15	U	7.6	U
SW8270D	Benzo(b)fluoranthene	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	25		190	U	19		7.6	U
SW8270D	Benzo(ghi)perylene	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	11		190	U	15	U	7.6	U
SW8270D	Benzo(k)fluoranthene	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	8.8		190	U	8.3	J	7.6	U
SW8270D	Benzoic Acid	ug/kg		190	U	190	U	210	U	180	U	200	R	4700	U	370	U	190	U
SW8270D	Benzyl alcohol	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	59	
SW8270D	Biphenyl	ug/kg		37	U	36	U	40	U	35	U	7.1	J	14000		75		38	U
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg		37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	Bis(2-Chloroethyl)ether	ug/kg		7.5	U	7.3	U	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U

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Olin Chemical Superfund Site
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		Location	SB-710		SB-710		SB-710		SB-710		SB-711		SB-711		SB-711		SB-711	
		Sample Date	11/4/2019		11/4/2019		11/5/2019		11/5/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX		OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX	
		Sample Depth (ft bgs)	6 - 8		8 - 10		23 - 24		36 - 37		0 - 2		4 - 6		2 - 4		6 - 8	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8270D	Bis(2-Ethylhexyl)phthalate	ug/kg	370	U	120	J	400	U	350	U	4900		420000		19000		56	J
SW8270D	Butylbenzylphthalate	ug/kg	37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	Caprolactam	ug/kg	190	U	190	U	210	U	180	U	200	U	4700	U	370	U	190	U
SW8270D	Carbazole	ug/kg	7.5	U	7.3	U	8.2	U	7.2	U	3.5	J	190	U	15	U	7.6	U
SW8270D	Chrysene	ug/kg	7.5	U	7.3	U	8.2	U	7.2	U	27		190	U	20		7.6	U
SW8270D	Di-n-butylphthalate	ug/kg	37	U	36	U	40	U	35	U	21	J	920	U	71	U	38	U
SW8270D	Di-n-octylphthalate	ug/kg	37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	Dibenz(a,h)anthracene	ug/kg	7.5	U	7.3	U	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SW8270D	Dibenzofuran	ug/kg	37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	Diethylphthalate	ug/kg	37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	Dimethylphthalate	ug/kg	37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	Fluoranthene	ug/kg	7.5	U	7.3	U	8.2	U	7.2	U	46		160	J	23		7.6	U
SW8270D	Fluorene	ug/kg	7.5	U	7.3	U	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SW8270D	Hexachlorobenzene	ug/kg	7.5	U	7.3	U	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SW8270D	Hexachlorocyclopentadiene	ug/kg	37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	Hexachloroethane	ug/kg	37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	Indeno(1,2,3-cd)pyrene	ug/kg	7.5	U	7.3	U	8.2	U	7.2	U	11		190	U	15	U	7.6	U
SW8270D	Isophorone	ug/kg	37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	N-Nitrosodi-n-propylamine	ug/kg	7.5	U	7.3	U	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SW8270D	N-Nitrosodimethylamine	ug/kg	37	U	36	U	40	U	35	U	40	U	920	U	71	U	38	U
SW8270D	N-Nitrosodiphenylamine	ug/kg	37	U	36	U	40	U	35	U	40	U	54000		1700		31	J
SW8270D	Nitrobenzene	ug/kg	75	U	73	U	81	U	72	U	80	U	1900	U	140	U	76	U
SW8270D	Pentachlorophenol	ug/kg	190	U	190	U	210	U	180	U	200	UJ	4700	U	370	U	190	U
SW8270D	Phenanthrene	ug/kg	7.5	U	2.2	J	8.2	U	7.2	U	21		660		15		7.6	U
SW8270D	Phenol	ug/kg	37	U	36	U	40	U	35	U	40	U	920	U	8800		120	
SW8270D	Phthalic anhydride	ug/kg	11000	UJ	11000	UJ	12000	UJ	11000	UJ	12000	UJ	230000	UJ	54000	UJ	57000	UJ
SW8270D	Pyrene	ug/kg	7.5	U	7.3	U	8.2	U	7.2	U	40		190	U	20		7.6	U
SW8270D	Pentachlorophenol	ug/kg	190	U	190	U	210	U	180	U	2000	U F1	76000	U	7400	U	190	U
SW8270D	Phenanthrene	ug/kg	7.5	U	2.2	J	8.2	U	7.2	U	80	U	840	J	290	U	7.6	U
SW8270D	Phenol	ug/kg	37	U	36	U	40	U	35	U	400	U	920	U	8800	E	120	
SW8270D	Phthalic anhydride	ug/kg	11000	U	11000	U	12000	U	11000	U	12000	U	230000	U	54000	U	57000	U
SW8270D	Pyrene	ug/kg	7.5	U	7.3	U	8.2	U	7.2	U	48	J	3000	U	290	U	7.6	U

Notes

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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Location	SB-711		SB-711		SB-711		SB-712		SB-712		SB-712		SB-712	
			Sample Date	11/12/2019		11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
			Sample ID	OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX		OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX	
			Sample Depth (ft bgs)	8 - 10		35 - 36		18 - 19		0 - 2		2 - 4		4 - 6		6 - 8		8 - 10	
			Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs																			
SW8260C	1,1,1,2-Tetrachloroethane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,1,1-Trichloroethane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,1,2,2-Tetrachloroethane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,1,2-Trichloroethane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,1-Dichloroethane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,1-Dichloroethene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,1-Dichloropropene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,2,3-Trichlorobenzene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,2,3-Trichloropropane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,2,4-Trichlorobenzene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,2,4-Trimethylbenzene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,2-Dibromo-3-chloropropane	ug/kg		6100	U	19	U	20	U	23	U	22	U	26	U	22	U	21	U
SW8260C	1,2-Dibromoethane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,2-Dichlorobenzene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,2-Dichloroethane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,2-Dichloropropane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,3,5-Trimethylbenzene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,3-Dichlorobenzene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,3-Dichloropropane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,4-Dichlorobenzene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	1,4-Dioxane	ug/kg		61000	U	190	U	200	U	230	U	220	U	260	U	220	U	210	U
SW8260C	2,2-Dichloropropane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg		1200	U	3.8	U	4	U	4.6	U	2	J	4	J	8.6		2.4	J
SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg		1200	U	3.8	U	4	U	4.6	U	0.67	J	1.5	J	3.3	J	0.59	J
SW8260C	2-Butanone	ug/kg		6100	U	19	U	20	U	23	U	6.9	J+	26	U	22	U	21	U
SW8260C	2-Chlorotoluene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	2-Hexanone	ug/kg		6100	U	19	U	20	U	23	U	22	U	26	U	22	U	21	U
SW8260C	4-Chlorotoluene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	4-iso-Propyltoluene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	0.45	J	4.4	U	4.2	U
SW8260C	4-Methyl-2-pentanone	ug/kg		6100	U	19	U	20	U	23	U	22	U	26	U	22	U	21	U
SW8260C	Acetic acid, methyl ester	ug/kg		12000	U	38	U	40	U	46	U	43	U	53	U	44	U	42	U
SW8260C	Acetone	ug/kg		61000	U	190	U	200	U	230	U	220	U	260	U	220	U	210	U
SW8260C	Benzene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	0.49	J	4.2	U
SW8260C	Bromobenzene	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Bromochloromethane	ug/kg		1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U

Notes

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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-711		SB-711		SB-711		SB-712		SB-712		SB-712		SB-712	
		Sample Date	11/12/2019		11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX		OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX
		Sample Depth (ft bgs)	8 - 10		35 - 36		18 - 19		0 - 2		2 - 4		4 - 6		6 - 8		8 - 10
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8260C	Bromochloromethane	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Bromodichloromethane	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Bromoform	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Bromomethane	ug/kg	1200	UJ	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Carbon disulfide	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Carbon tetrachloride	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Chlorobenzene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Chloroethane	ug/kg	1200	UJ	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Chloroform	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Chloromethane	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	cis-1,2-Dichloroethene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	cis-1,3-Dichloropropene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Cyclohexane	ug/kg	6100	U	19	U	20	U	23	U	22	U	26	U	22	U	21	U
SW8260C	Dibromochloromethane	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Dibromomethane	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Dichlorodifluoromethane	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Diethyl ether	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Ethyl-t-Butyl Ether	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Ethylbenzene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Hexachlorobutadiene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Isopropyl ether	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Isopropylbenzene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Methyl cyclohexane	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Methyl Tertbutyl Ether	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Methylene chloride	ug/kg	1200	U	17	U	30	U	27	U	20	U	22	U	21	U	24	U
SW8260C	n-Butylbenzene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Naphthalene	ug/kg	6100	U	19	U	20	U	23	U	22	U	0.9	J	22	U	21	U
SW8260C	Propylbenzene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	sec-Butylbenzene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Styrene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	tert-Butylbenzene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Tetrachloroethene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Tetrahydrofuran	ug/kg	12000	U	38	U	40	U	46	U	43	U	53	U	44	U	42	U
SW8260C	Toluene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	trans-1,2-Dichloroethene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	trans-1,3-Dichloropropene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Trichloroethene	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Trichlorofluoromethane	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Vinyl chloride	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Xylene, o	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Xylenes (m&p)	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
SW8260C	Xylenes, Total	ug/kg	1200	U	3.8	U	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U

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November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-711		SB-711		SB-711		SB-712		SB-712		SB-712		SB-712	
		Sample Date	11/12/2019		11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX		OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX
		Sample Depth (ft bgs)	8 - 10		35 - 36		18 - 19		0 - 2		2 - 4		4 - 6		6 - 8		8 - 10
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs																		
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	1-Methylnaphthalene	ug/kg	8.7	U	7.3	U	7.2	U	40	U	7.3	U	2.1	J	22	U	7.4	U
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U	22	U	7.4	U
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	2,4,5-Trichlorophenol	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	2,4,6-Trichlorophenol	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	2,4-Dichlorophenol	ug/kg	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U	22	U	7.4	U
SW8270D	2,4-Dimethylphenol	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	2,4-Dinitrophenol	ug/kg	430	U	360	U	350	U	2000	U	360	U	370	U	1100	U	360	U
SW8270D	2,4-Dinitrotoluene	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	2,6-Dinitrotoluene	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	2-Chloronaphthalene	ug/kg	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U	22	U	7.4	U
SW8270D	2-Chlorophenol	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	2-Methylnaphthalene	ug/kg	2.7	J	7.3	U	7.2	U	40	U	7.3	U	2.3	J	22	U	7.4	U
SW8270D	2-Methylphenol	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	2-Nitroaniline	ug/kg	220	U	180	U	180	U	1000	U	190	U	190	U	570	U	190	U
SW8270D	2-Nitrophenol	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	3 & 4 Methylphenol	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	3,3'-Dichlorobenzidine	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	3-Nitroaniline	ug/kg	220	U	180	U	180	U	1000	U	190	U	190	U	570	U	190	U
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg	220	U	180	U	180	U	1000	U	190	U	190	U	570	U	190	U
SW8270D	4-Bromophenyl phenyl ether	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	4-Chloro-3-methylphenol	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	4-Chloroaniline	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	4-Chlorophenyl phenyl ether	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	4-Nitroaniline	ug/kg	220	U	180	U	180	U	1000	U	190	U	190	U	570	U	190	U
SW8270D	4-Nitrophenol	ug/kg	220	U	180	U	180	U	1000	U	190	U	190	U	570	U	190	U
SW8270D	Acenaphthene	ug/kg	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U	17	J	7.4	U
SW8270D	Acenaphthylene	ug/kg	8.7	U	7.3	U	7.2	U	40	U	7.3	U	4.7	J	6.3	J	7.4	U
SW8270D	Acetophenone	ug/kg	87	U	73	U	72	U	400	U	73	U	4.4	J	220	U	74	U
SW8270D	Aniline	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	Anthracene	ug/kg	8.7	U	2.3	J	2	J	40	U	2.6	J	4.3	J	36		7.4	U
SW8270D	Atrazine	ug/kg	87	U	73	U	72	U	400	U	73	U	75	U	220	U	74	U
SW8270D	Azobenzene	ug/kg	420	U	350	U	350	U	390	U	360	U	370	U	1800	U	360	U
SW8270D	Benzaldehyde	ug/kg	87	U	73	U	72	U	400	U	73	U	6.7	J	220	U	74	U
SW8270D	Benzo(a)anthracene	ug/kg	2.2	J	10		9.7		11	J	7.6		20		72		7.4	U
SW8270D	Benzo(a)pyrene	ug/kg	8.7	U	6	J	4.9	J	40	U	9.5		23		67		7.4	U
SW8270D	Benzo(b)fluoranthene	ug/kg	8.7	U	7.9		5.7	J	14	J	12		39		68		7.4	U
SW8270D	Benzo(ghi)perylene	ug/kg	8.7	U	3.2	J	2.1	J	40	U	8.2		24		56		7.4	U
SW8270D	Benzo(k)fluoranthene	ug/kg	8.7	U	7.3	U	7.2	U	40	U	3.7	J	13		32		7.4	U
SW8270D	Benzoic Acid	ug/kg	220	U	180	U	180	U	1000	U	190	U	190	U	570	U	190	U
SW8270D	Benzyl alcohol	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	Biphenyl	ug/kg	43	U	36	U	35	U	9.7	J	1.7	J	3.4	J	110	U	36	U
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	Bis(2-Chloroethyl)ether	ug/kg	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U	22	U	7.4	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
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UJ = not detected and value is approximate
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Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-711		SB-711		SB-711		SB-712		SB-712		SB-712		SB-712	
		Sample Date	11/12/2019		11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX		OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX
		Sample Depth (ft bgs)	8 - 10		35 - 36		18 - 19		0 - 2		2 - 4		4 - 6		6 - 8		8 - 10
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SW8270D	Bis(2-Ethylhexyl)phthalate	ug/kg	210	J	360	U	48	J	2100		43	J	570		1200		140	J
SW8270D	Butylbenzylphthalate	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	Caprolactam	ug/kg	220	U	180	U	180	U	1000	U	190	U	190	U	570	U	190	U
SW8270D	Carbazole	ug/kg	8.7	U	1.9	J	7.2	U	40	U	1.7	J	2.4	J	8.1	J	7.4	U
SW8270D	Chrysene	ug/kg	2.6	J	9.9		9.3		12	J	8.6		27		75		7.4	U
SW8270D	Di-n-butylphthalate	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	Di-n-octylphthalate	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	Dibenz(a,h)anthracene	ug/kg	8.7	U	7.3	U	7.2	U	40	U	7.3	U	6.1	J	12	J	7.4	U
SW8270D	Dibenzofuran	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	9.4	J	36	U
SW8270D	Diethylphthalate	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	Dimethylphthalate	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	Fluoranthene	ug/kg	4.8	J	13		8.5		19	J	18		30		120		7.4	U
SW8270D	Fluorene	ug/kg	8.7	U	7.3	U	7.2	U	40	U	7.3	U	2	J	12	J	7.4	U
SW8270D	Hexachlorobenzene	ug/kg	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U	22	U	7.4	U
SW8270D	Hexachlorocyclopentadiene	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	Hexachloroethane	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	Indeno(1,2,3-cd)pyrene	ug/kg	8.7	U	2.7	J	1.7	J	40	U	6.5	J	21		38		7.4	U
SW8270D	Isophorone	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	N-Nitrosodi-n-propylamine	ug/kg	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U	22	U	7.4	U
SW8270D	N-Nitrosodimethylamine	ug/kg	43	U	36	U	35	U	200	U	36	U	37	U	110	U	36	U
SW8270D	N-Nitrosodiphenylamine	ug/kg	43	U	36	U	35	U	200	U	36	U	72		130		36	U
SW8270D	Nitrobenzene	ug/kg	86	U	72	U	72	U	400	U	73	U	75	U	220	U	73	U
SW8270D	Pentachlorophenol	ug/kg	220	U	180	U	180	U	1000	U	190	U	190	U	570	U	190	U
SW8270D	Phenanthrene	ug/kg	8.1	J	8.5		7.1	J	40	U	10		17		93		7.4	U
SW8270D	Phenol	ug/kg	43	U	36	U	35	U	200	U	36	U	14	J	110	U	36	U
SW8270D	Phthalic anhydride	ug/kg	13000	UJ	11000	UJ	11000	UJ	12000	UJ	11000	UJ	11000	UJ	54000	UJ	11000	UJ
SW8270D	Pyrene	ug/kg	4.8	J	12		9.2		17	J	15		26		150		7.4	U
SW8270D	Pentachlorophenol	ug/kg	220	U	180	U	180	U	1000	U	190	U	190	U	570	U	190	U
SW8270D	Phenanthrene	ug/kg	8.1	J	8.5		7.1	J	40	U	10		17		93		7.4	U
SW8270D	Phenol	ug/kg	43	U	36	U	35	U	200	U	36	U	14	J	110	U	36	U
SW8270D	Phthalic anhydride	ug/kg	13000	U	11000	U	11000	U	12000	U	11000	U	11000	U	54000	U	11000	U
SW8270D	Pyrene	ug/kg	4.8	J	12		9.2		17	J	15		26		150		7.4	U

Notes

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Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-712		SB-712	
		Sample Date	11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Sample Depth (ft bgs)	37 - 38		23 - 24	
		Qc Code	FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier
VOCs						
SW8260C	1,1,1,2-Tetrachloroethane	ug/kg	4.3	U	4.2	U
SW8260C	1,1,1-Trichloroethane	ug/kg	4.3	U	4.2	U
SW8260C	1,1,2,2-Tetrachloroethane	ug/kg	4.3	U	4.2	U
SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg	4.3	U	4.2	U
SW8260C	1,1,2-Trichloroethane	ug/kg	4.3	U	4.2	U
SW8260C	1,1-Dichloroethane	ug/kg	4.3	U	4.2	U
SW8260C	1,1-Dichloroethene	ug/kg	4.3	U	4.2	U
SW8260C	1,1-Dichloropropene	ug/kg	4.3	U	4.2	U
SW8260C	1,2,3-Trichlorobenzene	ug/kg	4.3	U	4.2	U
SW8260C	1,2,3-Trichloropropane	ug/kg	4.3	U	4.2	U
SW8260C	1,2,4-Trichlorobenzene	ug/kg	4.3	U	4.2	U
SW8260C	1,2,4-Trimethylbenzene	ug/kg	4.3	U	4.2	U
SW8260C	1,2-Dibromo-3-chloropropane	ug/kg	21	U	21	U
SW8260C	1,2-Dibromoethane	ug/kg	4.3	U	4.2	U
SW8260C	1,2-Dichlorobenzene	ug/kg	4.3	U	4.2	U
SW8260C	1,2-Dichloroethane	ug/kg	4.3	U	4.2	U
SW8260C	1,2-Dichloropropane	ug/kg	4.3	U	4.2	U
SW8260C	1,3,5-Trimethylbenzene	ug/kg	4.3	U	4.2	U
SW8260C	1,3-Dichlorobenzene	ug/kg	4.3	U	4.2	U
SW8260C	1,3-Dichloropropane	ug/kg	4.3	U	4.2	U
SW8260C	1,4-Dichlorobenzene	ug/kg	4.3	U	4.2	U
SW8260C	1,4-Dioxane	ug/kg	210	U	210	U
SW8260C	2,2-Dichloropropane	ug/kg	4.3	U	4.2	U
SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg	4.3	U	4.2	U
SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg	4.3	U	4.2	U
SW8260C	2-Butanone	ug/kg	21	U	21	U
SW8260C	2-Chlorotoluene	ug/kg	4.3	U	4.2	U
SW8260C	2-Hexanone	ug/kg	21	U	21	U
SW8260C	4-Chlorotoluene	ug/kg	4.3	U	4.2	U
SW8260C	4-iso-Propyltoluene	ug/kg	4.3	U	4.2	U
SW8260C	4-Methyl-2-pentanone	ug/kg	21	U	21	U
SW8260C	Acetic acid, methyl ester	ug/kg	43	U	42	U
SW8260C	Acetone	ug/kg	210	U	210	U
SW8260C	Benzene	ug/kg	4.3	U	4.2	U
SW8260C	Bromobenzene	ug/kg	4.3	U	4.2	U
SW8260C	Bromochloromethane	ug/kg	4.3	U	4.2	U

Notes

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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-712		SB-712	
		Sample Date	11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Sample Depth (ft bgs)	37 - 38		23 - 24	
		Qc Code	FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier
SW8260C	Bromochloromethane	ug/kg	4.3	U	4.2	U
SW8260C	Bromodichloromethane	ug/kg	4.3	U	4.2	U
SW8260C	Bromoform	ug/kg	4.3	U	4.2	U
SW8260C	Bromomethane	ug/kg	4.3	U	4.2	U
SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	4.3	U	4.2	U
SW8260C	Carbon disulfide	ug/kg	4.3	U	4.2	U
SW8260C	Carbon tetrachloride	ug/kg	4.3	U	4.2	U
SW8260C	Chlorobenzene	ug/kg	4.3	U	4.2	U
SW8260C	Chloroethane	ug/kg	4.3	U	4.2	U
SW8260C	Chloroform	ug/kg	4.3	U	4.2	U
SW8260C	Chloromethane	ug/kg	4.3	U	4.2	U
SW8260C	cis-1,2-Dichloroethene	ug/kg	4.3	U	4.2	U
SW8260C	cis-1,3-Dichloropropene	ug/kg	4.3	U	4.2	U
SW8260C	Cyclohexane	ug/kg	21	U	21	U
SW8260C	Dibromochloromethane	ug/kg	4.3	U	4.2	U
SW8260C	Dibromomethane	ug/kg	4.3	U	4.2	U
SW8260C	Dichlorodifluoromethane	ug/kg	4.3	U	4.2	U
SW8260C	Diethyl ether	ug/kg	4.3	U	4.2	U
SW8260C	Ethyl-t-Butyl Ether	ug/kg	4.3	U	4.2	U
SW8260C	Ethylbenzene	ug/kg	4.3	U	4.2	U
SW8260C	Hexachlorobutadiene	ug/kg	4.3	U	4.2	U
SW8260C	Isopropyl ether	ug/kg	4.3	U	4.2	U
SW8260C	Isopropylbenzene	ug/kg	4.3	U	4.2	U
SW8260C	Methyl cyclohexane	ug/kg	4.3	U	4.2	U
SW8260C	Methyl Tertbutyl Ether	ug/kg	4.3	U	4.2	U
SW8260C	Methylene chloride	ug/kg	20	U	23	U
SW8260C	n-Butylbenzene	ug/kg	4.3	U	4.2	U
SW8260C	Naphthalene	ug/kg	21	U	21	U
SW8260C	Propylbenzene	ug/kg	4.3	U	4.2	U
SW8260C	sec-Butylbenzene	ug/kg	4.3	U	4.2	U
SW8260C	Styrene	ug/kg	4.3	U	4.2	U
SW8260C	tert-Butylbenzene	ug/kg	4.3	U	4.2	U
SW8260C	Tetrachloroethene	ug/kg	4.3	U	4.2	U
SW8260C	Tetrahydrofuran	ug/kg	43	U	42	U
SW8260C	Toluene	ug/kg	4.3	U	4.2	U
SW8260C	trans-1,2-Dichloroethene	ug/kg	4.3	U	4.2	U
SW8260C	trans-1,3-Dichloropropene	ug/kg	4.3	U	4.2	U
SW8260C	Trichloroethene	ug/kg	4.3	U	4.2	U
SW8260C	Trichlorofluoromethane	ug/kg	4.3	U	4.2	U
SW8260C	Vinyl chloride	ug/kg	4.3	U	4.2	U
SW8260C	Xylene, o	ug/kg	4.3	U	4.2	U
SW8260C	Xylenes (m&p)	ug/kg	4.3	U	4.2	U
SW8260C	Xylenes, Total	ug/kg	4.3	U	4.2	U

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Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-712		SB-712	
		Sample Date	11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Sample Depth (ft bgs)	37 - 38		23 - 24	
		Qc Code	FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier
SVOCs						
SW8270D	1,2,4,5-Tetrachlorobenzene	ug/kg	35	U	36	U
SW8270D	1-Methylnaphthalene	ug/kg	7.2	U	7.3	U
SW8270D	2,2'-Dichlorodiisopropylether	ug/kg	7.2	U	7.3	U
SW8270D	2,3,4,6-Tetrachlorophenol	ug/kg	35	U	36	U
SW8270D	2,4,5-Trichlorophenol	ug/kg	35	U	36	U
SW8270D	2,4,6-Trichlorophenol	ug/kg	35	U	36	U
SW8270D	2,4-Dichlorophenol	ug/kg	7.2	U	7.3	U
SW8270D	2,4-Dimethylphenol	ug/kg	35	U	36	U
SW8270D	2,4-Dinitrophenol	ug/kg	350	U	360	U
SW8270D	2,4-Dinitrotoluene	ug/kg	35	U	36	U
SW8270D	2,6-Dinitrotoluene	ug/kg	35	U	36	U
SW8270D	2-Chloronaphthalene	ug/kg	7.2	U	7.3	U
SW8270D	2-Chlorophenol	ug/kg	35	U	36	U
SW8270D	2-Methylnaphthalene	ug/kg	7.2	U	7.3	U
SW8270D	2-Methylphenol	ug/kg	35	U	36	U
SW8270D	2-Nitroaniline	ug/kg	180	U	190	U
SW8270D	2-Nitrophenol	ug/kg	35	U	36	U
SW8270D	3 & 4 Methylphenol	ug/kg	35	U	36	U
SW8270D	3,3'-Dichlorobenzidine	ug/kg	35	U	36	U
SW8270D	3-Nitroaniline	ug/kg	180	U	190	U
SW8270D	4,6-Dinitro-2-methylphenol	ug/kg	180	U	190	U
SW8270D	4-Bromophenyl phenyl ether	ug/kg	35	U	36	U
SW8270D	4-Chloro-3-methylphenol	ug/kg	35	U	36	U
SW8270D	4-Chloroaniline	ug/kg	35	U	36	U
SW8270D	4-Chlorophenyl phenyl ether	ug/kg	35	U	36	U
SW8270D	4-Nitroaniline	ug/kg	180	U	190	U
SW8270D	4-Nitrophenol	ug/kg	180	U	190	U
SW8270D	Acenaphthene	ug/kg	7.2	U	7.3	U
SW8270D	Acenaphthylene	ug/kg	7.2	U	7.3	U
SW8270D	Acetophenone	ug/kg	72	U	73	U
SW8270D	Aniline	ug/kg	35	U	36	U
SW8270D	Anthracene	ug/kg	7.2	U	7.3	U
SW8270D	Atrazine	ug/kg	72	U	73	U
SW8270D	Azobenzene	ug/kg	360	U	360	U
SW8270D	Benzaldehyde	ug/kg	72	U	73	U
SW8270D	Benzo(a)anthracene	ug/kg	7.2	U	7.3	U
SW8270D	Benzo(a)pyrene	ug/kg	7.2	U	7.3	U
SW8270D	Benzo(b)fluoranthene	ug/kg	7.2	U	7.3	U
SW8270D	Benzo(ghi)perylene	ug/kg	7.2	U	7.3	U
SW8270D	Benzo(k)fluoranthene	ug/kg	7.2	U	7.3	U
SW8270D	Benzoic Acid	ug/kg	180	U	190	U
SW8270D	Benzyl alcohol	ug/kg	35	U	36	U
SW8270D	Biphenyl	ug/kg	35	U	36	U
SW8270D	Bis(2-Chloroethoxy)methane	ug/kg	35	U	36	U
SW8270D	Bis(2-Chloroethyl)ether	ug/kg	7.2	U	7.3	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 2 - VOCs/SVOCs
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-712		SB-712	
		Sample Date	11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Sample Depth (ft bgs)	37 - 38		23 - 24	
		Qc Code	FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier
SW8270D	Bis(2-Ethylhexyl)phthalate	ug/kg	350	U	360	U
SW8270D	Butylbenzylphthalate	ug/kg	35	U	36	U
SW8270D	Caprolactam	ug/kg	180	U	190	U
SW8270D	Carbazole	ug/kg	7.2	U	7.3	U
SW8270D	Chrysene	ug/kg	7.2	U	7.3	U
SW8270D	Di-n-butylphthalate	ug/kg	35	U	36	U
SW8270D	Di-n-octylphthalate	ug/kg	35	U	36	U
SW8270D	Dibenz(a,h)anthracene	ug/kg	7.2	U	7.3	U
SW8270D	Dibenzofuran	ug/kg	35	U	36	U
SW8270D	Diethylphthalate	ug/kg	35	U	36	U
SW8270D	Dimethylphthalate	ug/kg	35	U	36	U
SW8270D	Fluoranthene	ug/kg	7.2	U	7.3	U
SW8270D	Fluorene	ug/kg	7.2	U	7.3	U
SW8270D	Hexachlorobenzene	ug/kg	7.2	U	7.3	U
SW8270D	Hexachlorocyclopentadiene	ug/kg	35	U	36	U
SW8270D	Hexachloroethane	ug/kg	35	U	36	U
SW8270D	Indeno(1,2,3-cd)pyrene	ug/kg	7.2	U	7.3	U
SW8270D	Isophorone	ug/kg	35	U	36	U
SW8270D	N-Nitrosodi-n-propylamine	ug/kg	7.2	U	7.3	U
SW8270D	N-Nitrosodimethylamine	ug/kg	35	U	36	U
SW8270D	N-Nitrosodiphenylamine	ug/kg	35	U	36	U
SW8270D	Nitrobenzene	ug/kg	72	U	73	U
SW8270D	Pentachlorophenol	ug/kg	180	U	190	U
SW8270D	Phenanthrene	ug/kg	7.2	U	2.1	J
SW8270D	Phenol	ug/kg	35	U	36	U
SW8270D	Phthalic anhydride	ug/kg	11000	UJ	11000	UJ
SW8270D	Pyrene	ug/kg	7.2	U	7.3	U
SW8270D	Pentachlorophenol	ug/kg	180	U	190	U
SW8270D	Phenanthrene	ug/kg	7.2	U	2.1	J
SW8270D	Phenol	ug/kg	35	U	36	U
SW8270D	Phthalic anhydride	ug/kg	11000	U	11000	U
SW8270D	Pyrene	ug/kg	7.2	U	7.3	U

Notes

Units:
ug/kg = micrograms per kilogram

Lab Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 3 - Metals/DMF/Hydrazine/Aldehydes/Inorganics
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-701		SB-701		SB-701		SB-701		SB-701		SB-701		SB-701	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX		OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX	
		Sample Depth (ft bgs)	0 - 2		0 - 2		8 - 10		6 - 8		4 - 6		2 - 4		31 - 32		20 - 21	
		Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Total Metals																		
SW6010D	Aluminum	mg/kg	8200		9900		3400		4000		4700		7400		13000		5200	
SW6010D	Antimony	mg/kg	0.53	J-	0.63	J-	19	U	17	U	18	U	17	U	0.85	J	1.1	J
SW6010D	Arsenic	mg/kg	10		8.6		3.5		1.9	J	0.76	J	7.3		2.4		11	
SW6010D	Barium	mg/kg	49	J+	71	J+	9.9		7.5		7		46		58		16	
SW6010D	Beryllium	mg/kg	0.34		0.46	J	0.16	J	0.18	J	0.16	J	0.33		0.58	J	0.31	
SW6010D	Cadmium	mg/kg	0.35		0.37		0.25	U	0.22	U	0.24	U	0.17	J	0.22	U	0.23	U
SW6010D	Calcium	mg/kg	24000		28000		1100		1100		2100		44000		7500		1300	
SW6010D	Chromium	mg/kg	120	J+	72	J+	12		14		8.1		200		460		580	
SW6010D	Chromium, Hexavalent	mg/kg	2.5		2.8		0.98		0.73		0.66		3.7		22.6		8.9	
SW6010D	Cobalt	mg/kg	5.2		3.9		3		1.4		1.1		3.5		11		2.1	
SW6010D	Copper	mg/kg	9.9		10		2.9		1.6		0.75	J	8.2		27		7.7	
SW6010D	Iron	mg/kg	11000		10000		4700		3700		3200		8800		22000		15000	
SW6010D	Lead	mg/kg	12		11		1.9		1.9		2.5		7.8		3.7		3.8	
SW6010D	Magnesium	mg/kg	2900	J+	3700	J+	1200		1200		1000		2400		8700		1600	
SW6010D	Manganese	mg/kg	150	J	180	J	45		41		50		120		340		100	
SW6010D	Mercury	mg/kg	0.036		0.031	J	0.024	U	0.023	U	0.024	U	0.069		0.02	U	0.022	U
SW6010D	Nickel	mg/kg	11		11		6.3		5.2	J	4.1	J	11		15		7.3	
SW6010D	Potassium	mg/kg	1100	J+	1200	J+	530		400		340		920		4100		550	
SW6010D	Selenium	mg/kg	4.9	U	4.8	U	5	U	4.4	U	4.9	U	4.4	U	4.4	U	4.6	U
SW6010D	Silver	mg/kg	0.73	U	0.72	U	0.75	U	0.67	U	0.73	U	0.66	U	0.66	U	0.69	U
SW6010D	Sodium	mg/kg	130	J	150	J	73	J	75	J	97	J	160		1100		240	
SW6010D	Thallium	mg/kg	7.3	U	7.2	U	7.5	U	6.7	U	7.3	U	6.6	U	6.6	U	6.9	U
SW6010D	Tin	mg/kg	1.1	J	0.72	J	2.5	U	2.2	U	2.4	U	1.1	J	0.69	J	0.61	J
SW7199	Vanadium	mg/kg	18	J+	19	J+	6.6		6		6.1		16		58		21	
SW7471A	Zinc	mg/kg	28	J+	26	J+	10		8.4		7		27		36		12	
DMF																		
SW8033M	Dimethylformamide	mg/kg	0.18	U	0.18	U	0.16	U	0.15	U	0.22	U	0.2	U	0.17	U	0.17	U
Hydrazine/Aldehydes																		
SW8315A	Formaldehyde	ug/kg	2500	UJ	2500	UJ	2400	UJ	2300	UJ	1500	J	1600	J	5300	J	2200	UJ
SW8315A MOD	Hydrazine	ng/g	5.7	J	5.3	J	2.2	J	1.7	J	2.8	J	11		5.3	U	1.8	J
SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	6.1	U	6.1	U	6.2	U	5.9	U	6	U	6	U	5.3	U	6.1	U
SW8315A MOD	UDMH	ng/g	6.1	U	6.1	U	6.2	U	5.9	U	6	U	6	U	5.3	U	6.1	U
Inorganics																		
E300	Chloride	mg/kg	12	UJ	12	UJ	12	UJ	11	UJ	12	UJ	11	UJ	390	J	11	UJ
E300	Sulfate	mg/kg	13000	J	12000	J	250	J	130	J	230	J	15000	J	3900	J	190	J
E350.1	Ammonia	mg/kg	6.5		4.7		27		21		35		28		210		25	
Field Parameters																		
D1498	Oxidation Reduction Potential	mV	399		415		356		347		352		367		373		356	

Notes

Units:
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
ng/g = nanogram per gram
mV = millivolts

Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 3 - Metals/DMF/Hydrazine/Aldehydes/Inorganics
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-702		SB-702		SB-703	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/5/2019	
		Sample ID	OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX		OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX	
		Sample Depth (ft bgs)	0 - 2		2 - 4		4 - 6		6 - 8		8 - 10		34 - 35		28 - 29		0 - 2	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Total Metals																		
SW6010D	Aluminum	mg/kg	9200		9000		11000		10000		6300		11000		3700		9000	
SW6010D	Antimony	mg/kg	17	U	16	U	17	U	16	U	0.55	J	0.74	J	18	U	20	U
SW6010D	Arsenic	mg/kg	5.1		7.6		9.7		11		26		3.8		6.5		13	
SW6010D	Barium	mg/kg	46		33		41		41		29		41		24		89	J
SW6010D	Beryllium	mg/kg	0.5		0.44		0.65		0.55		0.28		5.9		0.15	J	0.39	
SW6010D	Cadmium	mg/kg	0.036	J	0.21	U	0.22	U	0.22	U	0.23	U	0.22	U	0.23	U	0.3	J
SW6010D	Calcium	mg/kg	14000		3800		2800		2300		1400		5000		2200		92000	
SW6010D	Chromium	mg/kg	32		20		34		42		22		580		64		180	
SW6010D	Chromium, Hexavalent	mg/kg	1.6		0.98		0.71		0.55		0.44	U	7.5		1		5.8	
SW6010D	Cobalt	mg/kg	5.6		4.1		6.5		6		7		13		3.2		3.5	
SW6010D	Copper	mg/kg	8.2		9.3		9.4		12		9.5		29		7		9.2	
SW6010D	Iron	mg/kg	13000		9800		13000		13000		15000		20000		8000		9200	
SW6010D	Lead	mg/kg	12		22		7.4		14		9.3		5		10		9.7	
SW6010D	Magnesium	mg/kg	4000		2600		3900		4500		3600		6300		1700		2500	
SW6010D	Manganese	mg/kg	270		130		200		200		250		220		72		110	
SW6010D	Mercury	mg/kg	0.041		0.11		0.011	J	0.02	J	0.022	U	0.021	U	0.022	U	0.037	
SW6010D	Nickel	mg/kg	8.2		10		23		23		31		15		3.8	J	8.9	
SW6010D	Potassium	mg/kg	1300		1400		1800		1800		1500		2100		1100		980	
SW6010D	Selenium	mg/kg	4.6	U	4.3	U	0.61	J	4.4	U	4.6	U	4.4	U	0.54	J	5.3	U
SW6010D	Silver	mg/kg	0.69	U	0.64	U	0.66	U	0.65	U	0.68	U	0.66	U	0.7	U	0.8	U
SW6010D	Sodium	mg/kg	220		130	J	160		130	J	110	J	340		200		160	J
SW6010D	Thallium	mg/kg	6.9	U	6.4	U	6.6	U	6.5	U	6.8	U	6.6	U	7	U	8	U
SW6010D	Tin	mg/kg	0.91	J	0.69	J	0.82	J	1.2	J	0.62	J	0.61	J	2.3	U	1.1	J
SW7199	Vanadium	mg/kg	25		18		23		22		16		58		17		16	
SW7471A	Zinc	mg/kg	30		28		28		33		26		32		11		22	
DMF																		
SW8033M	Dimethylformamide	mg/kg	0.16	U	0.16	U	0.17	U	0.15	U	0.14	U	0.14	U	0.17	U	0.18	U
Hydrazine/Aldehydes																		
SW8315A	Formaldehyde	ug/kg	2300	U	1500	J	2200	UJ	2200	UJ	2200	UJ	2200	UJ	2300	UJ	1800	J
SW8315A MOD	Hydrazine	ng/g	5.8	U	1.5	J	5.4	U	5.5	U	2.1	J	5.5	U	5.5		6.7	U
SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	5.8	U	5.3	U	5.4	U	5.5	U	5.4	U	5.5	U	5.3	U	6.7	U
SW8315A MOD	UDMH	ng/g	5.8	U	5.3	U	5.4	U	5.5	U	5.4	U	5.5	U	5.3	U	6.7	U
Inorganics																		
E300	Chloride	mg/kg	9.3	J	10	UJ	11	UJ	11	UJ	10	U	5.8	J	5.3	J	5.4	J
E300	Sulfate	mg/kg	610	J	3000	J	6100	J	730	J	180		1000		140		18000	
E350.1	Ammonia	mg/kg	4	J	6		6		7.8		13		41		11		7	
Field Parameters																		
D1498	Oxidation Reduction Potential	mV	204		320		419		411		344		373		326		266	

Notes

Units:
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ug/kg = micrograms per kilogram
ng/g = nanogram per gram
mV = millivolts

Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
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Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 3 - Metals/DMF/Hydrazine/Aldehydes/Inorganics
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-703		SB-703		SB-703		SB-703		SB-703		SB-703		SB-703		SB-704	
		Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/7/2019	
		Sample ID	OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX	
		Sample Depth (ft bgs)	2 - 4		2 - 4		4 - 6		6 - 8		8 - 10		17 - 18		30 - 32		0 - 2	
		Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Total Metals																		
SW6010D	Aluminum	mg/kg	6700	J+	6500	J+	4700		4600		6100		1100		4800		7700	
SW6010D	Antimony	mg/kg	18	U	18	U	19	U	18	U	16	U	17	U	17	U	19	U
SW6010D	Arsenic	mg/kg	4.7		4.1		3.4		7.5		4.2		0.91	J	3.3		17	
SW6010D	Barium	mg/kg	15	J-	12	J-	11	J	10	J	15	J	20	J	14	J	61	
SW6010D	Beryllium	mg/kg	0.24		0.21	J	0.19	J	0.22	J	0.3		0.059	J	0.14	J	0.38	
SW6010D	Cadmium	mg/kg	0.11	J	0.06	J	0.26	U	0.25	U	0.22	U	0.044	J	0.23	U	0.45	
SW6010D	Calcium	mg/kg	6300	J+	5900	J+	3800		2000		1200		4800		5400		110000	
SW6010D	Chromium	mg/kg	20	J+	14	J+	6.8		9.9		52		10		190		140	
SW6010D	Chromium, Hexavalent	mg/kg	2.3	J	0.7	J	0.29	J	0.37	J	3.2		0.41	J	9.8		4.1	
SW6010D	Cobalt	mg/kg	2.6		2.2		2.4		2.4		2.8		0.62		4.3		3.7	
SW6010D	Copper	mg/kg	5.3	J	2.9	J	2.1		2.9		7.3		0.5	J	19		8.5	
SW6010D	Iron	mg/kg	6400	J+	5000	J+	5200		7900		7600		1400		11000		10000	
SW6010D	Lead	mg/kg	6.4		3.6		2.3		2.6		3.6		1.6		3		8.3	
SW6010D	Magnesium	mg/kg	1300	J+	1100	J+	1100		1800		1800		250		3100		2300	
SW6010D	Manganese	mg/kg	76	J+	63	J+	61		89		73		32		110		93	
SW6010D	Mercury	mg/kg	0.025		0.032		0.024	U	0.025	U	0.022	U	0.021	U	0.008	J	0.035	
SW6010D	Nickel	mg/kg	8		7		4.6	J	7.3		7.5		0.9	J	5.4	J	8.6	
SW6010D	Potassium	mg/kg	660		550		430		580		670		330		820		770	
SW6010D	Selenium	mg/kg	4.7	U	4.9	U	5.2	U	4.9	U	4.3	U	4.6	U	4.5	U	5	U
SW6010D	Silver	mg/kg	0.71	U	0.73	U	0.77	U	0.74	U	0.65	U	0.68	U	0.68	U	0.75	U
SW6010D	Sodium	mg/kg	170	U	170	U	180	U	170	U	150	U	160	U	260		190	
SW6010D	Thallium	mg/kg	7.1	U	7.3	U	7.7	U	7.4	U	6.5	U	6.8	U	6.8	U	7.5	U
SW6010D	Tin	mg/kg	0.73	J	2.4	U	2.6	U	2.5	U	2.2	U	2.3	U	2.3	U	0.97	J
SW7199	Vanadium	mg/kg	9.7		8.4		7.8		8.9		12		3.6		27		18	
SW7471A	Zinc	mg/kg	29		24		10		11		17		2.9		15		22	
DMF																		
SW8033M	Dimethylformamide	mg/kg	0.19	U	0.2	U	0.2	U	0.2	U	0.2	U	0.18	U	0.19	U	0.26	U
Hydrazine/Aldehydes																		
SW8315A	Formaldehyde	ug/kg	4900	J	2900	J	2500	U	2500	U	2200	U	2200	U	1300	J	2500	U
SW8315A MOD	Hydrazine	ng/g	4.2	J	7.4	J	6.6	U	5.8	U	5.8	U	5.8	U	9.4		86	
SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	6.4	U	5.8	U	6.6	U	5.8	UJ	5.8	UJ	5.8	U	5.6	U	7	UJ
SW8315A MOD	UDMH	ng/g	6.4	U	5.8	U	6.6	U	5.8	U	5.8	U	5.8	U	5.6	U	7	U
Inorganics																		
E300	Chloride	mg/kg	11	U	12	U	12	U	5.8	J	9.2	J	11	U	210		4.7	J
E300	Sulfate	mg/kg	16000		10000		430		180		160		16000		1300		18000	J
E350.1	Ammonia	mg/kg	10		12		7.9		10		10		5.1		130		15	
Field Parameters																		
D1498	Oxidation Reduction Potential	mV	263		321		326		322		320		313		334		260	

Notes

Units:
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
ng/g = nanogram per gram
mV = millivolts

Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 3 - Metals/DMF/Hydrazine/Aldehydes/Inorganics
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-704		SB-704		SB-704		SB-704		SB-704		SB-704		SB-704		SB-705	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/8/2019	
		Sample ID	OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX		OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX	
		Sample Depth (ft bgs)	2 - 4		4 - 6		6 - 8		8 - 10		12 - 13		33 - 34		19 - 20		0 - 2	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Total Metals																		
SW6010D	Aluminum	mg/kg	5600		4800		15000		9200		5200		3500		6800		5100	
SW6010D	Antimony	mg/kg	18	U	16	U	16	U	16	U	17	U	17	U	17	U	17	U
SW6010D	Arsenic	mg/kg	5.4		4.8		11		7.8		3.1		4.5		14		14	
SW6010D	Barium	mg/kg	11		12		79		37		18		10		22		12	
SW6010D	Beryllium	mg/kg	0.27		0.17	J	0.67	J	0.5	J	0.18	J	0.16	J	0.33		0.28	
SW6010D	Cadmium	mg/kg	0.058	J	0.22	U	0.21	U	0.21	U	0.22	U	0.039	J	0.22	U	0.17	J
SW6010D	Calcium	mg/kg	3700		2200		2100		1800		2100		2400		1700		1200	
SW6010D	Chromium	mg/kg	8.6		13		63		97		58		300		310		13	
SW6010D	Chromium, Hexavalent	mg/kg	0.49	U	0.46	U	2.4		5.3		1.3		6.3		4.1		0.46	U
SW6010D	Cobalt	mg/kg	2.2		2.3		6.1		4.4		2.9		3.6		7.1		1.9	
SW6010D	Copper	mg/kg	0.84	J	3.9		14		11		4.8		12		17		4.5	
SW6010D	Iron	mg/kg	3800		6200		20000		13000		9600		5300		17000		6400	
SW6010D	Lead	mg/kg	3.1		2.7		5.9		5.2		4.1		2.1		4.2		3.9	
SW6010D	Magnesium	mg/kg	820		1700		5200		3100		2500		1600		2800		1600	
SW6010D	Manganese	mg/kg	31		68		210		130		91		98		120		83	
SW6010D	Mercury	mg/kg	0.023	U	0.022	U	0.021	U	0.02	U	0.01	J	0.022	U	0.022	U	0.022	U
SW6010D	Nickel	mg/kg	4.7	J	7.8		18		11		7		6.9		14		6.1	
SW6010D	Potassium	mg/kg	410		640		4300		1700		740		460		1300		650	
SW6010D	Selenium	mg/kg	4.7	U	4.4	U	4.3	U	4.2	U	4.4	U	4.6	U	4.5	U	0.52	J
SW6010D	Silver	mg/kg	0.71	U	0.66	U	0.64	U	0.64	U	0.66	U	0.69	U	0.67	U	0.69	U
SW6010D	Sodium	mg/kg	80	J	130	J	280		240		100	J	2600		110	J	90	J
SW6010D	Thallium	mg/kg	7.1	U	6.6	U	6.4	U	6.4	U	6.6	U	6.9	U	6.7	U	6.9	U
SW6010D	Tin	mg/kg	0.51	J	2.2	U	0.92	J	0.59	J	2.2	U	2.3	U	0.66	J	0.52	J
SW7199	Vanadium	mg/kg	7.5		9.4		34		21		14		9.3		26		9.3	
SW7471A	Zinc	mg/kg	10		13		42		27		15		8.6		24		11	
DMF																		
SW8033M	Dimethylformamide	mg/kg	0.18	U	0.18	U	0.15	U	0.18	U	0.16	U	0.14	U	0.16	U	0.17	U
Hydrazine/Aldehydes																		
SW8315A	Formaldehyde	ug/kg	2700		2200	U	2200	U	1600	J	2100	U	1600	J	2200	U	1400	J
SW8315A MOD	Hydrazine	ng/g	19		1.3	J	5.5	U	1.7	J	5.3	U	5.6	U	5.7	U	5.6	U
SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	6	UJ	5.7	U	5.5	U	5.3	U	5.3	UJ	5.6	U	5.7	UJ	5.6	U
SW8315A MOD	UDMH	ng/g	6	U	5.7	U	5.5	U	5.3	U	5.3	U	5.6	U	5.7	U	5.6	U
Inorganics																		
E300	Chloride	mg/kg	11	UJ	11	UJ	11	UJ	4.8	J	10	UJ	1300	J	11	UJ	11	UJ
E300	Sulfate	mg/kg	16000	J	760	J	530	J	150	J	68	J	6100	J	270	J	77	J
E350.1	Ammonia	mg/kg	44		40		46		41		29		620		40		3.8	J
Field Parameters																		
D1498	Oxidation Reduction Potential	mV	345		215		268		293		271		319		420		334	

Notes

Units:
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ug/kg = micrograms per kilogram
ng/g = nanogram per gram
mV = millivolts

Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 3 - Metals/DMF/Hydrazine/Aldehydes/Inorganics
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-705		SB-705		SB-705		SB-705		SB-705		SB-705		SB-706		SB-706	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX		OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX	
		Sample Depth (ft bgs)	2 - 4		4 - 6		4 - 6		6 - 8		8 - 10		17 - 18		0 - 2		2 - 4	
		Qc Code	FS		FD		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Total Metals																		
SW6010D	Aluminum	mg/kg	5400		5700	J+	5900	J+	3700		5800		9700		5000		13000	
SW6010D	Antimony	mg/kg	17	U	19	U	20	U	17	U	16	U	17	U	0.63	J	1.1	J
SW6010D	Arsenic	mg/kg	7.1		7.1		6.6		6.5		4.4		3.6		11		7.6	
SW6010D	Barium	mg/kg	17		15		16		9.3		23		52		16		43	
SW6010D	Beryllium	mg/kg	0.22		0.24	J	0.23	J	0.14	J	0.34	J	0.4	J	0.27		0.39	
SW6010D	Cadmium	mg/kg	0.26		0.43		0.45		0.23	U	0.21	U	0.22	U	0.5		0.22	U
SW6010D	Calcium	mg/kg	1600		3500	J+	3600	J+	1200		1800		3300		1600		3500	
SW6010D	Chromium	mg/kg	21		130	J	77	J	410		250		330		19		200	
SW6010D	Chromium, Hexavalent	mg/kg	1.1		2.7	J	1.5	J	7.4		9.9		4.2		0.95		2.9	
SW6010D	Cobalt	mg/kg	2.4		2.4		2.9		2.1		3.9		7.4		2.2		9.1	
SW6010D	Copper	mg/kg	5		6.4		5.5		5		11		20		5.7		27	
SW6010D	Iron	mg/kg	6100		7100	J+	7700	J+	4900		9000		16000		7000		16000	
SW6010D	Lead	mg/kg	6.3		8.9		7.9		2.2		3.2		3		4.7		8.2	
SW6010D	Magnesium	mg/kg	1800		1500		1900		920		2500		6900		1700		6200	
SW6010D	Manganese	mg/kg	60		88	J+	98	J+	55		100		170		87		210	
SW6010D	Mercury	mg/kg	0.028		0.031		0.026	J	0.022	U	0.022	U	0.02	U	0.011	J	0.09	
SW6010D	Nickel	mg/kg	7.6		6.9		8.1		4.7	J	11		17		6.3		23	
SW6010D	Potassium	mg/kg	970		570		700		380		950		2600		750		2000	
SW6010D	Selenium	mg/kg	4.5	U	5	U	5.5	U	0.79	J	4.3	U	4.5	U	0.82	J	4.4	U
SW6010D	Silver	mg/kg	0.67	U	0.74	U	0.82	U	0.68	U	0.64	U	0.67	U	0.66	U	0.66	U
SW6010D	Sodium	mg/kg	60	J	58	J	67	J	69	J	140	J	170		82	J	220	
SW6010D	Thallium	mg/kg	6.7	U	7.4	U	8.2	U	6.8	U	6.4	U	6.7	U	6.6	U	6.6	U
SW6010D	Tin	mg/kg	2.2	U	0.57	J	0.69	J	2.3	U	2.1	U	0.53	J	0.59	J	0.78	J
SW7199	Vanadium	mg/kg	10		11		12		7		16		34		10		40	
SW7471A	Zinc	mg/kg	25		22		22		7.5		18		25		14		27	
DMF																		
SW8033M	Dimethylformamide	mg/kg	0.17	U	0.17	U	0.2	U	0.15	U	0.2	U	0.19	U	0.2	U	0.18	U
Hydrazine/Aldehydes																		
SW8315A	Formaldehyde	ug/kg	2200	U	7200	J	5400	J	1500	J	2200	UJ	2200	UJ	2300	UJ	2200	UJ
SW8315A MOD	Hydrazine	ng/g	5.6	U	5.8	UJ	1.7	J	5.5	U	5.8	U	5.7	U	5.4	U	5.7	U
SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	5.6	U	5.8	UJ	5.8	UJ	5.5	U	5.8	U	5.7	U	5.4	U	5.7	U
SW8315A MOD	UDMH	ng/g	5.6	U	5.8	U	5.8	U	5.5	U	5.8	U	5.7	U	5.4	U	5.7	U
Inorganics																		
E300	Chloride	mg/kg	11	UJ	12	U	13	U	11	U	11	U	5.4	J	11	UJ	11	UJ
E300	Sulfate	mg/kg	1400	J	3400	J	3400	J	160		190		200	J	1000	J-	410	J
E350.1	Ammonia	mg/kg	5.8		11		7.5		8.2		29		39		10		14	
Field Parameters																		
D1498	Oxidation Reduction Potential	mV	358		373		385		355		351		385		337		275	

Notes

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ng/g = nanogram per gram
mV = millivolts

Qualifiers:
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UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 3 - Metals/DMF/Hydrazine/Aldehydes/Inorganics
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-707		SB-707		SB-707	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX		OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX		OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX	
		Sample Depth (ft bgs)	4 - 6		6 - 8		10 - 12		20 - 22		26 - 27		0 - 2		2 - 4		4 - 6	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Total Metals																		
SW6010D	Aluminum	mg/kg	9000		11000		3800		5400		8100		8300		14000		6400	
SW6010D	Antimony	mg/kg	0.95	J	83	U	18	U	0.6	J	1.3	J	1	J	1.2	J	15	U
SW6010D	Arsenic	mg/kg	6.2		17		3.2		3.3		3.1		33		29		5	
SW6010D	Barium	mg/kg	34		41		10		25		42		28		55		16	
SW6010D	Beryllium	mg/kg	0.35		0.48		0.14	J	0.24		0.23		0.38		0.62		0.32	
SW6010D	Cadmium	mg/kg	0.23	U	0.22	U	0.24	U	0.22	U	0.22	U	0.18	J	0.22	U	0.051	J
SW6010D	Calcium	mg/kg	1700		3800		1500		770		3200		12000		3700		7000	
SW6010D	Chromium	mg/kg	890		1300		310		460		460		79		44		120	
SW6010D	Chromium, Hexavalent	mg/kg	6.6		20.8		3.6		4.7		5.6		2.7		1		7.6	
SW6010D	Cobalt	mg/kg	4.4		6.8		1.6		3.3		6.2		5.7		13		3.2	
SW6010D	Copper	mg/kg	11		25		3.5		9.9		39		11		22		12	
SW6010D	Iron	mg/kg	12000		23000		4500		11000		14000		16000		19000		7700	
SW6010D	Lead	mg/kg	5.6		21		3.4		3		3.8		11		14		4.8	
SW6010D	Magnesium	mg/kg	2700		4200		1100		1700		3900		3000		6400		3200	
SW6010D	Manganese	mg/kg	130		180		53		89		140		110		310		150	
SW6010D	Mercury	mg/kg	0.022	U	0.022	U	0.065		0.01	J	0.0089	J	0.042		0.022	U	0.0086	J
SW6010D	Nickel	mg/kg	12		17		4	J	7		12		15		40		13	
SW6010D	Potassium	mg/kg	1500		2000		460		730		1500		890		2700		750	
SW6010D	Selenium	mg/kg	4.6	U	4.4	U	4.8	U	4.4	U	4.3	U	5	U	4.4	U	4.1	U
SW6010D	Silver	mg/kg	0.68	U	0.66	U	0.71	U	0.66	U	0.65	U	0.75	U	0.66	U	0.62	U
SW6010D	Sodium	mg/kg	210		330		58	J	97	J	290		86	J	170		130	J
SW6010D	Thallium	mg/kg	6.8	U	6.6	U	7.1	U	6.6	U	6.5	U	7.5	U	6.6	U	6.2	U
SW6010D	Tin	mg/kg	2.3	U	0.81	J	2.4	U	2.2	U	2.2	U	0.61	J	0.84	J	2.1	U
SW7199	Vanadium	mg/kg	19		35		8.3		18		35		19		33		15	
SW7471A	Zinc	mg/kg	23		46		9.5		19		26		28		43		16	
DMF																		
SW8033M	Dimethylformamide	mg/kg	0.16	U	0.17	U	0.23	U	0.16	U	0.17	U	0.17	U	0.22	U	0.16	U
Hydrazine/Aldehydes																		
SW8315A	Formaldehyde	ug/kg	2200	UJ	2200	UJ	2400	J	2200	UJ	2200	UJ	3200	J	2200	UJ	2200	UJ
SW8315A MOD	Hydrazine	ng/g	5.6	U	5.5	U	6.1	U	5.6	U	5.6	U	5.6	J	2	J	9.3	
SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	5.6	U	5.5	U	6.1	U	5.6	U	5.6	U	6.1	U	5.8	U	5.4	U
SW8315A MOD	UDMH	ng/g	5.6	U	5.5	U	6.1	U	5.6	U	5.6	U	6.1	U	5.8	U	5.4	U
Inorganics																		
E300	Chloride	mg/kg	7	J	4.8	J	12	UJ	11	UJ	15	J	5.2	J	11	UJ	11	UJ
E300	Sulfate	mg/kg	120	J	160	J	290	J	66	J	140	J	170	J	2100	J	7100	J
E350.1	Ammonia	mg/kg	9.6		12		11		11		12		6		13		6.5	
Field Parameters																		
D1498	Oxidation Reduction Potential	mV	420		400		214		325		397		375		379		380	

Notes

Units:
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UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 3 - Metals/DMF/Hydrazine/Aldehydes/Inorganics
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-707		SB-707		SB-707		SB-707		SB-707		SB-708		SB-708		SB-708	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX	
		Sample Depth (ft bgs)	6 - 8		6 - 8		8 - 10		12 - 13		15 - 17		0 - 2		2 - 4		4 - 6	
		Qc Code	FD		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Total Metals																		
SW6010D	Aluminum	mg/kg	8200	J+	7400	J+	7700		14000		2700		8600		5200		11000	
SW6010D	Antimony	mg/kg	0.62	J-	0.65	J-	0.5	J	1	J	17	U	0.72	J	18	U	1.1	J
SW6010D	Arsenic	mg/kg	3.5		3.6		2.4		3.7		1.4	J	17		6.3		16	
SW6010D	Barium	mg/kg	26		26		25		60		15		54		16		47	
SW6010D	Beryllium	mg/kg	0.38		0.4		0.38		0.48		0.14	J	0.43		0.24		0.34	
SW6010D	Cadmium	mg/kg	0.21	U	0.22	U	0.23	U	0.23	U	0.22	U	0.035	J	0.16	J	0.036	J
SW6010D	Calcium	mg/kg	2700		2400		3300		4400		950		7900		2400		2300	
SW6010D	Chromium	mg/kg	84	J-	83	J-	72		170		100		26		40		40	
SW6010D	Chromium, Hexavalent	mg/kg	2.9		3.4		4.2		5.5		5.5		4.9		0.7		0.76	
SW6010D	Cobalt	mg/kg	3.7		3.2		3.8		6.2		1.2		5.8		2.8		7.4	
SW6010D	Copper	mg/kg	11		11		9.6		13		3.9		11		5.2		15	
SW6010D	Iron	mg/kg	10000		9500		7800		16000		4500		11000		5700		16000	
SW6010D	Lead	mg/kg	5.4		5.5		4.3		9.2		1.7		7.5		4.4		7.2	
SW6010D	Magnesium	mg/kg	2900		2500		2500		4900		960		3200		1700		7300	
SW6010D	Manganese	mg/kg	180	J+	160	J+	120		170		36		170		77		190	
SW6010D	Mercury	mg/kg	0.021	U	0.022	U	0.021	U	0.02	J	0.011	J	0.016	J	0.012	J	0.022	U
SW6010D	Nickel	mg/kg	10		8.9		9.8		19		3.2	J	18		9.5		33	
SW6010D	Potassium	mg/kg	1700		1400		1300		2600		710		1700		780		2800	
SW6010D	Selenium	mg/kg	4.2	U	4.4	U	4.5	U	4.5	U	4.5	U	4.2	U	4.7	U	4.6	U
SW6010D	Silver	mg/kg	0.63	U	0.66	U	0.68	U	0.68	U	0.67	U	0.63	U	0.71	U	0.7	U
SW6010D	Sodium	mg/kg	310		240		370		470		110	J	200		63	J	160	
SW6010D	Thallium	mg/kg	6.3	U	6.6	U	6.8	U	6.8	U	6.7	U	6.3	U	7.1	U	7	U
SW6010D	Tin	mg/kg	0.57	J	0.57	J	0.5	J	0.85	J	2.2	U	0.65	J	2.4	U	0.59	J
SW7199	Vanadium	mg/kg	19	J	17	J	15		32		8.6		18		9.9		28	
SW7471A	Zinc	mg/kg	23		21		15		40		7.8		22		17		35	
DMF																		
SW8033M	Dimethylformamide	mg/kg	0.16	U	0.15	U	0.14	U	0.19	U	0.18	U	0.2	U	0.21	U	0.18	U
Hydrazine/Aldehydes																		
SW8315A	Formaldehyde	ug/kg	2100	UJ	1300	J	1500	J	2300	UJ	2100	UJ	2200	UJ	2400	UJ	2200	UJ
SW8315A MOD	Hydrazine	ng/g	2.6	J	2.7	J	1.7	J	6.3	U	5.4	U	6.4		5.9	U	5.5	U
SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	5.4	U	5.3	U	5.5	U	6.3	U	5.4	U	6.2	UJ	5.9	UJ	5.5	UJ
SW8315A MOD	UDMH	ng/g	5.4	U	5.3	U	5.5	U	6.3	U	5.4	U	6.2	U	5.9	U	5.5	U
Inorganics																		
E300	Chloride	mg/kg	5.6	J	4.1	J	9.9	J	11	U	11	U	11	UJ	12	UJ	11	UJ
E300	Sulfate	mg/kg	150		130	J	190		53		46		430	J	590	J	190	J
E350.1	Ammonia	mg/kg	5.5	J-	5.6	J-	7.5		17		18		7.3	U	18		6.6	U
Field Parameters																		
D1498	Oxidation Reduction Potential	mV	361		362		402		351		340		85.5		257		280	

Notes

Units:
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
ng/g = nanogram per gram
mV = millivolts

Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 3 - Metals/DMF/Hydrazine/Aldehydes/Inorganics
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-708		SB-708		SB-708		SB-708		SB-708		SB-708		SB-709		SB-709	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX		OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX	
		Sample Depth (ft bgs)	6 - 8		8 - 10		16 - 18		28 - 30		33 - 34		22 - 24		0 - 2		2 - 4	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Total Metals																		
SW6010D	Aluminum	mg/kg	7300		12000		9500		2300		4800		8800		8400		5200	
SW6010D	Antimony	mg/kg	16	U	0.57	J	0.77	J	17	U	16	U	0.91	J	19	U	18	U
SW6010D	Arsenic	mg/kg	2.9		3.2		3.8		0.75	J	1.2	J	2.3		7.6		5.6	
SW6010D	Barium	mg/kg	23		45		15	J+	15		23		58		49	J	13	J
SW6010D	Beryllium	mg/kg	0.34		0.52		0.36		0.085	J	0.16	J	0.27		0.3		0.18	J
SW6010D	Cadmium	mg/kg	0.2	J	0.14	J	0.21	U	0.23	U	0.22	U	0.22	U	0.13	J	0.6	J
SW6010D	Calcium	mg/kg	3700		2900		1200	J+	910		1500		2300		11000		4600	
SW6010D	Chromium	mg/kg	18		31		150	J-	140		400		270		63		29	
SW6010D	Chromium, Hexavalent	mg/kg	0.72		0.8		2.6		7.9		6		11.4		2.2		1.2	
SW6010D	Cobalt	mg/kg	2.9		6.6		5.6		0.87		2.4		4		3.7		2.6	
SW6010D	Copper	mg/kg	10		17		15	J-	2		9.3		9		7.7		4.8	
SW6010D	Iron	mg/kg	6900		12000		14000		9200		7200		15000		10000		5900	
SW6010D	Lead	mg/kg	4.5		6.2		3		2		2.3		5.4		8.2		5	
SW6010D	Magnesium	mg/kg	2100		3800		5200	J-	1000		2500		4100		3100		1400	
SW6010D	Manganese	mg/kg	110		140		100	J-	42		90		140		150		53	
SW6010D	Mercury	mg/kg	0.019	U	0.019	U	0.022	U	0.021	U	0.012	J	0.021	U	0.022	J	0.042	
SW6010D	Nickel	mg/kg	9		19		17		2.8	J	8.6		12		10		7.4	
SW6010D	Potassium	mg/kg	1100		2400		1000	J+	1700		1400		3000		1000		540	
SW6010D	Selenium	mg/kg	4.4	U	4.1	U	1.3	J	4.6	U	4.3	U	0.61	J	5	U	4.7	U
SW6010D	Silver	mg/kg	0.66	U	0.61	U	0.63	U	0.69	U	0.65	U	0.65	U	0.75	U	0.7	U
SW6010D	Sodium	mg/kg	86	J	470		81	J	230		380		300		170	U	160	U
SW6010D	Thallium	mg/kg	6.6	U	6.1	U	6.3	U	6.9	U	6.5	U	6.5	U	7.5	U	7	U
SW6010D	Tin	mg/kg	0.52	J	0.96	J	2.1	U	2.3	U	2.2	U	0.68	J	2.5	U	0.5	J
SW7199	Vanadium	mg/kg	17		36		31	J-	9.1		16		33		16		10	
SW7471A	Zinc	mg/kg	23		37		23		7.2		15		26		21		18	
DMF																		
SW8033M	Dimethylformamide	mg/kg	0.21	U	0.21	U	0.19	U	0.23	U	0.19	U	0.22	U	0.2	U	0.21	U
Hydrazine/Aldehydes																		
SW8315A	Formaldehyde	ug/kg	2100	UJ	2100	UJ	2100	UJ	2300	UJ	1900	J	2200	UJ	2400	U	2100	J
SW8315A MOD	Hydrazine	ng/g	5.5	U	5.3	UJ	5.6	UJ	1.5	J	5.9	UJ	2.4	J	6.1	U	5.8	U
SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	5.5	UJ	5.3	UJ	5.6	UJ	6	UJ	5.9	UJ	5.7	UJ	6.1	UJ	5.8	UJ
SW8315A MOD	UDMH	ng/g	5.5	U	5.3	U	5.6	U	6	U	5.9	U	5.7	U	6.1	U	5.8	U
Inorganics																		
E300	Chloride	mg/kg	10	UJ	10	UJ	11	UJ	70	J	210	J	7.2	J	12	U	11	U
E300	Sulfate	mg/kg	1800	J	57	J	35	J	460	J	1200	J	100	J	1300		12000	
E350.1	Ammonia	mg/kg	15		9.9	U	8.5		62		150		17		4.1	J	7.6	
Field Parameters																		
D1498	Oxidation Reduction Potential	mV	306		298		307		323		318		313		415		413	

Notes

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ug/kg = micrograms per kilogram
ng/g = nanogram per gram
mV = millivolts

Qualifiers:
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U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 3 - Metals/DMF/Hydrazine/Aldehydes/Inorganics
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-709		SB-710		SB-710	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX		OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX	
		Sample Depth (ft bgs)	4 - 6		6 - 8		8 - 10		8 - 10		16 - 17		32 - 33		2 - 4		4 - 6	
		Qc Code	FS		FS		FD		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Total Metals																		
SW6010D	Aluminum	mg/kg	7500		5000		8300		10000		9700		12000		7300		5800	
SW6010D	Antimony	mg/kg	17	U	18	U	16	U	18	U	16	U	17	U	19	U	0.56	J
SW6010D	Arsenic	mg/kg	6		3.8		4.8		7		4.2		0.97	J	10		9.2	
SW6010D	Barium	mg/kg	21	J	12	J	46	J-	49	J-	81	J	53	J	43		24	
SW6010D	Beryllium	mg/kg	0.25	J	0.22	J	0.36	J	0.52		0.28	J	2.2	U	0.32		0.21	J
SW6010D	Cadmium	mg/kg	0.29	J	0.24	U	0.22	U	0.24	U	0.22	U	0.22	U	0.1	J	0.05	J
SW6010D	Calcium	mg/kg	4200		550		1500		2200		2800		8700		11000		2800	
SW6010D	Chromium	mg/kg	39		420		17		21		44		420		140		41	
SW6010D	Chromium, Hexavalent	mg/kg	1.7		8		0.7		0.74		3.9		6.7		2		1.2	
SW6010D	Cobalt	mg/kg	4.6		2.1		6.5		6.6		6.8		13		4.6		3.7	
SW6010D	Copper	mg/kg	11		5		9.2		11		9		29		14		7.5	
SW6010D	Iron	mg/kg	8100		5300		9900		13000		15000		21000		9900		8700	
SW6010D	Lead	mg/kg	6.2		5.7		5.7		7.1		4.7		5.7		7.4		4.4	
SW6010D	Magnesium	mg/kg	2600		1300		3000	J-	3300	J-	4500		10000		3000		3000	
SW6010D	Manganese	mg/kg	100		45		120	J-	130	J-	200		270		170		130	
SW6010D	Mercury	mg/kg	0.041		0.014	J	0.021	U	0.024	U	0.022	U	0.021	U	0.021	J	0.01	J
SW6010D	Nickel	mg/kg	14		7.1		14		13		14		60		14		14	
SW6010D	Potassium	mg/kg	1000		580		1800		1600		3500		2700		1700		1200	
SW6010D	Selenium	mg/kg	4.5	U	4.9	U	4.4	U	4.9	U	4.3	U	4.4	U	5.2	U	4.7	U
SW6010D	Silver	mg/kg	0.67	U	0.73	U	0.66	U	0.73	U	0.65	U	0.67	U	0.78	U	0.7	U
SW6010D	Sodium	mg/kg	160	U	170	U	150	U	150	J	160		870		250		130	J
SW6010D	Thallium	mg/kg	6.7	U	7.3	U	6.6	U	7.3	U	6.5	U	6.7	U	7.8	U	7	U
SW6010D	Tin	mg/kg	0.62	J	2.4	U	0.5	J	0.77	J	0.47	J	0.57	J	0.74	J	0.51	J
SW7199	Vanadium	mg/kg	16		8.2		18		23		28		53		18		13	
SW7471A	Zinc	mg/kg	20		17		24	J-	28	J-	35		39		28		19	
DMF																		
SW8033M	Dimethylformamide	mg/kg	0.2	U	0.19	U	0.18	U	0.18	U	0.18	U	0.2	U	0.23	U	0.21	U
Hydrazine/Aldehydes																		
SW8315A	Formaldehyde	ug/kg	2900	J	2400	UJ	2300	UJ	2300	UJ	3300	J	2300	J	2000	J	4000	J
SW8315A MOD	Hydrazine	ng/g	6.9	U	5.7	U	5.6	UJ	5.7	UJ	4.9	J	5.4	U	5.7	UJ	1.8	J
SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	6.9	UJ	5.7	UJ	5.6	UJ	5.7	UJ	5.6	UJ	5.4	UJ	5.7	UJ	5.8	UJ
SW8315A MOD	UDMH	ng/g	6.9	U	5.7	U	5.6	U	5.7	U	5.6	U	5.4	U	5.7	U	5.8	U
Inorganics																		
E300	Chloride	mg/kg	12	U	17		11	U	12	U	11	U	11	U	19	J	6.9	J
E300	Sulfate	mg/kg	63		150		140		110		890		320		3900	J	6400	J
E350.1	Ammonia	mg/kg	15		3.5	J	14	J	6.7	J	8.6		150		15		12	
Field Parameters																		
D1498	Oxidation Reduction Potential	mV	266		313		427		391		421		394		371		253	

Notes

Units:
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Qualifiers:
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U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

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Checked by: LLK 03/19/2020

Table 3 - Metals/DMF/Hydrazine/Aldehydes/Inorganics
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-710		SB-710		SB-710		SB-710		SB-711		SB-711		SB-711		SB-711	
		Sample Date	11/4/2019		11/4/2019		11/5/2019		11/5/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX		OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX	
		Sample Depth (ft bgs)	6 - 8		8 - 10		23 - 24		36 - 37		0 - 2		4 - 6		2 - 4		6 - 8	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Total Metals																		
SW6010D	Aluminum	mg/kg	2100		6500		3900		12000		8200		4000		8100	J	3100	
SW6010D	Antimony	mg/kg	17	U	17	U	19	U	1.2	J	0.64	J	17	U	0.45	J-	17	U
SW6010D	Arsenic	mg/kg	2.1	J	2	J	8.9		8.4		8.1		3.9		12		0.91	J
SW6010D	Barium	mg/kg	14		14		26		46		73		18		32		6.6	
SW6010D	Beryllium	mg/kg	0.08	J	0.27		0.17	J	0.35		0.34		0.16	J	0.36		0.11	J
SW6010D	Cadmium	mg/kg	0.04	J	1.9		0.25	U	0.21	U	0.34		9.3		2.5		0.79	
SW6010D	Calcium	mg/kg	1100		950		1500		6400		30000		1200		4100	J-	1000	
SW6010D	Chromium	mg/kg	10		12		310		740		95		28		63	J+	5.9	
SW6010D	Chromium, Hexavalent	mg/kg	0.79		0.61		8.5		7.3		5.1		0.49		0.74		0.18	J
SW6010D	Cobalt	mg/kg	0.79		3.2		2.1		15		3.9		1.5		5.4		0.92	
SW6010D	Copper	mg/kg	3.8		8.6		7		25		8.6		4.3		12		2.8	
SW6010D	Iron	mg/kg	3200		5300		11000		26000		9300		5300		11000		2800	
SW6010D	Lead	mg/kg	1.9		4.8		4.9		5.6		8.1		5.7		13		1.7	
SW6010D	Magnesium	mg/kg	840		1900		1400		11000		3400		940		2800		860	
SW6010D	Manganese	mg/kg	47		69		72		290		160		45		140	J+	42	
SW6010D	Mercury	mg/kg	0.022	U	0.02	U	0.025	U	0.0093	J	0.035		0.029		0.19		0.024	U
SW6010D	Nickel	mg/kg	2.5	J	10		7.1		39		9.2		6.4		16		4.6	J
SW6010D	Potassium	mg/kg	650		810		1900		2300		1200		460		1500		440	
SW6010D	Selenium	mg/kg	4.5	U	0.57	J	5.1	U	0.58	J	1.1	J	0.5	J	0.58	J	4.5	U
SW6010D	Silver	mg/kg	0.67	U	0.67	U	0.76	U	0.62	U	0.76	U	0.7	U	0.65	U	0.68	U
SW6010D	Sodium	mg/kg	81	J	110	J	380		1300		140	J	87	J	180	J	81	J
SW6010D	Thallium	mg/kg	6.7	U	6.7	U	7.6	U	6.2	U	7.6	U	7	U	6.5	U	6.8	U
SW6010D	Tin	mg/kg	2.2	U	2.2	U	0.55	J	0.75	J	0.76	J	2.3	U	0.86	J	2.3	U
SW7199	Vanadium	mg/kg	5.2		9.9		16		60		16		7.4		19		5.2	
SW7471A	Zinc	mg/kg	6.4		21		12		46		25		63		78	J+	8.8	
DMF																		
SW8033M	Dimethylformamide	mg/kg	0.2	U	0.22	U	0.23	U	0.2	U	0.2	U	0.17	U	0.19	U	0.17	U
Hydrazine/Aldehydes																		
SW8315A	Formaldehyde	ug/kg	11000	J	2200	UJ	2500	UJ	3700	J	2500	UJ	2900	J	1500	J	2300	UJ
SW8315A MOD	Hydrazine	ng/g	1.6	J	1.8	J	1.7	J	1.9	J	1.9	J	13		5.7		5.9	U
SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	5.8	UJ	5.4	UJ	6.3	UJ	5.4	UJ	5.9	U	5.6	U	5.5	U	5.9	U
SW8315A MOD	UDMH	ng/g	5.8	U	5.4	U	6.3	U	5.4	U	5.9	U	5.6	U	5.5	U	5.9	U
Inorganics																		
E300	Chloride	mg/kg	11	UJ	11	UJ	57	J	670	J	12	UJ	11	UJ	11	UJ	12	UJ
E300	Sulfate	mg/kg	170	J	71	J	1100	J	3700	J	1800	J	290	J	2400	J	12	J
E350.1	Ammonia	mg/kg	18		14		52		58		14		42		8.8		58	
Field Parameters																		
D1498	Oxidation Reduction Potential	mV	228		298		363		387		311		323		333		362	

Notes

Units:
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
ng/g = nanogram per gram
mV = millivolts

Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 3 - Metals/DMF/Hydrazine/Aldehydes/Inorganics
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-711		SB-711		SB-711		SB-712		SB-712		SB-712		SB-712		SB-712	
		Sample Date	11/12/2019		11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX		OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX	
		Sample Depth (ft bgs)	8 - 10		35 - 36		18 - 19		0 - 2		2 - 4		4 - 6		6 - 8		8 - 10	
		Qc Code	FS		FS		FS		FS		FS		FS		FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Total Metals																		
SW6010D	Aluminum	mg/kg	3000		13000		6900		8100		10000		8400		10000		4500	
SW6010D	Antimony	mg/kg	20	U	0.52	J	16	U	18	U	16	U	16	U	0.86	J	0.53	J
SW6010D	Arsenic	mg/kg	1.5	J	1.6	J	2.8		7.7		8.9		7.5		13		5.5	
SW6010D	Barium	mg/kg	11		110		21		61		43		34		41		15	
SW6010D	Beryllium	mg/kg	0.12	J	0.29		0.38		0.36		0.54		0.37		0.5		0.16	J
SW6010D	Cadmium	mg/kg	0.054	J	0.21	U	0.21	U	0.16	J	0.062	J	0.067	J	0.098	J	0.22	U
SW6010D	Calcium	mg/kg	1300		3000		1400		22000		4100		15000		3300		1500	
SW6010D	Chromium	mg/kg	5.3		260		250		78		35		38		38		130	
SW6010D	Chromium, Hexavalent	mg/kg	0.37	J	10.1		5.7		5.5		0.71		0.56		1.4		2.8	
SW6010D	Cobalt	mg/kg	1		8.4		3.3		4.2		5.8		3.7		7.1		2.5	
SW6010D	Copper	mg/kg	3.6		28		14		11		11		11		23		4.8	
SW6010D	Iron	mg/kg	2700		16000		7900		9800		11000		8900		13000		7700	
SW6010D	Lead	mg/kg	1.7		2.5		4		12		6.3		20		19		2.8	
SW6010D	Magnesium	mg/kg	900		11000		2100		3300		3800		2200		4000		2600	
SW6010D	Manganese	mg/kg	45		270		110		160		190		130		210		120	
SW6010D	Mercury	mg/kg	0.025	U	0.022	U	0.021	U	0.048		0.021	U	0.069		0.087		0.021	U
SW6010D	Nickel	mg/kg	4.5	J	17		9.8		10		24		9.3		21		11	
SW6010D	Potassium	mg/kg	620		7100		970		1500		2100		1500		1800		1200	
SW6010D	Selenium	mg/kg	0.7	J	4.1	U	0.46	J	4.8	U	0.55	J	4.3	U	4.4	U	4.4	U
SW6010D	Silver	mg/kg	0.81	U	0.62	U	0.64	U	0.73	U	0.65	U	0.65	U	0.66	U	0.66	U
SW6010D	Sodium	mg/kg	95	J	350		82	J	170		200		170		220		110	J
SW6010D	Thallium	mg/kg	8.1	U	6.2	U	6.4	U	7.3	U	6.5	U	6.5	U	6.6	U	6.6	U
SW6010D	Tin	mg/kg	2.7	U	0.76	J	2.1	U	0.69	J	0.84	J	0.72	J	1.6	J	2.2	U
SW7199	Vanadium	mg/kg	5.4		38		12		19		22		17		25		12	
SW7471A	Zinc	mg/kg	9.2		37		21		25		24		24		41		15	
DMF																		
SW8033M	Dimethylformamide	mg/kg	0.16	U	0.13	U	0.16	U	0.19	U	0.19	U	0.18	U	0.21	U	0.22	U
Hydrazine/Aldehydes																		
SW8315A	Formaldehyde	ug/kg	2600	UJ	4700	J	2200	UJ	2400	UJ	2100	J	2000	J	2600	J	2200	UJ
SW8315A MOD	Hydrazine	ng/g	6	U	5.5	U	5.3	U	3.8	J	7.7		5.5	U	5.6	U	5.6	U
SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	6	U	5.5	U	5.3	U	5.8	U	5.5	U	5.5	U	5.6	U	5.6	U
SW8315A MOD	UDMH	ng/g	6	U	5.5	U	5.3	U	5.8	U	5.5	U	5.5	U	5.6	U	5.6	U
Inorganics																		
E300	Chloride	mg/kg	7.2	J	42	J	11	UJ	12	UJ	6.8	J	11	UJ	12	J	6.7	J
E300	Sulfate	mg/kg	43	J	500	J	13	J	4000	J	520	J	12000	J	1500	J	180	J
E350.1	Ammonia	mg/kg	50		42		9.2		4.4	J	3.6	J	18		11		9.9	
Field Parameters																		
D1498	Oxidation Reduction Potential	mV	381		394		397		318		321		341		345		411	

Notes

Units:
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
ng/g = nanogram per gram
mV = millivolts

Qualifiers:
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UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Table 3 - Metals/DMF/Hydrazine/Aldehydes/Inorganics
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-712		SB-712	
		Sample Date	11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Sample Depth (ft bgs)	37 - 38		23 - 24	
		Qc Code	FS		FS	
Method	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier
Total Metals						
SW6010D	Aluminum	mg/kg	10000		2500	
SW6010D	Antimony	mg/kg	1.5	J	16	U
SW6010D	Arsenic	mg/kg	4.1		4.5	
SW6010D	Barium	mg/kg	71		18	
SW6010D	Beryllium	mg/kg	0.27		0.097	J
SW6010D	Cadmium	mg/kg	0.22	U	0.21	U
SW6010D	Calcium	mg/kg	12000		850	
SW6010D	Chromium	mg/kg	250		32	
SW6010D	Chromium, Hexavalent	mg/kg	16.8		1	
SW6010D	Cobalt	mg/kg	18		1.4	
SW6010D	Copper	mg/kg	64		2.2	
SW6010D	Iron	mg/kg	28000		5000	
SW6010D	Lead	mg/kg	2.8		2	
SW6010D	Magnesium	mg/kg	5700		1300	
SW6010D	Manganese	mg/kg	310		58	
SW6010D	Mercury	mg/kg	0.02	U	0.021	U
SW6010D	Nickel	mg/kg	15		4.7	J
SW6010D	Potassium	mg/kg	3300		940	
SW6010D	Selenium	mg/kg	0.58	J	4.2	U
SW6010D	Silver	mg/kg	0.65	U	0.63	U
SW6010D	Sodium	mg/kg	1500		92	J
SW6010D	Thallium	mg/kg	6.5	U	6.3	U
SW6010D	Tin	mg/kg	0.87	J	2.1	U
SW7199	Vanadium	mg/kg	110		7.9	
SW7471A	Zinc	mg/kg	48		7.4	
DMF						
SW8033M	Dimethylformamide	mg/kg	0.15	U	0.78	
Hydrazine/Aldehydes						
SW8315A	Formaldehyde	ug/kg	6100	J	2200	UJ
SW8315A MOD	Hydrazine	ng/g	5.4	U	5.5	U
SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	5.4	U	5.5	U
SW8315A MOD	UDMH	ng/g	5.4	U	5.5	U
Inorganics						
E300	Chloride	mg/kg	250	J	11	UJ
E300	Sulfate	mg/kg	3700	J	43	J
E350.1	Ammonia	mg/kg	140		5.9	
Field Parameters						
D1498	Oxidation Reduction Potential	mV	337		300	

Notes

Units:
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
ng/g = nanogram per gram
mV = millivolts

Qualifiers:
J = concentration is an approximate value
U = not detected
UJ = not detected and value is approximate
J+ = concentration is an approximate value with a potential high bias
J- = concentration is an approximate value with a potential low bias

Created by: KMS 3/19/2020
Checked by: LLK 03/19/2020

Buried Debris Area

Drum Area A

Drum Area B

Acid Pit

Acid Pit

Acid Pit

Lined Lagoon I

Lined Lagoon II

SB-701

SB-702

SB-703

SB-704

SB-705

SB-706

SB-707

SB-708

SB-709

SB-710

SB-712

40

40

32

32

23

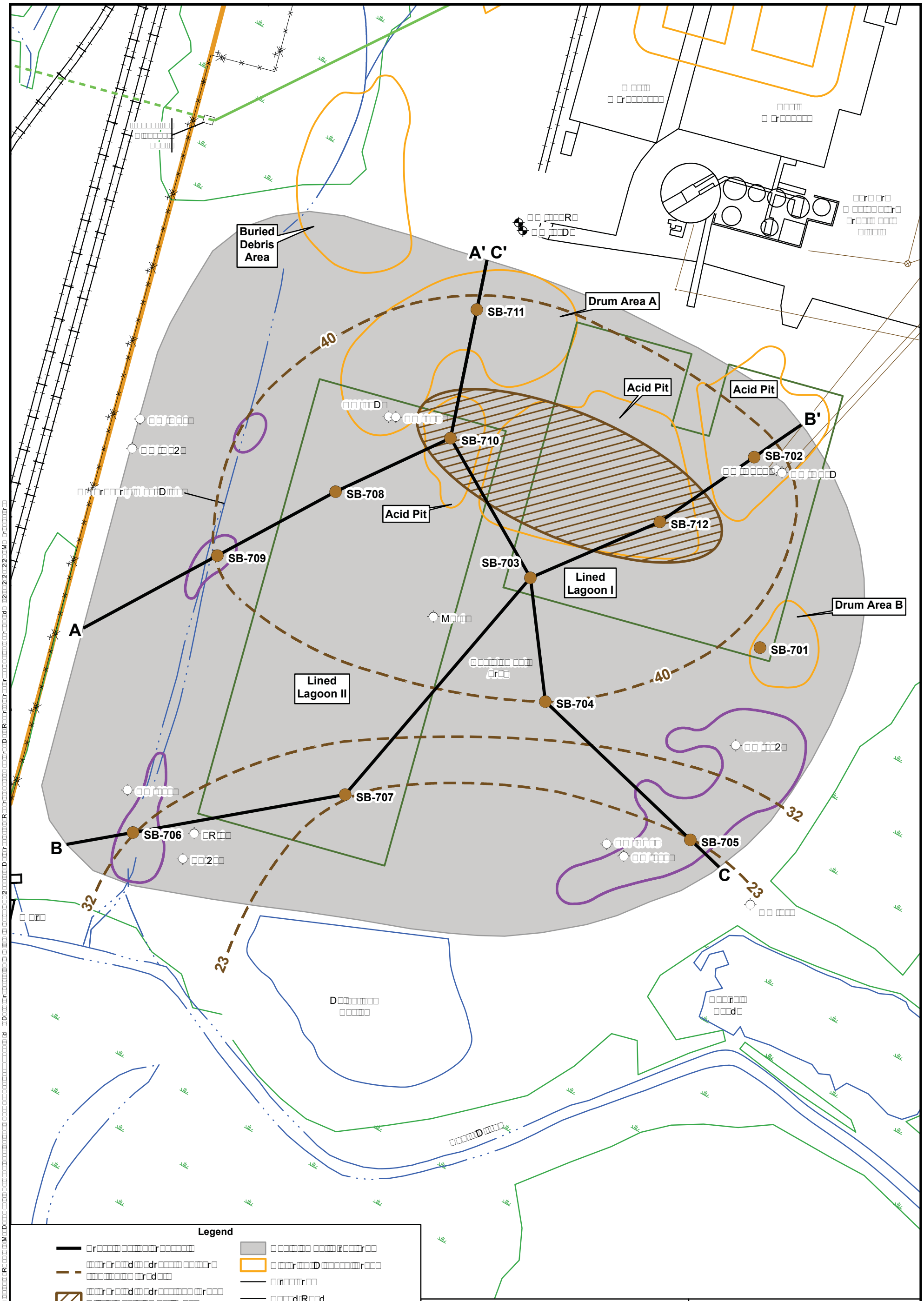
23

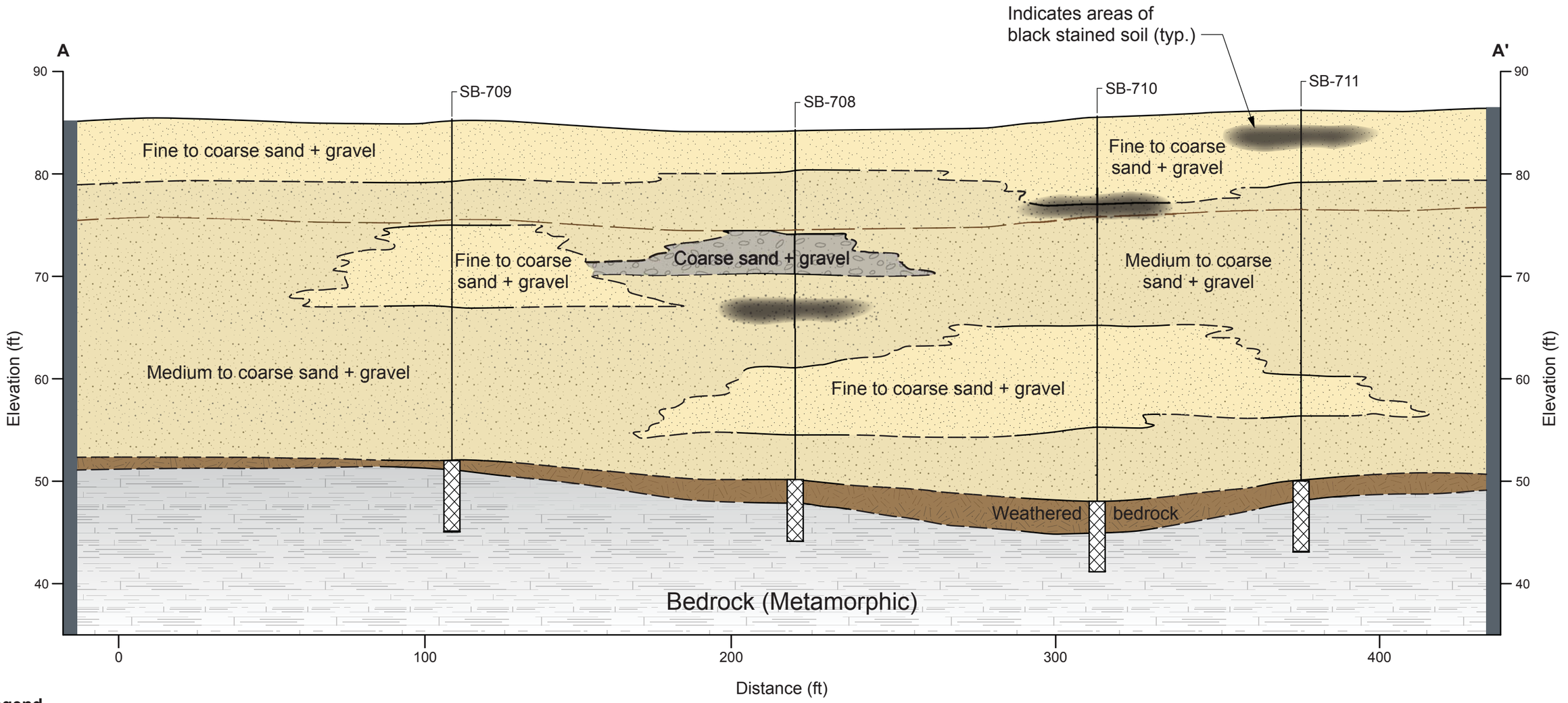
Legend

wood.

Figure 1
Soil Boring Locations
2019 Containment Area Investigation

Olin Chemical Superfund Site
Wilmington, Massachusetts


Buried Debris Area
A' C'
SB-711
Drum Area A
40
Acid Pit
Acid Pit
B'
SB-710
SB-702
SB-708
Acid Pit
SB-712
SB-709
SB-703
Lined Lagoon I
Drum Area B
A
SB-701
Lined Lagoon II
40
SB-704
32
SB-707
SB-706
B
SB-705
C
32
23
23
Legend
wood.
Figure 2
Cross Section Overview
2019 Containment Area Investigation
Olin Chemical Superfund Site
Wilmington, Massachusetts



Legend

- Fine to coarse sand + gravel
- Medium to coarse sand + gravel
- Coarse sand + gravel
- Weathered bedrock
- Amphibolitic Gneiss
- Soil Boring
- Indicates areas of black stained soil
- Approximate location of subgrades
- Depth of previous excavation
- Bedrock Coring
- Slurry Wall

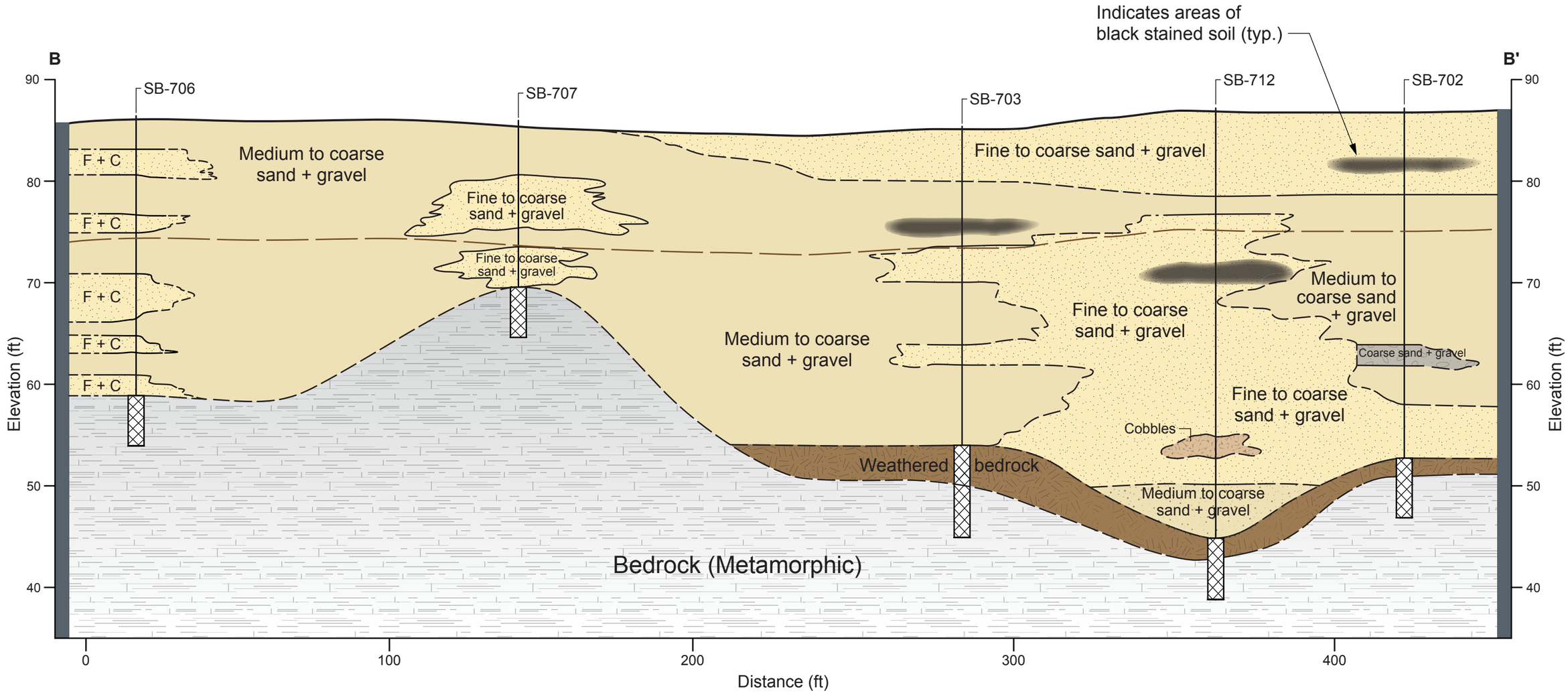
wood.
Wood
Environment & Infrastructure Solutions
271 Mill Road
Chelmsford, MA 01824

Figure 3
Cross Section A-A'
2019 Containment Area Investigation

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: JPH 02/18/20 | Checked/Date: BH 02/18/20

PORT2019016_A-A



Legend

- Fine to coarse sand + gravel
- Medium to coarse sand + gravel
- Coarse sand + gravel
- Weathered bedrock
- Amphibolitic Gneiss
- Soil Boring
- Indicates areas of black stained soil
- Approximate location of subgrades
- Depth of previous excavation
- Bedrock Coring
- Cobbles
- Slurry Wall

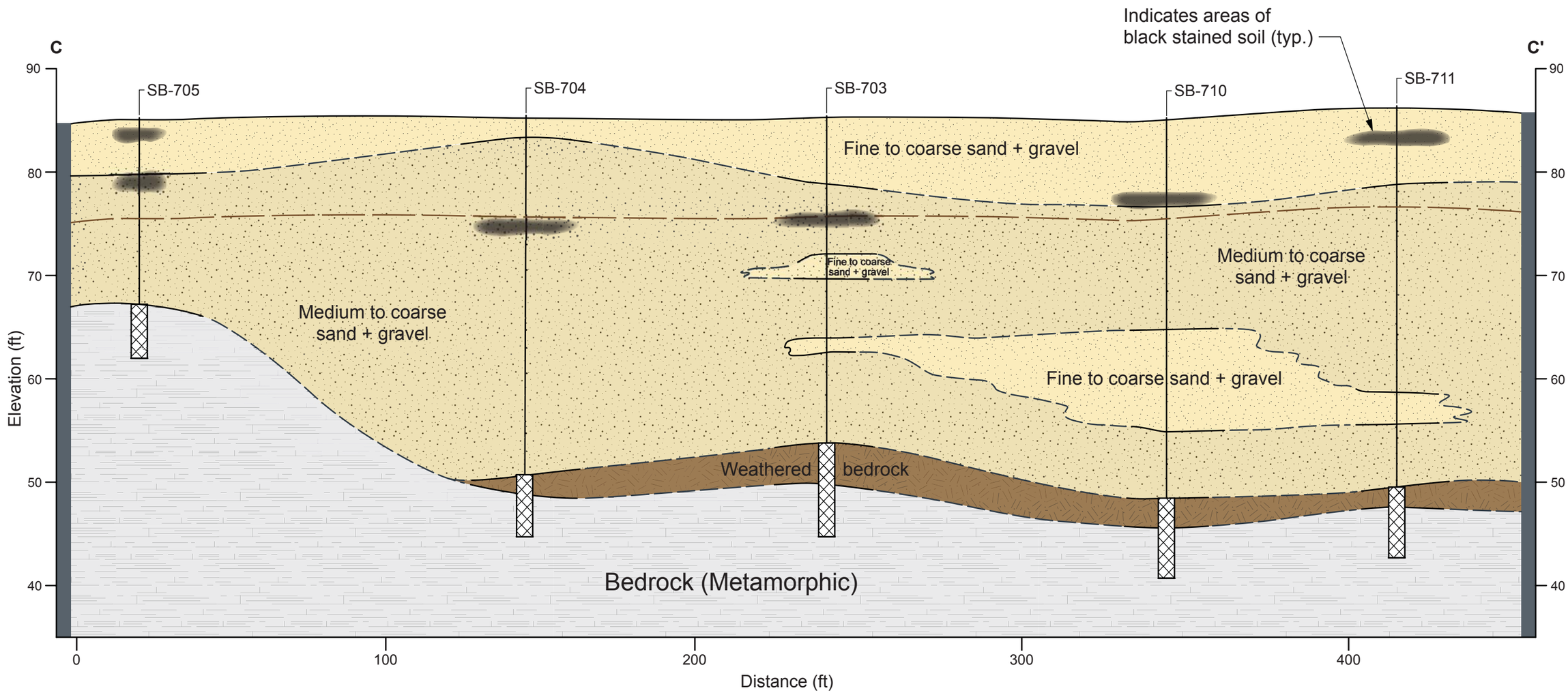
wood.
Wood
Environment & Infrastructure Solutions
271 Mill Road
Chelmsford, MA 01824

Figure 4
Cross Section B-B'
2019 Containment Area Investigation

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: JPH 02/18/20 | Checked/Date: BH 02/18/20

PORT2019016_B-B



Legend

- Fine to coarse sand + gravel
- Medium to coarse sand + gravel
- Coarse sand + gravel
- Weathered bedrock
- Amphibolitic Gneiss
- Soil Boring
- Indicates areas of black stained soil
- Approximate location of subgrades
- Depth of previous excavation
- Bedrock Coring
- Slurry Wall

wood.
Wood
Environment & Infrastructure Solutions
271 Mill Road
Chelmsford, MA 01824

Figure 5
Cross Section C-C'
2019 Containment Area Investigation

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: JPH 02/18/20 | Checked/Date: BH 02/18/20

PORT2019016_C-C

BORING NO.: **SB-701**

PROJECT NAME: Olin - Wilmington, MA	**DRILLING CO.:** Glacier Drilling	**SHEET:** 1 OF 1
PROJECT NUMBER: 6107190016	**DRILLER:** Mike Aldo	**DRILLING METHOD:** Rotary Sonic
LOCATION: Containment Area	**DATE STARTED:** 11/11/19	**DRILL RIG MODEL:** Geoprobe 8140LS
BOREHOLE DEPTH: 39 ft. BGS	**DATE FINISHED:** 11/11/19	**SAMPLER SIZE & TYPE:** Dual Tube 4"
BOREHOLE DIAMETER: 4-in. x 6-in.	**GEOLOGIST:** Jerry Rawcliffe	**HAMMER WEIGHT:** N/A
REMARKS: Soils Analytes: VOCs, SVOCs, Metals, Hydrazine, Ammonia, Monomethylhydrazine, 1,1-dimethylhydrazine, Cr+6, Formaldehyde, Anions, N-Nitrosodimethylamine, Dimethylformamide, and phthalic anhydride. TCLP Analytes: Metals, Corrosivity, Ignitability, Reactivity, Cyanide, and Sulfide		**HAMMER DROP:** N/A **HAMMER TYPE:** N/A

Sample #	Sample Depth	Blow Counts	Rec. (ft./ft.)	Description	Well Diagram	Headspace (ppmv)	Lab Sample
S1 (0'-10')	0.0-1.0	N/A	9.8/10.0	Light Brown to brown fine to coarse **SAND** and gravel with a trace of silt.	N/A	1.4	OC-SB-701-0.0/2.0-XXX OC-SB-701-0.0/2.0-DUP
	1.0-2.5			Dark brown fine to coarse **SAND** and gravel with some small cobbles and a trace of silt.		1.4	OC-SB-701-0.0/2.0-MS OC-SB-701-0.0/2.0-MSD
	2.5-6.0			Dark brown to very dark brown to black fine to coarse **SAND** and gravel with organics and some small cobbles and a trace of silt.		7.1	OC-SB-701-2.0/4.0-XXX
				(4.5-5.0 large amount of organic debris pieces of wood)		24.3	OC-SB-701-4.0/6.0-XXX
	6.0-8.5			Brown to dark brown medium **SAND** with some coarse sand. Cobbles and trace of gravel near bottom.		4.3	OC-SB-701-6.8/8.0-XXX
	8.5-9.0			Olive to olive brown medium to coarse **SAND** with a little fine sand and silt.		2.2	OC-SB-701-8.0/10-XXX
	9.0-10.0			Olive brown fine to coarse **SAND** and gravel with a trace of silt and cobbles.			OC-SB-701-0.0/10-XXX (TCLP)
S2 (10'-15')	10.0-10.5	N/A	4.7/5.0	Olive brown fine to coarse **SAND** and gravel with a trace of silt and cobbles	N/A	1.4	
	10.5-11.0			Brown to dark reddish brown, fine to coarse **SAND** and gravel with some silt and small cobbles.			
	11.0-12.0			Brown to reddish brown fine to coarse **SAND** and gravel with a little small cobbles and a trace of silt.		1.6	
	12.0-14.5			Reddish brown to strong reddish brown (iron stained) fine to coarse **SAND** with traces of gravel and silt. Stratified with some coarse layers and some fine grained layers.		3.4	
	14.5-15.0			Reddish brown to olive brown fine to coarse **SAND** and gravel with a little cobbles and traces of silt.		NR	
S3 (15'-23')	15.0-17.5	N/A	8.0/8.0	Olive brown to reddish brown medium to coarse **SAND** and a little gravel and traces of fine sand.	N/A	2.1	
	17.5-20.0			Reddish brown medium to coarse **SAND** and gravel with traces of fine sand and small cobbles.		2.6	
	20.0-23.0			Strong reddish brown (iron stain colored) (20-21') to reddish brown medium to coarse **SAND** and gravel. Trace of fine sand. Stratified appearance.		1.6 3.7	OC-SB-701-20/21-XXX
S4 (23'-33')	23.0-24.0	N/A	10.0/10.0	Brown to reddish brown medium to coarse **SAND** with some gravel and traces of fine sand.	N/A	NR	
	24.0-25.0			Olive to yellow brown to reddish brown mottled fine to coarse **SAND** and gravel with a little cobbles and silt.		1.0	
	25.0-30.0			Olive brown fine to coarse **SAND** and gravel with cobbles and a little silt.		0.9	OC-SB-701-31/32-XXX
	30.0-32.0			Olive to olive brown to reddish brown fine to coarse **SAND** and gravel with traces of cobbles and some silt. (Till-like).		5 7	
	32.0-33.0			Light gray to olive **WEATHERED BEDROCK**. Cobbles at 32'.		21.0	
S5 (34'-39')	34.0-39.0	N/A	4.0/5.0	Fine to medium grained green to pink (**QUARTZITE/AMPHIBOLIC GNIESS**) quite altered and foliated disturbed. Lower 2' is darker colored with better developed foliations ~ 45° and some high angle nearly vertical fractures.	N/A	NR	
				Bottom of boring, grouted borehole to surface.		NR	

Created by: BKH Checked by: JKR

BORING NO.: **SB-702**

PROJECT NAME: Olin - Wilmington, MA	**DRILLING CO.:** Glacier Drilling	**SHEET:** 1 OF 1
PROJECT NUMBER: 6107190016	**DRILLER:** Mike Aldo	**DRILLING METHOD:** Rotary Sonic
LOCATION: Containment Area	**DATE STARTED:** 11/08/19	**DRILL RIG MODEL:** Geoprobe 8140LS
BOREHOLE DEPTH: 41 ft. BGS	**DATE FINISHED:** 11/08/19	**SAMPLER SIZE & TYPE:** Dual Tube 4"
BOREHOLE DIAMETER: 4-in. x 6-in.	**GEOLOGIST:** Jerry Rawcliffe	**HAMMER WEIGHT:** N/A
REMARKS: Soils Analytes: VOCs, SVOCs, Metals, Hydrazine, Ammonia, Monomethylhydrazine, 1,1-dimethylhydrazine, Cr+6, Formaldehyde, Anions, N-Nitrosodimethylamine, Dimethylformamide, and phthalic anhydride. TCLP Analytes: Metals, Corrosivity, Ignitability, Reactivity, Cyanide, and Sulfide		**HAMMER DROP:** N/A
		HAMMER TYPE: N/A

Sample #	Sample Depth	Blow Counts	Rec. (ft./ft.)	Description	Well Diagram	Headspace (ppmv)	Lab Sample
S1 0'-5'	0.0-1.0	N/A	5.0/5.0	Olive fine to coarse **SAND** and gravel with cobles and some silt. (Wet)	N/A	0.5	OC-SB-702-0.0/2.0-XXX
	1.0-3.0			Brown to olive brown fine to coarse **SAND** and gravel with a little silt, trace small cobbles.			
	3.0-3.5			Brown to dark brown fine to coarse **SAND** and gravel with a little silt.		5.4	OC-SB-702-2.0/4.0-XXX
	3.5-4.0			Brown fine to coarse **SAND** and gravel with a little silt.		NR	
	4.0-5.0			Brown to olive colored similar to above.		8.9	OC-SB-702-4.0/6.0-XXX
S2 5'-15'	5.0-6.0	N/A	8.0/10.0	Olive to brown fine to coarse **SAND** and gravel with a little silt.	N/A	0.5	
	6.0-6.5			Brown to dark brown fine to coarse **SAND** and gravel with some silt and organics.		1.8	OC-SB-702-6.0/8.0-XXX
	6.5-8.5			Brown to yellow brown fine to coarse **SAND** and gravel with traces of small cobbles and silt.			
	8.5-9.0			Brown medium to coarse **SAND** and gravel trace of fine sand.		NR	OC-SB-702-8.0/10-XXX
	9.0-15.0			Light brown to light yellow brown medium to coarse **SAND** and gravel with some areas with cobbles.		9.7	OC-SB-702-0.0/10-XXX (TCLP)
S3 15'-25'	15.0-18.0	N/A	10.0/10.0	Brown to yellow brown coarse to medium **SAND** with a little gravel.	N/A	0.5	
	18.0-23.0			Light brown to light yellow brown medium to coarse **SAND** with some to a little gravel.		1.1 1.5	
	23.0-25.0			Light brown to yellow brown coarse **SAND** and gravel with some medium sand and traces of small cobbles. (24-24.5 **GRAVEL** layer with coarse sand).		1.1 1.5	
S4 25'-35'	25.0-26.0	N/A	10.0/10.0	Light brown to reddish brown coarse to medium **SAND** with a little gravel.	N/A	0.5	
	26.0-26.5			Brown to light brown medium **SAND** with little coarse and fine sand.		0.5	
	26.5-27.5			Brown to light reddish brown medium to coarse **SAND**.		0.6	
	27.5-29.0			Brown to light reddish brown medium to coarse **SAND** and gravel with some small cobbles and trace of fine sand.		0.6	OC-SB-702-28/29-XXX
	29.0-33.0			Brown to olive brown fine to coarse **SAND** and gravel with some cobbles and a little silt.		1.6	
	33.0-34.0			Olive to olive gray fine to coarse **SAND** cobbles and gravel with a little silt.		2.8	
	34.0-35.0			Olive to gray fine coarse **SAND** and gravel with some silt.		0.8	OC-SB-702-34/35-XXX
S5 36'-41'	35.0-36.0	N/A	4.0/5.0	Top of **WEATHERED BEDROCK**.	N/A	NR	
				Encountered hard **QUARTZITE** at 36'. Fracture at 37.0'-37.5'. Recovered nice sections of sonic cored rocks.			
	36.0-41.0			Medium to fine grained. **QUARTZITE/AMPHIBOLE GNIESS**, very hard rock as reported by driller.			
				Bottom of boring. Grouted borehole to surface.			

Created by: BKH Checked by: JKR

BORING NO.: **SB-703**

PROJECT NAME: Olin - Wilmington, MA	**DRILLING CO.:** Glacier Drilling	**SHEET:** 1 OF 1
PROJECT NUMBER: 6107190016	**DRILLER:** Mike Aldo	**DRILLING METHOD:** Rotary Sonic
LOCATION: Containment Area	**DATE STARTED:** 11/05/19	**DRILL RIG MODEL:** Geoprobe 8140LS
BOREHOLE DEPTH: 40 ft. BGS	**DATE FINISHED:** 11/05/19	**SAMPLER SIZE & TYPE:** Dual Tube 4"
BOREHOLE DIAMETER: 4-in. x 6-in.	**GEOLOGIST:** Jerry Rawcliffe	**HAMMER WEIGHT:** N/A
REMARKS: Soils Analytes: VOCs, SVOCs, Metals, Hydrazine, Ammonia, Monomethylhydrazine, 1,1-dimethylhydrazine, Cr+6, Formaldehyde, Anions, N-Nitrosodimethylamine, Dimethylformamide, and phthalic anhydride. TCLP Analytes: Metals, Corrosivity, Ignitability, Reactivity, Cyanide, and Sulfide		**HAMMER DROP:** N/A
		HAMMER TYPE: N/A

Sample #	Sample Depth	Blow Counts	Rec. (ft./ft.)	Description	Well Diagram	Headspace (ppmv)	Lab Sample
S1 0'-10'	0.0-1.5	N/A	10.0/10.0	Brown to dark brown fine to coarse **SAND** and silt with some gravel and roots/organic debris.	N/A	1.3	OC-SB-703-0.0/2.0-XXX
	1.5-3.0			Very dark brown to black fine to medium **SAND** and organics.			OC-SB-703-2.0/4.0-XXX OC-SB-703-2.0/4.0-DUP
	3.0-6.0			Light brown to light olive brown (some iron stained spots) fine to medium **SAND** with traces of coarser material.		1.6 3.8	OC-SB-703-2.0/4.0-MS OC-SB-703-2.0/4.0-MSD
	6.0-7.5			Brown medium to coarse **SAND** with traces fine sand and gravel.		1.7	OC-SB-703-4.0/6.0-XXX
	7.5-8.5			Strong reddish brown (iron stained) medium to coarse **SAND** and gravel with traces of fine sand.			OC-SB-703-6.0/8.0-XXX
	8.5-10.0			Brown medium to coarse **SAND** and gravel with cobbles. Wet.		1.6	OC-SB-703-8.0/10.0-XXX OC-SB-703-0.0/10.0-XXX (TCLP)
S2 10'-20'	10.0-13.0	N/A	7.5/10.0	Brown medium to coarse **SAND** and gravel with a trace of fine sand and cobbles.	N/A	6.5	
	13.0-14.0			Yellowish brown fine to coarse **SAND** and gravel with some small cobbles.		1.6	
	14.0-15.5			Light brown medium to coarse **SAND** and gravel with traces of fine sand. Gravel layer from 15.0'-15.5'.		3.4	
	15.5-17.5			Light brown to light grayish brown medium to coarse **SAND** and gravel with small cobbles.		4.0	OC-SB-703-17/18-XXX
S3 20'-30'	20.0-21.0	N/A	5.0/10.0	Light brown to light grayish brown medium to coarse **SAND** and gravel.	N/A	4.6	
	21.0-21.5			Yellowish brown fine to coarse **SAND** and gravel with traces silt and cobbles.		1.8	
	21.5-22.5			Yellow brown fine to coarse **SAND** and gravel.		1.4	
	22.5-24.0			Brown medium **SAND** with traces of fine to coarse sand.		1.7	
	24.0-25.0			Brown to yellow brown fine to coarse **SAND** and gravel with traces of cobbles. Some bright orange iron staining.		0.5	
S4 30'-35'	30.0-31.7	N/A	4.6/5.0	Brown to yellow brown fine to coarse **SAND** and gravel with cobbles and silt.	N/A	0.8	OC-SB-703-30/32-XXX
	31.7-35.0			Gray pulverized **WEATHERED** BED**ROCK**. 33' bgs estimated top of weathered rock.		4.2	
S5 35'-40'	35.0-40.0	N/A	2.0/5.0	Estimated top of competent bedrock 35' bgs	N/A	3.3	
				Drilled to 40' refusal.		1.4	
				Bottom of boring. Grouted borehole to surface.			

Created by: BKH Checked by: JKR

BORING NO.: **SB-704**

PROJECT NAME: Olin - Wilmington, MA	**DRILLING CO.:** Glacier Drilling	**SHEET:** 1 OF 1
PROJECT NUMBER: 6107190016	**DRILLER:** Mike Aldo	**DRILLING METHOD:** Rotary Sonic
LOCATION: Containment Area	**DATE STARTED:** 11/07/19	**DRILL RIG MODEL:** Geoprobe 8140LS
BOREHOLE DEPTH: 40 ft. BGS	**DATE FINISHED:** 11/07/19	**SAMPLER SIZE & TYPE:** Dual Tube 4"
BOREHOLE DIAMETER: 4-in. x 6-in.	**GEOLOGIST:** Jerry Rawcliffe	**HAMMER WEIGHT:** N/A
REMARKS: Soils Analytes: VOCs, SVOCs, Metals, Hydrazine, Ammonia, Monomethylhydrazine, 1,1-dimethylhydrazine, Cr+6, Formaldehyde, Anions, N-Nitrosodimethylamine, Dimethylformamide, and phthalic anhydride. TCLP Analytes: Metals, Corrosivity, Ignitability, Reactivity, Cyanide, and Sulfide		**HAMMER DROP:** N/A **HAMMER TYPE:** N/A

Sample #	Sample Depth	Blow Counts	Rec. (ft./ft.)	Description	Well Diagram	Headspace (ppmv)	Lab Sample
S1 0'-10'	0.0-1.5	N/A	10.0/10.0	Brown to dark brown fine to coarse **SAND** and gravel with some silt. Very moist layers of white material at bottom of interval.	N/A	7.7	OC-SB-704-0.0/2.0-XXX
	1.5-2.5			Very dark brown **SANDY ORGANIC MATERIAL** with roots (peat).			
	2.5-3.5			Dark brown to very dark brown fine to medium **SAND** with some darker organic rich layers. Saturated.		13	OC-SB-704-2.0/4.0-XXX
	3.5-5.5			Dark brown to brown fine to coarse **SAND** and gravel with some cobbles and a little silt.			OC-SB-704-4.0/6.0-XXX
	5.5-8.0			Brown to olive brown fine to coarse **SAND** and gravel with some to a little silt and some cobbles.		3.5	OC-SB-704-6.0/8.0-XXX
	8.0-9.5			Olive brown to brown fine to coarse **SAND** and gravel with a little silt and little to traces of cobbles. Has a slightly mottled appearance.		2.3	OC-SB-704-8.0/10-XXX
	9.5-10.0			Light olive brown to olive brown fine to coarse **SAND** and gravel with a little silt and cobbles.		7.6	OC-SB-704-0.0/10-XXX (TCLP)
S2 10'-15'	10.0-11.5	N/A	5.0/5.0	Olive brown to dark olive brown fine to coarse **SAND** and gravel with cobbles and a trace of silt.	N/A	1.7	
	11.5-13.5			Very dark brown coarse **SAND** and gravel with a little fine to medium sand.		1.7	OC-SB-704-12/13-XXX
	13.5-15.0			Yellow brown coarse **SAND** and gravel with some cobbles and medium sand and a trace of fine sand.		1.4 1.9	
S3 15'-25'	15.0-18.0	N/A	10.0/10.0	Strong yellow brown coarse **SAND** and gravel with some medium sand and traces of fine sand and cobbles.	N/A	3.6	
	18.0-19.0			Strong yellow brown coarse **SAND** with some medium sand and a little gravel.		6.8	OC-SB-704-18/19-XXX
	19.0-19.7			Reddish brown (iron stained) medium to coarse **SAND** with a little gravel and fine sand.		2.0	
	19.7-21.0			Strong yellowish olive brown to olive gray fine to coarse **SAND** and gravel with a little silt and cobbles.		2.0	
	21.0-24.0			Olive gray to gray fine to coarse **SAND** and silt with gravel and cobbles. (23.0-24.0) Possible pulverized cobble.		1.5	
	24.0-25.0			Olive brown to brown fine to coarse **SAND** and silt with gravel and some cobbles.		NR	
S4 25'-35'	25.0-27.5	N/A	9.5/10.0	Yellowish olive brown to olive gray fine to coarse **SAND** and silt with gravel and some cobbles.	N/A	NR	
	27.5-30.0			Yellowish dark brown to brown medium to coarse **SAND** and gravel with a little fine sand and traces of silt and cobbles.		0.6	
	30.0-31.0			**COBBLE**.		0.5	
	31.0-32.0			Strong reddish brown medium to coarse **SAND** and gravel with a little fine sand and some cobbles.		NR	
	32.0-34.5			Light olive brown to olive gray fine to coarse **SAND** and gravel with a little silt and some cobbles (Sandy Till)		0.9	OC-SB-704-33/34-XXX
	34.5-35.0			Gray **WEATHERED BEDROCK** pulverized by sonic.		0.4	
S5 35'-40'	35.0-40.0	N/A	3.0/5.0	Very poor recovery mostly sand sized cuttings. Rock reported drilled fairly easy/soft with intermittent hard spots. Bottom of boring. Grouted borehole to surface.	N/A	0.3	

Created by: BKH Checked by: JKR

BORING NO.: **SB-705**

PROJECT NAME: Olin - Wilmington, MA	**DRILLING CO.:** Glacier Drilling	**SHEET:** 1 OF 1
PROJECT NUMBER: 6107190016	**DRILLER:** Mike Aldo	**DRILLING METHOD:** Rotary Sonic
LOCATION: Containment Area	**DATE STARTED:** 11/08/19	**DRILL RIG MODEL:** Geoprobe 8140LS
BOREHOLE DEPTH: 23 ft. BGS	**DATE FINISHED:** 11/08/19	**SAMPLER SIZE & TYPE:** Dual Tube 4"
BOREHOLE DIAMETER: 4-in. x 6-in.	**GEOLOGIST:** Jerry Rawcliffe	**HAMMER WEIGHT:** N/A
REMARKS: Soils Analytes: VOCs, SVOCs, Metals, Hydrazine, Ammonia, Monomethylhydrazine, 1,1-dimethylhydrazine, Cr+6, Formaldehyde, Anions, N-Nitrosodimethylamine, Dimethylformamide, and phthalic anhydride. TCLP Analytes: Metals, Corrosivity, Ignitability, Reactivity, Cyanide, and Sulfide		**HAMMER DROP:** N/A **HAMMER TYPE:** N/A

Sample #	Sample Depth	Blow Counts	Rec. (ft./ft.)	Description	Well Diagram	Headspace (ppmv)	Lab Sample
S1 0'-8'	0.0-1.5	N/A	8.0/8.0	Light yellow brown fine to medium **SAND** with a little coarse sand and gravel. Moist	N/A	0.5	OC-SB-705-0.0/2.0-XXX
	1.5-2.0			Dark brown to black fine to medium **SAND** with a little coarse sand and gravel (organics).			
	2.0-2.7			Brown to yellow brown medium **SAND** with a little fine and coarse sand, trace gravel.		1.6	OC-SB-705-2.0/4.0-XXX
	2.7-5.0			Brown to dark brown medium **SAND** with some coarse sand and gravel and a little fine sand.			OC-SB-705-4.0/6.0-XXX OC-SB-705-4.0/6.0-DUP
	5.0-6.5			Very dark brown to black medium to coarse **SAND** with some fine sand and a little gravel trace cobbles and organics some white layers at bottom.		0.5	OC-SB-705-4.0/6.0-MS OC-SB-705-4.0/6.0-MSD
	6.5-7.0			Brown medium to coarse **SAND** trace fine sand and gravel.		0.4	OC-SB-7045-6.0/8.0-XXX
	7.0-8.0			Brown to olive brown medium to coarse **SAND** and gravel with cobbles and some fine sand. Cobble in shoe at 8' bgs.			
S2 8'-18'	8.0-11.0	N/A	9.0/10.0	Brown to olive brown to reddish brown medium to coarse **SAND** and gravel with some cobbles and a little fine sand. Very moist to wet.	N/A	3.1	OC-SB-705-8.0/10-XXX OC-SB-708-0.0/10-XXX (TCLP)
	11.0-12.5			Olive brown fine to coarse **SAND** and gravel with a little silt and small cobbles.		1.9	
	12.5-14.5			Olive to olive brown fine to coarse **SAND** and gravel with traces of silt and small cobbles.		0.8	
	14.5-18.0			Brown to olive brown fine to coarse **SAND** and gravel with some cobbles. Trace of silt.		1.4	OC-SB-7045-17/18-XXX
S3 18'-23'	18.0-23.0	N/A	4.0/5.0	Encountered something hard at 18' bgs Top of **BEDROCK** 18' bgs Top of recovery is gray to dark gray fine grained with some steep fracture lines with green alteration or staining becomes much lighter colored (**QUARTZITE**) near bottom with some green alteration a long high angle fracture line. Driller reported very hard drilling for entire 5' run. 23' Bottom of boring. Grouted borehole to surface.	N/A	NR	

Created by: BKH Checked by: JKR

BORING NO.: **SB-706**

PROJECT NAME: Olin - Wilmington, MA	**DRILLING CO.:** Glacier Drilling	**SHEET:** 1 OF 1
PROJECT NUMBER: 6107190016	**DRILLER:** Mike Aldo	**DRILLING METHOD:** Rotary Sonic
LOCATION: Containment Area	**DATE STARTED:** 11/06/19	**DRILL RIG MODEL:** Geoprobe 8140LS
BOREHOLE DEPTH: 32 ft. BGS	**DATE FINISHED:** 11/06/19	**SAMPLER SIZE & TYPE:** Dual Tube 4"
BOREHOLE DIAMETER: 4-in. x 6-in.	**GEOLOGIST:** Jerry Rawcliffe	**HAMMER WEIGHT:** N/A
REMARKS: Soils Analytes: VOCs, SVOCs, Metals, Hydrazine, Ammonia, Monomethylhydrazine, 1,1-dimethylhydrazine, Cr+6, Formaldehyde, Anions, N-Nitrosodimethylamine, Dimethylformamide, and phthalic anhydride. TCLP Analytes: Metals, Corrosivity, Ignitability, Reactivity, Cyanide, and Sulfide		**HAMMER DROP:** N/A
		HAMMER TYPE: N/A

Sample #	Sample Depth	Blow Counts	Rec. (ft./ft.)	Description	Well Diagram	Headspace (ppmv)	Lab Sample
S1 0'-10'	0.0-1.0	N/A	7.0/10.0	Brown to yellow brown medium to coarse **SAND** and gravel with some small cobbles and a trace of fine sand. Moist.	N/A	1.7	OC-SB-706-0.0/2.0-XXX
	1.0-3.0			Dark brown fine to coarse **SAND** and gravel with some small cobbles. Moist.			OC-SB-706-2.0/4.0-XXX
	3.0-4.0			Dark brown fine to coarse **SAND** and gravel and cobbles.		3.2	
	4.0-5.0			Brown to olive brown fine to coarse **SAND** and gravel with cobbles and a little trace of silt.			OC-SB-706-4.0/6.0-XXXX
	5.0-7.0			Brown to yellow olive brown fine to coarse **SAND** and gravel with a couple cobbles.		8.2	OC-SB-706-6.0/8.0-XXX (6-7')
S2 10'-15'	10.0-11.5	N/A	5.0/5.0	Very dark brown fine to coarse **SAND** and gravel with a little silt and organics. Some type of fiber. Has a sheen like appearance, wet.	N/A	3.9	OC-SB-706-0.0/10-XXX TCLP (0-7')
	11.5-13.0			Dark brown to dark olive brown medium to coarse **SAND** and gravel with cobbles and traces of fine sand and silt.			OC-SB-706-10/12-XXX
	13.0-14.0			Brown medium to coarse **SAND** and gravel with some small cobbles and a little fine sand.		5.2	
	14.0-15.0			Brown to yellow brown medium to coarse **SAND** with some gravel and traces of fine sand.		3.7	
S3 15'-25'	15.0-20.0	N/A	10.0/10.0	Brown to olive brown fine to coarse **SAND** and gravel with cobbles and a trace of silt. Very moist to wet.	N/A	10	
	20.0-21.5			Yellow brown to reddish yellow brown (iron stained) medium to coarse **SAND** and gravel with a little fine sand.		11 2	OC-SB-706-20/22-XXX
	21.5-23.0			Brown to olive brown fine to coarse **SAND** and gravel with cobbles and a trace of silt.		10	
	23.0-25.0			Brown to yellow brown medium to coarse **SAND** and gravel with some cobbles and a little fine sand.		9.0	
S4 25'-27'	25.0-26.0	N/A	NR	Brown to olive brown medium to coarse **SAND** and gravel with cobbles with trace fine sand and silt.	N/A	2.8	
	26.0-27.0			Yellow olive brown fine to coarse **SAND** and gravel with cobles and a little to trace of silt.		2.9	OC-SB-706-26/27-XXX
S5 27'-32'	27.0-32.0	N/A	1.0/5.0	Dark gray fine grained (**QUARTZITE**) some thin quartz veins. Sonic cored through hard dense rock from 27'-30'.	N/A	NR	
				Bottom of boring 32' bgs. Grouted borehole to surface.			

Created by: BKH Checked by: JKR

BORING NO.: **SB-707**

PROJECT NAME: Olin - Wilmington, MA	**DRILLING CO.:** Glacier Drilling	**SHEET:** 1 OF 1
PROJECT NUMBER: 6107190016	**DRILLER:** Mike Aldo	**DRILLING METHOD:** Rotary Sonic
LOCATION: Containment Area	**DATE STARTED:** 11/07/19	**DRILL RIG MODEL:** Geoprobe 8140LS
BOREHOLE DEPTH: 23 ft. BGS	**DATE FINISHED:** 11/07/19	**SAMPLER SIZE & TYPE:** Dual Tube 4"
BOREHOLE DIAMETER: 4-in. x 6-in.	**GEOLOGIST:** Jerry Rawcliffe	**HAMMER WEIGHT:** N/A
REMARKS: Soils Analytes: VOCs, SVOCs, Metals, Hydrazine, Ammonia, Monomethylhydrazine, 1,1-dimethylhydrazine, Cr+6, Formaldehyde, Anions, N-Nitrosodimethylamine, Dimethylformamide, and phthalic anhydride. TCLP Analytes: Metals, Corrosivity, Ignitability, Reactivity, Cyanide, and Sulfide		**HAMMER DROP:** N/A
		HAMMER TYPE: N/A

Sample #	Sample Depth	Blow Counts	Rec. (ft./ft.)	Description	Well Diagram	Headspace (ppmv)	Lab Sample
S1 0'-10'	0.0-0.8	N/A	10.0/10.0	Brown to dark brown medium to coarse **SAND** and gravel with small cobbles some fine sand and a trace silt, wet.	N/A	0.3	OC-SB-707-0.0/2.0-XXX
	0.8-2.5			Olive to very dark brown fine to coarse **SAND** and gravel with some small cobbles and organics (roots, wood, peaty material).			OC-SB-707-2.0/4.0-XXX
	2.5-3.5			Brown fine to medium **SAND** with a little silt and trace medium to coarse sand and gravel.			OC-SB-707-4.0/6.0-XXX
	3.5-5.0			Brown to olive brown medium to coarse **SAND** and gravel with a little fine sand trace silt. Moist.		0.5	OC-SB-707-6.0/8.0-XXX OC-SB-707-6.0/8.0-DUP OC-SB-707-6.0/8.0-MS OC-SB-707-6.0/8.0-MSD
	5.0-6.0			Olive to light olive brown fine to coarse **SAND** and gravel with a little silt.		4.1	
	6.0-10.0			Light olive brown to yellow brown fine to coarse **SAND** and gravel with some cobbles.		7.0	OC-SB-707-8.0/10-XXX
S2 10'-17'	10.0-11.0	N/A	7.0/7.0	Brown to dark olive brown medium to coarse **SAND** and gravel with some fine sand and cobbles.	N/A	5.5	OC-SB-707-0.0/10-XXX (TCLP)
	11.0-13.0			Light olive brown fine to coarse **SAND** and gravel with a little silt and cobbles. Wet.		2.4	
	13.0-15.0			Brown to light olive yellow brown medium to coarse **SAND** and gravel with some cobbles traces fine sand and silt.		2.8	OC-SB-707-12/13-XXX
	15.0-16.5			Yellowish brown gravel with medium to coarse **SAND** and a little fine sand. Wet.		1.7 1.4	OC-SB-707-15/17-XXX (15-16.5')
S3 17'-23'	18.0-23.0	N/A	5.0/5.0	Encountered bedrock at ~16.5' bgs. 6" casing set to 18' bgs. Very hard bedrock (as per driller) Dark gray fine grained **QUARTZITE**. Dark black gray to gray fine grained with some near vertical fractures lines with greenish staining. Bottom of boring. Grouted borehole to surface.	N/A	NR	

Created by: BKH Checked by: JKR

BORING NO.: **SB-708**

PROJECT NAME: Olin - Wilmington, MA	**DRILLING CO.:** Glacier Drilling	**SHEET:** 1 OF 1
PROJECT NUMBER: 6107190016	**DRILLER:** Mike Aldo	**DRILLING METHOD:** Rotary Sonic
LOCATION: Containment Area	**DATE STARTED:** 11/04/19	**DRILL RIG MODEL:** Geoprobe 8140LS
BOREHOLE DEPTH: 40.5 ft. BGS	**DATE FINISHED:** 11/04/19	**SAMPLER SIZE & TYPE:** Dual Tube 4"
BOREHOLE DIAMETER: 4-in. x 6-in.	**GEOLOGIST:** Jerry Rawcliffe	**HAMMER WEIGHT:** N/A
REMARKS: Soils Analytes: VOCs, SVOCs, Metals, Hydrazine, Ammonia, Monomethylhydrazine, 1,1-dimethylhydrazine, Cr+6, Formaldehyde, Anions, N-Nitrosodimethylamine, Dimethylformamide, and phthalic anhydride. TCLP Analytes: Metals, Corrosivity, Ignitability, Reactivity, Cyanide, and Sulfide		**HAMMER DROP:** N/A
		HAMMER TYPE: N/A

Sample #	Sample Depth	Blow Counts	Rec. (ft./ft.)	Description	Well Diagram	Headspace (ppmv)	Lab Sample
S1 0'-10'	0.0-3.0	N/A	10.0/10.0	Light brown to very dark brown fine to coarse **SAND** and gravel. Slight layered appearance but difficult to tell due to drilling disturbance. Some very dark colored peaty organic layers.	N/A	NR	OC-SB-708-0.0/2.0-XXX
	3.0-4.0			Brown silty fine **SAND** layer.		4	OC-SB-708-2.0/4.0-XXX
	4.0-6.5			Brown to olive brown medium to coarse **SAND** and gravel with a little fine sand and silt. Very moist. Soils have a slight odor.		31	OC-SB-708-4.0/6.0-XXX
	6.5-7.0			Silty fine **SAND** with traces of coarser material.			
	7.0-8.0			Olive to olive brown medium to coarse **SAND** and gravel. Very moist to wet.		18.0	OC-SB-708-6.0/8.0-XXX
	8.0-10.0			Brown to olive brown coarse **SAND** and gravel with some fine to medium sand and traces of silt. Wet. Soils have a slight odor.		10.0	OC-SB-708-8.0/10-XXX
S2 10'-20'	10.0-14.5	N/A	9.4/10.0	Brown medium to coarse **SAND** and gravel with a little fine sand. Becomes olive brown at bottom.	N/A	3.5	OC-SB-708-0.0/10-XXX
	14.5-15.5			Layered and stained medium to coarse **SAND** with some to a little fine sand and gravel. Yellow brown staining. Wet		15.5	
	15.5-16.5			Olive medium to coarse **SAND** and gravel with traces of fine sand and silt. Wet. Dark stained layer 16'-17'.		15.0 21.0	OC-SB-708-16/18-XXX
	16.5-20.0			Brown to yellow brown medium to coarse **SAND** and gravel with trace of fine sand. Very moist to wet.		7.5	
S3 20'-30'	20.0-23.0	N/A	8.0/10.0	Light brown medium to coarse **SAND** and gravel with a trace of fine sand.	N/A	NR	OC-SB-708-22/24-XXX
	23.0-25.0			Light yellowish green to olive fine to coarse **SAND** and gravel with a trace to a little silt. Wet.		15.0	
	25.0-28.0			Light yellow brown with a greenish tint fine to coarse **SAND** and gravel.		3.4	
	28.0-30.0			Bright yellow brown to olive fine **SAND** with traces of medium to coarse sand.		0.7	OC-SB-708-28/30-XXX
S4 30'-34'	30.0-33.0	N/A	4.0/4.0	Light yellowish brown with faint green tint. Medium to coarse **SAND** and gravel with a little fine sand.	N/A	6.5	
	33.0-34.0			Olive gray to gray fine to coarse **SAND** and gravel. Preliminary refusal at 34' bgs.		13.0	OC-SB-708-33/34-XXX
S5 34'-36'	34.0-36.0	N/A	2.0/2.0	**BEDROCK** well foliated amphibole gneiss appearance(Diorite) Medium grained foliated ~ 45° some pinkish clasts. Refusal at 36' bgs 34' Top of bedrock (11/4/19) (weathered bedrock) Competent bedrock at 35' bgs 36' bottom of boring (11/13/19 - cored boring deeper at request of USEPA)	N/A	NR	
S6 36'-40.5'	36.0-40.5	N/A	2.0/4.5	Dark gray fine grained foliated metamorphic rock (**GNEISS**) with general foliations at 35°-45°. Bottom of boring 40.5' bgs (11/13/19). Grouted borehole to surface.	N/A	NR	

Created by: BKH Checked by: JKR

BORING NO.: **SB-709**

PROJECT NAME: Olin - Wilmington, MA	**DRILLING CO.:** Glacier Drilling	**SHEET:** 1 OF 1
PROJECT NUMBER: 6107190016	**DRILLER:** Mike Aldo	**DRILLING METHOD:** Rotary Sonic
LOCATION: Containment Area	**DATE STARTED:** 11/06/19	**DRILL RIG MODEL:** Geoprobe 8140LS
BOREHOLE DEPTH: 40 ft. BGS	**DATE FINISHED:** 11/06/19	**SAMPLER SIZE & TYPE:** Dual Tube 4"
BOREHOLE DIAMETER: 4-in. x 6-in.	**GEOLOGIST:** Jerry Rawcliffe	**HAMMER WEIGHT:** N/A
REMARKS: Soils Analytes: VOCs, SVOCs, Metals, Hydrazine, Ammonia, Monomethylhydrazine, 1,1-dimethylhydrazine, Cr+6, Formaldehyde, Anions, N-Nitrosodimethylamine, Dimethylformamide, and phthalic anhydride. TCLP Analytes: Metals, Corrosivity, Ignitability, Reactivity, Cyanide, and Sulfide		**HAMMER DROP:** N/A
		HAMMER TYPE: N/A

Sample #	Sample Depth	Blow Counts	Rec. (ft./ft.)	Description	Well Diagram	Headspace (ppmv)	Lab Sample
S1 0'-10'	0.0-1.0	N/A	10.0/10.0	Brown to dark brown fine to coarse **SAND** and gravel with a trace of silt.	N/A	0.5	OC-SB-709-0.0/2.0-XXX
	1.0-6.5			Dark brown to very dark brown to olive gray fine to coarse **SAND** and gravel with a little silt some cobbles. Some organic material, roots, twigs, and pieces of geofabric.		3.8	OC-SB-709-2.0/4.0-XXX
	6.5-7.5			Reddish brown (iron stained) medium to coarse **SAND** and gravel with a little fine sand trace silt, small cobbles.		4.6	OC-SB-709-4.0/6.0-XXX OC-SB-709-6.0/8.0-XXX
	7.5-10			Brown to olive brown slight green tint fine to coarse **SAND** and gravel with a trace of silt.		2.5	OC-SB-709-8.0/10-XXX OC-SB-709-8.0/10-DUP OC-SB-709-8.0/10-MS OC-SB-709-8.0/10-MSD
S2 10'-20'	10.0-13.0	N/A	10.0/10.0	Brown to dark brown fine to coarse **SAND** and gravel with cobbles.	N/A	4.0	OC-SB-709-0.0/10-XXX (TCLP)
	13.0-17.0			Light olive brown fine to coarse **SAND** and gravel with cobbles and a trace of silt.		6.0	
	17.0-19.0			Olive brown to light olive brown fine to coarse **SAND** and gravel.		12.0	OC-SB-709-16/17-XXX
	19.0-20.0			Yellow brown to brown medium to coarse **SAND** and gravel.		17.0	
S3 20'-30'	20.0-21.0	N/A	6.0/10.0	Yellow brown to brown coarse to medium **SAND** and gravel. Wet.	N/A	2.9	
	21.0-22.0			Yellowish olive brown medium to coarse **SAND** and gravel (to small cobbles)			
	22.0-25.0			Yellow brown to yellowish olive brown medium to coarse **SAND** with some gravel traces of fine sand. Wet.		10.7	
	25.0-26.0			Brown to yellow brown medium to coarse **SAND** and gravel. Wet.		6.9	
S4 30'-34'	30.0-33.0	N/A	4.0/4.0	Brown to yellow brown medium to coarse **SAND** with some gravel. Trace fine sand.	N/A	6.0 6.2	
	33.0-34.0			Gray to greenish olive gray weathered and somewhat pulverized **BEDROCK**.		4.2 4.7	OC-SB-709-32/33-XXX
S5 34'-40'	34.0-40.0	N/A	2.5/6.0	Drilled **GNEISS**, fairly competent. Possible fracture (36.0-37.0'). Some iron stained fracture faces.	N/A	NR	
				Bottom of boring. Grouted borehole to surface.			

Created by: BKH Checked by: JKR

BORING NO.: **SB-710**

PROJECT NAME: Olin - Wilmington, MA	**DRILLING CO.:** Glacier Drilling	**SHEET:** 1 OF 1
PROJECT NUMBER: 6107190016	**DRILLER:** Mike Aldo	**DRILLING METHOD:** Rotary Sonic
LOCATION: Containment Area	**DATE STARTED:** 11/06/19	**DRILL RIG MODEL:** Geoprobe 8140LS
BOREHOLE DEPTH: 45 ft. BGS	**DATE FINISHED:** 11/06/19	**SAMPLER SIZE & TYPE:** Dual Tube 4"
BOREHOLE DIAMETER: 4-in. x 6-in.	**GEOLOGIST:** Jerry Rawcliffe	**HAMMER WEIGHT:** N/A
REMARKS: Soils Analytes: VOCs, SVOCs, Metals, Hydrazine, Ammonia, Monomethylhydrazine, 1,1-dimethylhydrazine, Cr+6, Formaldehyde, Anions, N-Nitrosodimethylamine, Dimethylformamide, and phthalic anhydride. TCLP Analytes: Metals, Corrosivity, Ignitability, Reactivity, Cyanide, and Sulfide		**HAMMER DROP:** N/A
		HAMMER TYPE: N/A

Sample #	Sample Depth	Blow Counts	Rec. (ft./ft.)	Description	Well Diagram	Headspace (ppmv)	Lab Sample
S1 0'-4'	0.0-2.0 2.0-4.0	N/A	2.0/4.0	Not enough recovery for 0'-2' sample Brown to dark brown fine to coarse **SAND** and gravel with a little fine sand. Cobbles. Cobble in toe of shoe (~8" cobble).	N/A	 6.5	 OC-SB-710-2.0/4.0-XXX
S2 4'-10'	4.0-6.0 6.0-8.0 8.0-10.0	N/A	6.0/6.0	Brown to olive brown fine to coarse **SAND** and gravel with a trace of silt. Very moist to wet. Dark gray to very dark gray to black fine to medium **SAND** with some coarse sand. Very moist to wet. Cobble. Dark brown to brown medium to coarse **SAND** and gravel with a little fine sand. Gravel and cobbles are rounded.	N/A	8.1 20 14.0	OC-SB-710-4.0/6.0-XXX OC-SB-710-6.0/8.0-XXX OC-SB-710-8.0/10.0-XXX OC-SB-710-0.0/10-XXX (TCLP)
S3 10'-20'	10.0-15.0 15.0-18.0 18.0-19.0 19.0-20.0	N/A	8.5/10	Brown to olive brown medium to coarse **SAND** and gravel with sand cobbles and traces of fine sand. Finer at top of sample. Brown medium to coarse **SAND** and gravel with cobbles. Layered appearance (Alluvial). Brown to olive brown medium to coarse **SAND** and gravel. Brown to light brown medium to coarse **SAND** and gravel with some small cobbles to large gravel. Trace fine sand. Alluvial.	N/A	13.5 11.8 11 4.8 7.6	
S4 20'-30'	20.0-23.0 23.0-24.0	N/A	4.0/10.0	Light brown to brown fine to coarse **SAND** and gravel with some small cobbles. Wet. Light brown to light yellow brown fine to medium **SAND** with traces of silt and coarse sand, fine grained sands are well stratified. Lost bottom of sample and bit. Offset and redrilled to 30' and resumed sampling.	N/A	3.3 1.4 3.2 NR	OC-SB-710-23/24-XXX
S5 30'-39'	30.0-33.5 33.5-35.5 35.5-37.5 37.5-39.0	N/A	8.0/10.0	Brown to light brown medium to coarse **SAND** with trace gravel and fine sand. Brown to dark brown medium to coarse **SAND** and gravel with traces of fine sand. Some small cobbles. Dark yellow brown to dark olive brown silty fine to coarse **SAND** and gravel with some small cobbles. Possible basal till. Very moist to wet. Gray to olive with slight greenish tint. Appears to be **WEATHERED BEDROCK**. Very moist to dry. Top of **BEDROCK** 38', becomes more competent by 39'.	N/A	2.1 3.2 4.9 3.9 3.9	 OC-SB-710-36/37-XXX
S6 39'-45'	39.0-45.0 45	N/A	3.0/6.0	Top 1' of recovery is broken up **SCHIST** to gneissic rock with numerous iron stained fracture lines. Some green stained faces. Bottom 2' of recovery is darker greenish gray much more competent but still very broken up. Foliation/fracture trend is high angle (60°) fine grained. Bottom of boring. Grouted borehole to surface.	N/A	NR	

Created by: BKH Checked by: JKR

BORING NO.: **SB-711**

PROJECT NAME: Olin - Wilmington, MA	**DRILLING CO.:** Glacier Drilling	**SHEET:** 1 OF 1
PROJECT NUMBER: 6107190016	**DRILLER:** Mike Aldo	**DRILLING METHOD:** Rotary Sonic
LOCATION: Containment Area	**DATE STARTED:** 11/12/19	**DRILL RIG MODEL:** Geoprobe 8140LS
BOREHOLE DEPTH: 43' ft. BGS	**DATE FINISHED:** 11/12/19	**SAMPLER SIZE & TYPE:** Dual Tube 4"
BOREHOLE DIAMETER: 4-in. x 6-in.	**GEOLOGIST:** Jerry Rawcliffe	**HAMMER WEIGHT:** N/A
REMARKS: Soils Analytes: VOCs, SVOCs, Metals, Hydrazine, Ammonia, Monomethylhydrazine, 1,1-dimethylhydrazine, Cr+6, Formaldehyde, Anions, N-Nitrosodimethylamine, Dimethylformamide, and phthalic anhydride. TCLP Analytes: Metals, Corrosivity, Ignitability, Reactivity, Cyanide, and Sulfide		**HAMMER DROP:** N/A
		HAMMER TYPE: N/A

Sample #	Sample Depth	Blow Counts	Rec. (ft./ft.)	Description	Well Diagram	Headspace (ppmv)	Lab Sample
S1 (0'-8')	0.0-2.0	N/A	8.0/8.0	Brown medium to coarse **SAND** and gravel with some fine sand and a trace of silt.	N/A	51	OC-SB-711-0.0/2.0-XXX
	2.0-3.5			Dark brown to dark olive brown slightly mottled fine to coarse **SAND** and gravel, trace cobble and silt.		89.0	
	3.5-6.5			Very dark brown to black fine to coarse **SAND** with some gravel and gravelly areas, trace cobble and silt. Moist, petroleum like odor.		280	OC-SB-711-2.0/4.0-XXX OC-SB-711-4.0/6.0-XXX
	6.5-8.0			Brown medium to coarse **SAND** with some gravel and a little fine sand.		55.0	OC-SB-711-6.0/8.0-XXX
S2 (8'-18')	8.0-9.5	N/A	10.0/10.0	Brown to light brown medium **SAND** with some fine sand and traces of coarse sand and gravel.	N/A	5.1	OC-SB-711-8.0/10-XXX
	9.5-9.7			Gravel Layer.			
	9.7 - 10.5			Olive brown fine **SAND** with some medium sand and a little coarse sand and gravel and a trace of silt.		8.6	OC-SB-711-0.0/10-XXX
	10.5-13.0			Dark brown to brown medium to coarse **SAND** with a little gravel and traces of cobbles.			
	13.0-18.0			Light brown to olive brown to olive. Gravel with medium to coarse **SAND** and a little to traces of fine sand and silt. Trace small cobbles.		9.8	
				Light brown to olive brown to olive gravel with medium to coarse **SAND** and a little to traces of fine sand and silt. Trace of small cobbles. Wet.		6.4	
				Becomes more brown less fine near bottom of recovery (17'-18')		5.6	OC-SB-711-18/19-XXX (actual closer to 17-18')
S3 (18'-26')	18.0-20.0	N/A	8.0/8.0	Brown medium to coarse **SAND** and gravel with a little cobbles and traces of fine sand.	N/A	8.6	
	20.0-21.5			Light brown medium to coarse **SAND** and gravel with a little cobbles.		5.1	
	21.5-25.0			Light brown medium to coarse **SAND** with a little gravel and traces of fine sand.		3.5	
	25.0-26.0			Light brown to light reddish brown medium **SAND** with some coarse sand and a little gravel trace fine sand.		3.2	
S4 (26'-36')	26.0-27.0	N/A	9.0/10	Light reddish brown medium **SAND** similar to above.	N/A	6.3	
	27.0-28.0			Olive to yellowish olive fine to coarse **SAND** and gravel with a little cobbles and silt. Mottled appearance.		4.2	
	28.0-33.0			Olive brown to brown fine to coarse **SAND** and gravel with some cobbles and little to traces of silt. Wet.		1.8	
	33.0-36.0			Gray to olive gray fine to coarse **SAND** and gravel with cobbles and some silt (Till).		5.6	OC-SB-711-35/36-XXX
				Top of **WEATHERED ROCK** = 36' BGS			
S5 (38'-43')	38	N/A	2.0/5.0	Set 6" casing into weathered bedrock (**SCHIST**) to 38' - top of competent rock. Cored with Sonic 38'-43' BGS	N/A	NR	
	40			Recovered ~2' of **GRAVEL** and cobble sized bedrock fragments.			
	42			Dark gray fine to medium grained **SCHIST** with some foliation at ~45°.			
	43			Bottom of boring. Grouted borehole upon completion.			

Created by: SRC Checked by: JKR

BORING NO.: **SB-712**

PROJECT NAME: Olin - Wilmington, MA	**DRILLING CO.:** Glacier Drilling	**SHEET:** 1 OF 1
PROJECT NUMBER: 6107190016	**DRILLER:** Mike Aldo	**DRILLING METHOD:** Rotary Sonic
LOCATION: Containment Area	**DATE STARTED:** 11/11/2019	**DRILL RIG MODEL:** Geoprobe 8140LS
BOREHOLE DEPTH: 48 ft. BGS	**DATE FINISHED:** 11/12/2019	**SAMPLER SIZE & TYPE:** Dual Tube 4"
BOREHOLE DIAMETER: 4-in. x 6-in.	**GEOLOGIST:** Jerry Rawcliffe	**HAMMER WEIGHT:** N/A
REMARKS: Soils Analytes: VOCs, SVOCs, Metals, Hydrazine, Ammonia, Monomethylhydrazine, 1,1-dimethylhydrazine, Cr+6, Formaldehyde, Anions, N-Nitrosodimethylamine, Dimethylformamide, and phthalic anhydride. TCLP Analytes: Metals, Corrosivity, Ignitability, Reactivity, Cyanide, and Sulfide		**HAMMER DROP:** N/A **HAMMER TYPE:** N/A

Sample #	Sample Depth	Blow Counts	Rec. (ft./ft.)	Description	Well Diagram	Headspace (ppmv)	Lab Sample
S1 (0'-5')	1.0-1.4	N/A	5.0/5.0	Brown fine to coarse **SAND** with some gravel traces silt and small cobble. Moist.	N/A	6.0	OC-SB-712-0.0/2.0-XXX
	1.4-2.5			Dark brown fine to coarse **SAND** and gravel with a little silt. Some white material in thin layers.			OC-SB-712-2.0/4.0-XXX
	2.5-3.0			Very dark brown to black fine to coarse **SAND** with some gravel and organics. Moist.		1.5	
	3.0-4.5			Dark brown fine to coarse **SAND** and gravel with a little small cobbles and silt. Moist.			
	4.0-5.0			Brown to olive fine to coarse **SAND** with some gravel and a little silt. Slight mottled appearance.		2.9	OC-SB-712-4.0/6.0-XXX
S2 (5'-17')	5.0-6.0	N/A	11.0/12.0	Brown to olive brown - similar to above, mottled.	N/A	10.3	OC-SB-712-6.0/8.0-XXX
	6.0-7.0			Very dark brown fine to coarse **SAND** and gravel with a trace of silt and some organics. Slightly mottled.			
	7.0-8.0			Brown to yellow brown to olive fine to coarse **SAND** with a little gravel and traces of silt.		6.0	
	8.0-9.0			Brown medium to coarse **SAND** with a little gravel and fine sand.			OC-SB-712-8.0/10-XXX
	9.0-10.0			Brown to yellow brown medium to fine **SAND** with a trace gravel/small cobble.		2.4	OC-SB-712-0/10-XXX OC SB-712-0/10-DUP (TCLP)
	10.0-10.5			Olive fine to coarse **SAND** and gravel with a little small cobbles and a trace of silt.			
	10.0-11.5			Brown to reddish brown medium to coarse **SAND** with a little gravel and a trace of fine sand.			
	11.5-13.5			Strong reddish brown coarse to medium **SAND** with a little gravel.		0.8	
	13.5-15.0			Brown to yellow brown medium to coarse **SAND** and gravel with a little small cobbles and traces of fine sand.			
	15.0-17.0			Brown to reddish brown medium to coarse **SAND** and gravel with a trace of fine sand.		1.2	
S3 (17'-22')	17.0-22.0	N/A	2.5/5.0	Brown to reddish brown medium to coarse **SAND** and gravel.	N/A	2.1 0.8 1.2	
S4 (22'-32')	22.0-24.0	N/A	10.0/10.0	Brown to yellow brown medium to coarse **SAND** and gravel with a trace of fine sand and cobbles.	N/A	4.1	OC-SB-712-23/24-XXX
	24.0-24.8			Reddish brown medium to coarse **SAND** and gravel with a trace of fine sand.		1.6	
	24.8-29.0			Light brown to brown coarse to medium **SAND** and gravel.		0.6	
	29.0-29.5			Brown to light brown medium **SAND** with traces of fine sand and coarse sand.		0.7	
	29.5-32.0			Yellow brown to brown medium to coarse **SAND** and gravel with some cobbles and a little to traces of fine sand.		0.9	
				Very bottom is gray material and a **COBBLE**. Cobble from 32-34.5'			
S5 (32'-40')	34.5-35.5	N/A	6.0/8.0	Olive to olive brown gravel with fine to coarse **SAND** and a trace of silt. Wet.	N/A	2.2	
	35.5-36.0			Olive gray gravel with fine to coarse **SAND** trace of silt and cobble. Reddish stained layer at 36' (0.1' thick).		0.6	
	36.0-37.0			Dark gray to very dark brown fine to coarse **SAND** and gravel with a trace of silt and cobble.			
	37.0-38.0			Dark olive brown gravel with medium to coarse **SAND** and a little fine sand.		0.7	OC-SB-712-37/38-XXX
				Estimate top of **WEATHERED BEDROCK** = 42' BGS			
S6 (43'-48')	46	N/A		Recovered ~2.5' of **COBBLES** and gravel sized rock fragments. Dark grey fine to medium grained (**GNEISS**). General foliation of fracture lines at ~45°, with green staining on some visible faces.	N/A	NR	
	50			Bottom of boring. Grouted borehole upon completion.			

Created by: SRC Checked by: JKR

DATA VALIDATION REPORT - REMEDIAL INVESTIGATION

NOVEMBER 2019 CONTAINMENT AREA

SOIL SAMPLING EVENT

DATA VALIDATION REPORT
REMEDIAL INVESTIGATION

NOVEMBER 2019 CONTAINMENT AREA SOIL SAMPLING EVENT

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March 9, 2020

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LIST OF ACRONYMS AND ABBREVIATIONS

CCV	Continuing Calibration Verification
DMF	Dimethylformamide
DUP	Duplicate
EDD	Electronic Data Deliverable
FD	Field Duplicate
ICV	initial calibration verification
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
LCSM	Laboratory Control Sample/ Laboratory Control Sample Duplicate Missing
LCSSRMs/LCDSRMs	Laboratory control sample standard reference materials
MassDEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
MDL	Method Detection Limit
MMH	Monomethylhydrazine
MS/MSD	Matrix Spikes/Matrix Spike Duplicate
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
mg/L	milligrams per liter
mg/kg	milligrams per kilogram
ORP	Oxidation Reduction Potential
QAPP	Quality Assurance Project Plan
QC	Quality Control
RI/FS	Remedial Investigation/Feasibility Study
RPD	Relative Percent Difference
RRF	Relative Response Factor
SDG	Sample Delivery Group
SVOC	Semivolatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure

USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
Wood	Wood Environment & Infrastructure Solutions, Inc.

1.0 INTRODUCTION

Soil samples were collected by Wood Environment & Infrastructure Solutions, Inc. (Wood) at the Olin Chemical Superfund Site in November 2019 as part of a comprehensive containment area soil sampling program in accordance with the Remedial Investigation/Feasibility Study (RI/FS) Work Plan (Wood, 2019). Samples were analyzed by one or more of the following: United States Environmental Protection Agency (USEPA) SW-846 (USEPA, 1996), USEPA wastewater (USEPA, 1993), and Massachusetts Department of Environmental Protection ([MassDEP], 2010) compendium methods:

Laboratory	Parameter	Analytical Method	Validation Level
Eurofins TestAmerica – Buffalo, NY	Volatile Organic Compounds (VOCs)	SW-846 8260C	10% Stage 4/ 90% Stage 2A
Eurofins TestAmerica – Pittsburgh, PA	Semivolatile Organic Compounds (SVOCs)	SW-846 8270D	10% Stage 4/ 90% Stage 2A
Eurofins TestAmerica – Buffalo, NY	Project Analyte List Metals	SW-846 6010D/7471A	10% Stage 4/ 90% Stage 2A
Eurofins TestAmerica – Buffalo, NY	Metals Toxicity Characteristic Leaching Procedure (TCLP)	1311/SW-846 6010C/7470A	10% Stage 4/ 90% Stage 2A
Eurofins – Lancaster, PA	Hexavalent Chromium	SW-846 3060A/7199	10% Stage 4/ 90% Stage 2A
Eurofins – Lancaster, PA	pH/Temperature*	SW9045	Olin Level 1
Eurofins – Lancaster, PA	Oxidation Reduction Potential* (ORP)	D1498	Olin Level 1
Eurofins TestAmerica – Buffalo, NY	Ammonia	USEPA 350.1	Olin Level 1
Eurofins TestAmerica – Pittsburgh, PA	Anions Chloride and Sulfate	USEPA 300.0	Olin Level 1
Eurofins TestAmerica – Edison, NJ	Ignitability	SW1030	Olin Level 1
Eurofins TestAmerica – Buffalo, NY	Reactive Cyanide/Sulfate	SW9012/SW9034	Olin Level 1

Laboratory	Parameter	Analytical Method	Validation Level
Eurofins TestAmerica – Buffalo, NY	Corrosivity (pH)	SW9045	Olin Level 1
Eurofins TestAmerica – Buffalo, NY & Katahdin Analytical Services – Scarborough, ME	Percent Moisture/Percent Solids	E160.3/SW3540C	Olin Level 1
Eurofins TestAmerica – Canton, OH	Formaldehyde	SW-846 8315A	Chemist Review
Eurofins – Lancaster, PA	Hydrazine/ Monomethylhydrazine / Unsymmetrical Dimethylhydrazine	Modified 8315A LC/MS/MS	Chemist Review
Katahdin Analytical Services – Scarborough, ME	Dimethylformamide (DMF)	SW3540C	Chemist Review

* pH, temperature and ORP analysis completed as required during Alkaline Digestion Method 3060A

The containment area soil samples were collected from November 4, 2019 through November 12, 2019. A summary of samples (by Sample Delivery Group [SDG]) included in this data validation report is presented in **Table 1**. Analytical data packages were reviewed in accordance with the Olin Chemical Superfund Site Final RI/FS Work Plan Quality Assurance Project Plan (QAPP) [Wood, 2019]. VOCs, SVOCs, and metals data were validated using staged data validation (USEPA, 2009) identified in Region I EPA-New England Environmental Data Review Program Guidance (USEPA, 2018b), the USEPA National Functional Guidelines (USEPA, 2017a; USEPA 2017b), and the Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP) (MassDEP, 2010). USEPA National Guideline data validation procedures were modified for SW-846 Methods to include method-specific criteria (i.e., measurement performance criteria detailed in the QAPP) from the MCP Methods. For other methods that were not addressed in USEPA guidelines or the MCP Compendium, method performance criteria were developed for this project as indicated in the QAPP. Validation levels for each method reviewed (Stage 4, Stage 2A, Olin Level 1, chemist review) are summarized above.

Final validated sample results are presented in a series of tables (**Table 2s**) associated with **Sections 2 through 12** of this document. **Tables 2.1 through 2.9** present the final data for the various analytical methods that are addressed in **Sections 2 through 12**. Results for pH, temperature, and ORP are presented with the hexavalent chromium results on **Table 2.5**. All general chemistry results (anions,

ammonia, percent solids, percent moisture, reactive cyanide and sulfide, and ignitability) were combined in **Table 2.6**.

Documentation of data validation actions is presented in a series of tables (**Table 3s**) associated with **Sections 2 through 12** of this document. **Tables 3.1 through 3.8** present final results that have been qualified (data validation has resulted in revisions to the laboratory result) for the various analytical methods that are addressed in **Sections 2 through 12** as well as the associated validation reason codes. All general chemistry data validation actions (anions, ammonia, percent solids, percent moisture, reactive cyanide and sulfide, and ignitability) were combined in **Table 3.6**. An index of the qualification reason codes is presented on the last page of **Table 3**. If no qualifiers were added during the review of the data for a specific method then no **Table 3** is presented (e.g., DMF).

2.0 VOLATILE ORGANIC COMPOUNDS

Samples were analyzed for VOCs by Method 8260C. Data were evaluated based on the following parameters:

* Data Completeness
* Holding Times and Preservation

  Blanks
* Instrument Calibration

  Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)

  Matrix Spikes/Matrix Spike Duplicates (MS/MSD)

  FDs
* Surrogate Recovery
* Internal Standard Response and Retention Time
* Detection Limits
* Sample Result Verification/Electronic Evaluation Verification (EDD)
* Raw data verification and calculation checks

* = indicates that criteria were met for this parameter

Except for the validation actions noted below, sample results are interpreted to be usable as reported by the laboratory. A summary of final results is presented on **Table 2.1**. A summary of data validation actions is presented on **Table 3.1**.

2.1 Blanks

Four equipment rinsate blanks were included with the soil samples. Detections of acetone (8.4 micrograms per liter [µg/l] to 46 µg/l) and 2-butanone (1.6 µg/l to 9.2 µg/l) were reported in all four equipment rinsate blanks. Low level detections of methylene chloride (0.69 µg/l) and tetrahydrofuran (4.4 µg/l) were reported in two of the equipment rinsate blanks. Soil sample results were not qualified due to equipment rinsate blank detections. A summary of blank qualification actions is presented in **Table 3.1** for VOCs with results being assigned a validation qualifier reason code of BL1 for method blanks and BL2 for field blanks.

SDG 480-162140-1

Chloroform was detected at 0.922 J micrograms per kilogram (µg/kg) in the method blank (MB 480-503169/3-A) analyzed on November 8, 2019. Chloroform was reported at similar concentrations below

the reporting limit in associated samples OC-SB-708-0.0/2.0-XXX at 0.51 J µg/kg, OC-SB-708-6.0/8.0-XXX at 0.24 J µg/kg, and OC-SB-708-8.0/10-XXX at 0.29 J µg/kg and was qualified not detected (U) at the reporting limits.

SDG 480-162199-1

Chloroform was detected at 0.922 J µg/kg in the method blank (MB 480-503169/3-A) analyzed on November 8, 2019. Chloroform was reported at similar concentrations below the reporting limit in associated samples OC-SB-708-22/24-XXX at 0.23 J µg/kg, OC-SB-708-33/34-XXX at 0.55 J µg/kg, OC-SB-710-2.0/4.0-XXX at 0.34 J µg/kg, OC-SB-710-4.0/6.0-XXX at 0.23 J µg/kg, OC-SB-710-6.0/8.0-XXX at 0.25 J µg/kg, OC-SB-710-22/24-XXX at 0.25 J µg/kg, and OC-SB-710-33/34-XXX at 0.55 J µg/kg and was qualified not detected (U) at the reporting limits.

SDG 480-162315-1

For a subset of samples, chloroform was detected at 0.944 J µg/kg and methylene chloride was detected at 2.43 J µg/kg in the method blank (MB 480-503689/3-A) analyzed on November 11, 2019. Associated sample result for methylene chloride were not detected; no action required. Chloroform was reported at similar concentrations below the reporting limit in associated samples OC-SB-703-0.0/2.0-XXX at 0.35 J µg/kg, OC-SB-709-4.0/6.0-XXX at 0.30 J µg/kg, and OC-SB-709-32/33-XXX at 0.33 J µg/kg and was qualified not detected (U) at the reporting limits.

For a subset of samples, chloroform was detected at 0.692 J µg/kg, methylene chloride was detected at 5.26 µg/kg, and naphthalene was detected at 0.926 J µg/kg in the method blank (MB 480-504069/3-A) analyzed on November 12, 2019. Associated sample result for methylene chloride were not detected; no action required. Chloroform was reported in associated sample OC-SB-703-30/32-XXX at 1.4 J µg/kg and was qualified not detected at the reporting limit. Naphthalene was reported in associated samples OC-SB-703-2.0/4.0-XXX at 1.0 J µg/kg and OC-SB-703-30/32-XXX at 0.42 J µg/kg and were qualified not detected (U) at the reporting limits.

SDG 480-162353-1

Acetone was detected at 16 µg/kg in the trip blank associated with all samples. All reported detections of acetone were less than the reporting limits adjusted for dilution and were qualified not detected (U) at the reporting limits.

For a subset of samples, chloroform was detected at 0.692 J µg/kg, methylene chloride was detected at 5.26 µg/kg, and naphthalene was detected at 0.926 J µg/kg in the method blank (MB 480-504069/3-A) analyzed on November 12, 2019. Associated sample results for chloroform and methylene chloride were not detected; no action required. Naphthalene was reported in associated sample OC-SB-706-10/12-XXX at 0.95 J µg/kg and was qualified not detected (U) at the reporting limit.

SDG 480-162426-1

Methylene chloride was detected at 8.8 µg/kg in the trip blank associated with all samples. All reported detections of methylene chloride were qualified not detected (U).

For a subset of samples, chloroform was detected at 0.552 J µg/kg and methylene chloride was detected at 24.3 µg/kg in the method blank (MB 480-504300/3-A) analyzed on November 13, 2019. Chloroform was reported in associated samples OC-SB-702-0.0/2.0-XXX at 0.37 J µg/kg and OC-SB-704-33/34-XXX at 0.34 J µg/kg and were qualified not detected (U) at the reporting limits. All reported detections of methylene chloride were qualified not detected (U).

For a subset of samples, chloroform was detected at 0.593 J µg/kg and methylene chloride was detected at 7.31 µg/kg in the method blank (MB 480-504474/24-A) analyzed on November 14, 2019. Chloroform was not detected in associated samples; no action required. All reported detections of methylene chloride were qualified not detected (U).

SDG 480-162513-1

Methylene chloride was detected at 3.0 µg/kg in the trip blank associated with all samples. All reported detections of methylene chloride were qualified not detected (U).

For a subset of samples, chloroform was detected at 0.593 J µg/kg and methylene chloride was detected at 7.31 µg/kg in the method blank (MB 480-504474/24-A) analyzed on November 14, 2019. Chloroform was not detected in associated samples; no action required. All reported detections of methylene chloride were qualified not detected (U).

For a subset of samples, chloroform was detected at 0.498 J µg/kg and methylene chloride was detected at 30.2 µg/kg in the method blank (MB 480-504727/24-A) analyzed on November 15, 2019. Chloroform was not detected in associated samples; no action required. Methylene chloride was reported in associated sample OC-SB-701-0.0/2.0-XXX at 19 µg/kg and was qualified not detected (U).

SDG 480-162572-1

Styrene (0.45 J µg/kg), toluene (4.1 J µg/kg), acetone (18 J µg/kg), and methylene chloride (21 µg/kg) were detected in the trip blank associated with all samples. Styrene was not detected in associated samples.; no action required. Toluene was reported in associated samples OC-SB-712-4.0/6.0-XXX at 0.42 J µg/kg, OC-SB-712-23/24-XXX at 0.75 J µg/kg, and OC-SB-712-37/38-XXX at 0.35 J µg/kg and were qualified not detected (U) at the reporting limits. Acetone was reported in samples OC-SB-711-0.0/2.0-XXX at 14 J µg/kg, OC-SB-711-6.0/8.0-XXX at 23 J µg/kg, OC-SB-711-18/19-XXX at 7.3 J µg/kg, OC-SB-711-35/36-XXX at 16 J µg/kg, OC-SB-712-0.0/2.0-XXX at 21 J µg/kg, OC-SB-712-2.0/4.0-XXX at 42 J µg/kg, OC-SB-712-4.0/6.0-XXX at 27 J µg/kg, OC-SB-712-6.0/8.0-XXX at 57 J µg/kg, OC-SB-712-8.0/10-XXX at 14 J µg/kg, OC-SB-712-23/24-XXX at 16 J µg/kg, and OC-SB-712-37/38-XXX at 14 J µg/kg and were qualified not detected (U) at the reporting limits. Methylene chloride was reported in samples OC-SB-711-0.0/2.0-XXX at 26 µg/kg, OC-SB-711-6.0/8.0-XXX at 10 µg/kg, OC-SB-711-18/19-

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XXX at 30 µg/kg, OC-SB-711-35/36-XXX at 17 µg/kg, OC-SB-712-0.0/2.0-XXX at 27 µg/kg, OC-SB-712-2.0/4.0-XXX at 20 µg/kg, OC-SB-712-4.0/6.0-XXX at 22 µg/kg, OC-SB-712-6.0/8.0-XXX at 21 µg/kg, OC-SB-712-8.0/10-XXX at 24 µg/kg, OC-SB-712-23/24-XXX at 23 µg/kg, and OC-SB-712-37/38-XXX at 20 µg/kg and were qualified not detected (U).

For a subset of samples, chloroform was detected at 0.473 J µg/kg and methylene chloride was detected at 33 µg/kg in the method blank (MB 480-504747/4-A) analyzed on November 15, 2019. Chloroform was not detected in associated samples; no action required. All reported detections of methylene chloride were qualified not detected (U).

2.2 Laboratory Control Sample

A summary of LCS/LCSD qualification actions is presented in **Table 3.1** for VOC results being assigned a validation qualifier reason code of LCS-H for percent recoveries greater than the upper Quality Control (QC) limit of 130, LCS-L for percent recoveries less than the lower QC limit of 70, and LCS-Relative Percent Difference (RPD) for LCS/LCSD relative percent difference greater than the QC limit of 30.

SDG 480-16 **2**140-1

The LCS/LCSD associated with samples had percent recoveries greater than the upper project recovery limit of 130 for 2-butanone (184/196), indicating a high bias. 2-Butanone was detected in sample OC-SB-708-2.0/4.0-XXX and was qualified estimated (J+).

SDG 480-16 **2**199-1

The LCS/LCSD associated with samples had percent recoveries greater than the upper project recovery limit of 130 for 2-butanone (184/196), indicating a high bias. 2-Butanone was detected in samples OC-SB-708-16/18-XXX, OC-SB-708-33/34-XXX, OC-SB-710-4.0/6.0-XXX, and OC-SB-710-6.0/8.0-XXX and was qualified estimated (J+).

SDG 480-16 **2**315-1

The LCS/LCSD associated with a subset of samples had percent recoveries greater than the upper project recovery limit of 130 for 2-butanone (179/197), indicating a high bias. 2-Butanone was detected in sample OC-SB-709-4.0/6.0-XXX and was qualified estimated (J+).

The LCS/LCSD associated with a subset of samples had percent recoveries greater than the upper project recovery limit of 130 for 2-butanone (162/171), indicating a high bias. 2-Butanone was detected in sample OC-SB-703-2.0/6.0-XXX and was qualified estimated (J+).

SDG 480-16 **2**353-1

The LCS/LCSD associated with a subset of samples had percent recoveries greater than the upper project recovery limit of 130 for 2-butanone (162/171), indicating a high bias. 2-Butanone was

2-4

detected in samples OC-SB-706-2.0/6.0-XXX, OC-SB-706-10/12-XXX, and OC-SB-707-2.0/6.0-XXX and was qualified estimated (J+).

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The LCS/LCSD associated with a subset of samples had percent recoveries greater than the upper project recovery limit of 130 for 2-butanone (189/164), indicating a high bias. 2-Butanone was detected in samples OC-SB-702-2.0/4.0-XXX, OC-SB-702-4.0/6.0-XXX, OC-SB-702-6.0/8.0-XXX, OC-SB-704-2.0/4.0-XXX, OC-SB-704-4.0/6.0-XXX, OC-SB-704-6.0/8.0-XXX, OC-SB-704-8.0/10-XXX, OC-SB-705-2.0/4.0-XXX, OC-SB-705-4.0/6.0-XXX and was qualified estimated (J+).

The LCS/LCSD associated with a subset of samples had percent recoveries greater than the upper project recovery limit of 130 for 2-butanone (169/166), indicating a high bias. 2-Butanone was detected in samples OC-SB-705-4.0/6.0-Duplicate (DUP) and OC-SB-705-6.0/8.0-XXX and was qualified estimated (J+).

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The LCS/LCSD associated with a subset of samples had percent recoveries greater than the upper project recovery limit of 130 for 2-butanone (169/166), indicating a high bias. 2-Butanone was detected in samples OC-SB-701-2.0/4.0-XXX and OC-SB-701-4.0/6.0-XXX and was qualified estimated (J+).

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The LCS/LCSD associated with a subset of samples had percent recoveries greater than the upper project recovery limit of 130 for 2-butanone (183/167) and methylene chloride (147/149), indicating a high bias. Methylene was non-detect in associated samples; no action required. 2-Butanone was detected in associated sample OC-SB-712-2.0/4.0-XXX and was qualified estimated (J+).

The LCS/LCSD associated with a subset of samples had percent recoveries greater than the upper project recovery limit of 130 for 2-butanone (216/194) indicating a high bias, and LCS/LCSD RPD for acetone (21), and dichlorodifluoromethane (27) that exceeded the QC limit of 20. 2-Butanone was detected in associated sample OC-SB-711-6.0/8.0-XXX was qualified estimated (J+). The result for Acetone and dichlorodifluoromethane was not detected in associated sample OC-SB-711-6.0/8.0-XXX and the reporting limits were qualified estimated (UJ).

The LCS and/or LCSD associated with a subset of samples had percent recoveries greater than the upper project recovery limit of 130 for 2-butanone (174/167) indicating a high bias, and less than the lower QC limit of 70 for bromomethane (64) and chloroethane (60/54) indicating a low bias. 2-Butanone was not detected in associated samples; no action required. Bromomethane and chloroethane in samples OC-SB-711-2.0/4.0-XXX, OC-SB-711-4.0/6.0-XXX, and OC-SB-711-8.0/10-XXX were not detected and reporting limits were qualified estimated (UJ).

2.3 MS/MSD

A summary of MS/MSD qualification actions is presented in **Table 3.2** for VOCs with results being assigned a validation qualifier reason code of MS-L.

SDG 480-162315-1

The MS/MSD associated with samples OC-SB-703-2.0/4.0-XXX and its field duplicate (FD) OC-SB-703-2.0/4.0-DUP had percent recoveries less than the lower QC limit of 70 for 47 percent of the spiked analytes. MS and/or MSD percent recoveries ranged from 29 to 69, indicating low bias. Based on professional judgment, results and reporting limits for all analytes in samples OC-SB-703-2.0/4.0-XXX and its FD OC-SB-703-2.0/4.0-DUP were qualified estimated (J-/UJ).

The MS and/or MSD associated with samples OC-SB-709-8.0/10-XXX and its FD OC-SB-709-8.0/10-DUP had percent recoveries less than the lower QC limit of 70 for 1,1,2,2-tetrachloroethane (67/66), 1,2,3-trichloropropane (61/60), 1,2-dibromo-3-chloropropane (61/60), 1,3-dichloropropane (69), 1,4-dioxane (63/62), 2-hexanone (58/58), 4-methyl-2-pentanone (60/60), acetone (46/48), 1,2-dibromoethane (67/68), acetic acid-methyl ester (62/60), naphthalene (64/65), and tetrahydrofuran (62/58), indicating low bias. Acetone results in samples OC-SB-709-8.0/10-XXX and its FD OC-SB-709-8.0/10-DUP were qualified estimated (J-). Results for 1,1,2,2-tetrachloroethane, 1,2,3-trichloropropane, 1,2-dibromo-3-chloropropane, 1,3-dichloropropane, 1,4-dioxane, 2-hexanone, 4-methyl-2-pentanone, 1,2-dibromoethane, acetic acid-methyl ester, naphthalene, and tetrahydrofuran in samples OC-SB-709-8.0/10-XXX and its FD OC-SB-709-8.0/10-DUP were not detected and the reporting limits were qualified estimated (UJ).

SDG 480-162353-1

The MS and/or MSD associated with samples OC-SB-707-6.0/8.0-XXX and its FD OC- SB-707-6.0/8.0-DUP had percent recoveries less than the lower QC limit of 70 for 1,1,2,2-tetrachloroethane (64/68), 1,2,3-trichlorobenzene (69), 1,2,3-trichloropropane (60/64), 1,2-dibromo-3-chloropropane (57/62), 1,3-dichloropropane (68), 1,4-dioxane (62/65), 2-hexanone (59/61), 4-methyl-2-pentanone (60/63), acetone (55/65), 1,2-dibromoethane (66), acetic acid-methyl ester (62/64), naphthalene (65/65), and tetrahydrofuran (59/66), indicating low bias. Results for 1,1,2,2-tetrachloroethane, 1,2,3-trichlorobenzene, 1,2,3-trichloropropane, 1,2-dibromo-3-chloropropane, 1,3-dichloropropane, 1,4-dioxane, 2-hexanone, 4-methyl-2-pentanone, acetone, 1,2-dibromoethane, acetic acid-methyl ester, naphthalene, and tetrahydrofuran in samples OC-SB-707-6.0/8.0-XXX and its FD OC-SB-707-6.0/8.0-DUP were not detected and the reporting limits were qualified estimated (UJ).

SDG 480-162426-1

The MS and/or MSD associated with samples OC-SB-705-4.0/6.0-XXX and its FD OC-SB-705-4.0/6.0-DUP had percent recoveries less than the lower QC limit of 70 for 1,1,2,2-tetrachloroethane (67), 1,2,3-trichlorobenzene (32/36), 1,2,3-trichloropropane (66), 1,2,4-trichlorobenzene (37/41), 1,2-dibromo-3-

chloropropane (63/57), 1,2-dichlorobenzene (60/61), 1,3-dichlorobenzene (61/61), 1,4-dichlorobenzene (60/60), 2,2,4-trimethyl-1-pentene (52), 2,4,4-trimethyl-2-pentene (60), 2-hexanone (63), 4-isopropyltoluene (63/66), acetone (41/45), hexachlorobutadiene (31/34), methylcyclohexane (62/63), naphthalene (40/43), n-butylbenzene (53/52), n-propylbenzene (69), sec-butylbenzene (63/61), styrene (67), tert-butylbenzene (68), and tetrahydrofuran (66) indicating low bias. The MS percent recovery for acetic acid, methyl ester (137) was greater than the upper QC limit of 130, indicating high bias. The MS/MSD RPD for 2,2,4-trimethyl-1-pentene (48) and acetone (41) exceeded the project QC limit of 30. The result for acetic acid, methyl ester in FD sample OC-SB-705-4.0/6.0-DUP was qualified estimated (J+). Detected results for acetone, 2,4,4-trimethyl-1-pentene, and 2,4,4-trimethyl-2-pentene were qualified estimated (J-). Results for 1,1,2,2-tetrachloroethane, 1,2,3-trichlorobenzene, 1,2,3-trichloropropane, 1,2,4-trichlorobenzene, 1,2-dibromo-3-chloropropane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 2-hexanone, 4-isopropyltoluene, hexachlorobutadiene, methylcyclohexane, naphthalene, n-butylbenzene, n-propylbenzene, sec-butylbenzene, styrene, tert-butylbenzene, and tetrahydrofuran in samples OC-SB-705-4.0/6.0-XXX and its FD OC-SB-705-4.0/6.0-DUP were not detected and the reporting limits were qualified estimated (UJ).

SDG 480-162513-1

The MS and/or MSD associated with samples OC-SB-701-0.0/2.0-XXX and its FD OC-SB-701-0.0/2.0-DUP had percent recoveries less than the lower QC limit of 70 for 1,1,2,2-tetrachloroethane (64/63), 1,1,2-trichloroethane (69), 1,2,3-trichlorobenzene (32/36), 1,2,3-trichloropropane (58/59), 1,2,4-trichlorobenzene (57/56), 1,2-dibromo-3-chloropropane (57/53), 1,2-dichlorobenzene (69/69), 1,3-dichloropropane (68), 1,4-dichlorobenzene (69/68), 1,4-dioxane (60/54), 2,2,4-trimethyl-1-pentene (60/59), 2,4,4-trimethyl-2-pentene (64/60), 2-hexanone (59/55), 4-isopropyltoluene (66/66), acetone (60/52), bromoform (67/67), 1,2-dibromoethane (67/65), hexachlorobutadiene (39/40), acetic acid, methyl ester (62/62), methylcyclohexane (62/65), naphthalene (53/503), n-butylbenzene (61/61), sec-butylbenzene (66/65), tert-butylbenzene (69), and tetrahydrofuran (56/576) indicating low bias. The MS/MSD RPD for 1,4-dioxane (33) and acetone (33) exceeded the project QC limit of 30. The result for acetone in samples OC-SB-701-0.0/2.0-XXX and OC-SB-701-0.0/2.0-DUP were qualified estimated (J-). Results for 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,2,3-trichlorobenzene, 1,2,3-trichloropropane, 1,2,4-trichlorobenzene, 1,2-dibromo-3-chloropropane, 1,2-dichlorobenzene, 1,3-dichloropropane, 1,4-dichlorobenzene, 1,4-dioxane, 2,2,4-trimethyl-1-pentene, 2,4,4-trimethyl-2-pentene, 2-hexanone, 4-isopropyltoluene, bromoform, 1,2-dibromoethane, hexachlorobutadiene, acetic acid, methyl ester, methylcyclohexane, naphthalene, n-butylbenzene, sec-butylbenzene, tert-butylbenzene, and tetrahydrofuran in samples OC-SB-701-0.0/2.0-XXX and its FD OC-SB-701-0.0/2.0-DUP were not detected and the reporting limits were qualified estimated (UJ).

2.4 Field Duplicate

Four soil FDs were collected. A summary of FD qualification actions is presented in **Table 3.2** for VOCs with results being assigned a validation qualifier reason code of FD. Good agreement was observed for the majority of target analytes. Qualified results are discussed in the following sections.

SDG 480-162426-1

A FD sample was collected with field sample OC-SB-705-4.0/6.0-XXX. Acetic acid, methyl ester was detected in the FD and reported as not detected in the original sample. The result for acetic acid, methyl ester in sample OC-SB-705-4.0/6.0-DUP was qualified estimated (J). The reporting limit for acetic acid, methyl ester in sample OC-SB-705-4.0/6.0-XXX was qualified estimated (UJ).

SDG 480-162513-1

A FD sample was collected with field sample OC-SB-701-0.0/2.0-XXX. The RPD for acetone (62) exceeded the project QC limit of 50. The result for acetone in samples OC-SB-701-0.0/2.0-XXX and OC-SB-701-0.0/2.0-DUP were qualified estimated (J).

2.5 Detection Limits

SDG 480-162572-1

The case narrative states samples OC-SB-711-2.0/4.0-XXX and OC-SB-711-8.0/10-XXX were analyzed using the medium level soil analysis (methanol extraction) and diluted due to foaming at the time of purging during the original analysis. Sample OC-SB-711-4.0/6.0-XXX was analyzed using the medium level soil analysis and diluted to bring the concentration of target analytes within the calibration range. Reporting limits were elevated accordingly. Reporting limits are listed on **Table 2**.

3.0 SEMIVOLATILES

Samples were analyzed for SVOCs by Method 8270D.

Data Completeness

* Holding Times and Preservation
* Blanks
* Instrument Tunes
* Initial Calibration Standards

Continuing Calibration Standards

LCS/LCSD

MS/MSD

FDs

Surrogate Recovery

* Internal Standards

Detection Limits

* Sample Result Verification/Electronic Evaluation Verification (EDD)

Raw data verification and calculation checks

* = indicates that criteria were met for this parameter

Except for the validation actions noted below, sample results are interpreted to be usable as reported by the laboratory. A summary of final results is presented on **Table 2.2**. A summary of data validation actions is presented on **Table 3.2**.

1,2,4-Trichlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, hexachlorobutadiene, and naphthalene are reported as target compounds in both the VOC and SVOC methods. In accordance with the QAPP, results from the VOC analysis are used when samples are analyzed by both methods. Results for these compounds reported from the SVOC analysis are marked not used in the project database and are not included in the final validated results tables.

3.1 Data Completeness

Target analyte, 3&4 methylphenol was missing from the laboratory reports and EDDs for all soil samples. The laboratory was contacted regarding the missing analyte and results for 4-methylphenol were included in revised laboratory reports for all soil samples. Because 3-methylphenol and 4-methylphenol coelute when analyzed by Method 8270, the 4-methylphenol results reported by the

laboratory are equivalent to 3&4 methylphenol identified in the project QAPP. Results are reported as 3&4 methylphenol in the final dataset.

Results for N-nitrosodiphenylamine were reported for all soil and water samples (QC blanks). Additional results for diphenylamine were reported only for water QC samples. These compounds are reported as N-nitrosodiphenylamine by the laboratory in the soil data and are not distinguishable from each other in the Method 8270 analysis.

3.2 Blanks

Four equipment rinsate blanks were included with the soil samples. Detections of 2-methylphenol (0.15 µg/l), acetophenone (0.78 µg/l to 2.0 µg/l), benzaldehyde (0.23 µg/l to 0.64 µg/l), benzyl alcohol (4.9 µg/l to 5.3 µg/l), bis(2-ethylhexyl)phthalate (0.67 µg/l to 0.84 µg/l), butylbenzylphthalate (1.1 µg/l to 1.6 µg/l), caprolactam (1.1 µg/l), diethylphthalate (0.15 µg/l to 25 µg/l), dimethylphthalate (0.66 µg/l to 1.8 µg/l), di-n-butylphthalate (1.2 µg/l), isophorone (0.20 µg/l to 0.5 µg/l), phenanthrene (0.075) µg/l), and phenol (0.33 µg/l to 0.39 µg/l) were reported above the method detection limits in one or more equipment rinsate blanks. Soil sample results were not qualified due to equipment rinsate blank detections.

3.3 Continuing Calibration Standards

A summary of continuing calibration qualification actions is presented in **Table 3.2** for SVOCs with results being assigned a validation qualifier reason code of Continuing Calibration Verification (CCV)%D.

SDG 480-162199-1

Continuing calibration standard 180-298440/4 in SDG 480-162199-1 had a relative response factor (RRF) percent difference outside the QC limit of 20 for 2-nitroaniline (20.1) and 4-nitrophenol (48). 2-Nitroaniline and 4-nitrophenol were not detected in associated samples OC-SB-708-16/18-XXX, OC-SB-708-22/24-XXX, OC-SB-708-33/34-XXX, OC-SB-710-2.0/4.0-XXX, OC-SB-710-4.0/6.0-XXX, OC-SB-710-6.0/8.0-XXX, OC-SB-710-23/24-XXX, and OC-SB-710-36/37-XXX, and reporting limits were qualified estimated (UJ).

Continuing calibration standard 180-298557/4 in SDG 480-162199-1 had an RRF percent difference outside the QC limit of 20 for 4-nitrophenol (40). 4-Nitrophenol was not detected in associated samples OC-SB-708-28/30-XXX and OC-SB-710-8.0/10-XXX, and reporting limits were qualified estimated (UJ).

3.4 Laboratory Control Sample

A summary of LCS/LCSD qualification actions is presented in **Table 3.2** for SVOC results being assigned a validation qualifier reason code of LCSL for percent recoveries lower than the lower QC limits of 40 for base neutral target compounds and 30 for acid target compounds.

An LCS was not extracted with the preparation batches in all SDGs for phthalic anhydride. A review of surrogate, internal standard, and calibration data determined that all parameters were within criteria.

Phthalic anhydride was not detected in samples, and based on professional judgement and acceptable surrogate, internal standard, and calibration data, results were reported estimated (J). All phthalic anhydride results were assigned a validation qualifier reason code of Laboratory Control Sample/ Laboratory Control Sample Duplicate Missing (LCSM) as presented in **Table 3.2**.

SDG 480-162140-1

The LCS/LCSD associated with a subset of samples had percent recoveries below the lower project recovery limit of 40 for base neutral compounds for benzaldehyde (4/4), indicating a low bias. Benzaldehyde was not detected in associated samples OC-SB-708-0.0/2.0-XXX, OC-SB-708-2.0/4.0-XXX, OC-SB-708-4.0/6.0-XXX, OC-SB-708-6.0/8.0-XXX, and OC-SB-708-8.0/10.0-XXX and was qualified rejected (R).

SDG 480-162199-1

The LCS/LCSD associated with a subset of samples had percent recoveries below the lower project recovery limit of 40 for base neutral compounds for benzaldehyde (4/4), indicating a low bias. Benzaldehyde was not detected in associated samples OC-SB-708-16/18-XXX, OC-SB-708-22/24-XXX, OC-SB-708-28/30-XXX, OC-SB-708-33/34-XXX, OC-SB-710-2.0/4.0-XXX, OC-SB-710-23/24-XXX, OC-SB-710-36/37-XXX, OC-SB-710-4.0/6.0-XXX, OC-SB-710-6.0/8.0-XXX, and OC-SB-710-8.0/10.0-XXX and was qualified rejected (R).

SDG 480-162315-1

The LCS/LCSD associated with a subset of samples had percent recoveries below the lower project recovery limit of 40 for base neutral compound benzaldehyde (4/5), indicating a low bias. Benzaldehyde was not detected in associated samples OC-SB-709-0.0/2.0-XXX, OC-SB-709-2.0/4.0-XXX, OC-SB-709-4.0/6.0-XXX, OC-SB-709-6.0/8.0-XXX, OC-SB-709-8.0/10.0-XXX, OC-SB-709-8.0/10.0-DUP, OC-SB-709-16/17-XXX, and OC-SB-709-32/33-XXX and was qualified rejected (R).

SDG 480-162353-1

The LCS/LCSD associated with a subset of samples had percent recoveries below the lower project recovery limit of 40 for base neutral compound benzaldehyde (4/5), indicating a low bias. The LCS/LCSD associated with a subset of samples had percent recoveries below the lower project recovery limit of 40 for base neutral compound benzaldehyde (5/5), indicating a low bias. Benzaldehyde was not detected in associated samples OC-SB-706-0.0/2.0-XXX, OC-SB-706-2.0/4.0-XXX, OC-SB-706-4.0/6.0-XXX, OC-SB-706-6.0/8.0-XXX, OC-SB-706-10/12-XXX, OC-SB-706-20/22-XXX, OC-SB-706-26/27-XXX, OC-SB-707-0.0/2.0-XXX, OC-SB-707-2.0/4.0-XXX, OC-SB-707-4.0/6.0-XXX, OC-SB-707-6.0/8.0-XXX, OC-SB-707-6.0/8.0-DUP, OC-SB-707-8.0/10.0-XXX, OC-SB-707-12/13-XXX, and OC-SB-707-15/17-XXX and was qualified rejected (R).

SDG 480-162315-1

The LCS/LCSD associated with a subset of samples had percent recoveries below the lower project recovery limit of 40 for base neutral compound benzaldehyde (7/6), indicating a low bias. Benzaldehyde was not detected in associated samples OC-SB-704-33/34-XXX, OC-SB-702-6.0/8.0-XXX, OC-SB-705-0.0/2.0-XXX, OC-SB-704-8.0/10-XXX, OC-SB-704-6.0/8.0-XXX, OC-SB-704-4.0/6.0-XXX, OC-SB-704-19/20-XXX, OC-SB-704-12/13-XXX, OC-SB-702-4.0/6.0-XXX, OC-SB-702-2.0/4.0-XXX, OC-SB-702-0.0/2.0-XXX, and OC-SB-704-0.0/2.0-XXX and was qualified rejected (R). Benzaldehyde was detected in associated samples OC-SB-705-2.0/4.0-XXX and OC-SB-704-2.0/4.0-XXX and was qualified estimated with low bias (J-).

3.5 MS/MSD

A summary of MS/MSD qualification actions is presented in **Table 3.2** for SVOCs with results being assigned a validation qualifier reason code of MSL.

SDG 480-162315-1

The MS and/or MSD associated with sample OC-SB-703-2.0/4.0-XXX and its FD OC-SB-703-2.0/4.0-DUP had percent recoveries less than the lower QC limit of 40 for base neutral target compounds benzaldehyde (4/4) and hexachlorocyclopentadiene (27/25) and the lower QC limit of 30 for acid target compounds pentachlorophenol (11/4), benzoic acid (0/0), 2,4-dinitrophenol (8/0), and 4,6-dinitro-2-methylphenol (27), indicating low bias. Detected results for benzaldehyde and benzoic acid in FD OC-SB-703-2.0/4.0-DUP were qualified estimated (J-). Benzaldehyde and benzoic acid were not detected in OC-SB-703-2.0/4.0-XXX and reporting limits were qualified rejected (R). Pentachlorophenol was not detected in sample OC-SB-703-2.0/4.0-XXX and its FD OC-SB-703-2.0/4.0-DUP, and reporting limits were qualified estimated (UJ). 2,4-Dinitrophenol and hexachlorocyclopentadiene were not detected in sample OC-SB-703-2.0/4.0-XXX and its FD OC-SB-703-2.0/4.0-DUP and the reporting limits were qualified estimated (UJ). 4.6-Dinitro-2-methylphenol was not detected in sample OC-SB-703-2.0/4.0-XXX and its FD OC-SB-703-2.0/4.0-DUP and reporting limits were qualified rejected (R).

The MS and/or MSD associated with sample OC-SB-709-8.0/10-XXX and its FD OC-SB-709-8.0/10-DUP had percent recoveries less than the lower QC limit of 40 for base neutral target compound benzaldehyde (17) and the lower QC limit of 30 for acid target compound benzoic acid (0/0). Benzaldehyde and benzoic acid were not detected in sample OC-SB-709-8.0/10-XXX and its FD OC-SB-709-8.0/10-DUP and reporting limits were qualified rejected (R).

The MS and/or MSD associated with sample OC-SB-703-8.0/10-XXX had percent recoveries less than the lower QC limit of 40 for base neutral target compounds benzaldehyde (3/3), aniline (33/28), hexachlorocyclopentadiene (33/38), 1,2,4,5-tetrachlorobenzene (37), (34/35), bis(2/chloroethyl)ether (36/37), acetophenone (38/36), N-nitrosodimethylamine (27/27), 4-chloroaniline (38) and hexachloroethane (31/32) and the lower QC limit of 30 for acid target compounds benzoic acid (0/0) and 2,4-dinitrophenol (17/15). Benzaldehyde and benzoic acid were not detected in sample OC-SB-

703-8.0/10-XXX and reporting limits were qualified rejected (R). Hexachlorobutadiene, aniline, hexachlorocyclopentadiene, 1,2,4,5-tetrachlorobenzene, nitrobenzene, bis(2-chloroethyl)ether, acetophenone, N-nitrosodimethylamine, hexachloroethane, 2.4-dinitrophenol, and 4-chloroaniline were not detected in sample OC-SB-703-8.0/10-XXX and the reporting limits were qualified estimated (UJ).

SDG 480-162353-1

The MS and/or MSD associated with sample OC-SB-707-6.0/8.0-XXX and its FD OC- SB-707-6.0/8.0-DUP had percent recoveries less than the lower QC limit of 40 for base neutral target compound benzaldehyde (8/10) and the lower QC limit of 30 for acid target compound benzoic acid (0/0). Benzaldehyde and benzoic acid in sample OC-SB-707-6.0/8.0-XXX and its FD OC- SB-707-6.0/8.0-DUP were not detected and were qualified rejected (R).

SDG 480-162426-1

The MS and/or MSD associated with sample OC-SB-704-0.0/2.0-XXX had percent recoveries less than the lower QC limit of 40 for base neutral target compound benzaldehyde (15/25) and the lower QC limit of 30 for acid target compounds pentachlorophenol (25/14), 4,6-dinitro-2-methylphenol (21), benzoic acid (0/0), 2,3,4,6-tetrachlorophenol (20), 2,4,6-trichlorophenol (27), and 4-nitrophenol (27). The RPD between the MS and MSD associated with sample OC-SB-704-0.0/2.0-XXX exceeded the respective laboratory limits for benzaldehyde (47), pentachlorophenol (58), 4,6-dinitro-2-methylphenol (37), 2,3,4,6-tetrachlorophenol (66), 2,4,6-trichlorophenol (54), and 4-nitrophenol (20). Benzoic acid was not detected in sample OC-SB-704-0.0/2.0-XXX and the reporting limit was qualified rejected (R). Pentachlorophenol, 4,6-dinitro-2-methylphenol, 2,3,4,6-tetrachlorophenol, 2,4,6-trichlorophenol, and 4-nitrophenol were not detected in sample OC-SB-704-0.0/2.0-XXX and the reporting limits were qualified estimated (UJ). Benzaldehyde was not detected in sample OC-SB-704-0.0/2.0-XXX and was qualified rejected (R) based on low MS/MSD and LCS recoveries.

SDG 480-162513-1

The MS and/or MSD associated with sample OC-SB-701-0.0/2.0-XXX and its FD OC-SB-701-0.0/2.0-DUP had percent recoveries less than the lower QC limit of 40 for base neutral target compounds benzaldehyde (29) and hexachlorocyclopentadiene (32/31) and the lower QC limit of 30 for acid target compound benzoic acid (27/29). Benzaldehyde, hexachlorocyclopentadiene, and benzoic acid were not detected in sample OC-SB-701-0.0/2.0-XXX and its FD OC-SB-701-0.0/2.0-DUP and the reporting limits were qualified estimated (UJ).

SDG 480-162572-1

The MS and/or MSD associated with sample OC-SB-711-0.0/2.0-XXX had percent recoveries less than the lower QC limit of 40 for base neutral target compound benzaldehyde (5/4) and the lower QC limit

of 30 for acid target compounds pentachlorophenol (18/17), benzoic acid (0/0), and 2,4-dinitrophenol (14/14). 2,4-Dinitrophenol and pentachlorophenol were not detected in sample OC-SB-711-0.0/2.0-XXX and the reporting limits were qualified estimated (UJ). Benzoic acid and benzaldehyde were not detected in sample OC-SB-711-0.0/2.0-XXX and reporting limits were qualified rejected (R).

3.6 Field Duplicate

Four soil FDs were collected. A summary of FD qualification actions is presented in **Table 3.2** for SVOCs with results being assigned a validation qualifier reason code of FD. Good agreement was observed for the majority of target analytes. Qualified results are discussed in the following section.

3.7 SDG 480-162315-1

A FD sample was collected with field sample OC-SB-703-2.0/4.0-XXX. The RPDs for bis(2-ethylhexyl)phthalate (73) and n-nitrosodiphenylamine (92) exceeded the project QC limit of 50. The results for bis(2-ethylhexyl)phthalate and n-nitrosodiphenylamine in samples OC-SB-703-2.0/4.0-XXX and OC-SB-703-2.0/4.0-DUP were qualified estimated (J).

3.8 Surrogate Recovery

SDG 480-162426-1

The surrogate recoveries for surrogates 2,4,6-tribromophenol (4) and 2-fluorophenol (29) in sample OC-SB-704-33/34-XXX were below the lower QC limit of 30 for acid compound surrogates. Sample OC-SB-704-33/34-XXX was reextracted 11 days outside of the 14 day hold time with passing surrogate recoveries. Results for the associated target compounds in the original extraction matched the results of the reextracted sample. Based on professional judgement, results from the original extraction were reported and all acid fraction compounds were qualified estimated (J/UJ).

3.9 Detection Limits

The following samples were analyzed at dilutions due to matrix interference and/or high concentrations of target compounds and were reported with elevated reporting limits: OC-SB-701-2.0/4.0-XXX, OC-SB-702-6.0/8.0-XXX, OC-SB-704-0.0/2.0-XXX, OC-SB-705-2.0/4.0-XXX, OC-SB-705-4.0/6.0-DUP, OC-SB-705-4.0/6.0-XXX, OC-SB-706-0.0/2.0-XXX, OC-SB-706-10/12-XXX, OC-SB-706-2.0/4.0-XXX, OC-SB-706-6.0/8.0-XXX, OC-SB-707-0.0/2.0-XXX, OC-SB-709-2.0/4.0-XXX, OC-SB-711-2.0/4.0-XXX, OC-SB-711-4.0/6.0-XXX, OC-SB-711-6.0/8.0-XXX, OC-SB-712-0.0/2.0-XXX, and OC-SB-712-6.0/8.0-XXX.

3.10 Raw Data Verification

An initial calibration verification (ICV) sample was not analyzed for the calibrations for phthalic anhydride. Eurofins TestAmerica confirmed that there was no second source for phthalic anhydride to analyze an ICV and the standard was not analyzed for this target compound. Sample results for phthalic anhydride were qualified estimated (UJ).

4.0 PROJECT ANALYTE LIST METALS

Samples were analyzed for the following Target Analyte List metals by SW-846 Method 6010D and Method 7471A: aluminum, antimony, arsenic, barium, beryllium, chromium, cadmium, cobalt, copper, calcium, iron, lead, magnesium, manganese, nickel, potassium, silver, selenium, sodium, thallium, tin, vanadium, zinc, and mercury.

* Data Completeness

  Sample Preservation and Holding Times

  Blanks
* Initial and Continuing Calibration Standards

  LCS

  MS Analysis

  FDs
* Laboratory Duplicate Analysis
* Interference Check Standard
* Internal Standards (inductively coupled plasma-MS)

  Serial Dilution Analysis

  Detection Limits
* Sample Result Verification/EDD

* = indicates that criteria were met for this parameter

Except for the validation actions noted below, the results are interpreted to be usable as reported by the laboratory. A summary of final results is presented on **Table 2.3**. A summary of data validation actions is presented on **Table 3.3**.

4.1 Sample Preservation and Holding Times

The detection for mercury in sample OC-SB-701-0.0/2.0-XXX was qualified estimated (J) due to exceedance of the 28 day hold time by 1 day.

4.2 Blanks

Target compounds antimony, aluminum, barium, calcium, iron, sodium, potassium, manganese, selenium, and zinc were detected at low concentrations in method blanks. Sample results were qualified in accordance with the USEPA guidelines. A summary of method blank qualification actions is presented in **Table 3.3** for metals with results being assigned a validation qualifier reason code of BL1. Detailed discussions of qualification actions for each SDG are presented in the following sections. The laboratory qualified samples results associated with method blank detections with a B. After review of the method blanks, the B qualifiers were removed.

Four equipment blanks were collected and analyzed with the samples. Low concentrations of zinc (0.012 J milligrams per liter [mg/L]), calcium (0.15 J mg/L), cobalt (0.0078 mg/L), copper (0.032 mg/L), manganese (0.0059 mg/L), and iron (0.069 mg/L) were detected in the initial equipment blank, OC-EBK-01-XXX, associated with all borings. Low concentrations of chromium (0.0033 J mg/L), zinc (0.0089 J mg/L), copper (0.038 mg/L) manganese (0.0029 J mg/L), and iron (0.33 mg/L) were detected in OC-EBK-02-XXX, associated with borings SB-703, SB-708, SB-709, and SB-710. Low concentrations of zinc (0.0063 J mg/L), calcium (0.17 J mg/L), and copper (0.0023 J mg/L) were detected in OC-EBK-03-XXX associated with borings SB-702, SB-704, SB-705, SB-706, and SB-707. Low level concentrations of zinc (0.0029 J mg/L), calcium (0.44 J mg/L), copper (0.0051 J mg/L), and potassium (0.10 J mg/L) in OC-EBK-04-XXX associated with borings SB-701, SB-711, and SB-712. No qualifications of soil samples were made based on equipment blank results.

SDG 480-162140-1

Zinc (0.981 J milligrams per kilogram [mg/kg]) and calcium (5.65 J mg/kg) were detected at concentrations less than the reporting limit in the method blank associated with samples in SDG 480-162140-1. The concentration reported in the blanks were compared to sample results. All sample results were above the reporting limit and no qualifications were necessary.

SDG 480-162199-1

Zinc (0.981 J mg/kg) and calcium (5.65 J mg/kg) were detected at concentrations less than the reporting limit in the method blank associated with samples in SDG 480-162199-1. The concentration reported in the blanks were compared to sample results. All sample results were above the reporting limit and no qualifications were necessary.

SDG 480-162315-1

Calcium (5.53 J mg/kg), potassium (22.4 J mg/kg), and manganese (0.0570 J mg/kg) were detected at concentrations less than the reporting limit in the method blank associated with the samples in SDG 480-162315-1. The concentration reported in the blanks were compared to sample results. All sample results were above the reporting limit and no qualifications were necessary.

Sodium (23.4 J mg/kg) was detected at a concentration less than the reporting limit in the method blank associated with the samples in SDG 480-162315-1. The blank concentration was multiplied by 5 and compared to associated sample results. Low concentrations of sodium below 5x the blank and below the reporting limit were qualified non detect (U) at the reporting limit and were assigned reason code BL1. Qualified results are summarized on **Table 3.3**.

SDG 480-162353-1

Calcium (5.04 J mg/kg) and manganese (0.101 J mg/kg) were detected at concentrations less than the reporting limit in the method blank associated with samples in SDG 480-162353-1. Sample concentrations were above the reporting limit and no qualifications were necessary.

SDG 480-162426-1

Barium (0.118 J mg/kg), calcium (5.53 J mg/kg, 4.40 J mg/kg), manganese (0.108 J mg/kg), iron (4.47 J mg/kg) were detected at concentrations less than the reporting limit in the method blanks associated with samples in SDG 480-162426-1. The sample concentrations were above the reporting limit and no qualifications were necessary.

Antimony (0.411 J mg/kg) was detected at a concentration less than the reporting limit in a method blank associated with samples in SDG 480-162426-1. Similar concentrations of antimony below the reporting limit in samples were qualified non detect (U) at the reporting limit and were assigned reason code BL1. Qualified results are summarized on **Table 3.3**.

Selenium (0.428 J mg/kg) was detected at a concentration less than the reporting limit in a method blank associated with samples in SDG 480-162426-1. The detection of selenium below the reporting limit in sample OC-SB-702-34/35-XXX was qualified non detect (U) at the reporting limit and was assigned reason code BL1.

SDG 480-162513-1

Selenium (0.428 J mg/kg) was detected at a concentration less than the reporting limit in a method blank associated with samples in SDG 480-162513-1. Similar concentrations of selenium in samples OC-SB-701-6.0/8.0-XXX and OC-SB-701-8.0/10-XXX were qualified non detect (U) at the reporting limit and were assigned reason code BL1.

SDG 480-162572-1

Calcium (3.47 J mg/kg) and manganese (0.0404 J mg/kg) were detected at concentrations less than the reporting limit in the method blanks associated with samples in SDG 480-162572-1. All results were above the reporting limit and no qualifications were necessary.

4.3 Detection Limits

The project quantitation limit specified in the QAPP for antimony by USEPA Method 6010C is 0.5 mg/kg. The laboratory reported non-detects for antimony at a reporting limit of 15 mg/kg. Estimated values were reported down to the QAPP method detection limit of 0.4 mg/kg.

4.4 Laboratory Control Sample

Laboratory control sample standard reference materials (LCSSRMs/LCDSRMs) were analyzed for method 6010D. Laboratory provided SRM limits were used to evaluate LCSSRMs.

The relative percent differences for barium and cadmium in the LCS/LCSD pair associated with samples in SDG 480-162315-1 exceeded the laboratory precision goal of 20%. All detections of barium and cadmium in the associated samples were qualified estimated (J) and assigned reason code LCS RPD□□

4.5 Matrix Spike

SDG 480-162199-1

The MS/MSD performed on sample OC-SB-708-16/18-XXX had percent recoveries out of project control limits of 75-125% for the following parameters.

- Barium (162)
- Chromium (43, 68)
- Calcium (206)
- Copper (74, 70)
- Magnesium (-26, -33)
- Manganese (74)
- Potassium (143)
- Vanadium (60)

Results for chromium, copper, magnesium, manganese, and vanadium in sample OC-SB-708-16/18-XXX were qualified estimated with potential low bias (J-) and assigned the reason code MSL. Results for barium and potassium in sample OC-SB-708-16/18-XXX were qualified estimated with potential high bias (J+) and assigned the reason code MSH.

The relative percent difference for calcium in the MS/MSD pair for sample OC-SB-708-16/18-XXX exceeded the QAPP precision goal of 35%. The result for calcium in sample OC-SB-708-16/18-XXX was qualified estimated with a potential high bias (J+) and assigned reason codes MSH and MSRPD.

SDG 480-162315-1

The MSD performed on sample OC-SB-709-8.0/10-XXX had percent recoveries out of project control limits of 75-125% for the following parameters.

- Barium (73)
- Magnesium (42)
- Manganese (62)
- Zinc (71)

Results for barium, magnesium, manganese, and zinc in sample OC-SB-709-8.0/10-XXX and FD OC-SB-709-8.0/10-DUP were qualified estimated with potential low bias (J-) and assigned the reason code MSL.

The MS/MSD performed on sample OC-SB-703-2.0/4.0-XXX had percent recoveries out of project control limits of 75-125% for the following parameters.

- Aluminum (192, 204)

- Barium (186)
- Chromium (140)
- Calcium (162, 644)
- Manganese (169, 170)
- Magnesium (127)
- Iron (162, 140)

Results for aluminum, chromium, and manganese in sample OC-SB-703-2.0/4.0-XXX and FD OC-SB-703-2.0/4.0-DUP were qualified estimated with potential high bias (J+) and assigned the reason code MSH.

The relative percent differences for calcium and barium in the MS/MSD pair for sample OC-SB-703-2.0/4.0-XXX exceeded the QAPP precision goal of 35%. The results for calcium and barium in sample OC-SB-703-2.0/4.0-XXX and FD OC-SB-703-2.0/4.0-DUP were qualified estimated with a potential high bias (J+) and assigned reason codes MSH and MSRPD.

SDG 480-162353-1

The MS/MSD performed on sample OC-SB-707-6.0/8.0-XXX had percent recoveries out of project control limits of 75-125% for the following parameters.

- Chromium (66)
- Antimony (71)
- Aluminum (171, 175)
- Manganese (136, 127)

Results for chromium and antimony in sample OC-SB-707-6.0/8.0-XXX and FD OC-SB-707-6.0/8.0-DUP were qualified estimated with potential low bias (J-) and assigned the reason code MSL. Results for aluminum and manganese in sample OC-SB-707-6.0/8.0-XXX and FD OC-SB-707-6.0/8.0-DUP were qualified estimated with potential high bias (J+) and assigned the reason code MSH.

SDG 480-162426-1

The MS/MSD performed on sample OC-SB-705-4.0/6.0-XXX had percent recoveries out of project control limits of 75-125% for the following parameters.

- Aluminum (232, 177)
- Chromium (273, 74)
- Calcium (142, 150)
- Manganese (262)
- Iron (231)

Results for aluminum, calcium, and iron in sample OC-SB-705-4.0/6.0-XXX and FD OC-SB-705-4.0/6.0-DUP were qualified estimated with potential high bias (J+) and assigned the reason code MSH.

The relative percent differences for chromium and manganese in the MS/MSD pair for sample OC-SB-705-4.0/6.0-XXX exceeded the QAPP precision goal of 35%. Results for manganese in sample OC-SB-705-4.0/6.0-XXX and FD OC-SB-705-4.0/6.0-DUP were qualified estimated with a potential high bias (J+) and assigned reason codes MSH and MSRPD. Results for chromium in sample OC-SB-705-4.0/6.0-XXX and FD OC-SB-705-4.0/6.0-DUP were qualified estimated (J) and assigned the reason codes MSL, MSH, and MSRPD.

SDG 480-162513-1

The MS/MSD performed on sample OC-SB-701-0.0/2.0-XXX had percent recoveries out of project control limits of 75-125% for the following parameters.

- Antimony (72)
- Barium (215, 163)
- Chromium (137)
- Magnesium (263, 141)
- Manganese (384, 168)
- Potassium (275, 150)
- Vanadium (151)
- Zinc (133)

Results for barium, chromium, zinc, magnesium, and vanadium in sample OC-SB-701-0.0/2.0 and FD OC-SB-701-0.0/2.0-DUP were qualified estimated with potential high bias (J+) and assigned the reason code MSH. Results for antimony in sample OC-SB-701-0.0/2.0-XXX and FD OC-SB-701-0.0/2.0-DUP were qualified estimated with potential low bias (J-) and qualified results were assigned the reason code MSL.

The relative percent difference for potassium in the MS/MSD pair for sample OC-SB-701-0.0/2.0-XXX exceeded the QAPP precision goal of 35%. The results for potassium in sample OC-SB-701-0.0/2.0-XXX and FD OC-SB-701-0.0/2.0-DUP were qualified estimated with a potential high bias (J+) and assigned reason codes MSH and MSRPD.

The result for manganese in the post digestion spike for sample OC-SB-701-0.0/2.0-XXX had a percent recovery below the lower project control limit. The results for manganese in sample OC-SB-701-0.0/2.0-XXX and FD OC-SB-701-0.0/2.0-DUP were qualified estimated (J) and assigned reason codes MSH and PDSL.

SDG 480-162572-1

The MS/MSD performed on sample OC-SB-711-2.0/4.0-XXX had percent recoveries out of project control limits of 75-125% for the following parameters.

- Antimony (72, 66)
- Aluminum (128, 190)

- Chromium (186, 127)
- Calcium (68)
- Manganese (140)
- Zinc (388, 128)

Results for calcium and antimony in sample OC-SB-711-2.0/4.0-XXX were qualified estimated with potential low bias (J-) and assigned the reason code MSL. Results for chromium and manganese in sample OC-SB-711-2.0/4.0-XXX were qualified estimated with potential high bias (J+) and assigned the reason code MSH.

The relative percent difference for zinc in the MS/MSD pair for sample OC-SB-711-2.0/4.0-XXX exceeded the QAPP precision goal of 35%. The result for zinc in sample OC-SB-711-2.0/4.0-XXX was qualified estimated with a potential high bias (J+) and assigned reason codes MSH and MSRPD.

The result for aluminum in the post digestion spike for sample OC-SB-711-2.0/4.0-XXX had a percent recovery below the lower project control limit. The result for aluminum in sample OC-SB-711-2.0/4.0-XXX was qualified estimated (J) and assigned reason codes MSH and PDSL.

4.6 Field Duplicates

The relative percent difference for copper between sample OC-SB-703-2.0/4.0-XXX and FD OC-SB-703-2.0/4.0-DUP exceeded the QAPP precision goal of 50%. The results for copper in sample OC-SB-703-2.0/4.0-XXX and FD OC-SB-703-2.0/4.0-DUP were qualified estimated (J) and assigned reason code FD.

The relative percent difference for chromium between sample OC-SB-705-4.0/6.0-XXX and FD OC-SB-705-4.0/6.0-DUP exceeded the QAPP precision goal of 50%. The results for chromium in sample OC-SB-705-4.0/6.0-XXX and FD OC-SB-705-4.0/6.0-DUP were qualified estimated (J) and assigned reason code FD.

The relative percent difference for chromium between sample OC-SB-701-0.0/2.0-XXX and FD OC-SB-701-0.0/2.0-DUP exceeded the QAPP precision goal of 50%. The results for chromium in sample OC-SB-701-0.0/2.0-XXX and FD OC-SB-701-0.0/2.0-DUP were qualified estimated with a potential high bias (J+) due to high recovery in the associated matrix spike (see Section 4.5 above) and assigned reason code FD.

4.7 Serial Dilutions

The percent difference (99) between the result for vanadium in the serial dilution (SD) for sample OC-SB-707-6.0/8.0-XXX and the result for vanadium in the original sample exceeded the QAPP control limit of 15%. The results for vanadium in sample OC-SB-707-6.0/8.0-XXX and FD OC-SB-707-6.0/8.0-DUP were qualified estimated (J) and assigned the reason code SD. The SD result for vanadium was approximately 10x less than the sample result, indicating a potential high bias in the results for OC-SB-707-6.0/8.0-XXX and FD OC-SB-707-6.0/8.0-DUP.

5.0 TCLP METALS

Samples were analyzed for the TCLP metals list by SW-846 Method 6010C and Method 7470A: arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury.

* Data Completeness
* Sample Preservation and Holding Times

  Blanks
* Initial and Continuing Calibration Standards
* Laboratory Control Sample

  Matrix Spike Analysis

  FDs
* Laboratory Duplicate Analysis
* Interference Check Standard
* Serial Dilution Analysis
* Detection Limits
* Sample Result Verification/EDD

* = indicates that criteria were met for this parameter

Except for the validation actions noted below, the results are interpreted to be usable as reported by the laboratory. A summary of final results is presented on **Table 2.4**. A summary of data validation actions is presented on **Table 3.4**.

5.1 Blanks

Arsenic was detected at low concentrations in leachate blanks. Sample results were qualified in accordance with the USEPA guidelines. A summary of method blank qualification actions is presented in **Table 3.4** for TCLP metals with results being assigned a validation qualifier reason code of BL1. Detailed discussions of qualification actions for each SDG are presented in the following sections.

SDG 480-162315-1

Arsenic (0.00641 J mg/L) was detected at a concentration less than the reporting limit in the leachate blank associated with the TCLP extracts of samples OC-SB-709-0.0/10-XXX and OC-SB-703-0.0/10-XXX. The concentrations of arsenic in samples OC-SB-709-0.0/10-XXX (0.012 J mg/L) and OC-SB-703-0.0/10-XXX (0.0074 J mg/L) were below the reporting limit for arsenic and were qualified not detected (U) at the reporting limit.

SDG 480-162353-1

Arsenic (0.00641 J mg/L) was detected at a concentration less than the reporting limit in the leachate blank associated with the TCLP extracts of samples OC-SB-706-0.0/10-XXX and OC-SB-707-0.0/10-XXX. The concentration of arsenic in sample OC-SB-706-0.0/10-XXX (0.0088 J mg/L) was below the reporting limit for arsenic and was qualified not detected (U) at the reporting limit. The concentration of arsenic in sample OC-SB-707-0.0/10-XXX (0.035 mg/L) was qualified estimated with high bias (J+).

5.2 Matrix Spike

[illegible]

SDG 480-162353-1

The MS/MSD that were analyzed on sample OC-SB-706-0.0/10-XXX had percent recoveries for mercury (59/60) below the lower QC limit of 75, indicating low bias. Mercury was not detected in sample OC-SB-706-0.0/10-XXX and the reporting limit was qualified estimated (UJ).

5.3 Field Duplicate

A summary of FD qualification actions is presented in **Table 3.4** for TCLP Metals with results being assigned a validation qualifier reason code of FD.

SDG 480-162572-1

A FD sample was collected with field sample OC-SB-712-0.0/10-XXX. The RPD for lead (91) exceeded the project QC limit of 30. The results for lead in samples OC-SB-712-0.0/10-XXX and OC-SB-712-0.0/10-DUP were qualified estimated (J).

6.0 HEXAVALENT CHROMIUM

Samples were analyzed for hexavalent chromium by SW-846 Method 7199. Data were reviewed for the following parameters:

* Data Completeness
* Holding Time

  Blanks
* Initial Calibration Standards
* Continuing Calibration Standards
* LCS/LCSD
* MS/MSD
* Laboratory Duplicate Analysis

  FDs
* Detection Limits
* Sample Result Verification/EDD

* = indicates that criteria were met for this parameter

Except for the validation actions noted below, the results are interpreted to be usable as reported by the laboratory. A summary of final results is presented on **Table 2.5.** A summary of data validation actions is presented on **Table 3.5**.

In accordance with Alkaline Digestion Method 3060A, hexavalent chromium samples were analyzed for pH and/or temperature by method 9045D and Oxidation Reduction Potential (ORP) by method D1498. The pH, temperature, and ORP data are used to monitor chemical conditions of the sample prior to the digestion step and to monitor digestate chemistry during preparation. The initial measurement results are reported in the data summary **Table 3.5** along with the hexavalent chromium results.

6.1 Blanks

SDG 2073916

Hexavalent chromium (0.21 J mg/kg and 0.28 J mg/kg) was detected in the prep blanks associated with samples in SDG 2073916. The concentration reported in the blank was compared to sample results. Hexavalent chromium was reported as a detection at a concentration less than the reporting limit in samples OC-SB-705-0.0/2.0-XXX and OC-SB-702-8.0/10-XXX and qualified not detected (U) at the reporting limit. The result qualified due to blank detects was assigned a reason code of BL1.

6.2 Matrix Spike

SDG 2073662

The insoluble MS that was analyzed on sample OC-SB-707-6.0/8.0-XXX had a percent recovery for hexavalent chromium at 20 percent and was below the lower QC limit of 75, indicating a possible low bias. The MS and post digestion spike on sample OC-SB-707-6.0/8.0-XXX and recovered hexavalent chromium within acceptance limits at 95 and 103 percent. The plot of Eh and pH data generated by the laboratory indicates reducing conditions in the soil. No qualifications were applied due to the MS recovery.

SDG 2073916

The MS that was analyzed on sample OC-SB-705-4.0/6.0-XXX had a percent recovery for hexavalent chromium at 50 percent and was below the lower QC limit of 75, indicating a possible low bias. The laboratory performed an insoluble spike and a post digestion spike on sample OC-SB-705-4.0/6.0-XXX and recovered hexavalent chromium within acceptance limits at 88 and 115 percent. The plot of Eh and pH data generated by the laboratory indicates reducing conditions in the soil. No qualifications were applied due to the MS recovery.

6.3 Field Duplicates

SDG 2073905

A FD sample was collected with field sample OC-SB-703-2.0/4.0-XXX. The RPD was not calculated since the sample concentrations were less than 5X the reporting limit. The absolute difference of 1.6 mg/kg was calculated from the concentrations of hexavalent chromium: 0.7 mg/kg (OC-SB-703-2.0/4.0-XXX) and 2.3 mg/kg (OC-SB-703-2.0/4.0-DUP). The absolute difference is greater than 2X the reporting limit (1.02 mg/kg). Hexavalent chromium was qualified as estimated (J) in the field sample and FD.

SDG 2073916

A FD sample was collected with field sample OC-SB-705-4.0/6.0-XXX. The (RPD was calculated on the following concentrations of hexavalent chromium: 1.5 mg/kg (OC-SB-705-4.0/6.0-XXX) and 2.7 mg/kg (OC-SB-705-4.0/6.0-DUP). The RPD of 57% exceeded the RPD control limit of 30%. The RPD limit is 30 due to one result being >5X the reporting limit and the other result being <5X the reporting limit. Hexavalent chromium was qualified estimated (J) in the field sample and FD.

A summary of FD qualification actions is presented in **Table 3.5** for hexavalent chromium with results being assigned a validation qualifier reason code of FD.

7.0 ANIONS AND AMMONIA

General chemistry includes analysis for chloride and sulfate by USEPA Method 300 and ammonia by QuikChem: Lachat Method 10-107-06-1-B (Method 350.1). An Olin Level 1 validation was performed on the data. Data were reviewed for the following parameters:

* Data Completeness
  Holding Time
  Blanks
* Laboratory Control Sample
  Matrix Spike Analysis
* Laboratory Duplicate Analysis
  FDs
  Detection Limits
* Sample Result Verification/EDD

***** = indicates that criteria were met for this parameter

Except for the validation actions noted below, the results are interpreted to be usable as reported by the laboratory. A summary of final results is presented on **Table 2.6**. A summary of data validation actions is presented on **Table 3.6**.

7.1 Holding Time

R r d r r d r d 2 d d

7.2 Blanks

Ammonia was detected at low concentrations in method blanks. Sample results were qualified in accordance with the Olin Level I Data Quality Evaluation checklist. A summary of method blank qualification actions is presented in **Table 3.6** for ammonia results being assigned a validation qualifier reason code of BL1. Detailed discussions of qualification actions for each SDG are presented in the following sections. The laboratory qualified samples results associated with method blank detections with a B. After review of the method blanks, the B qualifiers were removed.

SDG 480-162140-1

Ammonia (2.08 J mg/kg) was detected in the method blanks associated with samples in SDG 480-162140-1. Action levels were established at five times the concentration reported in the blanks and compared to sample results. Ammonia was detected below the action level in samples OC-SB-708-0.0/2.0-XXX, OC-SB-708-4.0/6.0-XXX, and OC-SB-708-8.0/10-XXX was qualified as not detected (U) at the reported concentration. All other associated sample results were above the action limit and no additional qualifications were necessary.

7.3 Field Duplicates

SDG 480-162315-1

Sample OC-SB-709-8.0/10-DUP was submitted as a FD of sample OC-SB-709-8.0/10-XXX. The relative percent difference for ammonia (70) was outside of the project criterion of 30. The results for ammonia were qualified as estimated (J). The reason code FD was applied.

7.4 Matrix Spike

The laboratory qualified sample results associated with MS/MSD outside limits with a F1. After review of the MS/MSDs, the F1 qualifiers were removed. Validation qualifiers were applied after review of MS/MSD data.

SDG 480-162353-1

Ammonia recovered below the lower project recovery limit of 75 at 67% in the MS associated with sample OC-SB-707-6.0/8.0-XXX. Ammonia results in sample OC-SB-707-6.0/8.0-XXX and FD OC-SB-707-6.0/8.0-DUP were qualified estimated with low bias (J-) and assigned reason code MSL.

Sulfate recovered below the lower project recovery limit of 75 at 13% and 52% in the MS/MSD associated with sample OC-SB-706-0.0/2.0-XXX. The sulfate detection in sample OC-SB-706-0.0/2.0-XXX was qualified estimated with low bias (J-) and assigned reason code MSL.

SDG 480-162572-1

Chloride and sulfate recovered below the lower project recovery limit of 75 at 74% and 58% respectively in the MSD associated with sample OC-SB-712-8.0/10-XXX. The relative percent differences for chloride and sulfate in the MS/MSD pair exceeded the project criterion of 20. The chloride and sulfate results for sample OC-SB-712-8.0/10-XXX were qualified estimated (J). Reason codes MSL and MSRPD were applied.

7.5 Detection Limits

Estimated values were reported by the lab down to a method detection limit less than the QAPP defined reporting limit.

8.0 REACTIVE SULFIDE AND REACTIVE CYANIDE

Composite samples from depth of 0-10 ft were analyzed for reactive cyanide and reactive sulfide. An Olin Level 1 validation was performed on the data. Data were reviewed for the following parameters:

* Data Completeness

  Holding Time
* Blanks
* Laboratory Control Sample
* Matrix Spike Analysis
* Laboratory Duplicate Analysis
* FDs
* Detection Limits
* Sample Result Verification/EDD

***** = indicates that criteria were met for this parameter

Except for the validation actions noted below, the results are interpreted to be usable as reported by the laboratory. A summary of final results is presented on **Table 2.6**. A summary of data validation actions is presented on **Table 3.6**.

8.1 Holding Time

Reporting limits for reactive sulfide in 8 out of the 13 total samples were qualified estimated (UJ) based on exceedance of the 7 day hold time. Qualified results were assigned the reason code Holding Time (HT).

9.0 OTHER GENERAL CHEMISTRY

The composite samples from 0-10 ft depth were analyzed for ignitability (burn rate) by method SW1030. Percent moisture and percent solids were determined for all samples by methods 160.3, SW3540C, and calculations. An Olin Level 1 validation was performed on the data. Data were reviewed for the following parameters:

* Data Completeness
* Holding Time
* Blanks
* Laboratory Control Sample
* Matrix Spike Analysis
* Laboratory Duplicate Analysis
* FDs
* Detection Limits
* Sample Result Verification/EDD

***** = indicates that criteria were met for this parameter

Except for the validation actions noted below, the results are interpreted to be usable as reported by the laboratory. A summary of final results is presented on **Table 2.6**. A summary of data validation actions is presented on **Table 3.6**.

9.1 Holding Time

Samples were analyzed for pH, temperature, and ORP as required in Alkaline Digestion Method 3060A. The results of these tests are reported with the hexavalent chromium results. Holding times were not evaluated for these parameters.

10.0 FORMALDEHYDE

* Data Completeness
* Holding Time
* Blanks

  Laboratory Control Sample

  Matrix Spike Analysis
* Laboratory Duplicate Analysis

  FDs

  Detection Limits
* Sample Result Verification/EDD

* = indicates that criteria were met for this parameter

Except for the validation actions noted below, sample results are interpreted to be usable as reported by the laboratory. A summary of final results is presented on **Table 2.7**. A summary of data validation actions is presented on **Table 3.7.**

10.1 Laboratory Control Sample

A summary of LCS/LCSD qualification actions is presented in **Table 3.7** for formaldehyde results being assigned a validation qualifier reason code of LCS-L.

SDG 480-162140-1

The LCS associated with a subset of samples had a percent recovery below the project recovery limit of 80 for formaldehyde at 63%, indicating a low bias. Formaldehyde was not detected in the associated samples (OC-SB-708-0.0/2.0-XXX, OC-SB-708-2.0/4.0-XXX, OC-SB-708-4.0/6.0-XXX, OC-SB-708-6.0/8.0-XXX, and OC-SB-708-8.0/10-XXX) and the reporting limits were qualified as estimated (UJ).

SDG 480-162199-1

The LCS associated with a subset of samples had a percent recovery below the project recovery limit of 80 for formaldehyde at 74%, indicating a low bias. Formaldehyde was not detected in the associated samples (OC-SB-708-16/18-XXX, OC-SB-710-8.0/10-XXX, OC-SB-708-22/24-XXX, OC-SB-708-28/30-XXX, and OC-SB-710-23/24-XXX) and the reporting limits were qualified as estimated (UJ). Formaldehyde was detected in the associated samples (OC-SB-710-6.0/8.0-XXX, OC-SB-708-33/34-XXX, OC-SB-710-2.0/4.0-XXX, OC-SB-710-36/37-XXX, and OC-SB-710-4.0/6.0-XXX) and the detected concentrations were qualified as estimated (J).

SDG 480-162315-1

The LCS associated with a subset of samples had a percent recovery below the project recovery limit of 80 for formaldehyde at 74%, indicating a low bias. Formaldehyde was not detected in samples OC-SB-709-6.0/8.0-XXX, OC-SB-709-8.0/10-DUP, and OC-SB-709-8.0/10-XXX and the reporting limits were qualified as estimated (UJ). Formaldehyde was detected in samples OC-SB-703-0.0/2.0-XXX, OC-SB-709-16/17-XXX, OC-SB-709-2.0/4.0-XXX, OC-SB-709-32/33-XXX, and OC-SB-709-4.0/6.0-XXX and the results were qualified as estimated (J).

SDG 480-162353-1

The LCS associated with a subset of samples had a percent recovery below the project recovery limit of 80 for formaldehyde at 66%, indicating a low bias. Formaldehyde was not detected in samples OC-SB-707-2.0/4.0-XXX, OC-SB-707-4.0/6.0-XXX, OC-SB-707-12/13-XXX, OC-SB-707-15/17-XXX, OC-SB-707-6.0/8.0-DUP, OC-SB-706-0.0/2.0-XXX, OC-SB-706-2.0/4.0-XXX, OC-SB-706-20/22-XXX, OC-SB-706-26/27-XXX, OC-SB-706-4.0/6.0-XXX, and OC-SB-706-6.0/8.0-XXX and the reporting limits were qualified as estimated (UJ). Formaldehyde was detected in samples OC-SB-707-6.0/8.0-XXX, OC-SB-707-8.0/10-XXX, OC-SB-706-10/12-XXX, and OC-SB-707-0.0/2.0-XXX and the results were qualified as estimated (J).

SDG 480-162426-1

The LCS's associated with a subset of samples had a percent recovery below the project recovery limit of 80 for formaldehyde at 66% and 76%, indicating a low bias. Formaldehyde was not detected in samples OC-SB-702-28/29-XXX, OC-SB-702-34/35-XXX, OC-SB-702-4.0/6.0-XXX, OC-SB-702-6.0/8.0-XXX, OC-SB-702-8.0/10-XXX, OC-SB-705-17/18-XXX, and OC-SB-705-8.0/10-XXX and the reporting limits were qualified as estimated (UJ). Formaldehyde was detected in samples OC-SB-705-4.0/6.0-DUP, OC-SB-705-4.0/6.0-XXX and OC-SB-705-6.0/8.0-XXX and the results were qualified as estimated (J).

SDG 480-162513-1

The LCS associated with a subset of samples had a percent recovery below the project recovery limit of 80 for formaldehyde at 63%, indicating a low bias. Formaldehyde was not detected in samples OC-SB-701-0.0/2.0-DUP, OC-SB-701-0.0/2.0-XXX, OC-SB-701-6.0/8.0-XXX, OC-SB-701-8.0/10-XXX, and OC-SB-701-20/21-XXX and the reporting limits were qualified as estimated (UJ). Formaldehyde was detected in samples OC-SB-701-2.0/4.0-XXX, OC-SB-701-31/32-XXX and OC-SB-701-4.0/6.0-XXX and the results were qualified as estimated (J).

SDG 480-162572-1

The LCS's associated with a subset of samples had a percent recovery below the project recovery limit of 80 for formaldehyde at 76% and 63%, indicating a low bias. Formaldehyde was not detected in samples OC-SB-711-0.0/2.0-XXX, OC-SB-711-18/19-XXX, OC-SB-711-6.0/8.0-XXX, OC-SB-711-8.0/10-XXX, OC-SB-712-0.0/2.0-XXX, OC-SB-712-23/24-XXX, and OC-SB-712-8.0/10-XXX and the reporting limits were qualified as estimated (UJ). Formaldehyde was detected in samples OC-SB-711-2.0/4.0-XXX, OC-SB-711-35/36-XXX, OC-SB-711-4.0/6.0-XXX, OC-SB-712-2.0/4.0-XXX, OC-SB-712-37/38-XXX, OC-SB-712-4.0/6.0-XXX, and OC-SB-712-6.0/8.0-XXX and the results were qualified as estimated (J).

10.2 Matrix Spike

A summary of MS/MSD qualification actions is presented in **Table 3.7** for formaldehyde results being assigned a validation qualifier reason code of MS-L.

SDG 480-162315-1

The MS and MSD associated with sample OC-SB-703-2.0/4.0-XXX and its FD OC-SB-703-2.0/4.0-DUP recovered below the lower project recovery limit of 75 at 44% (MS) and 58% (MSD), indicating a low bias. Formaldehyde was detected above the reporting limit in both samples and the detected concentrations were qualified as estimated (J).

SDG 480-162353-1

The MS and MSD associated with sample OC-SB-707-6.0/8.0-XXX and its FD OC-SB-707-6.0/8.0-DUP recovered below the lower project recovery limit of 75 at 35% (MS) and 51% (MSD), indicating a low bias. Formaldehyde was detected below the reporting limit in sample OC-SB-707-6.0/8.0-XXX and the detected concentration was qualified as estimated (J). Formaldehyde was not detected in sample OC-SB-707-6.0/8.0-DUP and the reporting limit was qualified as estimated (UJ).

SDG 480-162513-1

The MS and MSD associated with sample OC-SB-701-0.0/2.0-XXX and its FD OC-SB-701-0.0/2.0-DUP recovered below the lower project recovery limit of 75 at 50% (MS) and 61% (MSD), indicating a low bias. Formaldehyde was not detected in sample OC-SB-701-0.0/2.0-XXX or OC-SB-701-0.0/2.0-DUP and the reporting limits were qualified as estimated (UJ).

10.3 Field Duplicates

SDG 480-162315-1

A FD sample was collected with field sample OC-SB-703-2.0/4.0-XXX. The RPD was calculated on the following concentrations of formaldehyde: 2900 µg/kg (OC-SB-703-2.0/4.0-XXX) and 4900µg/kg (OC-SB-703-2.0/4.0-DUP). The RPD was 51.3% and exceeded the RPD control limit of 50%. Formaldehyde was qualified estimated (J) in the field sample and FD.

A summary of FD qualification actions is presented in **Table 3.7** for formaldehyde with results being assigned a validation qualifier reason code of FD.

10.4 Detection Limits

All samples were submitted to the TA Canton laboratory for formaldehyde analysis. TA Nashville is listed in the QAPP as the laboratory analyzing formaldehyde. The formaldehyde RL and Method Detection Limit (MDL) from TA Canton (2100 µg/kg and 1300 µg/kg) is higher than the QAPP RL and MDL (100 µg/kg and 16 µg/kg).

11.0 HYDRAZINE, METHYLHYDRAZINE, 1,1'-DIMETHYLHYDRAZINE

Samples were analyzed for hydrazine, methylhydrazine (MMH), and 1,1'-dimethylhydrazine by a modified SW-846 Method 8315A LC/MS/MS. Data were reviewed for the following parameters:

* Data Completeness
* Holding Time and Sample Preservation
* Blanks

  Continuing Calibration
* LCS/LCSD

  MS/MSD
* FDs
* Detection Limits
* Sample Result Verification/EDD

* = indicates that criteria were met for this parameter

Except for the validation actions noted below, sample results are interpreted to be usable as reported by the laboratory. A summary of final results is presented on **Table 2.8**. A summary of data validation actions is presented on **Table 3.8**.

11.1 Continuing Calibration Standards

A summary of continuing calibration qualification actions is presented in **Table 3.8** for hydrazine and MMH with results being assigned a validation qualifier reason code of CCV.

SDG 2072711

The continuing calibrations associated with a subset of samples had percent differences outside the QC limits of 15%D for MMH (-17/ -16) and hydrazine (-22). MMH was reported as not detected in associated samples OC-SB-708-0.0/2.0-XXX, OC-SB-708-2.0/4.0-XXX, OC-SB-708-4.0/6.0-XXX, and OC-SB-708-6.0/8.0-XXX, and OC-SB-708-8.0/10-XXX and reporting limits were qualified estimated (UJ). Hydrazine was reported as not detected in associated sample OC-SB-708-8.0/10-XXX and the reporting limit was qualified estimated (UJ).

SDG 2072990

The continuing calibrations associated with a subset of samples had percent differences outside the QC limits of 15%D for MMH (-17/ -16) and hydrazine (-22). MMH and hydrazine were reported as not

detected in associated samples OC-SB-708-33/34-XXX, OC-SB-708-16/18-XXX, and OC-SB-710-2.0/4.0-XXX; MMH was reported as not detected in samples OC-SB-708-22/24-XXX, OC-SB-708-28/30-XXX, OC-SB-710-23/24-XXX, OC-SB-710-36/37-XXX, OC-SB-710-4.0/6.0-XXX, OC-SB-710-6.0/8.0-XXX, and OC-SB-710-8.0/10-XXX and reporting limits were qualified estimated (UJ). Hydrazine was detected in samples OC-SB-708-22/24-XXX, OC-SB-708-28/30-XXX, OC-SB-710-23/24-XXX, OC-SB-710-36/37-XXX, OC-SB-710-4.0/6.0-XXX, and OC-SB-710-6.0/8.0-XXX and the reported concentrations were qualified estimated (J).

SDG 2073905

The continuing calibration associated with a subset of samples had a percent difference outside the QC limits of 15%D for MMH (-16). MMH was reported as not detected in associated samples OC-SB-703-6.0/8.0-XXX, OC-SB-703-8.0/10-XXX, OC-SB-709-0.0/2.0-XXX, OC-SB-709-16/17-XXX, OC-SB-709-2.0/4.0-XXX, OC-SB-709-32/33-XXX, OC-SB-709-4.0/6.0-XXX, OC-SB-709-6.0/8.0-XXX, OC-SB-709-8.0/10-XXX, and OC-SB-709-8.0/10-DUP and the reported concentration were qualified estimated (J).

SDG 2073916

The continuing calibration associated with a subset of samples had a percent difference outside the QC limits of 15%D for MMH (-16). MMH was reported as not detected in associated samples OC-SB-704-0.0/2.0-XXX, OC-SB-704-12/13-XXX, OC-SB-704-19/20-XXX, and OC-SB-704-2.0/4.0-XXX and the reported concentration were qualified estimated (J).

11.2 MS/MSD

A summary of MS/MSD qualification actions is presented in **Table 3.8** for hydrazine and MMH with results being assigned a validation qualifier reason code of MS-L.

SDG 2073905

The MS/MSD associated with sample OC-SB-703-2.0/4.0-XXX had percent recoveries less than the lower QC limit of 40 for hydrazine (39/35) indicating low bias. Hydrazine was detected above the reporting limit in sample OC-SB-703-2.0/4.0-XXX and below the reporting limit in its FD sample OC-SB-703-2.0/4.0-DUP. The detected results were qualified as estimated.

The MS/MSD associated with sample OC-SB-709-8.0/10-XXX had percent recoveries less than the lower QC limit of 40 for hydrazine (33/35) indicating low bias. Hydrazine was not detected in sample OC-SB-709-8.0/10-XXX or its FD sample OC-SB-709-8.0/10-DUP. The reporting limits were qualified as estimated.

SDG 2073916

The MS/MSD associated with sample OC-SB-705-4.0/6.0-XXX had percent recoveries less than the lower QC limit of 40 for hydrazine (2/2) and methyl hydrazine (2/2) indicating low bias in the matrix. Hydrazine was detected below the reporting limit in sample OC-SB-705-4.0/6.0-XXX and ND in its FD OC-SB-705-4.0/6.0-DUP. The detected result was qualified as estimated in sample OC-SB-705-4.0/6.0-XXX and the reporting limit was qualified as estimated in sample OC-SB-705-4.0/6.0-DUP. Methylhydrazine was not detected in either sample OC-SB-705-4.0/6.0-XXX or its FD OC-SB-705-4.0/6.0-DUP. The reporting limits were qualified as estimated.

SDG 2074150

The MSD associated with sample OC-SB-701-0.0/2.0-XXX had a percent recovery less than the lower QC limit of 40 for hydrazine (37). Hydrazine was detected below the reporting limit in sample OC-SB-701-0.0/2.0-XXX and its FD OC-SB-701-0.0/2.0-DUP. The detected results were qualified as estimated in sample OC-SB-701-0.0/2.0-XXX and OC-SB-701-0.0/2.0-DUP.

12.0 DIMETHYLFORMAMIDE

Samples were analyzed for dimethylformamide by method SW8033M. Data were reviewed for the following parameters:

* Data Completeness
* Holding Time and Sample Preservation
* Blanks
* Continuing Calibration
* LCS/LCSD
* MS/MSD
* FDs
* Detection Limits
* Sample Result Verification/EDD

* = indicates that criteria were met for this parameter

Sample results are interpreted to be usable as reported by the laboratory. A summary of final results is presented on **Table 2.8.**

13.0 REFERENCES

MassDEP, 2010. "The Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP)"; Bureau of Waste Site Cleanup; 1 Winter Street, Boston, Massachusetts 02108; WSC-CAM; July 2010.

USEPA, 2009. "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use"; Office of Solid Waste and Emergency Response; EPA-540-R-08-005; January 2009.

USEPA, 1993. "Methods for Chemical Analysis and Water and Wastes (MCAWW)", EPA/600/4-79-020 (March 1983) with updates and supplements EPA/600/4-91-010 (June 1991), EPA/600/R-92-129 (August 1992) and EPA/600/R-93-100 (August 1993).

USEPA, 1996. "Test Methods for Evaluating Solid Waste"; Laboratory Manual Physical/Chemical Methods; Office of Solid Waste and Emergency Response; Washington, DC; SW-846; November 1986; Revision 4 -December 1996 with subsequent revisions and updates.

USEPA, 2017a. "USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Data Review"; Office of Emergency and Remedial Response; EPA-540-/R-2017-002; January 2017.

USEPA, 2017b. "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review"; Office of Superfund Remediation and Technology Innovation; EPA-540-R-2017-001; January 2017.

USEPA, 2018b. "Region I EPA-New England Environmental Data Review Program Guidance"; Office of Environmental Measurement and Evaluation (OEME); June 2018.

Wood, 2019. "Final Remedial Investigation/Feasibility Study Project Operations Plan"; Volume III-B Quality Assurance Project Plan; Olin Chemical Superfund Site; 51 Eames Street; Wilmington, MA; May, 2019.

Data validation was completed by:

Liesel Krout

Madison Dinsmore

Elizabeth Penta

Wolfgang Calicchio

TABLES

Table 1 - Sample Summary
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

							Method Class	VOCs	SVOCs	Metals		Metals-Hex Chrom	TCLP Metals		Ignitability
							Analysis Method	SW8260C	SW8270D	SW6010D	SW7471A	SW7199	SW6010C	SW7470A	SW1030
							Fraction	N	N	T	T	N	C	C	T
TestAmerica	**Lancaster**	**Katahdin**	**Location**	**Field Sample ID**	**Sample Date**	**Media**	**Qc Code**	Count	Count	Count	Count	Count	Count	Count	Count
480-162513-1	--	--	SB-701	OC-SB-701-0.0/10-XXX	11/11/2019	SOIL	FS						7	1	1
480-162513-1	2074150	--	SB-701	OC-SB-701-0.0/2.0-DUP	11/11/2019	SOIL	FD	78	77	23	1	1			
480-162513-1	2074150	--	SB-701	OC-SB-701-0.0/2.0-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162513-1	2074150	--	SB-701	OC-SB-701-2.0/4.0-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162513-1	2074150	--	SB-701	OC-SB-701-20/21-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162513-1	2074150	--	SB-701	OC-SB-701-31/32-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162513-1	2074150	--	SB-701	OC-SB-701-4.0/6.0-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162513-1	2074150	--	SB-701	OC-SB-701-6.0/8.0-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162513-1	2074150	--	SB-701	OC-SB-701-8.0/10-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	--	--	SB-702	OC-SB-702-0.0/10-XXX	11/8/2019	SOIL	FS						7	1	1
480-162426-1	2073916	--	SB-702	OC-SB-702-0.0/2.0-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-702	OC-SB-702-2.0/4.0-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-702	OC-SB-702-28/29-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-702	OC-SB-702-34/35-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-702	OC-SB-702-4.0/6.0-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-702	OC-SB-702-6.0/8.0-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-702	OC-SB-702-8.0/10-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	--	--	SB-703	OC-SB-703-0.0/10-XXX	11/5/2019	SOIL	FS						7	1	1
480-162315-1	2073905	--	SB-703	OC-SB-703-0.0/2.0-XXX	11/5/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	2073905	--	SB-703	OC-SB-703-17/18-XXX	11/5/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	2073905	--	SB-703	OC-SB-703-2.0/4.0-DUP	11/5/2019	SOIL	FD	78	77	23	1	1			
480-162315-1	2073905	--	SB-703	OC-SB-703-2.0/4.0-XXX	11/5/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	2073905	--	SB-703	OC-SB-703-30/32-XXX	11/5/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	2073905	--	SB-703	OC-SB-703-4.0/6.0-XXX	11/5/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	2073905	--	SB-703	OC-SB-703-6.0/8.0-XXX	11/5/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	2073905	--	SB-703	OC-SB-703-8.0/10-XXX	11/5/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	--	--	SB-704	OC-SB-704-0.0/10-XXX	11/7/2019	SOIL	FS						7	1	1
480-162426-1	2073916	--	SB-704	OC-SB-704-0.0/2.0-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-704	OC-SB-704-12/13-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-704	OC-SB-704-19/20-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-704	OC-SB-704-2.0/4.0-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-704	OC-SB-704-33/34-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-704	OC-SB-704-4.0/6.0-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-704	OC-SB-704-6.0/8.0-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-704	OC-SB-704-8.0/10-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			

prepared by KS 1/10/20
reviewed by LLT 1/10/20

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November 2019 Containment Area Soil Sampling Event
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								VOCs	SVOCs	Metals		Metals-Hex Chrom	TCLP Metals		Ignitability
							Method Class	SW8260C	SW8270D	SW6010D	SW7471A	SW7199	SW6010C	SW7470A	SW1030
							Analysis Method	N	N	T	T	N	C	C	T
							Fraction								
							Qc								
TestAmerica	**Lancaster**	**Katahdin**	**Location**	**Field Sample ID**	**Sample Date**	**Media**	**Code**	Count	Count	Count	Count	Count	Count	Count	Count
480-162426-1	--	--	SB-705	OC-SB-705-0.0/10-XXX	11/8/2019	SOIL	FS						7	1	1
480-162426-1	2073916	--	SB-705	OC-SB-705-0.0/2.0-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-705	OC-SB-705-17/18-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-705	OC-SB-705-2.0/4.0-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-705	OC-SB-705-4.0/6.0-DUP	11/8/2019	SOIL	FD	78	77	23	1	1			
480-162426-1	2073916	--	SB-705	OC-SB-705-4.0/6.0-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-705	OC-SB-705-6.0/8.0-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162426-1	2073916	--	SB-705	OC-SB-705-8.0/10-XXX	11/8/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	--	--	SB-706	OC-SB-706-0.0/10-XXX	11/6/2019	SOIL	FS						7	1	1
480-162353-1	2073662	--	SB-706	OC-SB-706-0.0/2.0-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	--	SB-706	OC-SB-706-10/12-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	--	SB-706	OC-SB-706-2.0/4.0-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	--	SB-706	OC-SB-706-20/22-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	--	SB-706	OC-SB-706-26/27-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	--	SB-706	OC-SB-706-4.0/6.0-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	--	SB-706	OC-SB-706-6.0/8.0-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	--	--	SB-707	OC-SB-707-0.0/10-XXX	11/7/2019	SOIL	FS						7	1	1
480-162353-1	2073662	--	SB-707	OC-SB-707-0.0/2.0-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	--	SB-707	OC-SB-707-12/13-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	--	SB-707	OC-SB-707-15/17-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	--	SB-707	OC-SB-707-2.0/4.0-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	--	SB-707	OC-SB-707-4.0/6.0-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	--	SB-707	OC-SB-707-6.0/8.0-DUP	11/7/2019	SOIL	FD	78	77	23	1	1			
480-162353-1	2073662	--	SB-707	OC-SB-707-6.0/8.0-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	--	SB-707	OC-SB-707-8.0/10-XXX	11/7/2019	SOIL	FS	78	77	23	1	1			
480-162140-1	--	--	SB-708	OC-SB-708-0.0/10-XXX	11/4/2019	SOIL	FS						7	1	1
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-0.0/2.0-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			
480-162199-1	2072990	--	SB-708	OC-SB-708-16/18-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-2.0/4.0-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			
480-162199-1	2072990	--	SB-708	OC-SB-708-22/24-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			
480-162199-1	2072990	--	SB-708	OC-SB-708-28/30-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			
480-162199-1	2072990	--	SB-708	OC-SB-708-33/34-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-4.0/6.0-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-6.0/8.0-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-8.0/10-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			

prepared by KS 1/10/20
reviewed by LLT 1/10/20

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November 2019 Containment Area Soil Sampling Event
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								VOCs	SVOCs	Metals		Metals-Hex Chrom	TCLP Metals		Ignitability
							Method Class	SW8260C	SW8270D	SW6010D	SW7471A	SW7199	SW6010C	SW7470A	SW1030
							Analysis Method	N	N	T	T	N	C	C	T
							Fraction								
							Qc								
TestAmerica	**Lancaster**	**Katahdin**	**Location**	**Field Sample ID**	**Sample Date**	**Media**	**Code**	Count	Count	Count	Count	Count	Count	Count	Count
480-162315-1	--	--	SB-709	OC-SB-709-0.0/10-XXX	11/6/2019	SOIL	FS						7	1	1
480-162315-1	2073905	--	SB-709	OC-SB-709-0.0/2.0-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	2073905	--	SB-709	OC-SB-709-16/17-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	2073905	--	SB-709	OC-SB-709-2.0/4.0-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	2073905	--	SB-709	OC-SB-709-32/33-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	2073905	--	SB-709	OC-SB-709-4.0/6.0-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	2073905	--	SB-709	OC-SB-709-6.0/8.0-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162315-1	2073905	--	SB-709	OC-SB-709-8.0/10-DUP	11/6/2019	SOIL	FD	78	77	23	1	1			
480-162315-1	2073905	--	SB-709	OC-SB-709-8.0/10-XXX	11/6/2019	SOIL	FS	78	77	23	1	1			
480-162199-1	--	--	SB-710	OC-SB-710-0.0/10XXX	11/4/2019	SOIL	FS						7	1	1
480-162199-1	2072990	--	SB-710	OC-SB-710-2.0/4.0-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			
480-162199-1	2072990	--	SB-710	OC-SB-710-23/24-XXX	11/5/2019	SOIL	FS	78	77	23	1	1			
480-162199-1	2072990	--	SB-710	OC-SB-710-36/37-XXX	11/5/2019	SOIL	FS	78	77	23	1	1			
480-162199-1	2072990	--	SB-710	OC-SB-710-4.0/6.0-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			
480-162199-1	2072990	--	SB-710	OC-SB-710-6.0/8.0-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			
480-162199-1	2072990	--	SB-710	OC-SB-710-8.0/10-XXX	11/4/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	--	--	SB-711	OC-SB-711-0.0/10-XXX	11/12/2019	SOIL	FS						7	1	1
480-162572-1	2074385	--	SB-711	OC-SB-711-0.0/2.0-XXX	11/12/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	2074385	--	SB-711	OC-SB-711-18/19-XXX	11/12/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	2074385	--	SB-711	OC-SB-711-2.0/4.0-XXX	11/12/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	2074385	--	SB-711	OC-SB-711-35/36-XXX	11/12/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	2074385	--	SB-711	OC-SB-711-4.0/6.0-XXX	11/12/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	2074385	--	SB-711	OC-SB-711-6.0/8.0-XXX	11/12/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	2074385	--	SB-711	OC-SB-711-8.0/10-XXX	11/12/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	--	--	SB-712	OC-SB-712-0.0/10-DUP	11/11/2019	SOIL	FD						7	1	1
480-162572-1	--	--	SB-712	OC-SB-712-0.0/10-XXX	11/11/2019	SOIL	FS						7	1	1
480-162572-1	2074385	--	SB-712	OC-SB-712-0.0/2.0-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	2074385	--	SB-712	OC-SB-712-2.0/4.0-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	2074385	--	SB-712	OC-SB-712-23/24-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	2074385	--	SB-712	OC-SB-712-37/38-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	2074385	--	SB-712	OC-SB-712-4.0/6.0-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	2074385	--	SB-712	OC-SB-712-6.0/8.0-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162572-1	2074385	--	SB-712	OC-SB-712-8.0/10-XXX	11/11/2019	SOIL	FS	78	77	23	1	1			
480-162353-1	2073662	TM1916	QC	OC-EBK-01-XXX	11/7/2019	BW	EB	78	79	23		1		1	
480-162353-1	2073662	TM1916	QC	OC-EBK-02-XXX	11/7/2019	BW	EB	78	79	23		1		1	

prepared by KS 1/10/20
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Table 1 - Sample Summary
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

							Method Class	VOCs	SVOCs	Metals		Metals-Hex Chrom	TCLP Metals		Ignitability
							Analysis Method	SW8260C	SW8270D	SW6010D	SW7471A	SW7199	SW6010C	SW7470A	SW1030
							Fraction	N	N	T	T	N	C	C	T
TestAmerica	**Lancaster**	**Katahdin**	**Location**	**Field Sample ID**	**Sample Date**	**Media**	**Qc Code**	Count	Count	Count	Count	Count	Count	Count	Count
480-162515-1	2074032	TM2018	QC	OC-EBK-03-XXX	11/11/2019	BW	EB	78	79	23		1		1	
480-162572-1	2074262	TM2019	QC	OC-EBK-04-XXX	11/12/2019	BW	EB	78	79	23		1		1	
480-162353-1	--	--	QC	OC-TB-11072019	11/7/2019	BS	TB	78							
480-162426-1	--	--	QC	OC-TB-11082019	11/8/2019	BS	TB	78							
480-162513-1	--	--	QC	OC-TB-11112019	11/11/2019	BS	TB	78							
480-162572-1	--	--	QC	OC-TB-11122019	11/12/2019	BS	TB	78							

Notes:
BW = blank water
BS = blank soil
EB = equipment blank
FD = field duplicate
FS = field sample
C = TCLP fraction
N = normal sample
QC = quality control sample
T = total fraction
TB = trip blank

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November 2019 Containment Area Soil Sampling Event
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								Corrosivity	Reactive CN, S		IOCs-Sulfate-Chloride-Ammonia		Hydrazine/Aldehydes		DMF
							Method Class								
							Analysis Method	SW9045D	SW9012	SW9034	E300	E350.1	SW8315A	SW8315A MOD	SW8033M
							Fraction	N	T	T	N	T	N	N	T
							Qc								
TestAmerica	**Lancaster**	**Katahdin**	**Location**	**Field Sample ID**	**Sample Date**	**Media**	**Code**	Count	Count	aram_Cour	Count	Param_Count	Count	Count	Count
480-162513-1	--	--	SB-701	OC-SB-701-0.0/10-XXX	11/11/2019	SOIL	FS	1	1	1					
480-162513-1	2074150	--	SB-701	OC-SB-701-0.0/2.0-DUP	11/11/2019	SOIL	FD				2	1	1	3	
480-162513-1	2074150	--	SB-701	OC-SB-701-0.0/2.0-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162513-1	2074150	--	SB-701	OC-SB-701-2.0/4.0-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162513-1	2074150	--	SB-701	OC-SB-701-20/21-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162513-1	2074150	--	SB-701	OC-SB-701-31/32-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162513-1	2074150	--	SB-701	OC-SB-701-4.0/6.0-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162513-1	2074150	--	SB-701	OC-SB-701-6.0/8.0-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162513-1	2074150	--	SB-701	OC-SB-701-8.0/10-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162426-1	--	--	SB-702	OC-SB-702-0.0/10-XXX	11/8/2019	SOIL	FS	1	1	1					
480-162426-1	2073916	--	SB-702	OC-SB-702-0.0/2.0-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-702	OC-SB-702-2.0/4.0-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-702	OC-SB-702-28/29-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-702	OC-SB-702-34/35-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-702	OC-SB-702-4.0/6.0-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-702	OC-SB-702-6.0/8.0-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-702	OC-SB-702-8.0/10-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162315-1	--	--	SB-703	OC-SB-703-0.0/10-XXX	11/5/2019	SOIL	FS	1	1	1					
480-162315-1	2073905	--	SB-703	OC-SB-703-0.0/2.0-XXX	11/5/2019	SOIL	FS				2	1	1	3	
480-162315-1	2073905	--	SB-703	OC-SB-703-17/18-XXX	11/5/2019	SOIL	FS				2	1	1	3	
480-162315-1	2073905	--	SB-703	OC-SB-703-2.0/4.0-DUP	11/5/2019	SOIL	FD				2	1	1	3	
480-162315-1	2073905	--	SB-703	OC-SB-703-2.0/4.0-XXX	11/5/2019	SOIL	FS				2	1	1	3	
480-162315-1	2073905	--	SB-703	OC-SB-703-30/32-XXX	11/5/2019	SOIL	FS				2	1	1	3	
480-162315-1	2073905	--	SB-703	OC-SB-703-4.0/6.0-XXX	11/5/2019	SOIL	FS				2	1	1	3	
480-162315-1	2073905	--	SB-703	OC-SB-703-6.0/8.0-XXX	11/5/2019	SOIL	FS				2	1	1	3	
480-162315-1	2073905	--	SB-703	OC-SB-703-8.0/10-XXX	11/5/2019	SOIL	FS				2	1	1	3	
480-162426-1	--	--	SB-704	OC-SB-704-0.0/10-XXX	11/7/2019	SOIL	FS	1	1	1					
480-162426-1	2073916	--	SB-704	OC-SB-704-0.0/2.0-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-704	OC-SB-704-12/13-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-704	OC-SB-704-19/20-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-704	OC-SB-704-2.0/4.0-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-704	OC-SB-704-33/34-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-704	OC-SB-704-4.0/6.0-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-704	OC-SB-704-6.0/8.0-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-704	OC-SB-704-8.0/10-XXX	11/7/2019	SOIL	FS				2	1	1	3	

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November 2019 Containment Area Soil Sampling Event
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								Corrosivity	Reactive CN, S		IOCs-Sulfate-Chloride-Ammonia		Hydrazine/Aldehydes		DMF
							Method Class								
							Analysis Method	SW9045D	SW9012	SW9034	E300	E350.1	SW8315A	SW8315A MOD	SW8033M
							Fraction	N	T	T	N	T	N	N	T
							Qc								
TestAmerica	**Lancaster**	**Katahdin**	**Location**	**Field Sample ID**	**Sample Date**	**Media**	**Code**	Count	Count	aram_Cour	Count	Param_Count	Count	Count	Count
480-162426-1	--	--	SB-705	OC-SB-705-0.0/10-XXX	11/8/2019	SOIL	FS	1	1	1					
480-162426-1	2073916	--	SB-705	OC-SB-705-0.0/2.0-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-705	OC-SB-705-17/18-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-705	OC-SB-705-2.0/4.0-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-705	OC-SB-705-4.0/6.0-DUP	11/8/2019	SOIL	FD				2	1	1	3	
480-162426-1	2073916	--	SB-705	OC-SB-705-4.0/6.0-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-705	OC-SB-705-6.0/8.0-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162426-1	2073916	--	SB-705	OC-SB-705-8.0/10-XXX	11/8/2019	SOIL	FS				2	1	1	3	
480-162353-1	--	--	SB-706	OC-SB-706-0.0/10-XXX	11/6/2019	SOIL	FS	2	1	1					
480-162353-1	2073662	--	SB-706	OC-SB-706-0.0/2.0-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	--	SB-706	OC-SB-706-10/12-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	--	SB-706	OC-SB-706-2.0/4.0-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	--	SB-706	OC-SB-706-20/22-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	--	SB-706	OC-SB-706-26/27-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	--	SB-706	OC-SB-706-4.0/6.0-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	--	SB-706	OC-SB-706-6.0/8.0-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162353-1	--	--	SB-707	OC-SB-707-0.0/10-XXX	11/7/2019	SOIL	FS	1	1	1					
480-162353-1	2073662	--	SB-707	OC-SB-707-0.0/2.0-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	--	SB-707	OC-SB-707-12/13-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	--	SB-707	OC-SB-707-15/17-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	--	SB-707	OC-SB-707-2.0/4.0-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	--	SB-707	OC-SB-707-4.0/6.0-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	--	SB-707	OC-SB-707-6.0/8.0-DUP	11/7/2019	SOIL	FD				2	1	1	3	
480-162353-1	2073662	--	SB-707	OC-SB-707-6.0/8.0-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	--	SB-707	OC-SB-707-8.0/10-XXX	11/7/2019	SOIL	FS				2	1	1	3	
480-162140-1	--	--	SB-708	OC-SB-708-0.0/10-XXX	11/4/2019	SOIL	FS	1	1	1					
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-0.0/2.0-XXX	11/4/2019	SOIL	FS				2	1	1	3	1
480-162199-1	2072990	--	SB-708	OC-SB-708-16/18-XXX	11/4/2019	SOIL	FS				2	1	1	3	
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-2.0/4.0-XXX	11/4/2019	SOIL	FS				2	1	1	3	1
480-162199-1	2072990	--	SB-708	OC-SB-708-22/24-XXX	11/4/2019	SOIL	FS				2	1	1	3	
480-162199-1	2072990	--	SB-708	OC-SB-708-28/30-XXX	11/4/2019	SOIL	FS				2	1	1	3	
480-162199-1	2072990	--	SB-708	OC-SB-708-33/34-XXX	11/4/2019	SOIL	FS				2	1	1	3	
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-4.0/6.0-XXX	11/4/2019	SOIL	FS				2	1	1	3	1
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-6.0/8.0-XXX	11/4/2019	SOIL	FS				2	1	1	3	1
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-8.0/10-XXX	11/4/2019	SOIL	FS				2	1	1	3	1

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							Method Class	Corrosivity	Reactive CN, S		IOCs-Sulfate-Chloride-Ammonia		Hydrazine/Aldehydes		DMF
							Analysis Method	SW9045D	SW9012	SW9034	E300	E350.1	SW8315A	SW8315A MOD	SW8033M
							Fraction	N	T	T	N	T	N	N	T
							Qc								
TestAmerica	**Lancaster**	**Katahdin**	**Location**	**Field Sample ID**	**Sample Date**	**Media**	**Code**	Count	Count	aram_Cour	Count	Param_Count	Count	Count	Count
480-162315-1	--	--	SB-709	OC-SB-709-0.0/10-XXX	11/6/2019	SOIL	FS	1	1	1					
480-162315-1	2073905	--	SB-709	OC-SB-709-0.0/2.0-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162315-1	2073905	--	SB-709	OC-SB-709-16/17-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162315-1	2073905	--	SB-709	OC-SB-709-2.0/4.0-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162315-1	2073905	--	SB-709	OC-SB-709-32/33-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162315-1	2073905	--	SB-709	OC-SB-709-4.0/6.0-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162315-1	2073905	--	SB-709	OC-SB-709-6.0/8.0-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162315-1	2073905	--	SB-709	OC-SB-709-8.0/10-DUP	11/6/2019	SOIL	FD				2	1	1	3	
480-162315-1	2073905	--	SB-709	OC-SB-709-8.0/10-XXX	11/6/2019	SOIL	FS				2	1	1	3	
480-162199-1	--	--	SB-710	OC-SB-710-0.0/10XXX	11/4/2019	SOIL	FS	1	1	1					
480-162199-1	2072990	--	SB-710	OC-SB-710-2.0/4.0-XXX	11/4/2019	SOIL	FS				2	1	1	3	
480-162199-1	2072990	--	SB-710	OC-SB-710-23/24-XXX	11/5/2019	SOIL	FS				2	1	1	3	
480-162199-1	2072990	--	SB-710	OC-SB-710-36/37-XXX	11/5/2019	SOIL	FS				2	1	1	3	
480-162199-1	2072990	--	SB-710	OC-SB-710-4.0/6.0-XXX	11/4/2019	SOIL	FS				2	1	1	3	
480-162199-1	2072990	--	SB-710	OC-SB-710-6.0/8.0-XXX	11/4/2019	SOIL	FS				2	1	1	3	
480-162199-1	2072990	--	SB-710	OC-SB-710-8.0/10-XXX	11/4/2019	SOIL	FS				2	1	1	3	
480-162572-1	--	--	SB-711	OC-SB-711-0.0/10-XXX	11/12/2019	SOIL	FS	1	1	1					
480-162572-1	2074385	--	SB-711	OC-SB-711-0.0/2.0-XXX	11/12/2019	SOIL	FS				2	1	1	3	
480-162572-1	2074385	--	SB-711	OC-SB-711-18/19-XXX	11/12/2019	SOIL	FS				2	1	1	3	
480-162572-1	2074385	--	SB-711	OC-SB-711-2.0/4.0-XXX	11/12/2019	SOIL	FS				2	1	1	3	
480-162572-1	2074385	--	SB-711	OC-SB-711-35/36-XXX	11/12/2019	SOIL	FS				2	1	1	3	
480-162572-1	2074385	--	SB-711	OC-SB-711-4.0/6.0-XXX	11/12/2019	SOIL	FS				2	1	1	3	
480-162572-1	2074385	--	SB-711	OC-SB-711-6.0/8.0-XXX	11/12/2019	SOIL	FS				2	1	1	3	
480-162572-1	2074385	--	SB-711	OC-SB-711-8.0/10-XXX	11/12/2019	SOIL	FS				2	1	1	3	
480-162572-1	--	--	SB-712	OC-SB-712-0.0/10-DUP	11/11/2019	SOIL	FD	1	1	1					
480-162572-1	--	--	SB-712	OC-SB-712-0.0/10-XXX	11/11/2019	SOIL	FS	1	1	1					
480-162572-1	2074385	--	SB-712	OC-SB-712-0.0/2.0-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162572-1	2074385	--	SB-712	OC-SB-712-2.0/4.0-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162572-1	2074385	--	SB-712	OC-SB-712-23/24-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162572-1	2074385	--	SB-712	OC-SB-712-37/38-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162572-1	2074385	--	SB-712	OC-SB-712-4.0/6.0-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162572-1	2074385	--	SB-712	OC-SB-712-6.0/8.0-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162572-1	2074385	--	SB-712	OC-SB-712-8.0/10-XXX	11/11/2019	SOIL	FS				2	1	1	3	
480-162353-1	2073662	TM1916	QC	OC-EBK-01-XXX	11/7/2019	BW	EB				2	1	1	3	1
480-162353-1	2073662	TM1916	QC	OC-EBK-02-XXX	11/7/2019	BW	EB				2	1	1	3	1

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Table 1 - Sample Summary
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November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

								Corrosivity	Reactive CN, S		IOCs-Sulfate-Chloride-Ammonia		Hydrazine/Aldehydes		DMF
							Method Class								
							Analysis Method	SW9045D	SW9012	SW9034	E300	E350.1	SW8315A	SW8315A MOD	SW8033M
							Fraction	N	T	T	N	T	N	N	T
							Qc								
TestAmerica	**Lancaster**	**Katahdin**	**Location**	**Field Sample ID**	**Sample Date**	**Media**	**Code**	Count	Count	aram_Cour	Count	Param_Count	Count	Count	Count
480-162515-1	2074032	TM2018	QC	OC-EBK-03-XXX	11/11/2019	BW	EB				2	1	1	3	1
480-162572-1	2074262	TM2019	QC	OC-EBK-04-XXX	11/12/2019	BW	EB				2	1	1	3	1
480-162353-1	--	--	QC	OC-TB-11072019	11/7/2019	BS	TB								
480-162426-1	--	--	QC	OC-TB-11082019	11/8/2019	BS	TB								
480-162513-1	--	--	QC	OC-TB-11112019	11/11/2019	BS	TB								
480-162572-1	--	--	QC	OC-TB-11122019	11/12/2019	BS	TB								

Notes:
BW = blank water
BS = blank soil
EB = equipment blank
FD = field duplicate
FS = field sample
C = TCLP fraction
N = normal sample
QC = quality control sample
T = total fraction
TB = trip blank

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Table 1 - Sample Summary
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

								Moisture/Solids		
							Method Class	CALC	E160.3	SW3540C
							Analysis Method	N	T	T
							Fraction			
							Qc			
TestAmerica	**Lancaster**	**Katahdin**	**Location**	**Field Sample ID**	**Sample Date**	**Media**	**Code**	Count	Count	Count
480-162513-1	--	--	SB-701	OC-SB-701-0.0/10-XXX	11/11/2019	SOIL	FS			
480-162513-1	2074150	--	SB-701	OC-SB-701-0.0/2.0-DUP	11/11/2019	SOIL	FD	1	2	
480-162513-1	2074150	--	SB-701	OC-SB-701-0.0/2.0-XXX	11/11/2019	SOIL	FS	1	2	
480-162513-1	2074150	--	SB-701	OC-SB-701-2.0/4.0-XXX	11/11/2019	SOIL	FS	1	2	
480-162513-1	2074150	--	SB-701	OC-SB-701-20/21-XXX	11/11/2019	SOIL	FS	1	2	
480-162513-1	2074150	--	SB-701	OC-SB-701-31/32-XXX	11/11/2019	SOIL	FS	1	2	
480-162513-1	2074150	--	SB-701	OC-SB-701-4.0/6.0-XXX	11/11/2019	SOIL	FS	1	2	
480-162513-1	2074150	--	SB-701	OC-SB-701-6.0/8.0-XXX	11/11/2019	SOIL	FS	1	2	
480-162513-1	2074150	--	SB-701	OC-SB-701-8.0/10-XXX	11/11/2019	SOIL	FS	1	2	
480-162426-1	--	--	SB-702	OC-SB-702-0.0/10-XXX	11/8/2019	SOIL	FS			
480-162426-1	2073916	--	SB-702	OC-SB-702-0.0/2.0-XXX	11/8/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-702	OC-SB-702-2.0/4.0-XXX	11/8/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-702	OC-SB-702-28/29-XXX	11/8/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-702	OC-SB-702-34/35-XXX	11/8/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-702	OC-SB-702-4.0/6.0-XXX	11/8/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-702	OC-SB-702-6.0/8.0-XXX	11/8/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-702	OC-SB-702-8.0/10-XXX	11/8/2019	SOIL	FS	1	2	
480-162315-1	--	--	SB-703	OC-SB-703-0.0/10-XXX	11/5/2019	SOIL	FS			
480-162315-1	2073905	--	SB-703	OC-SB-703-0.0/2.0-XXX	11/5/2019	SOIL	FS	1	2	
480-162315-1	2073905	--	SB-703	OC-SB-703-17/18-XXX	11/5/2019	SOIL	FS	1	2	
480-162315-1	2073905	--	SB-703	OC-SB-703-2.0/4.0-DUP	11/5/2019	SOIL	FD	1	2	
480-162315-1	2073905	--	SB-703	OC-SB-703-2.0/4.0-XXX	11/5/2019	SOIL	FS	1	2	
480-162315-1	2073905	--	SB-703	OC-SB-703-30/32-XXX	11/5/2019	SOIL	FS	1	2	
480-162315-1	2073905	--	SB-703	OC-SB-703-4.0/6.0-XXX	11/5/2019	SOIL	FS	1	2	
480-162315-1	2073905	--	SB-703	OC-SB-703-6.0/8.0-XXX	11/5/2019	SOIL	FS	1	2	
480-162315-1	2073905	--	SB-703	OC-SB-703-8.0/10-XXX	11/5/2019	SOIL	FS	1	2	
480-162426-1	--	--	SB-704	OC-SB-704-0.0/10-XXX	11/7/2019	SOIL	FS			
480-162426-1	2073916	--	SB-704	OC-SB-704-0.0/2.0-XXX	11/7/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-704	OC-SB-704-12/13-XXX	11/7/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-704	OC-SB-704-19/20-XXX	11/7/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-704	OC-SB-704-2.0/4.0-XXX	11/7/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-704	OC-SB-704-33/34-XXX	11/7/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-704	OC-SB-704-4.0/6.0-XXX	11/7/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-704	OC-SB-704-6.0/8.0-XXX	11/7/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-704	OC-SB-704-8.0/10-XXX	11/7/2019	SOIL	FS	1	2	

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								Moisture/Solids		
							Method Class	CALC	E160.3	SW3540C
							Analysis Method	N	T	T
							Fraction			
							Qc			
TestAmerica	**Lancaster**	**Katahdin**	**Location**	**Field Sample ID**	**Sample Date**	**Media**	**Code**	Count	Count	Count
480-162426-1	--	--	SB-705	OC-SB-705-0.0/10-XXX	11/8/2019	SOIL	FS			
480-162426-1	2073916	--	SB-705	OC-SB-705-0.0/2.0-XXX	11/8/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-705	OC-SB-705-17/18-XXX	11/8/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-705	OC-SB-705-2.0/4.0-XXX	11/8/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-705	OC-SB-705-4.0/6.0-DUP	11/8/2019	SOIL	FD	1	2	
480-162426-1	2073916	--	SB-705	OC-SB-705-4.0/6.0-XXX	11/8/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-705	OC-SB-705-6.0/8.0-XXX	11/8/2019	SOIL	FS	1	2	
480-162426-1	2073916	--	SB-705	OC-SB-705-8.0/10-XXX	11/8/2019	SOIL	FS	1	2	
480-162353-1	--	--	SB-706	OC-SB-706-0.0/10-XXX	11/6/2019	SOIL	FS			
480-162353-1	2073662	--	SB-706	OC-SB-706-0.0/2.0-XXX	11/6/2019	SOIL	FS	1	2	
480-162353-1	2073662	--	SB-706	OC-SB-706-10/12-XXX	11/6/2019	SOIL	FS	1	2	
480-162353-1	2073662	--	SB-706	OC-SB-706-2.0/4.0-XXX	11/6/2019	SOIL	FS	1	2	
480-162353-1	2073662	--	SB-706	OC-SB-706-20/22-XXX	11/6/2019	SOIL	FS	1	2	
480-162353-1	2073662	--	SB-706	OC-SB-706-26/27-XXX	11/6/2019	SOIL	FS	1	2	
480-162353-1	2073662	--	SB-706	OC-SB-706-4.0/6.0-XXX	11/6/2019	SOIL	FS	1	2	
480-162353-1	2073662	--	SB-706	OC-SB-706-6.0/8.0-XXX	11/6/2019	SOIL	FS	1	2	
480-162353-1	--	--	SB-707	OC-SB-707-0.0/10-XXX	11/7/2019	SOIL	FS			
480-162353-1	2073662	--	SB-707	OC-SB-707-0.0/2.0-XXX	11/7/2019	SOIL	FS	1	2	
480-162353-1	2073662	--	SB-707	OC-SB-707-12/13-XXX	11/7/2019	SOIL	FS	1	2	
480-162353-1	2073662	--	SB-707	OC-SB-707-15/17-XXX	11/7/2019	SOIL	FS	1	2	
480-162353-1	2073662	--	SB-707	OC-SB-707-2.0/4.0-XXX	11/7/2019	SOIL	FS	1	2	
480-162353-1	2073662	--	SB-707	OC-SB-707-4.0/6.0-XXX	11/7/2019	SOIL	FS	1	2	
480-162353-1	2073662	--	SB-707	OC-SB-707-6.0/8.0-DUP	11/7/2019	SOIL	FD	1	2	
480-162353-1	2073662	--	SB-707	OC-SB-707-6.0/8.0-XXX	11/7/2019	SOIL	FS	1	2	
480-162353-1	2073662	--	SB-707	OC-SB-707-8.0/10-XXX	11/7/2019	SOIL	FS	1	2	
480-162140-1	--	--	SB-708	OC-SB-708-0.0/10-XXX	11/4/2019	SOIL	FS			
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-0.0/2.0-XXX	11/4/2019	SOIL	FS	1	2	1
480-162199-1	2072990	--	SB-708	OC-SB-708-16/18-XXX	11/4/2019	SOIL	FS	1	2	
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-2.0/4.0-XXX	11/4/2019	SOIL	FS	1	2	1
480-162199-1	2072990	--	SB-708	OC-SB-708-22/24-XXX	11/4/2019	SOIL	FS	1	2	
480-162199-1	2072990	--	SB-708	OC-SB-708-28/30-XXX	11/4/2019	SOIL	FS	1	2	
480-162199-1	2072990	--	SB-708	OC-SB-708-33/34-XXX	11/4/2019	SOIL	FS	1	2	
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-4.0/6.0-XXX	11/4/2019	SOIL	FS	1	2	1
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-6.0/8.0-XXX	11/4/2019	SOIL	FS	1	2	1
480-162140-1	2072711	TM1675	SB-708	OC-SB-708-8.0/10-XXX	11/4/2019	SOIL	FS	1	2	1

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November 2019 Containment Area Soil Sampling Event
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								Moisture/Solids		
							Method Class	CALC	E160.3	SW3540C
							Analysis Method	N	T	T
							Fraction			
							Qc			
TestAmerica	**Lancaster**	**Katahdin**	**Location**	**Field Sample ID**	**Sample Date**	**Media**	**Code**	Count	Count	Count
480-162315-1	--	--	SB-709	OC-SB-709-0.0/10-XXX	11/6/2019	SOIL	FS			
480-162315-1	2073905	--	SB-709	OC-SB-709-0.0/2.0-XXX	11/6/2019	SOIL	FS	1	2	
480-162315-1	2073905	--	SB-709	OC-SB-709-16/17-XXX	11/6/2019	SOIL	FS	1	2	
480-162315-1	2073905	--	SB-709	OC-SB-709-2.0/4.0-XXX	11/6/2019	SOIL	FS	1	2	
480-162315-1	2073905	--	SB-709	OC-SB-709-32/33-XXX	11/6/2019	SOIL	FS	1	2	
480-162315-1	2073905	--	SB-709	OC-SB-709-4.0/6.0-XXX	11/6/2019	SOIL	FS	1	2	
480-162315-1	2073905	--	SB-709	OC-SB-709-6.0/8.0-XXX	11/6/2019	SOIL	FS	1	2	
480-162315-1	2073905	--	SB-709	OC-SB-709-8.0/10-DUP	11/6/2019	SOIL	FD	1	2	
480-162315-1	2073905	--	SB-709	OC-SB-709-8.0/10-XXX	11/6/2019	SOIL	FS	1	2	
480-162199-1	--	--	SB-710	OC-SB-710-0.0/10XXX	11/4/2019	SOIL	FS			
480-162199-1	2072990	--	SB-710	OC-SB-710-2.0/4.0-XXX	11/4/2019	SOIL	FS	1	2	
480-162199-1	2072990	--	SB-710	OC-SB-710-23/24-XXX	11/5/2019	SOIL	FS	1	2	
480-162199-1	2072990	--	SB-710	OC-SB-710-36/37-XXX	11/5/2019	SOIL	FS	1	2	
480-162199-1	2072990	--	SB-710	OC-SB-710-4.0/6.0-XXX	11/4/2019	SOIL	FS	1	2	
480-162199-1	2072990	--	SB-710	OC-SB-710-6.0/8.0-XXX	11/4/2019	SOIL	FS	1	2	
480-162199-1	2072990	--	SB-710	OC-SB-710-8.0/10-XXX	11/4/2019	SOIL	FS	1	2	
480-162572-1	--	--	SB-711	OC-SB-711-0.0/10-XXX	11/12/2019	SOIL	FS			
480-162572-1	2074385	--	SB-711	OC-SB-711-0.0/2.0-XXX	11/12/2019	SOIL	FS	1	2	
480-162572-1	2074385	--	SB-711	OC-SB-711-18/19-XXX	11/12/2019	SOIL	FS	1	2	
480-162572-1	2074385	--	SB-711	OC-SB-711-2.0/4.0-XXX	11/12/2019	SOIL	FS	1	2	
480-162572-1	2074385	--	SB-711	OC-SB-711-35/36-XXX	11/12/2019	SOIL	FS	1	2	
480-162572-1	2074385	--	SB-711	OC-SB-711-4.0/6.0-XXX	11/12/2019	SOIL	FS	1	2	
480-162572-1	2074385	--	SB-711	OC-SB-711-6.0/8.0-XXX	11/12/2019	SOIL	FS	1	2	
480-162572-1	2074385	--	SB-711	OC-SB-711-8.0/10-XXX	11/12/2019	SOIL	FS	1	2	
480-162572-1	--	--	SB-712	OC-SB-712-0.0/10-DUP	11/11/2019	SOIL	FD			
480-162572-1	--	--	SB-712	OC-SB-712-0.0/10-XXX	11/11/2019	SOIL	FS			
480-162572-1	2074385	--	SB-712	OC-SB-712-0.0/2.0-XXX	11/11/2019	SOIL	FS	1	2	
480-162572-1	2074385	--	SB-712	OC-SB-712-2.0/4.0-XXX	11/11/2019	SOIL	FS	1	2	
480-162572-1	2074385	--	SB-712	OC-SB-712-23/24-XXX	11/11/2019	SOIL	FS	1	2	
480-162572-1	2074385	--	SB-712	OC-SB-712-37/38-XXX	11/11/2019	SOIL	FS	1	2	
480-162572-1	2074385	--	SB-712	OC-SB-712-4.0/6.0-XXX	11/11/2019	SOIL	FS	1	2	
480-162572-1	2074385	--	SB-712	OC-SB-712-6.0/8.0-XXX	11/11/2019	SOIL	FS	1	2	
480-162572-1	2074385	--	SB-712	OC-SB-712-8.0/10-XXX	11/11/2019	SOIL	FS	1	2	
480-162353-1	2073662	TM1916	QC	OC-EBK-01-XXX	11/7/2019	BW	EB			
480-162353-1	2073662	TM1916	QC	OC-EBK-02-XXX	11/7/2019	BW	EB			

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November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

								Moisture/Solids		
							Method Class	CALC	E160.3	SW3540C
							Analysis Method	N	T	T
							Fraction			
							Qc			
TestAmerica	**Lancaster**	**Katahdin**	**Location**	**Field Sample ID**	**Sample Date**	**Media**	**Code**	Count	Count	Count
480-162515-1	2074032	TM2018	QC	OC-EBK-03-XXX	11/11/2019	BW	EB			
480-162572-1	2074262	TM2019	QC	OC-EBK-04-XXX	11/12/2019	BW	EB			
480-162353-1	--	--	QC	OC-TB-11072019	11/7/2019	BS	TB			
480-162426-1	--	--	QC	OC-TB-11082019	11/8/2019	BS	TB			
480-162513-1	--	--	QC	OC-TB-11112019	11/11/2019	BS	TB			
480-162572-1	--	--	QC	OC-TB-11122019	11/12/2019	BS	TB			

Notes:
BW = blank water
BS = blank soil
EB = equipment blank
FD = field duplicate
FS = field sample
C = TCLP fraction
N = normal sample
QC = quality control sample
T = total fraction
TB = trip blank

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Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
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	Location	QC		QC		QC		QC		QC		QC	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162426-1		480-162513-1		480-162515-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/8/2019		11/11/2019		11/11/2019	
	Sample ID	OC-EBK-01-XXX		OC-EBK-02-XXX		OC-TB-11072019		OC-TB-11082019		OC-TB-11112019		OC-EBK-03-XXX	
	Qc Code	EB		EB		TB		TB		TB		EB	
	Units	ug/l		ug/l		ug/kg		ug/kg		ug/kg		ug/l	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,1,1-Trichloroethane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,1,2,2-Tetrachloroethane	0.5	U	0.5	U	5	U	5	U	5	U	0.5	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,1,2-Trichloroethane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,1-Dichloroethane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,1-Dichloroethene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,1-Dichloropropene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,2,3-Trichlorobenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,2,3-Trichloropropane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,2,4-Trichlorobenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,2,4-Trimethylbenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,2-Dibromo-3-chloropropane	5	U	5	U	25	U	25	U	25	U	5	U
VOCs	1,2-Dibromoethane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,2-Dichlorobenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,2-Dichloroethane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,2-Dichloropropane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,3,5-Trimethylbenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,3-Dichlorobenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,3-Dichloropropane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,4-Dichlorobenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	1,4-Dioxane	50	U	50	U	250	U	250	U	250	U	50	U
VOCs	2,2-Dichloropropane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	2,4,4-Trimethyl-1-pentene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	2,4,4-Trimethyl-2-pentene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	2-Butanone	2.9	J	3	J	25	U	25	U	25	U	9.2	J
VOCs	2-Chlorotoluene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	2-Hexanone	10	U	10	U	25	U	25	U	25	U	10	U
VOCs	4-Chlorotoluene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	4-iso-Propyltoluene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	4-Methyl-2-pentanone	10	U	10	U	25	U	25	U	25	U	10	U
VOCs	Acetic acid, methyl ester	20	U	20	U	50	U	50	U	50	U	20	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	QC		QC		QC		QC		QC		QC	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162426-1		480-162513-1		480-162515-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/8/2019		11/11/2019		11/11/2019	
	Sample ID	OC-EBK-01-XXX		OC-EBK-02-XXX		OC-TB-11072019		OC-TB-11082019		OC-TB-11112019		OC-EBK-03-XXX	
	Qc Code	EB		EB		TB		TB		TB		EB	
	Units	ug/l		ug/l		ug/kg		ug/kg		ug/kg		ug/l	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone	17	J	17	J	16	J	250	U	250	U	46	J
VOCs	Benzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Bromobenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Bromochloromethane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Bromodichloromethane	0.5	U	0.5	U	5	U	5	U	5	U	0.5	U
VOCs	Bromoform	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Bromomethane	2	U	2	U	5	U	5	U	5	U	2	U
VOCs	Butane, 2-methoxy-2-methyl-	5	U	5	U	5	U	5	U	5	U	5	U
VOCs	Carbon disulfide	10	U	10	U	5	U	5	U	5	U	10	U
VOCs	Carbon tetrachloride	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Chlorobenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Chloroethane	2	U	2	U	5	U	5	U	5	U	2	U
VOCs	Chloroform	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Chloromethane	2	U	2	U	5	U	5	U	5	U	2	U
VOCs	cis-1,2-Dichloroethene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	cis-1,3-Dichloropropene	0.4	U	0.4	U	5	U	5	U	5	U	0.4	U
VOCs	Cyclohexane	1	U	1	U	25	U	25	U	25	U	1	U
VOCs	Dibromochloromethane	0.5	U	0.5	U	5	U	5	U	5	U	0.5	U
VOCs	Dibromomethane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Dichlorodifluoromethane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Diethyl ether	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Ethyl-t-Butyl Ether	5	U	5	U	5	U	5	U	5	U	5	U
VOCs	Ethylbenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Hexachlorobutadiene	0.4	U	0.4	U	5	U	5	U	5	U	0.4	U
VOCs	Isopropyl ether	10	U	10	U	5	U	5	U	5	U	10	U
VOCs	Isopropylbenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Methyl cyclohexane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Methyl Tertbutyl Ether	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Methylene chloride	1	U	1	U	5	U	8.8		3	J	1	U
VOCs	n-Butylbenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Naphthalene	5	U	5	U	25	U	25	U	25	U	5	U
VOCs	Propylbenzene	1	U	1	U	5	U	5	U	5	U	1	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	QC		QC		QC		QC		QC		QC	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162426-1		480-162513-1		480-162515-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/8/2019		11/11/2019		11/11/2019	
	Sample ID	OC-EBK-01-XXX		OC-EBK-02-XXX		OC-TB-11072019		OC-TB-11082019		OC-TB-11112019		OC-EBK-03-XXX	
	Qc Code	EB		EB		TB		TB		TB		EB	
	Units	ug/l		ug/l		ug/kg		ug/kg		ug/kg		ug/l	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Styrene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	tert-Butylbenzene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Tetrachloroethene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Tetrahydrofuran	10	U	10	U	50	U	50	U	50	U	4.4	J
VOCs	Toluene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	trans-1,2-Dichloroethene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	trans-1,3-Dichloropropene	0.4	U	0.4	U	5	U	5	U	5	U	0.4	U
VOCs	Trichloroethene	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Trichlorofluoromethane	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Vinyl chloride	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Xylene, o	1	U	1	U	5	U	5	U	5	U	1	U
VOCs	Xylenes (m&p)	2	U	2	U	5	U	5	U	5	U	2	U
VOCs	Xylenes, Total	2	U	2	U	5	U	5	U	5	U	2	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank
TB = trip blank

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	QC	QC	SB-701	SB-701	SB-701	SB-701
	Lab SDG	480-162572-1	480-162572-1	480-162513-1	480-162513-1	480-162513-1	480-162513-1
	Sample Date	11/12/2019	11/12/2019	11/11/2019	11/11/2019	11/11/2019	11/11/2019
	Sample ID	OC-TB-11122019	OC-EBK-04-XXX	OC-SB-701-0.0/2.0-DUP	OC-SB-701-0.0/2.0-XXX	OC-SB-701-8.0/10-XXX	OC-SB-701-6.0/8.0-XXX
	Qc Code	TB	EB	FD	FS	FS	FS
	Units	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg
Method Class	Parameter	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier
VOCs	1,1,1,2-Tetrachloroethane	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	1,1,1-Trichloroethane	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	1,1,2,2-Tetrachloroethane	13000 U	0.5 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	1,1,2-Trichloroethane	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	1,1-Dichloroethane	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	1,1-Dichloroethene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	1,1-Dichloropropene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	1,2,3-Trichlorobenzene	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	1,2,3-Trichloropropane	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	1,2,4-Trichlorobenzene	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	1,2,4-Trimethylbenzene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	1,2-Dibromo-3-chloropropane	67000 U	5 U	29 UJ	22 UJ	26 U	21 U
VOCs	1,2-Dibromoethane	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	1,2-Dichlorobenzene	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	1,2-Dichloroethane	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	1,2-Dichloropropane	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	1,3,5-Trimethylbenzene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	1,3-Dichlorobenzene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	1,3-Dichloropropane	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	1,4-Dichlorobenzene	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	1,4-Dioxane	670000 U	50 U	290 UJ	220 UJ	260 U	210 U
VOCs	2,2-Dichloropropane	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	2,4,4-Trimethyl-1-pentene	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	0.76 J
VOCs	2,4,4-Trimethyl-2-pentene	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	2-Butanone	67000 U	1.6 J	29 U	22 U	26 U	21 U
VOCs	2-Chlorotoluene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	2-Hexanone	67000 U	10 U	29 UJ	22 UJ	26 U	21 U
VOCs	4-Chlorotoluene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	4-iso-Propyltoluene	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	4-Methyl-2-pentanone	67000 U	10 U	29 U	22 U	26 U	21 U
VOCs	Acetic acid, methyl ester	130000 U	20 U	58 UJ	43 UJ	52 U	43 U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	QC	QC	SB-701	SB-701	SB-701	SB-701
	Lab SDG	480-162572-1	480-162572-1	480-162513-1	480-162513-1	480-162513-1	480-162513-1
	Sample Date	11/12/2019	11/12/2019	11/11/2019	11/11/2019	11/11/2019	11/11/2019
	Sample ID	OC-TB-11122019	OC-EBK-04-XXX	OC-SB-701-0.0/2.0-DUP	OC-SB-701-0.0/2.0-XXX	OC-SB-701-8.0/10-XXX	OC-SB-701-6.0/8.0-XXX
	Qc Code	TB	EB	FD	FS	FS	FS
	Units	ug/kg	ug/l	ug/kg	ug/kg	ug/kg	ug/kg
Method Class	Parameter	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier
VOCs	Acetone	670000 U	8.4 J	7.4 J-	14 J-	12 J	16 J
VOCs	Benzene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Bromobenzene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Bromochloromethane	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Bromodichloromethane	13000 U	0.5 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Bromoform	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	Bromomethane	13000 U	2 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Butane, 2-methoxy-2-methyl-	13000 U	5 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Carbon disulfide	13000 U	10 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Carbon tetrachloride	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Chlorobenzene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Chloroethane	13000 U	2 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Chloroform	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Chloromethane	13000 U	2 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	cis-1,2-Dichloroethene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	cis-1,3-Dichloropropene	13000 U	0.4 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Cyclohexane	67000 U	1 U	29 U	22 U	26 U	21 U
VOCs	Dibromochloromethane	13000 U	0.5 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Dibromomethane	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Dichlorodifluoromethane	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Diethyl ether	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Ethyl-t-Butyl Ether	13000 U	5 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Ethylbenzene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Hexachlorobutadiene	13000 U	0.4 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	Isopropyl ether	13000 U	10 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Isopropylbenzene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Methyl cyclohexane	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	Methyl Tertbutyl Ether	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U
VOCs	Methylene chloride	13000 U	0.69 J	18 U	19 U	26 U	25 U
VOCs	n-Butylbenzene	13000 U	1 U	5.8 UJ	4.3 UJ	5.2 U	4.3 U
VOCs	Naphthalene	67000 U	5 U	29 UJ	22 UJ	26 U	15 J
VOCs	Propylbenzene	13000 U	1 U	5.8 U	4.3 U	5.2 U	4.3 U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	QC		QC		SB-701		SB-701		SB-701		SB-701	
	Lab SDG	480-162572-1		480-162572-1		480-162513-1		480-162513-1		480-162513-1		480-162513-1	
	Sample Date	11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
	Sample ID	OC-TB-11122019		OC-EBK-04-XXX		OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX		OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX	
	Qc Code	TB		EB		FD		FS		FS		FS	
	Units	ug/kg		ug/l		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene	13000	U	1	U	5.8	UJ	4.3	UJ	5.2	U	4.3	U
VOCs	Styrene	13000	U	1	U	5.8	U	4.3	U	5.2	U	4.3	U
VOCs	tert-Butylbenzene	13000	U	1	U	5.8	UJ	4.3	UJ	5.2	U	4.3	U
VOCs	Tetrachloroethene	13000	U	1	U	5.8	U	4.3	U	5.2	U	4.3	U
VOCs	Tetrahydrofuran	130000	U	10	U	58	UJ	43	UJ	52	U	43	U
VOCs	Toluene	13000	U	1	U	5.8	U	4.3	U	5.2	U	4.3	U
VOCs	trans-1,2-Dichloroethene	13000	U	1	U	5.8	U	4.3	U	5.2	U	4.3	U
VOCs	trans-1,3-Dichloropropene	13000	U	0.4	U	5.8	U	4.3	U	5.2	U	4.3	U
VOCs	Trichloroethene	13000	U	1	U	5.8	U	4.3	U	5.2	U	4.3	U
VOCs	Trichlorofluoromethane	13000	U	1	U	5.8	U	4.3	U	5.2	U	4.3	U
VOCs	Vinyl chloride	13000	U	1	U	5.8	U	4.3	U	5.2	U	4.3	U
VOCs	Xylene, o	13000	U	1	U	5.8	U	4.3	U	5.2	U	4.3	U
VOCs	Xylenes (m&p)	13000	U	2	U	5.8	U	4.3	U	5.2	U	4.3	U
VOCs	Xylenes, Total	13000	U	2	U	5.8	U	4.3	U	5.2	U	4.3	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-701		SB-701		SB-701		SB-701		SB-702		SB-702	
	Lab SDG	480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162426-1		480-162426-1	
	Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/8/2019		11/8/2019	
	Sample ID	OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX		OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,1,1-Trichloroethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,1,2,2-Tetrachloroethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,1,2-Trichloroethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,1-Dichloroethane	0.7	J	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,1-Dichloroethene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,1-Dichloropropene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,2,3-Trichlorobenzene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,2,3-Trichloropropane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,2,4-Trichlorobenzene	0.54	J	1.9	J	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,2,4-Trimethylbenzene	16		3.8	J	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,2-Dibromo-3-chloropropane	26	U	23	U	20	U	26	U	23	U	21	U
VOCs	1,2-Dibromoethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,2-Dichlorobenzene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,2-Dichloroethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,2-Dichloropropane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,3,5-Trimethylbenzene	0.79	J	0.82	J	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,3-Dichlorobenzene	5.2	U	0.32	J	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,3-Dichloropropane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,4-Dichlorobenzene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	1,4-Dioxane	260	U	230	U	200	U	260	U	230	U	210	U
VOCs	2,2-Dichloropropane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	2,4,4-Trimethyl-1-pentene	67		59		4.1	U	0.58	J	4.7	U	2.4	J
VOCs	2,4,4-Trimethyl-2-pentene	34		24		4.1	U	5.2	U	4.7	U	0.84	J
VOCs	2-Butanone	23	J+	21	J+	20	U	26	U	23	U	14	J+
VOCs	2-Chlorotoluene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	2-Hexanone	26	U	23	U	20	U	26	U	23	U	21	U
VOCs	4-Chlorotoluene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	4-iso-Propyltoluene	0.48	J	0.41	J	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	4-Methyl-2-pentanone	26	U	23	U	20	U	26	U	23	U	21	U
VOCs	Acetic acid, methyl ester	52	U	46	U	41	U	52	U	47	U	41	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-701		SB-701		SB-701		SB-701		SB-702		SB-702	
	Lab SDG	480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162426-1		480-162426-1	
	Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/8/2019		11/8/2019	
	Sample ID	OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX		OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone	99	J	82	J	14	J	16	J	23	J	54	J
VOCs	Benzene	0.82	J	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Bromobenzene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Bromochloromethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Bromodichloromethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Bromoform	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Bromomethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Butane, 2-methoxy-2-methyl-	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Carbon disulfide	6.6		4.2	J	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Carbon tetrachloride	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Chlorobenzene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Chloroethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Chloroform	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Chloromethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	cis-1,2-Dichloroethene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	cis-1,3-Dichloropropene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Cyclohexane	26	U	23	U	20	U	26	U	23	U	21	U
VOCs	Dibromochloromethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Dibromomethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Dichlorodifluoromethane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Diethyl ether	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Ethyl-t-Butyl Ether	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Ethylbenzene	1.4	J	0.49	J	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Hexachlorobutadiene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Isopropyl ether	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Isopropylbenzene	3.7	J	1.2	J	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Methyl cyclohexane	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Methyl Tertbutyl Ether	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Methylene chloride	17	U	26	U	15	U	26	U	6.5	U	5.6	U
VOCs	n-Butylbenzene	5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Naphthalene	180		3	J	20	U	26	U	23	U	21	U
VOCs	Propylbenzene	7		1.2	J	4.1	U	5.2	U	4.7	U	4.1	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-701		SB-701		SB-701		SB-701		SB-702		SB-702	
		Lab SDG	480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162426-1		480-162426-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX		OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene		5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Styrene		5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	tert-Butylbenzene		5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Tetrachloroethene		5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Tetrahydrofuran		52	U	46	U	41	U	52	U	47	U	41	U
VOCs	Toluene		5.2	U	0.43	J	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	trans-1,2-Dichloroethene		5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	trans-1,3-Dichloropropene		5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Trichloroethene		5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Trichlorofluoromethane		5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Vinyl chloride		5.2	U	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Xylene, o		1.6	J	0.75	J	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Xylenes (m&p)		0.98	J	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U
VOCs	Xylenes, Total		2.6	J	4.6	U	4.1	U	5.2	U	4.7	U	4.1	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-703	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162315-1	
	Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/5/2019	
	Sample ID	OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX		OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,1,1-Trichloroethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,1,2,2-Tetrachloroethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,1,2-Trichloroethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,1-Dichloroethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,1-Dichloroethene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,1-Dichloropropene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,2,3-Trichlorobenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,2,3-Trichloropropane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,2,4-Trichlorobenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,2,4-Trimethylbenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,2-Dibromo-3-chloropropane	25	U	21	U	23	U	54	U	21	U	24	U
VOCs	1,2-Dibromoethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,2-Dichlorobenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,2-Dichloroethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,2-Dichloropropane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,3,5-Trimethylbenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,3-Dichlorobenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,3-Dichloropropane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,4-Dichlorobenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	1,4-Dioxane	250	U	210	U	230	U	540	U	210	U	240	U
VOCs	2,2-Dichloropropane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	2,4,4-Trimethyl-1-pentene	1.2	J	13		16		11	U	4.2	U	0.9	J
VOCs	2,4,4-Trimethyl-2-pentene	4.9	U	4.4		3.1	J	11	U	4.2	U	4.7	U
VOCs	2-Butanone	29	J+	4.4	J+	23	U	54	U	21	U	6.6	J
VOCs	2-Chlorotoluene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	2-Hexanone	25	U	21	U	23	U	54	U	21	U	24	U
VOCs	4-Chlorotoluene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	4-iso-Propyltoluene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	4-Methyl-2-pentanone	25	U	21	U	23	U	54	U	21	U	24	U
VOCs	Acetic acid, methyl ester	8.1	J	42	U	6.3	J	7.5	J	42	U	47	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-703	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162315-1	
	Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/5/2019	
	Sample ID	OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX		OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone	54	J	20	J	5.6	J	12	J	5.1	J	30	J
VOCs	Benzene	4.9	U	0.37	J	4.6	U	11	U	4.2	U	4.7	U
VOCs	Bromobenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Bromochloromethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Bromodichloromethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Bromoform	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Bromomethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Butane, 2-methoxy-2-methyl-	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Carbon disulfide	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Carbon tetrachloride	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Chlorobenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Chloroethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Chloroform	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Chloromethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	cis-1,2-Dichloroethene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	cis-1,3-Dichloropropene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Cyclohexane	25	U	21	U	23	U	54	U	21	U	24	U
VOCs	Dibromochloromethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Dibromomethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Dichlorodifluoromethane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Diethyl ether	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Ethyl-t-Butyl Ether	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Ethylbenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Hexachlorobutadiene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Isopropyl ether	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Isopropylbenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Methyl cyclohexane	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Methyl Tertbutyl Ether	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Methylene chloride	8.4	U	4.5	U	20	U	57	U	21	U	4.7	U
VOCs	n-Butylbenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Naphthalene	25	U	21	U	23	U	54	U	21	U	24	U
VOCs	Propylbenzene	4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-703	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162315-1	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/5/2019	
		Sample ID	OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX		OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Styrene		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	tert-Butylbenzene		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Tetrachloroethene		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Tetrahydrofuran		49	U	42	U	46	U	110	U	42	U	47	U
VOCs	Toluene		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	trans-1,2-Dichloroethene		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	trans-1,3-Dichloropropene		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Trichloroethene		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Trichlorofluoromethane		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Vinyl chloride		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Xylene, o		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Xylenes (m&p)		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U
VOCs	Xylenes, Total		4.9	U	4.2	U	4.6	U	11	U	4.2	U	4.7	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-703		SB-703		SB-703		SB-703		SB-703		SB-703	
	Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
	Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019	
	Sample ID	OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX	
	Qc Code	FD		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,1,1-Trichloroethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,1,2,2-Tetrachloroethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,1,2-Trichloroethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,1-Dichloroethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,1-Dichloroethene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,1-Dichloropropene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,2,3-Trichlorobenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,2,3-Trichloropropane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,2,4-Trichlorobenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,2,4-Trimethylbenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,2-Dibromo-3-chloropropane	20	UJ	22	UJ	23	U	25	U	25	U	22	U
VOCs	1,2-Dibromoethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,2-Dichlorobenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,2-Dichloroethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,2-Dichloropropane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,3,5-Trimethylbenzene	0.27	J-	0.37	J-	4.6	U	5	U	5	U	4.5	U
VOCs	1,3-Dichlorobenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,3-Dichloropropane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,4-Dichlorobenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	1,4-Dioxane	200	UJ	220	UJ	230	U	250	U	250	U	220	U
VOCs	2,2-Dichloropropane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	2,4,4-Trimethyl-1-pentene	1.4	J-	1.7	J-	4.6	U	5	U	5	U	4.5	U
VOCs	2,4,4-Trimethyl-2-pentene	0.46	J-	0.67	J-	4.6	U	5	U	5	U	4.5	U
VOCs	2-Butanone	9.5	J-	10	J	23	U	25	U	25	U	22	U
VOCs	2-Chlorotoluene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	2-Hexanone	20	UJ	22	UJ	23	U	25	U	25	U	22	U
VOCs	4-Chlorotoluene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	4-iso-Propyltoluene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	4-Methyl-2-pentanone	20	UJ	22	UJ	23	U	25	U	25	U	22	U
VOCs	Acetic acid, methyl ester	40	UJ	44	UJ	46	U	50	U	50	U	45	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-703		SB-703		SB-703		SB-703		SB-703		SB-703	
	Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
	Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019	
	Sample ID	OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX	
	Qc Code	FD		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone	43	J-	37	J-	6.5	J	23	J	4.2	J	220	U
VOCs	Benzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Bromobenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Bromochloromethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Bromodichloromethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Bromoform	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Bromomethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Butane, 2-methoxy-2-methyl-	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Carbon disulfide	6.5	J-	4.4	J-	4.6	U	5	U	5	U	4.5	U
VOCs	Carbon tetrachloride	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Chlorobenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Chloroethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Chloroform	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Chloromethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	cis-1,2-Dichloroethene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	cis-1,3-Dichloropropene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Cyclohexane	20	UJ	22	UJ	23	U	25	U	25	U	22	U
VOCs	Dibromochloromethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Dibromomethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Dichlorodifluoromethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Diethyl ether	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Ethyl-t-Butyl Ether	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Ethylbenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Hexachlorobutadiene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Isopropyl ether	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Isopropylbenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Methyl cyclohexane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Methyl Tertbutyl Ether	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Methylene chloride	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	n-Butylbenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Naphthalene	20	UJ	22	UJ	23	U	25	U	25	U	22	U
VOCs	Propylbenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-703		SB-703		SB-703		SB-703		SB-703		SB-703	
	Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
	Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019	
	Sample ID	OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX	
	Qc Code	FD		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Styrene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	tert-Butylbenzene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Tetrachloroethene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Tetrahydrofuran	40	UJ	44	UJ	46	U	50	U	50	U	45	U
VOCs	Toluene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	trans-1,2-Dichloroethene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	trans-1,3-Dichloropropene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Trichloroethene	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Trichlorofluoromethane	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Vinyl chloride	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Xylene, o	4	UJ	4.4	UJ	4.6	U	5	U	5	U	4.5	U
VOCs	Xylenes (m&p)	4	UJ	0.77	J-	4.6	U	5	U	5	U	4.5	U
VOCs	Xylenes, Total	4	UJ	0.77	J-	4.6	U	5	U	5	U	4.5	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-703		SB-704		SB-704		SB-704		SB-704		SB-704	
	Lab SDG	480-162315-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
	Sample Date	11/5/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
	Sample ID	OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX		OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX		OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,1,1-Trichloroethane	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,1,2,2-Tetrachloroethane	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,1,2-Trichloroethane	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,1-Dichloroethane	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,1-Dichloroethene	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,1-Dichloropropene	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,2,3-Trichlorobenzene	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,2,3-Trichloropropane	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,2,4-Trichlorobenzene	3	U	7.3	U	0.58	J	0.36	J	3.7	U	4.5	U
VOCs	1,2,4-Trimethylbenzene	3	U	3	J	2.7	J	4.1	U	3.7	U	4.5	U
VOCs	1,2-Dibromo-3-chloropropane	15	U	37	U	27	U	20	U	19	U	23	U
VOCs	1,2-Dibromoethane	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,2-Dichlorobenzene	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,2-Dichloroethane	1.1	J	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,2-Dichloropropane	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,3,5-Trimethylbenzene	3	U	1.4	J	1.1	J	4.1	U	3.7	U	4.5	U
VOCs	1,3-Dichlorobenzene	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,3-Dichloropropane	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,4-Dichlorobenzene	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	1,4-Dioxane	150	U	370	U	270	U	200	U	190	U	230	U
VOCs	2,2-Dichloropropane	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	2,4,4-Trimethyl-1-pentene	3	U	5.1	J	6.2		1.3	J	3.7	U	4.5	U
VOCs	2,4,4-Trimethyl-2-pentene	3	U	7.3	U	3	J	0.56	J	3.7	U	4.5	U
VOCs	2-Butanone	15	U	17	J+	23	J+	64	J+	9.6	J+	29	J+
VOCs	2-Chlorotoluene	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	2-Hexanone	15	U	37	U	27	U	20	U	19	U	23	U
VOCs	4-Chlorotoluene	3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	4-iso-Propyltoluene	3	U	1.9	J	1.2	J	4.1	U	3.7	U	4.5	U
VOCs	4-Methyl-2-pentanone	15	U	37	U	27	U	20	U	19	U	23	U
VOCs	Acetic acid, methyl ester	30	U	73	U	54	U	41	U	37	U	45	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-703		SB-704		SB-704		SB-704		SB-704		SB-704	
		Lab SDG	480-162315-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/5/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX		OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX		OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone		7.6	J	93	J	68	J	64	J	38	J	54	J
VOCs	Benzene		3	U	7.3	U	0.41	J	4.1	U	3.7	U	4.5	U
VOCs	Bromobenzene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Bromochloromethane		0.78	J	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Bromodichloromethane		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Bromoform		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Bromomethane		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Butane, 2-methoxy-2-methyl-		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Carbon disulfide		3	U	7.3	U	6		2.5	J	3.7	U	2.4	J
VOCs	Carbon tetrachloride		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Chlorobenzene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Chloroethane		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Chloroform		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Chloromethane		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	cis-1,2-Dichloroethene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	cis-1,3-Dichloropropene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Cyclohexane		15	U	37	U	27	U	20	U	19	U	23	U
VOCs	Dibromochloromethane		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Dibromomethane		4.6		7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Dichlorodifluoromethane		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Diethyl ether		3	U	3.4	J	2.8	J	4.1	U	3.7	U	4.5	U
VOCs	Ethyl-t-Butyl Ether		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Ethylbenzene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Hexachlorobutadiene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Isopropyl ether		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Isopropylbenzene		3	U	7.3	U	1.3	J	4.1	U	3.7	U	4.5	U
VOCs	Methyl cyclohexane		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Methyl Tertbutyl Ether		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Methylene chloride		3	U	14	U	11	U	6.1	U	4.7	U	8.8	U
VOCs	n-Butylbenzene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Naphthalene		15	U	2.5	J	1.4	J	20	U	19	U	23	U
VOCs	Propylbenzene		3	U	7.3	U	0.49	J	4.1	U	3.7	U	4.5	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-703		SB-704		SB-704		SB-704		SB-704		SB-704	
		Lab SDG	480-162315-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/5/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX		OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX		OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Styrene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	tert-Butylbenzene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Tetrachloroethene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Tetrahydrofuran		30	U	73	U	54	U	41	U	37	U	45	U
VOCs	Toluene		0.62	J	1.4	J	4.2	J	0.5	J	0.38	J	4.5	U
VOCs	trans-1,2-Dichloroethene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	trans-1,3-Dichloropropene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Trichloroethene		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Trichlorofluoromethane		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Vinyl chloride		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Xylene, o		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Xylenes (m&p)		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U
VOCs	Xylenes, Total		3	U	7.3	U	5.4	U	4.1	U	3.7	U	4.5	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-704		SB-704		SB-704		SB-705		SB-705		SB-705	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/8/2019		11/8/2019		11/8/2019	
	Sample ID	OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX		OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP	
	Qc Code	FS		FS		FS		FS		FS		FD	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	1,1,1-Trichloroethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	1,1,2,2-Tetrachloroethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	1,1,2-Trichloroethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	1,1-Dichloroethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	1,1-Dichloroethene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	1,1-Dichloropropene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	1,2,3-Trichlorobenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	1,2,3-Trichloropropane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	1,2,4-Trichlorobenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	1,2,4-Trimethylbenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	1,2-Dibromo-3-chloropropane	24	U	22	U	21	U	21	U	22	U	23	UJ
VOCs	1,2-Dibromoethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	1,2-Dichlorobenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	1,2-Dichloroethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	1,2-Dichloropropane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	1,3,5-Trimethylbenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	1,3-Dichlorobenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	1,3-Dichloropropane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	1,4-Dichlorobenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	1,4-Dioxane	240	U	220	U	210	U	210	U	220	U	230	U
VOCs	2,2-Dichloropropane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	2,4,4-Trimethyl-1-pentene	4.8	U	4.3	U	4.3	U	4.2	U	5.5		11	J-
VOCs	2,4,4-Trimethyl-2-pentene	4.8	U	4.3	U	4.3	U	4.2	U	2.1	J	3.8	J-
VOCs	2-Butanone	24	U	22	U	21	U	21	U	14	J+	32	J+
VOCs	2-Chlorotoluene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	2-Hexanone	24	U	22	U	21	U	21	U	22	U	23	UJ
VOCs	4-Chlorotoluene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	4-iso-Propyltoluene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	4-Methyl-2-pentanone	24	U	22	U	21	U	21	U	22	U	23	UJ
VOCs	Acetic acid, methyl ester	48	U	43	U	43	U	42	U	43	U	150	J+

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-704		SB-704		SB-704		SB-705		SB-705		SB-705	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/8/2019		11/8/2019		11/8/2019	
	Sample ID	OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX		OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP	
	Qc Code	FS		FS		FS		FS		FS		FD	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone	18	J	22	J	210	U	14	J	46	J	69	J-
VOCs	Benzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	0.28	J
VOCs	Bromobenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Bromochloromethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Bromodichloromethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Bromoform	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Bromomethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Butane, 2-methoxy-2-methyl-	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Carbon disulfide	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Carbon tetrachloride	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Chlorobenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Chloroethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Chloroform	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Chloromethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	cis-1,2-Dichloroethene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	cis-1,3-Dichloropropene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Cyclohexane	24	U	22	U	21	U	21	U	22	U	23	U
VOCs	Dibromochloromethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Dibromomethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Dichlorodifluoromethane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Diethyl ether	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Ethyl-t-Butyl Ether	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Ethylbenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Hexachlorobutadiene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	Isopropyl ether	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Isopropylbenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Methyl cyclohexane	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	Methyl Tertbutyl Ether	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Methylene chloride	7.8	U	7.2	U	6.7	U	9.7	U	6.2	U	6.9	U
VOCs	n-Butylbenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	Naphthalene	24	U	22	U	21	U	21	U	22	U	23	UJ
VOCs	Propylbenzene	4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-704		SB-704		SB-704		SB-705		SB-705		SB-705	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX		OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP	
		Qc Code	FS		FS		FS		FS		FS		FD	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene		4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	Styrene		4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	tert-Butylbenzene		4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	UJ
VOCs	Tetrachloroethene		4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Tetrahydrofuran		48	U	43	U	43	U	42	U	43	U	47	UJ
VOCs	Toluene		4.8	U	0.53	J	4.3	U	4.2	U	0.48	J	0.72	J
VOCs	trans-1,2-Dichloroethene		4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	trans-1,3-Dichloropropene		4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Trichloroethene		4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Trichlorofluoromethane		4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Vinyl chloride		4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Xylene, o		4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Xylenes (m&p)		4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U
VOCs	Xylenes, Total		4.8	U	4.3	U	4.3	U	4.2	U	4.3	U	4.7	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-705		SB-705		SB-705		SB-705		SB-706		SB-706	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162353-1		480-162353-1	
	Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX		OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,1,1-Trichloroethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,1,2,2-Tetrachloroethane	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,1,2-Trichloroethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,1-Dichloroethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,1-Dichloroethene	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,1-Dichloropropene	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,2,3-Trichlorobenzene	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,2,3-Trichloropropane	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,2,4-Trichlorobenzene	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,2,4-Trimethylbenzene	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,2-Dibromo-3-chloropropane	24	UJ	21	U	19	U	21	U	23	U	21	U
VOCs	1,2-Dibromoethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,2-Dichlorobenzene	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,2-Dichloroethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,2-Dichloropropane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,3,5-Trimethylbenzene	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,3-Dichlorobenzene	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,3-Dichloropropane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,4-Dichlorobenzene	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	1,4-Dioxane	240	U	210	U	190	U	210	U	230	U	210	U
VOCs	2,2-Dichloropropane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	2,4,4-Trimethyl-1-pentene	7.4	J-	4.3	U	3.7	U	4.2	U	4.5	U	1.3	J
VOCs	2,4,4-Trimethyl-2-pentene	2.3	J-	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	2-Butanone	20	J+	560	J+	19	U	21	U	23	U	15	J+
VOCs	2-Chlorotoluene	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	2-Hexanone	24	UJ	21	U	19	U	21	U	23	U	21	U
VOCs	4-Chlorotoluene	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	4-iso-Propyltoluene	0.52	J-	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	4-Methyl-2-pentanone	24	UJ	21	U	19	U	21	U	23	U	21	U
VOCs	Acetic acid, methyl ester	48	UJ	41	J	37	U	42	U	45	U	42	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-705		SB-705		SB-705		SB-705		SB-706		SB-706	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162353-1		480-162353-1	
	Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX		OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone	74	J-	18	J	190	U	19	J	230	U	210	U
VOCs	Benzene	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Bromobenzene	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Bromochloromethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Bromodichloromethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Bromoform	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Bromomethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Butane, 2-methoxy-2-methyl-	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Carbon disulfide	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Carbon tetrachloride	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Chlorobenzene	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Chloroethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Chloroform	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Chloromethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	cis-1,2-Dichloroethene	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	cis-1,3-Dichloropropene	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Cyclohexane	24	U	21	U	19	U	21	U	23	U	21	U
VOCs	Dibromochloromethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Dibromomethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Dichlorodifluoromethane	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Diethyl ether	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Ethyl-t-Butyl Ether	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Ethylbenzene	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Hexachlorobutadiene	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Isopropyl ether	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Isopropylbenzene	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Methyl cyclohexane	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Methyl Tertbutyl Ether	4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Methylene chloride	7.3	U	29	U	26	U	9.1	U	4.5	U	4.2	U
VOCs	n-Butylbenzene	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Naphthalene	24	UJ	21	U	19	U	21	U	23	U	21	U
VOCs	Propylbenzene	4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-705		SB-705		SB-705		SB-705		SB-706		SB-706	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162353-1		480-162353-1	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX		OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene		4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Styrene		4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	tert-Butylbenzene		4.8	UJ	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Tetrachloroethene		4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Tetrahydrofuran		48	UJ	43	U	37	U	42	U	45	U	42	U
VOCs	Toluene		0.6	J	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	trans-1,2-Dichloroethene		4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	trans-1,3-Dichloropropene		4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Trichloroethene		4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Trichlorofluoromethane		4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Vinyl chloride		4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Xylene, o		4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Xylenes (m&p)		4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U
VOCs	Xylenes, Total		4.8	U	4.3	U	3.7	U	4.2	U	4.5	U	4.2	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-707	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
	Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/7/2019	
	Sample ID	OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX		OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,1,1-Trichloroethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,1,2,2-Tetrachloroethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,1,2-Trichloroethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,1-Dichloroethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,1-Dichloroethene	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,1-Dichloropropene	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,2,3-Trichlorobenzene	3.9	U	3.7	U	0.85	J	5	U	3.1	U	5.2	U
VOCs	1,2,3-Trichloropropane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,2,4-Trichlorobenzene	3.9	U	3.7	U	1.9	J	5	U	3.1	U	2.5	J
VOCs	1,2,4-Trimethylbenzene	3.9	U	3.7	U	1.6	J	5	U	3.1	U	5.2	U
VOCs	1,2-Dibromo-3-chloropropane	19	U	19	U	21	U	25	U	15	U	26	U
VOCs	1,2-Dibromoethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,2-Dichlorobenzene	3.9	U	3.7	U	0.5	J	5	U	3.1	U	5.2	U
VOCs	1,2-Dichloroethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,2-Dichloropropane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,3,5-Trimethylbenzene	3.9	U	3.7	U	1.5	J	5	U	3.1	U	5.2	U
VOCs	1,3-Dichlorobenzene	3.9	U	3.7	U	1.2	J	5	U	3.1	U	5.2	U
VOCs	1,3-Dichloropropane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	1,4-Dichlorobenzene	3.9	U	3.7	U	0.68	J	5	U	3.1	U	5.2	U
VOCs	1,4-Dioxane	190	U	190	U	210	U	250	U	150	U	260	U
VOCs	2,2-Dichloropropane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	2,4,4-Trimethyl-1-pentene	1.9	J	3.7	U	75		0.54	J	1.9	J	5.2	U
VOCs	2,4,4-Trimethyl-2-pentene	3.9	U	3.7	U	25		5	U	3.1	U	5.2	U
VOCs	2-Butanone	8.2	J	19	U	17	J+	25	U	15	U	15	J
VOCs	2-Chlorotoluene	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	2-Hexanone	19	U	19	U	21	U	25	U	15	U	26	U
VOCs	4-Chlorotoluene	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	4-iso-Propyltoluene	3.9	U	3.7	U	2	J	5	U	3.1	U	5.2	U
VOCs	4-Methyl-2-pentanone	19	U	19	U	21	U	25	U	15	U	26	U
VOCs	Acetic acid, methyl ester	39	U	37	U	42	U	50	U	31	U	52	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-707	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
	Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/7/2019	
	Sample ID	OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX		OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone	190	U	190	U	210	U	250	U	150	U	260	U
VOCs	Benzene	3.9	U	3.7	U	2	J	5	U	3.1	U	5.2	U
VOCs	Bromobenzene	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Bromochloromethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Bromodichloromethane	3.9	U	3.7	U	2.6	J	5	U	3.1	U	5.2	U
VOCs	Bromoform	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Bromomethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Butane, 2-methoxy-2-methyl-	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Carbon disulfide	3.9	U	3.7	U	2.2	J	5	U	3.1	U	5.2	U
VOCs	Carbon tetrachloride	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Chlorobenzene	3.9	U	3.7	U	0.91	J	5	U	3.1	U	5.2	U
VOCs	Chloroethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Chloroform	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Chloromethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	cis-1,2-Dichloroethene	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	cis-1,3-Dichloropropene	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Cyclohexane	19	U	19	U	21	U	25	U	15	U	26	U
VOCs	Dibromochloromethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Dibromomethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Dichlorodifluoromethane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Diethyl ether	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Ethyl-t-Butyl Ether	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Ethylbenzene	3.9	U	3.7	U	5.6		5	U	3.1	U	5.2	U
VOCs	Hexachlorobutadiene	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Isopropyl ether	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Isopropylbenzene	3.9	U	3.7	U	2.9	J	5	U	3.1	U	5.2	U
VOCs	Methyl cyclohexane	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Methyl Tertbutyl Ether	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Methylene chloride	3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	n-Butylbenzene	3.9	U	3.7	U	0.94	J	5	U	3.1	U	5.2	U
VOCs	Naphthalene	19	U	19	U	21	U	25	U	15	U	26	U
VOCs	Propylbenzene	3.9	U	3.7	U	6.1		5	U	3.1	U	5.2	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-707	
		Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/7/2019	
		Sample ID	OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX		OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Styrene		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	tert-Butylbenzene		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Tetrachloroethene		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Tetrahydrofuran		39	U	37	U	42	U	50	U	31	U	52	U
VOCs	Toluene		3.9	U	3.7	U	0.5	J	5	U	3.1	U	5.2	U
VOCs	trans-1,2-Dichloroethene		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	trans-1,3-Dichloropropene		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Trichloroethene		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Trichlorofluoromethane		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Vinyl chloride		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Xylene, o		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Xylenes (m&p)		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U
VOCs	Xylenes, Total		3.9	U	3.7	U	4.2	U	5	U	3.1	U	5.2	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-707		SB-707		SB-707		SB-707		SB-707		SB-707	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
	Sample ID	OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX		OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX	
	Qc Code	FS		FS		FD		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,1,1-Trichloroethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,1,2,2-Tetrachloroethane	3.9	U	4.2	U	4.1	UJ	3.8	UJ	3.9	U	5	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,1,2-Trichloroethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,1-Dichloroethane	0.83	J	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,1-Dichloroethene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,1-Dichloropropene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,2,3-Trichlorobenzene	3.9	U	4.2	U	4.1	UJ	3.8	UJ	3.9	U	5	U
VOCs	1,2,3-Trichloropropane	3.9	U	4.2	U	4.1	UJ	3.8	UJ	3.9	U	5	U
VOCs	1,2,4-Trichlorobenzene	1.4	J	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,2,4-Trimethylbenzene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,2-Dibromo-3-chloropropane	20	U	21	U	20	UJ	19	UJ	19	U	25	U
VOCs	1,2-Dibromoethane	3.9	U	4.2	U	4.1	UJ	3.8	UJ	3.9	U	5	U
VOCs	1,2-Dichlorobenzene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,2-Dichloroethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,2-Dichloropropane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,3,5-Trimethylbenzene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,3-Dichlorobenzene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,3-Dichloropropane	3.9	U	4.2	U	4.1	UJ	3.8	UJ	3.9	U	5	U
VOCs	1,4-Dichlorobenzene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	1,4-Dioxane	200	U	210	U	200	UJ	190	UJ	190	U	250	U
VOCs	2,2-Dichloropropane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	2,4,4-Trimethyl-1-pentene	6.3		1	J	4.1	U	3.8	U	3.9	U	5	U
VOCs	2,4,4-Trimethyl-2-pentene	3.5	J	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	2-Butanone	21	J+	21	U	3.9	J	19	U	19	U	25	U
VOCs	2-Chlorotoluene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	2-Hexanone	20	U	21	U	20	UJ	19	UJ	19	U	25	U
VOCs	4-Chlorotoluene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	4-iso-Propyltoluene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	4-Methyl-2-pentanone	20	U	21	U	20	UJ	19	UJ	19	U	25	U
VOCs	Acetic acid, methyl ester	39	U	42	U	41	UJ	38	UJ	39	U	50	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-707		SB-707		SB-707		SB-707		SB-707		SB-707	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
	Sample ID	OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX		OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX	
	Qc Code	FS		FS		FD		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone	200	U	210	U	200	UJ	190	UJ	190	U	250	U
VOCs	Benzene	0.2	J	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Bromobenzene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Bromochloromethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Bromodichloromethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Bromoform	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Bromomethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Butane, 2-methoxy-2-methyl-	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Carbon disulfide	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Carbon tetrachloride	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Chlorobenzene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Chloroethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Chloroform	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Chloromethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	cis-1,2-Dichloroethene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	cis-1,3-Dichloropropene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Cyclohexane	20	U	21	U	20	U	19	U	19	U	25	U
VOCs	Dibromochloromethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Dibromomethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Dichlorodifluoromethane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Diethyl ether	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Ethyl-t-Butyl Ether	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Ethylbenzene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Hexachlorobutadiene	3.9	U	4.2	U	4.1	UJ	3.8	UJ	3.9	U	5	U
VOCs	Isopropyl ether	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Isopropylbenzene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Methyl cyclohexane	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Methyl Tertbutyl Ether	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Methylene chloride	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	n-Butylbenzene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Naphthalene	20	U	21	U	20	UJ	19	UJ	19	U	25	U
VOCs	Propylbenzene	3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-707		SB-707		SB-707		SB-707		SB-707		SB-707	
		Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX		OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX	
		Qc Code	FS		FS		FD		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene		3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Styrene		3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	tert-Butylbenzene		3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Tetrachloroethene		3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Tetrahydrofuran		39	U	42	U	41	UJ	38	UJ	39	U	50	U
VOCs	Toluene		0.41	J	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	trans-1,2-Dichloroethene		3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	trans-1,3-Dichloropropene		3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Trichloroethene		3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Trichlorofluoromethane		3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Vinyl chloride		3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Xylene, o		3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Xylenes (m&p)		3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U
VOCs	Xylenes, Total		3.9	U	4.2	U	4.1	U	3.8	U	3.9	U	5	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-707		SB-708		SB-708		SB-708		SB-708		SB-708	
	Lab SDG	480-162353-1		480-162140-1		480-162140-1		480-162140-1		480-162140-1		480-162140-1	
	Sample Date	11/7/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
	Sample ID	OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX		OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,1,1-Trichloroethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,1,2,2-Tetrachloroethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,1,2-Trichloroethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,1-Dichloroethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,1-Dichloroethene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,1-Dichloropropene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,2,3-Trichlorobenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,2,3-Trichloropropane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,2,4-Trichlorobenzene	4.4	U	6.4	U	0.37	J	4.4	U	0.43	J	4.3	U
VOCs	1,2,4-Trimethylbenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,2-Dibromo-3-chloropropane	22	U	32	U	30	U	22	U	19	U	21	U
VOCs	1,2-Dibromoethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,2-Dichlorobenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,2-Dichloroethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,2-Dichloropropane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,3,5-Trimethylbenzene	4.4	U	0.63	J	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,3-Dichlorobenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,3-Dichloropropane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,4-Dichlorobenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	1,4-Dioxane	220	U	320	U	300	U	220	U	190	U	210	U
VOCs	2,2-Dichloropropane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	2,4,4-Trimethyl-1-pentene	4.4	U	2.7	J	6	U	5.7		9.1		2.7	J
VOCs	2,4,4-Trimethyl-2-pentene	4.4	U	0.88	J	6	U	0.76	J	2.1	J	4.3	U
VOCs	2-Butanone	22	U	32	U	11	J+	22	U	19	U	21	U
VOCs	2-Chlorotoluene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	2-Hexanone	22	U	32	U	30	U	22	U	19	U	21	U
VOCs	4-Chlorotoluene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	4-iso-Propyltoluene	4.4	U	1.3	J	6	U	4.4	U	3.9	U	4.3	U
VOCs	4-Methyl-2-pentanone	22	U	32	U	30	U	22	U	19	U	21	U
VOCs	Acetic acid, methyl ester	44	U	64	U	60	U	44	U	39	U	43	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-707		SB-708		SB-708		SB-708		SB-708		SB-708	
	Lab SDG	480-162353-1		480-162140-1		480-162140-1		480-162140-1		480-162140-1		480-162140-1	
	Sample Date	11/7/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
	Sample ID	OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX		OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone	220	U	20	J	41	J	12	J	11	J	5.3	J
VOCs	Benzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Bromobenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Bromochloromethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Bromodichloromethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Bromoform	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Bromomethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Butane, 2-methoxy-2-methyl-	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Carbon disulfide	4.4	U	3.9	J	6	U	4.4	U	3.9	U	4.3	U
VOCs	Carbon tetrachloride	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Chlorobenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Chloroethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Chloroform	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Chloromethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	cis-1,2-Dichloroethene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	cis-1,3-Dichloropropene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Cyclohexane	22	U	32	U	30	U	22	U	19	U	21	U
VOCs	Dibromochloromethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Dibromomethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Dichlorodifluoromethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Diethyl ether	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Ethyl-t-Butyl Ether	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Ethylbenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Hexachlorobutadiene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Isopropyl ether	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Isopropylbenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Methyl cyclohexane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Methyl Tertbutyl Ether	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Methylene chloride	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	n-Butylbenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Naphthalene	22	U	1.1	J	30	U	22	U	19	U	21	U
VOCs	Propylbenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-707		SB-708		SB-708		SB-708		SB-708		SB-708	
	Lab SDG	480-162353-1		480-162140-1		480-162140-1		480-162140-1		480-162140-1		480-162140-1	
	Sample Date	11/7/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
	Sample ID	OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX		OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Styrene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	tert-Butylbenzene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Tetrachloroethene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Tetrahydrofuran	44	U	64	U	60	U	44	U	39	U	43	U
VOCs	Toluene	4.4	U	0.61	J	6	U	4.4	U	3.9	U	4.3	U
VOCs	trans-1,2-Dichloroethene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	trans-1,3-Dichloropropene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Trichloroethene	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Trichlorofluoromethane	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Vinyl chloride	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Xylene, o	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Xylenes (m&p)	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U
VOCs	Xylenes, Total	4.4	U	6.4	U	6	U	4.4	U	3.9	U	4.3	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-708		SB-708		SB-708		SB-708		SB-709		SB-709	
	Lab SDG	480-162199-1		480-162199-1		480-162199-1		480-162199-1		480-162315-1		480-162315-1	
	Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX		OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,1,1-Trichloroethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,1,2,2-Tetrachloroethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,1,2-Trichloroethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,1-Dichloroethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,1-Dichloroethene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,1-Dichloropropene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,2,3-Trichlorobenzene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,2,3-Trichloropropane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,2,4-Trichlorobenzene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	0.52	J
VOCs	1,2,4-Trimethylbenzene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,2-Dibromo-3-chloropropane	21	U	22	U	17	U	18	U	22	U	19	U
VOCs	1,2-Dibromoethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,2-Dichlorobenzene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,2-Dichloroethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,2-Dichloropropane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,3,5-Trimethylbenzene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,3-Dichlorobenzene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,3-Dichloropropane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,4-Dichlorobenzene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	1,4-Dioxane	210	U	220	U	170	U	180	U	220	U	190	U
VOCs	2,2-Dichloropropane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	2,4,4-Trimethyl-1-pentene	0.74	J	0.44	J	3.4	U	1	J	4.4	U	3	J
VOCs	2,4,4-Trimethyl-2-pentene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	1.2	J
VOCs	2-Butanone	4.1	J+	22	U	5.5	J+	18	U	22	U	9.5	J
VOCs	2-Chlorotoluene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	2-Hexanone	21	U	22	U	17	U	18	U	22	U	19	U
VOCs	4-Chlorotoluene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	4-iso-Propyltoluene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	4-Methyl-2-pentanone	21	U	22	U	17	U	18	U	22	U	19	U
VOCs	Acetic acid, methyl ester	41	U	45	U	34	U	36	U	44	U	39	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-708		SB-708		SB-708		SB-708		SB-709		SB-709	
	Lab SDG	480-162199-1		480-162199-1		480-162199-1		480-162199-1		480-162315-1		480-162315-1	
	Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX		OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone	13	J	15	J	24	J	4.4	J	5.8	J	33	J
VOCs	Benzene	4.1	U	4.5	U	1.3	J	3.6	U	4.4	U	3.9	U
VOCs	Bromobenzene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Bromochloromethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Bromodichloromethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Bromoform	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Bromomethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Butane, 2-methoxy-2-methyl-	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Carbon disulfide	2.9	J	4.5	U	3	J	3.6	U	4.4	U	3.9	U
VOCs	Carbon tetrachloride	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Chlorobenzene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Chloroethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Chloroform	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Chloromethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	cis-1,2-Dichloroethene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	cis-1,3-Dichloropropene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Cyclohexane	21	U	22	U	17	U	18	U	22	U	19	U
VOCs	Dibromochloromethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Dibromomethane	4.1	U	4.5	U	1	J	3.6	U	4.4	U	3.9	U
VOCs	Dichlorodifluoromethane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Diethyl ether	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Ethyl-t-Butyl Ether	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Ethylbenzene	4.1	U	4.5	U	3.4	U	3.6	U	0.42	J	0.27	J
VOCs	Hexachlorobutadiene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Isopropyl ether	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Isopropylbenzene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Methyl cyclohexane	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Methyl Tertbutyl Ether	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Methylene chloride	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	n-Butylbenzene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Naphthalene	21	U	22	U	0.53	J	18	U	22	U	19	U
VOCs	Propylbenzene	4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-708		SB-708		SB-708		SB-708		SB-709		SB-709	
		Lab SDG	480-162199-1		480-162199-1		480-162199-1		480-162199-1		480-162315-1		480-162315-1	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX		OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene		4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Styrene		4.1	U	4.5	U	0.34	J	3.6	U	4.4	U	3.9	U
VOCs	tert-Butylbenzene		4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Tetrachloroethene		4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Tetrahydrofuran		41	U	45	U	34	U	36	U	44	U	39	U
VOCs	Toluene		4.1	U	4.5	U	0.99	J	3.6	U	4.4	U	3.9	U
VOCs	trans-1,2-Dichloroethene		4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	trans-1,3-Dichloropropene		4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Trichloroethene		4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Trichlorofluoromethane		4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Vinyl chloride		4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Xylene, o		4.1	U	4.5	U	3.4	U	3.6	U	4.4	U	3.9	U
VOCs	Xylenes (m&p)		4.1	U	4.5	U	3.4	U	3.6	U	1.4	J	0.75	J
VOCs	Xylenes, Total		4.1	U	4.5	U	3.4	U	3.6	U	1.4	J	0.75	J

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-709	
	Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
	Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX		OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX	
	Qc Code	FS		FS		FD		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,1,1-Trichloroethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,1,2,2-Tetrachloroethane	4.4	U	4.5	U	4.9	UJ	3.7	UJ	4.4	U	4.2	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,1,2-Trichloroethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,1-Dichloroethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,1-Dichloroethene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,1-Dichloropropene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,2,3-Trichlorobenzene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,2,3-Trichloropropane	4.4	U	4.5	U	4.9	UJ	3.7	UJ	4.4	U	4.2	U
VOCs	1,2,4-Trichlorobenzene	0.89	J	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,2,4-Trimethylbenzene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,2-Dibromo-3-chloropropane	22	U	23	U	25	UJ	18	UJ	22	U	21	U
VOCs	1,2-Dibromoethane	4.4	U	4.5	U	4.9	UJ	3.7	UJ	4.4	U	4.2	U
VOCs	1,2-Dichlorobenzene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,2-Dichloroethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,2-Dichloropropane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,3,5-Trimethylbenzene	4.4	U	4.5	U	4.9	U	3.7	U	0.28	J	4.2	U
VOCs	1,3-Dichlorobenzene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,3-Dichloropropane	4.4	U	4.5	U	4.9	UJ	3.7	UJ	4.4	U	4.2	U
VOCs	1,4-Dichlorobenzene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	1,4-Dioxane	220	U	230	U	250	UJ	180	UJ	220	U	210	U
VOCs	2,2-Dichloropropane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	2,4,4-Trimethyl-1-pentene	2.7	J	4.5	U	4.9	U	3.7	U	1.2	J	4.2	U
VOCs	2,4,4-Trimethyl-2-pentene	0.77	J	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	2-Butanone	16	J+	23	U	25	U	18	U	22	U	21	U
VOCs	2-Chlorotoluene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	2-Hexanone	22	U	23	U	25	UJ	18	UJ	22	U	21	U
VOCs	4-Chlorotoluene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	4-iso-Propyltoluene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	4-Methyl-2-pentanone	22	U	23	U	25	UJ	18	UJ	22	U	21	U
VOCs	Acetic acid, methyl ester	44	U	45	U	49	UJ	37	UJ	44	U	42	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-709	
	Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
	Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX		OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX	
	Qc Code	FS		FS		FD		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone	77	J	22	J	10	J-	11	J-	17	J	9.7	J
VOCs	Benzene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Bromobenzene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Bromochloromethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Bromodichloromethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Bromoform	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Bromomethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Butane, 2-methoxy-2-methyl-	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Carbon disulfide	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Carbon tetrachloride	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Chlorobenzene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Chloroethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Chloroform	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Chloromethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	cis-1,2-Dichloroethene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	cis-1,3-Dichloropropene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Cyclohexane	22	U	23	U	25	U	18	U	22	U	21	U
VOCs	Dibromochloromethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Dibromomethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Dichlorodifluoromethane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Diethyl ether	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Ethyl-t-Butyl Ether	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Ethylbenzene	0.33	J	4.5	U	0.57	J	0.29	J	0.54	J	0.38	J
VOCs	Hexachlorobutadiene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Isopropyl ether	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Isopropylbenzene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Methyl cyclohexane	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Methyl Tertbutyl Ether	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Methylene chloride	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	n-Butylbenzene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Naphthalene	22	U	23	U	25	UJ	18	UJ	22	U	21	U
VOCs	Propylbenzene	4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-709	
		Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX		OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX	
		Qc Code	FS		FS		FD		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Styrene		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	tert-Butylbenzene		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Tetrachloroethene		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Tetrahydrofuran		44	U	45	U	49	UJ	37	UJ	44	U	42	U
VOCs	Toluene		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	trans-1,2-Dichloroethene		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	trans-1,3-Dichloropropene		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Trichloroethene		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Trichlorofluoromethane		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Vinyl chloride		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Xylene, o		4.4	U	4.5	U	4.9	U	3.7	U	4.4	U	4.2	U
VOCs	Xylenes (m&p)		1.1	J	0.76	J	1.7	J	0.88	J	1.9	J	1.3	J
VOCs	Xylenes, Total		1.1	J	0.76	J	1.7	J	0.88	J	1.9	J	1.3	J

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-710		SB-710		SB-710		SB-710		SB-710		SB-710	
	Lab SDG	480-162199-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
	Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/5/2019		11/5/2019	
	Sample ID	OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX		OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX		OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,1,1-Trichloroethane	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,1,2,2-Tetrachloroethane	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,1,2-Trichloroethane	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,1-Dichloroethane	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,1-Dichloroethene	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,1-Dichloropropene	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,2,3-Trichlorobenzene	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,2,3-Trichloropropane	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,2,4-Trichlorobenzene	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,2,4-Trimethylbenzene	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,2-Dibromo-3-chloropropane	24	U	18	U	19	U	26	U	23	U	19	U
VOCs	1,2-Dibromoethane	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,2-Dichlorobenzene	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,2-Dichloroethane	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	0.47	J
VOCs	1,2-Dichloropropane	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,3,5-Trimethylbenzene	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,3-Dichlorobenzene	4.8	U	0.35	J	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,3-Dichloropropane	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,4-Dichlorobenzene	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	1,4-Dioxane	240	U	180	U	190	U	260	U	230	U	190	U
VOCs	2,2-Dichloropropane	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	2,4,4-Trimethyl-1-pentene	7.1		35		3.9		0.81	J	4.6	U	3.7	U
VOCs	2,4,4-Trimethyl-2-pentene	1.4	J	18		1.8	J	5.2	U	4.6	U	3.7	U
VOCs	2-Butanone	24	U	7	J+	18	J+	26	U	23	U	19	U
VOCs	2-Chlorotoluene	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	2-Hexanone	24	U	18	U	19	U	26	U	23	U	19	U
VOCs	4-Chlorotoluene	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	4-iso-Propyltoluene	4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	4-Methyl-2-pentanone	24	U	18	U	19	U	26	U	23	U	19	U
VOCs	Acetic acid, methyl ester	48	U	37	U	37	U	52	U	46	U	37	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-710		SB-710		SB-710		SB-710		SB-710		SB-710	
		Lab SDG	480-162199-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/5/2019		11/5/2019	
		Sample ID	OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX		OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX		OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone		15	J	30	J	30	J	8.3	J	230	U	14	J
VOCs	Benzene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Bromobenzene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Bromochloromethane		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Bromodichloromethane		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Bromoform		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Bromomethane		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Butane, 2-methoxy-2-methyl-		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Carbon disulfide		4.8	U	5.7		2.7	J	5.2	U	4.6	U	3.7	U
VOCs	Carbon tetrachloride		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Chlorobenzene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Chloroethane		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Chloroform		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Chloromethane		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	cis-1,2-Dichloroethene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	cis-1,3-Dichloropropene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Cyclohexane		24	U	18	U	19	U	26	U	23	U	19	U
VOCs	Dibromochloromethane		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Dibromomethane		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Dichlorodifluoromethane		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Diethyl ether		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Ethyl-t-Butyl Ether		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Ethylbenzene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Hexachlorobutadiene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Isopropyl ether		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Isopropylbenzene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Methyl cyclohexane		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Methyl Tertbutyl Ether		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Methylene chloride		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	n-Butylbenzene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Naphthalene		24	U	18	U	19	U	26	U	23	U	19	U
VOCs	Propylbenzene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-710		SB-710		SB-710		SB-710		SB-710		SB-710	
		Lab SDG	480-162199-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/5/2019		11/5/2019	
		Sample ID	OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX		OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX		OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Styrene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	tert-Butylbenzene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Tetrachloroethene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Tetrahydrofuran		48	U	37	U	37	U	52	U	46	U	37	U
VOCs	Toluene		4.8	U	0.29	J	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	trans-1,2-Dichloroethene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	trans-1,3-Dichloropropene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Trichloroethene		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Trichlorofluoromethane		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Vinyl chloride		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Xylene, o		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Xylenes (m&p)		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U
VOCs	Xylenes, Total		4.8	U	3.7	U	3.7	U	5.2	U	4.6	U	3.7	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-711		SB-711		SB-711		SB-711		SB-711		SB-711	
	Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
	Sample Date	11/12/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
	Sample ID	OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX		OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,1,1-Trichloroethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,1,2,2-Tetrachloroethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,1,2-Trichloroethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,1-Dichloroethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,1-Dichloroethene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,1-Dichloropropene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,2,3-Trichlorobenzene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,2,3-Trichloropropane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,2,4-Trichlorobenzene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,2,4-Trimethylbenzene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,2-Dibromo-3-chloropropane	30	U	5200	U	9300	U	24	U	6100	U	19	U
VOCs	1,2-Dibromoethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,2-Dichlorobenzene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,2-Dichloroethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,2-Dichloropropane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,3,5-Trimethylbenzene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,3-Dichlorobenzene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,3-Dichloropropane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,4-Dichlorobenzene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	1,4-Dioxane	300	U	52000	U	93000	U	240	U	61000	U	190	U
VOCs	2,2-Dichloropropane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	2,4,4-Trimethyl-1-pentene	1.7	J	8000		3200		4	J	1200	U	3.8	U
VOCs	2,4,4-Trimethyl-2-pentene	1.3	J	6300		2600		2	J	1200	U	3.8	U
VOCs	2-Butanone	30	U	5200	U	9300	U	5.7	J+	6100	U	19	U
VOCs	2-Chlorotoluene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	2-Hexanone	30	U	5200	U	9300	U	24	U	6100	U	19	U
VOCs	4-Chlorotoluene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	4-iso-Propyltoluene	5.9	U	420	J	1900	U	4.7	U	1200	U	3.8	U
VOCs	4-Methyl-2-pentanone	30	U	5200	U	9300	U	24	U	6100	U	19	U
VOCs	Acetic acid, methyl ester	59	U	330	J	19000	U	47	U	12000	U	38	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-711		SB-711		SB-711		SB-711		SB-711		SB-711	
	Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
	Sample Date	11/12/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
	Sample ID	OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX		OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	Acetone	300	U	52000	U	93000	U	240	UJ	61000	U	190	U
VOCs	Benzene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Bromobenzene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Bromochloromethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Bromodichloromethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Bromoform	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Bromomethane	5.9	U	1000	UJ	1900	UJ	4.7	U	1200	UJ	3.8	U
VOCs	Butane, 2-methoxy-2-methyl-	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Carbon disulfide	5.9	U	1000	U	1900	U	3.3	J	1200	U	3.8	U
VOCs	Carbon tetrachloride	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Chlorobenzene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Chloroethane	5.9	U	1000	UJ	1900	UJ	4.7	U	1200	UJ	3.8	U
VOCs	Chloroform	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Chloromethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	cis-1,2-Dichloroethene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	cis-1,3-Dichloropropene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Cyclohexane	30	U	5200	U	9300	U	24	U	6100	U	19	U
VOCs	Dibromochloromethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Dibromomethane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Dichlorodifluoromethane	5.9	U	1000	U	1900	U	4.7	UJ	1200	U	3.8	U
VOCs	Diethyl ether	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Ethyl-t-Butyl Ether	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Ethylbenzene	5.9	U	370	J	1900	U	4.7	U	1200	U	3.8	U
VOCs	Hexachlorobutadiene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Isopropyl ether	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Isopropylbenzene	5.9	U	200	J	1900	U	4.7	U	1200	U	3.8	U
VOCs	Methyl cyclohexane	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Methyl Tertbutyl Ether	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Methylene chloride	26	U	1000	U	1900	U	10	U	1200	U	17	U
VOCs	n-Butylbenzene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Naphthalene	30	U	150	J	9300	U	24	U	6100	U	19	U
VOCs	Propylbenzene	5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-711		SB-711		SB-711		SB-711		SB-711		SB-711	
		Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/12/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX		OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Styrene		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	tert-Butylbenzene		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Tetrachloroethene		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Tetrahydrofuran		59	U	10000	U	19000	U	47	U	12000	U	38	U
VOCs	Toluene		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	trans-1,2-Dichloroethene		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	trans-1,3-Dichloropropene		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Trichloroethene		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Trichlorofluoromethane		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Vinyl chloride		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Xylene, o		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Xylenes (m&p)		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U
VOCs	Xylenes, Total		5.9	U	1000	U	1900	U	4.7	U	1200	U	3.8	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-711		SB-712		SB-712		SB-712		SB-712		SB-712	
	Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
	Sample Date	11/12/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
	Sample ID	OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX		OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,1,1-Trichloroethane	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,1,2,2-Tetrachloroethane	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,1,2-Trichloroethane	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,1-Dichloroethane	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,1-Dichloroethene	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,1-Dichloropropene	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,2,3-Trichlorobenzene	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,2,3-Trichloropropane	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,2,4-Trichlorobenzene	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,2,4-Trimethylbenzene	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,2-Dibromo-3-chloropropane	20	U	23	U	22	U	26	U	22	U	21	U
VOCs	1,2-Dibromoethane	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,2-Dichlorobenzene	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,2-Dichloroethane	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,2-Dichloropropane	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,3,5-Trimethylbenzene	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,3-Dichlorobenzene	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,3-Dichloropropane	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,4-Dichlorobenzene	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	1,4-Dioxane	200	U	230	U	220	U	260	U	220	U	210	U
VOCs	2,2-Dichloropropane	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	2,4,4-Trimethyl-1-pentene	4	U	4.6	U	2	J	4	J	8.6		2.4	J
VOCs	2,4,4-Trimethyl-2-pentene	4	U	4.6	U	0.67	J	1.5	J	3.3	J	0.59	J
VOCs	2-Butanone	20	U	23	U	6.9	J+	26	U	22	U	21	U
VOCs	2-Chlorotoluene	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	2-Hexanone	20	U	23	U	22	U	26	U	22	U	21	U
VOCs	4-Chlorotoluene	4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	4-iso-Propyltoluene	4	U	4.6	U	4.3	U	0.45	J	4.4	U	4.2	U
VOCs	4-Methyl-2-pentanone	20	U	23	U	22	U	26	U	22	U	21	U
VOCs	Acetic acid, methyl ester	40	U	46	U	43	U	53	U	44	U	42	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-711	SB-712	SB-712	SB-712	SB-712	SB-712
	Lab SDG	480-162572-1	480-162572-1	480-162572-1	480-162572-1	480-162572-1	480-162572-1
	Sample Date	11/12/2019	11/11/2019	11/11/2019	11/11/2019	11/11/2019	11/11/2019
	Sample ID	OC-SB-711-18/19-XXX	OC-SB-712-0.0/2.0-XXX	OC-SB-712-2.0/4.0-XXX	OC-SB-712-4.0/6.0-XXX	OC-SB-712-6.0/8.0-XXX	OC-SB-712-8.0/10-XXX
	Qc Code	FS	FS	FS	FS	FS	FS
	Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Method Class	Parameter	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier
VOCs	Acetone	200 U	230 U	220 U	260 U	220 U	210 U
VOCs	Benzene	4 U	4.6 U	4.3 U	5.3 U	0.49 J	4.2 U
VOCs	Bromobenzene	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Bromochloromethane	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Bromodichloromethane	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Bromoform	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Bromomethane	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Butane, 2-methoxy-2-methyl-	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Carbon disulfide	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Carbon tetrachloride	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Chlorobenzene	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Chloroethane	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Chloroform	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Chloromethane	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	cis-1,2-Dichloroethene	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	cis-1,3-Dichloropropene	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Cyclohexane	20 U	23 U	22 U	26 U	22 U	21 U
VOCs	Dibromochloromethane	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Dibromomethane	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Dichlorodifluoromethane	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Diethyl ether	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Ethyl-t-Butyl Ether	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Ethylbenzene	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Hexachlorobutadiene	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Isopropyl ether	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Isopropylbenzene	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Methyl cyclohexane	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Methyl Tertbutyl Ether	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Methylene chloride	30 U	27 U	20 U	22 U	21 U	24 U
VOCs	n-Butylbenzene	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U
VOCs	Naphthalene	20 U	23 U	22 U	0.9 J	22 U	21 U
VOCs	Propylbenzene	4 U	4.6 U	4.3 U	5.3 U	4.4 U	4.2 U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-711		SB-712		SB-712		SB-712		SB-712		SB-712	
		Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/12/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX		OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	Styrene		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	tert-Butylbenzene		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	Tetrachloroethene		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	Tetrahydrofuran		40	U	46	U	43	U	53	U	44	U	42	U
VOCs	Toluene		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	trans-1,2-Dichloroethene		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	trans-1,3-Dichloropropene		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	Trichloroethene		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	Trichlorofluoromethane		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	Vinyl chloride		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	Xylene, o		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	Xylenes (m&p)		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U
VOCs	Xylenes, Total		4	U	4.6	U	4.3	U	5.3	U	4.4	U	4.2	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-712		SB-712	
	Lab SDG	480-162572-1		480-162572-1	
	Sample Date	11/11/2019		11/11/2019	
	Sample ID	OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
	Qc Code	FS		FS	
	Units	ug/kg		ug/kg	
Method Class	Parameter	Result	Qualifier	Result	Qualifier
VOCs	1,1,1,2-Tetrachloroethane	4.3	U	4.2	U
VOCs	1,1,1-Trichloroethane	4.3	U	4.2	U
VOCs	1,1,2,2-Tetrachloroethane	4.3	U	4.2	U
VOCs	1,1,2-Trichloro-1,2,2-Trifluoroethane	4.3	U	4.2	U
VOCs	1,1,2-Trichloroethane	4.3	U	4.2	U
VOCs	1,1-Dichloroethane	4.3	U	4.2	U
VOCs	1,1-Dichloroethene	4.3	U	4.2	U
VOCs	1,1-Dichloropropene	4.3	U	4.2	U
VOCs	1,2,3-Trichlorobenzene	4.3	U	4.2	U
VOCs	1,2,3-Trichloropropane	4.3	U	4.2	U
VOCs	1,2,4-Trichlorobenzene	4.3	U	4.2	U
VOCs	1,2,4-Trimethylbenzene	4.3	U	4.2	U
VOCs	1,2-Dibromo-3-chloropropane	21	U	21	U
VOCs	1,2-Dibromoethane	4.3	U	4.2	U
VOCs	1,2-Dichlorobenzene	4.3	U	4.2	U
VOCs	1,2-Dichloroethane	4.3	U	4.2	U
VOCs	1,2-Dichloropropane	4.3	U	4.2	U
VOCs	1,3,5-Trimethylbenzene	4.3	U	4.2	U
VOCs	1,3-Dichlorobenzene	4.3	U	4.2	U
VOCs	1,3-Dichloropropane	4.3	U	4.2	U
VOCs	1,4-Dichlorobenzene	4.3	U	4.2	U
VOCs	1,4-Dioxane	210	U	210	U
VOCs	2,2-Dichloropropane	4.3	U	4.2	U
VOCs	2,4,4-Trimethyl-1-pentene	4.3	U	4.2	U
VOCs	2,4,4-Trimethyl-2-pentene	4.3	U	4.2	U
VOCs	2-Butanone	21	U	21	U
VOCs	2-Chlorotoluene	4.3	U	4.2	U
VOCs	2-Hexanone	21	U	21	U
VOCs	4-Chlorotoluene	4.3	U	4.2	U
VOCs	4-iso-Propyltoluene	4.3	U	4.2	U
VOCs	4-Methyl-2-pentanone	21	U	21	U
VOCs	Acetic acid, methyl ester	43	U	42	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-712		SB-712	
	Lab SDG	480-162572-1		480-162572-1	
	Sample Date	11/11/2019		11/11/2019	
	Sample ID	OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
	Qc Code	FS		FS	
	Units	ug/kg		ug/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier
VOCs	Acetone	210	U	210	U
VOCs	Benzene	4.3	U	4.2	U
VOCs	Bromobenzene	4.3	U	4.2	U
VOCs	Bromochloromethane	4.3	U	4.2	U
VOCs	Bromodichloromethane	4.3	U	4.2	U
VOCs	Bromoform	4.3	U	4.2	U
VOCs	Bromomethane	4.3	U	4.2	U
VOCs	Butane, 2-methoxy-2-methyl-	4.3	U	4.2	U
VOCs	Carbon disulfide	4.3	U	4.2	U
VOCs	Carbon tetrachloride	4.3	U	4.2	U
VOCs	Chlorobenzene	4.3	U	4.2	U
VOCs	Chloroethane	4.3	U	4.2	U
VOCs	Chloroform	4.3	U	4.2	U
VOCs	Chloromethane	4.3	U	4.2	U
VOCs	cis-1,2-Dichloroethene	4.3	U	4.2	U
VOCs	cis-1,3-Dichloropropene	4.3	U	4.2	U
VOCs	Cyclohexane	21	U	21	U
VOCs	Dibromochloromethane	4.3	U	4.2	U
VOCs	Dibromomethane	4.3	U	4.2	U
VOCs	Dichlorodifluoromethane	4.3	U	4.2	U
VOCs	Diethyl ether	4.3	U	4.2	U
VOCs	Ethyl-t-Butyl Ether	4.3	U	4.2	U
VOCs	Ethylbenzene	4.3	U	4.2	U
VOCs	Hexachlorobutadiene	4.3	U	4.2	U
VOCs	Isopropyl ether	4.3	U	4.2	U
VOCs	Isopropylbenzene	4.3	U	4.2	U
VOCs	Methyl cyclohexane	4.3	U	4.2	U
VOCs	Methyl Tertbutyl Ether	4.3	U	4.2	U
VOCs	Methylene chloride	20	U	23	U
VOCs	n-Butylbenzene	4.3	U	4.2	U
VOCs	Naphthalene	21	U	21	U
VOCs	Propylbenzene	4.3	U	4.2	U

Table 2.1 - Final Results Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-712		SB-712	
	Lab SDG	480-162572-1		480-162572-1	
	Sample Date	11/11/2019		11/11/2019	
	Sample ID	OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
	Qc Code	FS		FS	
	Units	ug/kg		ug/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier
VOCs	sec-Butylbenzene	4.3	U	4.2	U
VOCs	Styrene	4.3	U	4.2	U
VOCs	tert-Butylbenzene	4.3	U	4.2	U
VOCs	Tetrachloroethene	4.3	U	4.2	U
VOCs	Tetrahydrofuran	43	U	42	U
VOCs	Toluene	4.3	U	4.2	U
VOCs	trans-1,2-Dichloroethene	4.3	U	4.2	U
VOCs	trans-1,3-Dichloropropene	4.3	U	4.2	U
VOCs	Trichloroethene	4.3	U	4.2	U
VOCs	Trichlorofluoromethane	4.3	U	4.2	U
VOCs	Vinyl chloride	4.3	U	4.2	U
VOCs	Xylene, o	4.3	U	4.2	U
VOCs	Xylenes (m&p)	4.3	U	4.2	U
VOCs	Xylenes, Total	4.3	U	4.2	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	QC	QC	QC	QC	SB-701	SB-701
	Lab SDG	480-162353-1	480-162353-1	480-162515-1	480-162572-1	480-162513-1	480-162513-1
	Sample Date	11/7/2019	11/7/2019	11/11/2019	11/12/2019	11/11/2019	11/11/2019
	Sample ID	OC-EBK-01-XXX	OC-EBK-02-XXX	OC-EBK-03-XXX	OC-EBK-04-XXX	OC-SB-701-0.0/2.0-DUP	OC-SB-701-0.0/2.0-XXX
	Qc Code	EB	EB	EB	EB	FD	FS
	Units	ug/l	ug/l	ug/l	ug/l	ug/kg	ug/kg
Method C	Parameter	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	1-Methylnaphthalene	5 U	5 U	5 U	5 U	8.3 U	8.2 U
SVOCs	2,2'-Dichlorodiisopropylether	5 U	5 U	5 U	5 U	8.3 U	8.2 U
SVOCs	2,3,4,6-Tetrachlorophenol	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	2,4,5-Trichlorophenol	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	2,4,6-Trichlorophenol	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	2,4-Dichlorophenol	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	8.2 U
SVOCs	2,4-Dimethylphenol	1 U	1 U	1 U	1 U	41 U	40 U
SVOCs	2,4-Dinitrophenol	5 U	5 U	5 U	5 U	410 U	400 U
SVOCs	2,4-Dinitrotoluene	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	2,6-Dinitrotoluene	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	2-Chloronaphthalene	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	8.2 U
SVOCs	2-Chlorophenol	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	2-Methylnaphthalene	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	8.2 U
SVOCs	2-Methylphenol	0.15 J	1 U	1 U	1 U	41 U	40 U
SVOCs	2-Nitroaniline	5 U	5 U	5 U	5 U	210 U	210 U
SVOCs	2-Nitrophenol	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	3 & 4 Methylphenol	1 U	1 U	1 U	1 U	41 U	40 U
SVOCs	3,3'-Dichlorobenzidine	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	3-Nitroaniline	5 U	5 U	5 U	5 U	210 U	210 U
SVOCs	4,6-Dinitro-2-methylphenol	5 U	5 U	5 U	5 U	210 U	210 U
SVOCs	4-Bromophenyl phenyl ether	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	4-Chloro-3-methylphenol	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	4-Chloroaniline	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	4-Chlorophenyl phenyl ether	5 U	5 U	5 U	5 U	41 U	40 U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	QC	QC	QC	QC	SB-701	SB-701
	Lab SDG	480-162353-1	480-162353-1	480-162515-1	480-162572-1	480-162513-1	480-162513-1
	Sample Date	11/7/2019	11/7/2019	11/11/2019	11/12/2019	11/11/2019	11/11/2019
	Sample ID	OC-EBK-01-XXX	OC-EBK-02-XXX	OC-EBK-03-XXX	OC-EBK-04-XXX	OC-SB-701-0.0/2.0-DUP	OC-SB-701-0.0/2.0-XXX
	Qc Code	EB	EB	EB	EB	FD	FS
	Units	ug/l	ug/l	ug/l	ug/l	ug/kg	ug/kg
Method C	Parameter	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier
SVOCs	4-Nitroaniline	5 U	5 U	5 U	5 U	210 U	210 U
SVOCs	4-Nitrophenol	5 U	5 U	5 U	5 U	210 U	210 U
SVOCs	Acenaphthene	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	8.2 U
SVOCs	Acenaphthylene	0.3 U	0.3 U	0.3 U	0.3 U	8.3 U	8.2 U
SVOCs	Acetophenone	0.78 J	0.81 J	2 J	0.83 J	2.2 J	82 U
SVOCs	Aniline	0.5 U	0.5 U	0.5 U	0.5 U	41 U	40 U
SVOCs	Anthracene	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	8.2 U
SVOCs	Atrazine	2 U	2 U	2 U	2 U	83 U	82 U
SVOCs	Azobenzene	5 U	5 U	5 U	5 U	400 U	400 U
SVOCs	Benzaldehyde	0.29 J	5 U	5 U	0.29 J	83 UJ	82 UJ
SVOCs	Benzo(a)anthracene	0.3 U	0.3 U	0.3 U	0.3 U	5.4 J	8.2 U
SVOCs	Benzo(a)pyrene	0.18 U	0.18 U	0.18 U	0.18 U	8.3 U	8.2 U
SVOCs	Benzo(b)fluoranthene	0.3 U	0.3 U	0.3 U	0.3 U	5.7 J	8.2 U
SVOCs	Benzo(ghi)perylene	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	8.2 U
SVOCs	Benzo(k)fluoranthene	0.3 U	0.3 U	0.3 U	0.3 U	8.3 U	8.2 U
SVOCs	Benzoic Acid	5 U	5 U	5 U	5 U	210 UJ	210 UJ
SVOCs	Benzyl alcohol	5 U	5 U	5.3 J	5 U	41 U	40 U
SVOCs	Biphenyl	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	Bis(2-Chloroethoxy)methane	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	Bis(2-Chloroethyl)ether	5 U	5 U	5 U	5 U	8.3 U	8.2 U
SVOCs	Bis(2-Ethylhexyl)phthalate	0.84 J	0.67 J	5 U	5 U	800	640
SVOCs	Butylbenzylphthalate	3 U	3 U	1.6 J	3 U	41 U	40 U
SVOCs	Caprolactam	5 U	5 U	5 U	5 U	210 U	210 U
SVOCs	Carbazole	5 U	5 U	5 U	5 U	8.3 U	8.2 U
SVOCs	Chrysene	0.5 U	0.5 U	0.5 U	0.5 U	6 J	8.2 U
SVOCs	Di-n-butylphthalate	2 U	2 U	1.2 J	2 U	41 U	40 U
SVOCs	Di-n-octylphthalate	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	Dibenz(a,h)anthracene	0.5 U	0.5 U	0.5 U	0.5 U	8.3 U	8.2 U
SVOCs	Dibenzofuran	5 U	5 U	5 U	5 U	41 U	40 U
SVOCs	Diethylphthalate	0.3 J	0.27 J	25	0.24 J	41 U	40 U

Created by: KMS 2/5/2020
Checked by: MAD 02/06/2020
revised CR 2/27/20

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	QC		QC		QC		QC		SB-701		SB-701	
		Lab SDG	480-162353-1		480-162353-1		480-162515-1		480-162572-1		480-162513-1		480-162513-1	
		Sample Date	11/7/2019		11/7/2019		11/11/2019		11/12/2019		11/11/2019		11/11/2019	
		Sample ID	OC-EBK-01-XXX		OC-EBK-02-XXX		OC-EBK-03-XXX		OC-EBK-04-XXX		OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX	
		Qc Code	EB		EB		EB		EB		FD		FS	
		Units	ug/l		ug/l		ug/l		ug/l		ug/kg		ug/kg	
Method C	Parameter		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate		0.096	J	0.087	J	1.8		0.085	J	41	U	40	U
SVOCs	Diphenylamine		5	U	5	U	5	U	5	U				
SVOCs	Fluoranthene		0.5	U	0.5	U	0.5	U	0.5	U	7.9	J	3.5	J
SVOCs	Fluorene		0.5	U	0.5	U	0.5	U	0.5	U	8.3	U	8.2	U
SVOCs	Hexachlorobenzene		0.5	U	0.5	U	0.5	U	0.5	U	8.3	U	8.2	U
SVOCs	Hexachlorocyclopentadiene		1	U	1	U	1	U	1	U	41	UJ	40	UJ
SVOCs	Hexachloroethane		5	U	5	U	5	U	5	U	41	U	40	U
SVOCs	Indeno(1,2,3-cd)pyrene		0.5	U	0.5	U	0.5	U	0.5	U	8.3	U	8.2	U
SVOCs	Isophorone		0.5		0.48	J	0.5	U	0.23	J	41	U	40	U
SVOCs	N-Nitrosodi-n-propylamine		5	U	5	U	5	U	5	U	8.3	U	8.2	U
SVOCs	N-Nitrosodimethylamine		5	U	5	U	5	U	5	U	41	U	40	U
SVOCs	N-Nitrosodiphenylamine		5	U	5	U	5	U	5	U	120		93	
SVOCs	Nitrobenzene		0.5	U	0.5	U	0.5	U	0.5	U	82	U	82	U
SVOCs	Pentachlorophenol		1	U	1	U	1	U	1	U	210	U	210	U
SVOCs	Phenanthrene		0.075	J	0.2	U	0.2	U	0.2	U	4.6	J	2.4	J
SVOCs	Phenol		1	U	1	U	0.39	J	1	U	41	U	40	U
SVOCs	Phthalic anhydride		500	U	500	U	500	U	500	U	12000	UJ	12000	UJ
SVOCs	Pyrene		0.5	U	0.5	U	0.5	U	0.5	U	8.3	U	8.2	U

Notes:

U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

EB = equipment blank
TB = trip blank

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-701		SB-701		SB-701		SB-701		SB-701		SB-701	
	Lab SDG	480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162513-1	
	Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
	Sample ID	OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	1-Methylnaphthalene	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	2,2'-Dichlorodiisopropylether	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	2,3,4,6-Tetrachlorophenol	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	2,4,5-Trichlorophenol	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	2,4,6-Trichlorophenol	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	2,4-Dichlorophenol	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	2,4-Dimethylphenol	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	2,4-Dinitrophenol	400	U	380	U	390	U	380	U	340	U	370	U
SVOCs	2,4-Dinitrotoluene	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	2,6-Dinitrotoluene	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	2-Chloronaphthalene	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	2-Chlorophenol	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	2-Methylnaphthalene	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	2-Methylphenol	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	2-Nitroaniline	200	U	200	U	200	U	200	U	180	U	190	U
SVOCs	2-Nitrophenol	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	3 & 4 Methylphenol	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	3,3'-Dichlorobenzidine	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	3-Nitroaniline	200	U	200	U	200	U	200	U	180	U	190	U
SVOCs	4,6-Dinitro-2-methylphenol	200	U	200	U	200	U	200	U	180	U	190	U
SVOCs	4-Bromophenyl phenyl ether	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	4-Chloro-3-methylphenol	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	4-Chloroaniline	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	4-Chlorophenyl phenyl ether	40	U	38	U	39	U	38	U	34	U	37	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-701		SB-701		SB-701		SB-701		SB-701		SB-701	
	Lab SDG	480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162513-1	
	Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
	Sample ID	OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	4-Nitroaniline	200	U	200	U	200	U	200	U	180	U	190	U
SVOCs	4-Nitrophenol	200	U	200	U	200	U	200	U	180	U	190	U
SVOCs	Acenaphthene	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	Acenaphthylene	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	Acetophenone	81	U	78	U	79	U	77	U	70	U	75	U
SVOCs	Aniline	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	Anthracene	8.1	U	7.8	U	2.1	J	7.7	U	7	U	7.5	U
SVOCs	Atrazine	81	U	78	U	79	U	77	U	70	U	75	U
SVOCs	Azobenzene	390	U	380	U	400	U	1900	U	350	U	62	J
SVOCs	Benzaldehyde	81	U	78	U	79	U	77	U	70	U	75	U
SVOCs	Benzo(a)anthracene	8.1	U	7.8	U	4.2	J	7.7	U	7	U	7.5	U
SVOCs	Benzo(a)pyrene	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	Benzo(b)fluoranthene	8.1	U	7.8	U	3.2	J	7.7	U	7	U	7.5	U
SVOCs	Benzo(ghi)perylene	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	Benzo(k)fluoranthene	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	Benzoic Acid	200	U	200	U	200	U	200	U	180	U	190	U
SVOCs	Benzyl alcohol	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	Biphenyl	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	Bis(2-Chloroethoxy)methane	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	Bis(2-Chloroethyl)ether	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	Bis(2-Ethylhexyl)phthalate	400	U	380	U	150	J	3900		340	U	370	U
SVOCs	Butylbenzylphthalate	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	Caprolactam	200	U	200	U	200	U	200	U	180	U	190	U
SVOCs	Carbazole	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	Chrysene	8.1	U	7.8	U	4.6	J	7.7	U	7	U	7.5	U
SVOCs	Di-n-butylphthalate	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	Di-n-octylphthalate	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	Dibenz(a,h)anthracene	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	Dibenzofuran	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	Diethylphthalate	40	U	38	U	39	U	38	U	34	U	37	U

Created by: KMS 2/5/2020
Checked by: MAD 02/06/2020
revised CR 2/27/20

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-701		SB-701		SB-701		SB-701		SB-701		SB-701	
	Lab SDG	480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162513-1	
	Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
	Sample ID	OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	Diphenylamine												
SVOCs	Fluoranthene	8.1	U	7.8	U	6.3	J	8.2		7	U	7.5	U
SVOCs	Fluorene	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	Hexachlorobenzene	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	Hexachlorocyclopentadiene	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	Hexachloroethane	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	Indeno(1,2,3-cd)pyrene	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	Isophorone	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	N-Nitrosodi-n-propylamine	8.1	U	7.8	U	7.9	U	7.7	U	7	U	7.5	U
SVOCs	N-Nitrosodimethylamine	40	U	38	U	39	U	38	U	34	U	37	U
SVOCs	N-Nitrosodiphenylamine	40	U	38	U	1500		430		34	U	37	U
SVOCs	Nitrobenzene	80	U	77	U	79	U	77	U	69	U	74	U
SVOCs	Pentachlorophenol	200	U	200	U	200	U	200	U	180	U	190	U
SVOCs	Phenanthrene	8.1	U	2.8	J	5.6	J	6.5	J	7	U	7.5	U
SVOCs	Phenol	40	U	38	U	39	U	23	J	34	U	37	U
SVOCs	Phthalic anhydride	12000	UJ	11000	UJ	12000	UJ	56000	UJ	11000	UJ	11000	UJ
SVOCs	Pyrene	8.1	U	7.8	U	7.6	J	8.6		7	U	7.5	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-702	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
	Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
	Sample ID	OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	1-Methylnaphthalene	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U
SVOCs	2,2'-Dichlorodiisopropylether	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U
SVOCs	2,3,4,6-Tetrachlorophenol	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	2,4,5-Trichlorophenol	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	2,4,6-Trichlorophenol	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	2,4-Dichlorophenol	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U
SVOCs	2,4-Dimethylphenol	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	2,4-Dinitrophenol	380	U	350	U	370	U	750	U	350	U	350	U
SVOCs	2,4-Dinitrotoluene	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	2,6-Dinitrotoluene	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	2-Chloronaphthalene	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U
SVOCs	2-Chlorophenol	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	2-Methylnaphthalene	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U
SVOCs	2-Methylphenol	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	2-Nitroaniline	200	U	180	U	190	U	390	U	180	U	180	U
SVOCs	2-Nitrophenol	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	3 & 4 Methylphenol	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	3,3'-Dichlorobenzidine	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	3-Nitroaniline	200	U	180	U	190	U	390	U	180	U	180	U
SVOCs	4,6-Dinitro-2-methylphenol	200	U	180	U	190	U	390	U	180	U	180	U
SVOCs	4-Bromophenyl phenyl ether	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	4-Chloro-3-methylphenol	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	4-Chloroaniline	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	4-Chlorophenyl phenyl ether	38	U	35	U	37	U	75	U	35	U	35	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-702	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
	Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
	Sample ID	OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	4-Nitroaniline	200	U	180	U	190	U	390	U	180	U	180	U
SVOCs	4-Nitrophenol	200	U	180	U	190	U	390	U	180	U	180	U
SVOCs	Acenaphthene	7.7	U	7.1	U	7.5	U	5.5	J	7.1	U	7.2	U
SVOCs	Acenaphthylene	7.7	U	1.7	J	7.5	U	3.3	J	7.1	U	7.2	U
SVOCs	Acetophenone	77	U	71	U	75	U	150	U	71	U	72	U
SVOCs	Aniline	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	Anthracene	7.7	U	2.2	J	7.5	U	15		7.1	U	7.2	U
SVOCs	Atrazine	77	U	71	U	75	U	150	U	71	U	72	U
SVOCs	Azobenzene	380	U	350	U	370	U	360	U	350	U	350	U
SVOCs	Benzaldehyde	77	R	71	R	75	R	150	R	71	U	72	U
SVOCs	Benzo(a)anthracene	8.8		11		3.9	J	49		7.1	U	7.2	U
SVOCs	Benzo(a)pyrene	9.7		10		3.7	J	45		7.1	U	7.2	U
SVOCs	Benzo(b)fluoranthene	11		17		5.3	J	43		7.1	U	7.2	U
SVOCs	Benzo(ghi)perylene	8.5		10		3.2	J	29		7.1	U	7.2	U
SVOCs	Benzo(k)fluoranthene	5.3	J	5.9	J	7.5	U	20		7.1	U	7.2	U
SVOCs	Benzoic Acid	200	U	180	U	190	U	390	U	180	U	180	U
SVOCs	Benzyl alcohol	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	Biphenyl	38	U	2	J	37	U	75	U	35	U	35	U
SVOCs	Bis(2-Chloroethoxy)methane	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	Bis(2-Chloroethyl)ether	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U
SVOCs	Bis(2-Ethylhexyl)phthalate	230	J	270	J	3500		800		630		350	U
SVOCs	Butylbenzylphthalate	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	Caprolactam	200	U	180	U	190	U	390	U	180	U	180	U
SVOCs	Carbazole	7.7	U	1.8	J	7.5	U	3.7	J	7.1	U	7.2	U
SVOCs	Chrysene	10		14		4.5	J	46		7.1	U	7.2	U
SVOCs	Di-n-butylphthalate	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	Di-n-octylphthalate	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	Dibenz(a,h)anthracene	3.4	J	2.7	J	7.5	U	9.6	J	7.1	U	7.2	U
SVOCs	Dibenzofuran	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	Diethylphthalate	38	U	35	U	37	U	75	U	35	U	35	U

Created by: KMS 2/5/2020
Checked by: MAD 02/06/2020
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Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-702	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
	Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
	Sample ID	OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate	38	U	35	U	2	J	75	U	35	U	35	U
SVOCs	Diphenylamine												
SVOCs	Fluoranthene	14		15		5.9	J	81		3	J	7.2	U
SVOCs	Fluorene	7.7	U	7.1	U	7.5	U	5.3	J	7.1	U	7.2	U
SVOCs	Hexachlorobenzene	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U
SVOCs	Hexachlorocyclopentadiene	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	Hexachloroethane	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	Indeno(1,2,3-cd)pyrene	7.3	J	8.7		2.8	J	25		7.1	U	7.2	U
SVOCs	Isophorone	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	N-Nitrosodi-n-propylamine	7.7	U	7.1	U	7.5	U	15	U	7.1	U	7.2	U
SVOCs	N-Nitrosodimethylamine	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	N-Nitrosodiphenylamine	13	J	35	U	12	J	75	U	35	U	35	U
SVOCs	Nitrobenzene	77	U	70	U	75	U	150	U	71	U	71	U
SVOCs	Pentachlorophenol	200	U	180	U	190	U	390	U	180	U	180	U
SVOCs	Phenanthrene	6.4	J	9.4		4.5	J	48		7.1	U	7.2	U
SVOCs	Phenol	38	U	35	U	37	U	75	U	35	U	35	U
SVOCs	Phthalic anhydride	11000	UJ	10000	UJ	11000	UJ	11000	UJ	11000	UJ	11000	UJ
SVOCs	Pyrene	13		14		6.4	J	87		3	J	7.2	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-702		SB-703		SB-703		SB-703		SB-703		SB-703	
	Lab SDG	480-162426-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
	Sample Date	11/8/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019	
	Sample ID	OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX		OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX	
	Qc Code	FS		FS		FD		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	1-Methylnaphthalene	7.7	U	8.7	U	7.7	U	7.9	U	8.2	U	8.4	U
SVOCs	2,2'-Dichlorodiisopropylether	7.7	U	8.7	U	7.7	U	7.9	U	8.2	U	8.4	U
SVOCs	2,3,4,6-Tetrachlorophenol	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	2,4,5-Trichlorophenol	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	2,4,6-Trichlorophenol	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	2,4-Dichlorophenol	7.7	U	8.7	U	7.7	U	7.9	U	8.2	U	8.4	U
SVOCs	2,4-Dimethylphenol	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	2,4-Dinitrophenol	380	U	430	U	380	UJ	390	UJ	400	U	410	U
SVOCs	2,4-Dinitrotoluene	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	2,6-Dinitrotoluene	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	2-Chloronaphthalene	7.7	U	8.7	U	7.7	U	7.9	U	8.2	U	8.4	U
SVOCs	2-Chlorophenol	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	2-Methylnaphthalene	7.7	U	8.7	U	7.7	U	7.9	U	8.2	U	8.4	U
SVOCs	2-Methylphenol	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	2-Nitroaniline	190	U	220	U	200	U	200	U	210	U	210	U
SVOCs	2-Nitrophenol	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	3 & 4 Methylphenol	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	3,3'-Dichlorobenzidine	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	3-Nitroaniline	190	U	220	U	200	U	200	U	210	U	210	U
SVOCs	4,6-Dinitro-2-methylphenol	190	U	220	U	200	R	200	R	210	U	210	U
SVOCs	4-Bromophenyl phenyl ether	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	4-Chloro-3-methylphenol	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	4-Chloroaniline	38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	4-Chlorophenyl phenyl ether	38	U	43	U	38	U	39	U	40	U	41	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-702	SB-703	SB-703	SB-703	SB-703	SB-703
	Lab SDG	480-162426-1	480-162315-1	480-162315-1	480-162315-1	480-162315-1	480-162315-1
	Sample Date	11/8/2019	11/5/2019	11/5/2019	11/5/2019	11/5/2019	11/5/2019
	Sample ID	OC-SB-702-28/29-XXX	OC-SB-703-0.0/2.0-XXX	OC-SB-703-2.0/4.0-DUP	OC-SB-703-2.0/4.0-XXX	OC-SB-703-4.0/6.0-XXX	OC-SB-703-6.0/8.0-XXX
	Qc Code	FS	FS	FD	FS	FS	FS
	Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Method C	Parameter	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier
SVOCs	4-Nitroaniline	190 U	220 U	200 U	200 U	210 U	210 U
SVOCs	4-Nitrophenol	190 U	220 U	200 U	200 U	210 U	210 U
SVOCs	Acenaphthene	7.7 U	8.7 U	7.7 U	7.9 U	8.2 U	8.4 U
SVOCs	Acenaphthylene	7.7 U	3 J	7.7 U	7.9 U	8.2 U	8.4 U
SVOCs	Acetophenone	77 U	87 U	2.4 J	79 U	82 U	84 U
SVOCs	Aniline	38 U	43 U	38 U	39 U	40 U	41 U
SVOCs	Anthracene	7.7 U	3.1 J	7.7 U	7.9 U	8.2 U	8.4 U
SVOCs	Atrazine	77 U	87 U	77 U	79 U	82 U	84 U
SVOCs	Azobenzene	370 U	430 U	370 U	400 U	410 U	410 U
SVOCs	Benzaldehyde	77 U	10 J	5.8 J-	79 R	82 U	84 U
SVOCs	Benzo(a)anthracene	7.7 U	6.9 J	4.3 J	3.5 J	8.2 U	8.4 U
SVOCs	Benzo(a)pyrene	7.7 U	7.3 J	4.3 J	3.4 J	8.2 U	8.4 U
SVOCs	Benzo(b)fluoranthene	7.7 U	10	6.8 J	4.1 J	8.2 U	8.4 U
SVOCs	Benzo(ghi)perylene	7.7 U	7.6 J	4.9 J	3.7 J	8.2 U	8.4 U
SVOCs	Benzo(k)fluoranthene	7.7 U	3.1 J	7.7 U	3 J	8.2 U	8.4 U
SVOCs	Benzoic Acid	190 U	220 U	50 J-	200 R	210 U	210 U
SVOCs	Benzyl alcohol	38 U	43 U	38 U	39 U	40 U	41 U
SVOCs	Biphenyl	38 U	2.6 J	4.3 J	3.2 J	40 U	41 U
SVOCs	Bis(2-Chloroethoxy)methane	38 U	43 U	38 U	39 U	40 U	41 U
SVOCs	Bis(2-Chloroethyl)ether	7.7 U	8.7 U	7.7 U	7.9 U	8.2 U	8.4 U
SVOCs	Bis(2-Ethylhexyl)phthalate	380 U	1600	1400 J	650 J	400 U	410 U
SVOCs	Butylbenzylphthalate	38 U	43 U	38 U	39 U	40 U	41 U
SVOCs	Caprolactam	190 U	220 U	200 U	200 U	210 U	210 U
SVOCs	Carbazole	7.7 U	8.7 U	7.7 U	7.9 U	8.2 U	8.4 U
SVOCs	Chrysene	7.7 U	9.3	6.5 J	4.6 J	8.2 U	8.4 U
SVOCs	Di-n-butylphthalate	38 U	43 U	38 U	39 U	40 U	41 U
SVOCs	Di-n-octylphthalate	38 U	43 U	38 U	39 U	40 U	41 U
SVOCs	Dibenz(a,h)anthracene	7.7 U	2.4 J	7.7 U	7.9 U	8.2 U	8.4 U
SVOCs	Dibenzofuran	38 U	43 U	38 U	39 U	40 U	41 U
SVOCs	Diethylphthalate	38 U	43 U	38 U	39 U	40 U	41 U

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Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-702		SB-703		SB-703		SB-703		SB-703		SB-703	
		Lab SDG	480-162426-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
		Sample Date	11/8/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019	
		Sample ID	OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX		OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX	
		Qc Code	FS		FS		FD		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate		38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	Diphenylamine													
SVOCs	Fluoranthene		7.7	U	14		9		6.3	J	8.2	U	8.4	U
SVOCs	Fluorene		7.7	U	8.7	U	7.7	U	7.9	U	8.2	U	8.4	U
SVOCs	Hexachlorobenzene		7.7	U	8.7	U	7.7	U	7.9	U	8.2	U	8.4	U
SVOCs	Hexachlorocyclopentadiene		38	U	43	U	38	UJ	39	UJ	40	U	41	U
SVOCs	Hexachloroethane		38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	Indeno(1,2,3-cd)pyrene		7.7	U	6	J	3.5	J	3	J	8.2	U	8.4	U
SVOCs	Isophorone		38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	N-Nitrosodi-n-propylamine		7.7	U	8.7	U	7.7	U	7.9	U	8.2	U	8.4	U
SVOCs	N-Nitrosodimethylamine		38	U	43	U	38	U	39	U	40	U	41	U
SVOCs	N-Nitrosodiphenylamine		38	U	37	J	350	J	130	J	40	U	41	U
SVOCs	Nitrobenzene		76	U	86	U	77	U	79	U	82	U	83	U
SVOCs	Pentachlorophenol		190	U	220	U	200	UJ	200	UJ	210	U	210	U
SVOCs	Phenanthrene		7.7	U	8.1	J	5.4	J	3.9	J	8.2	U	8.4	U
SVOCs	Phenol		38	U	43	U	25	J	39	U	40	U	41	U
SVOCs	Phthalic anhydride		11000	UJ	13000	UJ	11000	UJ	12000	UJ	12000	UJ	12000	UJ
SVOCs	Pyrene		7.7	U	12		7.5	J	5.6	J	8.2	U	8.4	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-703		SB-703		SB-703		SB-704		SB-704		SB-704	
	Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162426-1		480-162426-1		480-162426-1	
	Sample Date	11/5/2019		11/5/2019		11/5/2019		11/7/2019		11/7/2019		11/7/2019	
	Sample ID	OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX		OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	36	UJ	37	U	36	U	84	U	38	U	36	U
SVOCs	1-Methylnaphthalene	7.3	U	7.4	U	7.2	U	23		2	J	7.3	U
SVOCs	2,2'-Dichlorodiisopropylether	7.3	U	7.4	U	7.2	U	17	U	7.6	U	7.3	U
SVOCs	2,3,4,6-Tetrachlorophenol	36	U	37	U	36	U	84	UJ	38	U	36	U
SVOCs	2,4,5-Trichlorophenol	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	2,4,6-Trichlorophenol	36	U	37	U	36	U	84	UJ	38	U	36	U
SVOCs	2,4-Dichlorophenol	7.3	U	7.4	U	7.2	U	17	U	7.6	U	7.3	U
SVOCs	2,4-Dimethylphenol	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	2,4-Dinitrophenol	360	UJ	370	U	360	U	840	U	380	U	360	U
SVOCs	2,4-Dinitrotoluene	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	2,6-Dinitrotoluene	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	2-Chloronaphthalene	7.3	U	7.4	U	7.2	U	17	U	7.6	U	7.3	U
SVOCs	2-Chlorophenol	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	2-Methylnaphthalene	7.3	U	7.4	U	7.2	U	37		1.9	J	7.3	U
SVOCs	2-Methylphenol	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	2-Nitroaniline	180	U	190	U	180	U	430	U	190	U	190	U
SVOCs	2-Nitrophenol	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	3 & 4 Methylphenol	36	U	37	U	36	U	47	J	90		36	U
SVOCs	3,3'-Dichlorobenzidine	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	3-Nitroaniline	180	U	190	U	180	U	430	U	190	U	190	U
SVOCs	4,6-Dinitro-2-methylphenol	180	U	190	U	180	U	430	UJ	190	U	190	U
SVOCs	4-Bromophenyl phenyl ether	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	4-Chloro-3-methylphenol	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	4-Chloroaniline	36	UJ	37	U	36	U	84	U	38	U	36	U
SVOCs	4-Chlorophenyl phenyl ether	36	U	37	U	36	U	31	J	6.4	J	36	U

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Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-703		SB-703		SB-703		SB-704		SB-704		SB-704	
	Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162426-1		480-162426-1		480-162426-1	
	Sample Date	11/5/2019		11/5/2019		11/5/2019		11/7/2019		11/7/2019		11/7/2019	
	Sample ID	OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX		OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	4-Nitroaniline	180	U	190	U	180	U	430	U	190	U	190	U
SVOCs	4-Nitrophenol	180	U	190	U	180	U	430	UJ	190	U	190	U
SVOCs	Acenaphthene	7.3	U	7.4	U	7.2	U	16	J	7.6	U	7.3	U
SVOCs	Acenaphthylene	7.3	U	7.4	U	7.2	U	17	U	7.6	U	7.3	U
SVOCs	Acetophenone	73	UJ	74	U	72	U	170	U	5.7	J	73	U
SVOCs	Aniline	36	UJ	37	U	36	U	84	U	38	U	36	U
SVOCs	Anthracene	7.3	U	7.4	U	7.2	U	9.1	J	7.6	U	7.3	U
SVOCs	Atrazine	73	U	74	U	72	U	170	U	76	U	73	U
SVOCs	Azobenzene	360	U	360	U	360	U	410	U	370	U	370	U
SVOCs	Benzaldehyde	73	R	74	U	72	U	170	R	10	J-	73	R
SVOCs	Benzo(a)anthracene	7.3	U	7.4	U	7.2	U	13	J	2.8	J	7.3	U
SVOCs	Benzo(a)pyrene	7.3	U	7.4	U	7.2	U	10	J	7.6	U	7.3	U
SVOCs	Benzo(b)fluoranthene	7.3	U	7.4	U	7.2	U	14	J	2.6	J	7.3	U
SVOCs	Benzo(ghi)perylene	7.3	U	7.4	U	7.2	U	8.4	J	1.8	J	7.3	U
SVOCs	Benzo(k)fluoranthene	7.3	U	7.4	U	7.2	U	5.2	J	7.6	U	7.3	U
SVOCs	Benzoic Acid	180	R	190	U	180	U	430	R	190	U	190	U
SVOCs	Benzyl alcohol	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	Biphenyl	36	U	37	U	36	U	24	J	7.8	J	36	U
SVOCs	Bis(2-Chloroethoxy)methane	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	Bis(2-Chloroethyl)ether	7.3	UJ	7.4	U	7.2	U	17	U	7.6	U	7.3	U
SVOCs	Bis(2-Ethylhexyl)phthalate	60	J	370	U	360	U	7600		2400		360	U
SVOCs	Butylbenzylphthalate	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	Caprolactam	180	U	190	U	180	U	430	U	190	U	190	U
SVOCs	Carbazole	7.3	U	7.4	U	7.2	U	17	U	7.6	U	7.3	U
SVOCs	Chrysene	7.3	U	7.4	U	7.2	U	18		3.7	J	7.3	U
SVOCs	Di-n-butylphthalate	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	Di-n-octylphthalate	36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	Dibenz(a,h)anthracene	7.3	U	7.4	U	7.2	U	17	U	7.6	U	7.3	U
SVOCs	Dibenzofuran	36	U	37	U	36	U	8.8	J	38	U	36	U
SVOCs	Diethylphthalate	36	U	37	U	36	U	84	U	38	U	36	U

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Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-703		SB-703		SB-703		SB-704		SB-704		SB-704	
		Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/5/2019		11/5/2019		11/5/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX		OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method	Parameter		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate		36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	Diphenylamine													
SVOCs	Fluoranthene		7.3	U	7.4	U	7.2	U	47		6.9	J	7.3	U
SVOCs	Fluorene		7.3	U	7.4	U	7.2	U	21		1.9	J	7.3	U
SVOCs	Hexachlorobenzene		7.3	U	7.4	U	7.2	U	17	U	7.6	U	7.3	U
SVOCs	Hexachlorocyclopentadiene		36	UJ	37	U	36	U	84	U	38	U	36	U
SVOCs	Hexachloroethane		36	UJ	37	U	36	U	84	U	38	U	36	U
SVOCs	Indeno(1,2,3-cd)pyrene		7.3	U	7.4	U	7.2	U	8.1	J	2	J	7.3	U
SVOCs	Isophorone		36	U	37	U	36	U	84	U	38	U	36	U
SVOCs	N-Nitrosodi-n-propylamine		7.3	U	7.4	U	7.2	U	17	U	7.6	U	7.3	U
SVOCs	N-Nitrosodimethylamine		36	UJ	37	U	36	U	84	U	38	U	36	U
SVOCs	N-Nitrosodiphenylamine		36	U	37	U	36	U	390		26	J	36	U
SVOCs	Nitrobenzene		72	UJ	74	U	72	U	170	U	76	U	73	U
SVOCs	Pentachlorophenol		180	U	190	U	180	U	430	UJ	190	U	190	U
SVOCs	Phenanthrene		7.3	U	7.4	U	2	J	84		9.7		2.8	J
SVOCs	Phenol		36	U	37	U	36	U	330		68		42	
SVOCs	Phthalic anhydride		11000	UJ	11000	UJ	11000	UJ	12000	UJ	11000	UJ	11000	UJ
SVOCs	Pyrene		7.3	U	7.4	U	7.2	U	42		6.3	J	7.3	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-704		SB-704		SB-704		SB-704		SB-704		SB-705	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/8/2019	
	Sample ID	OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	1-Methylnaphthalene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	2,2'-Dichlorodiisopropylether	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	2,3,4,6-Tetrachlorophenol	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	2,4,5-Trichlorophenol	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	2,4,6-Trichlorophenol	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	2,4-Dichlorophenol	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	2,4-Dimethylphenol	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	2,4-Dinitrophenol	350	U	360	U	360	U	360	U	370	U	390	U
SVOCs	2,4-Dinitrotoluene	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	2,6-Dinitrotoluene	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	2-Chloronaphthalene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	2-Chlorophenol	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	2-Methylnaphthalene	2.3	J	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	2-Methylphenol	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	2-Nitroaniline	180	U	190	U	190	U	190	U	190	U	200	U
SVOCs	2-Nitrophenol	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	3 & 4 Methylphenol	35	U	36	U	36	U	36	UJ	37	U	39	U
SVOCs	3,3'-Dichlorobenzidine	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	3-Nitroaniline	180	U	190	U	190	U	190	U	190	U	200	U
SVOCs	4,6-Dinitro-2-methylphenol	180	U	190	U	190	U	190	U	190	U	200	U
SVOCs	4-Bromophenyl phenyl ether	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	4-Chloro-3-methylphenol	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	4-Chloroaniline	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	4-Chlorophenyl phenyl ether	35	U	36	U	36	U	36	U	37	U	39	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-704		SB-704		SB-704		SB-704		SB-704		SB-705	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/8/2019	
	Sample ID	OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	4-Nitroaniline	180	U	190	U	190	U	190	U	190	U	200	U
SVOCs	4-Nitrophenol	180	U	190	U	190	U	190	U	190	U	200	U
SVOCs	Acenaphthene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	Acenaphthylene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	Acetophenone	72	U	74	U	74	U	74	U	74	U	78	U
SVOCs	Aniline	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	Anthracene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	Atrazine	72	U	74	U	74	U	74	U	74	U	78	U
SVOCs	Azobenzene	360	U	340	U	340	U	350	U	360	U	380	U
SVOCs	Benzaldehyde	72	R	74	R	74	R	74	R	74	R	78	R
SVOCs	Benzo(a)anthracene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	3	J
SVOCs	Benzo(a)pyrene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	2.6	J
SVOCs	Benzo(b)fluoranthene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	3.1	J
SVOCs	Benzo(ghi)perylene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	1.8	J
SVOCs	Benzo(k)fluoranthene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	Benzoic Acid	180	U	190	U	190	U	190	U	190	U	200	U
SVOCs	Benzyl alcohol	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	Biphenyl	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	Bis(2-Chloroethoxy)methane	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	Bis(2-Chloroethyl)ether	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	Bis(2-Ethylhexyl)phthalate	350	U	360	U	360	U	360	U	370	U	110	J
SVOCs	Butylbenzylphthalate	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	Caprolactam	180	U	190	U	190	U	190	U	190	U	200	U
SVOCs	Carbazole	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	Chrysene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	2.8	J
SVOCs	Di-n-butylphthalate	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	Di-n-octylphthalate	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	Dibenz(a,h)anthracene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	2.6	J
SVOCs	Dibenzofuran	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	Diethylphthalate	35	U	36	U	36	U	36	U	37	U	39	U

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Checked by: MAD 02/06/2020
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Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-704		SB-704		SB-704		SB-704		SB-704		SB-705	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/8/2019	
	Sample ID	OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	Diphenylamine												
SVOCs	Fluoranthene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	4.7	J
SVOCs	Fluorene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	Hexachlorobenzene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	Hexachlorocyclopentadiene	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	Hexachloroethane	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	Indeno(1,2,3-cd)pyrene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	1.7	J
SVOCs	Isophorone	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	N-Nitrosodi-n-propylamine	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	7.8	U
SVOCs	N-Nitrosodimethylamine	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	N-Nitrosodiphenylamine	35	U	36	U	36	U	36	U	37	U	39	U
SVOCs	Nitrobenzene	72	U	74	U	73	U	73	U	74	U	78	U
SVOCs	Pentachlorophenol	180	U	190	U	190	U	190	U	190	U	200	U
SVOCs	Phenanthrene	7.2	U	7.4	U	2.4	J	7.4	U	7.4	U	4.8	J
SVOCs	Phenol	14	J	36	U	36	U	36	U	37	U	39	U
SVOCs	Phthalic anhydride	11000	UJ	10000	UJ	10000	UJ	11000	UJ	11000	UJ	11000	UJ
SVOCs	Pyrene	7.2	U	7.4	U	7.4	U	7.4	U	7.4	U	4.2	J

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-705		SB-705		SB-705		SB-705		SB-705		SB-705	
	Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
	Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
	Sample ID	OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX	
	Qc Code	FS		FD		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	1-Methylnaphthalene	23	U	200	U	60	J	7.6	U	7.2	U	7	U
SVOCs	2,2'-Dichlorodiisopropylether	23	U	200	U	210	U	7.6	U	7.2	U	7	U
SVOCs	2,3,4,6-Tetrachlorophenol	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	2,4,5-Trichlorophenol	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	2,4,6-Trichlorophenol	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	2,4-Dichlorophenol	23	U	200	U	210	U	7.6	U	7.2	U	7	U
SVOCs	2,4-Dimethylphenol	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	2,4-Dinitrophenol	1100	U	10000	U	11000	U	370	U	350	U	350	U
SVOCs	2,4-Dinitrotoluene	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	2,6-Dinitrotoluene	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	2-Chloronaphthalene	23	U	200	U	210	U	7.6	U	7.2	U	7	U
SVOCs	2-Chlorophenol	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	2-Methylnaphthalene	23	U	51	J	100	J	7.6	U	7.2	U	7	U
SVOCs	2-Methylphenol	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	2-Nitroaniline	590	U	5100	U	5400	U	190	U	180	U	180	U
SVOCs	2-Nitrophenol	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	3 & 4 Methylphenol	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	3,3'-Dichlorobenzidine	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	3-Nitroaniline	590	U	5100	U	5400	U	190	U	180	U	180	U
SVOCs	4,6-Dinitro-2-methylphenol	590	U	5100	U	5400	U	190	U	180	U	180	U
SVOCs	4-Bromophenyl phenyl ether	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	4-Chloro-3-methylphenol	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	4-Chloroaniline	110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	4-Chlorophenyl phenyl ether	110	U	1000	U	1100	U	37	U	35	U	35	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-705	SB-705	SB-705	SB-705	SB-705	SB-705
	Lab SDG	480-162426-1	480-162426-1	480-162426-1	480-162426-1	480-162426-1	480-162426-1
	Sample Date	11/8/2019	11/8/2019	11/8/2019	11/8/2019	11/8/2019	11/8/2019
	Sample ID	OC-SB-705-2.0/4.0-XXX	OC-SB-705-4.0/6.0-DUP	OC-SB-705-4.0/6.0-XXX	OC-SB-705-6.0/8.0-XXX	OC-SB-705-8.0/10-XXX	OC-SB-705-17/18-XXX
	Qc Code	FS	FD	FS	FS	FS	FS
	Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Method C	Parameter	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier
SVOCs	4-Nitroaniline	590 U	5100 U	5400 U	190 U	180 U	180 U
SVOCs	4-Nitrophenol	590 U	5100 U	5400 U	190 U	180 U	180 U
SVOCs	Acenaphthene	23 U	200 U	210 U	7.6 U	7.2 U	7 U
SVOCs	Acenaphthylene	23 U	200 U	210 U	7.6 U	7.2 U	7 U
SVOCs	Acetophenone	230 U	2000 U	2100 U	76 U	72 U	70 U
SVOCs	Aniline	110 U	1000 U	1100 U	37 U	35 U	35 U
SVOCs	Anthracene	23 U	200 U	210 U	7.6 U	7.2 U	7 U
SVOCs	Atrazine	230 U	2000 U	2100 U	76 U	72 U	70 U
SVOCs	Azobenzene	1800 U	2000 U	2100 U	370 U	360 U	350 U
SVOCs	Benzaldehyde	230 J-	2000 U	2100 U	76 U	72 U	70 U
SVOCs	Benzo(a)anthracene	8.9 J	200 U	210 U	7.6 U	7.2 U	7 U
SVOCs	Benzo(a)pyrene	23 U	200 U	210 U	7.6 U	7.2 U	7 U
SVOCs	Benzo(b)fluoranthene	8.2 J	200 U	210 U	7.6 U	7.2 U	7 U
SVOCs	Benzo(ghi)perylene	5.4 J	200 U	210 U	7.6 U	7.2 U	7 U
SVOCs	Benzo(k)fluoranthene	23 U	200 U	210 U	7.6 U	7.2 U	7 U
SVOCs	Benzoic Acid	590 U	5100 U	5400 U	190 U	180 U	180 U
SVOCs	Benzyl alcohol	110 U	1000 U	1100 U	37 U	35 U	35 U
SVOCs	Biphenyl	33 J	45 J	1100 U	37 U	35 U	35 U
SVOCs	Bis(2-Chloroethoxy)methane	110 U	1000 U	1100 U	37 U	35 U	35 U
SVOCs	Bis(2-Chloroethyl)ether	23 U	200 U	210 U	7.6 U	7.2 U	7 U
SVOCs	Bis(2-Ethylhexyl)phthalate	2400	2200 J	2100 J	370 U	350 U	350 U
SVOCs	Butylbenzylphthalate	110 U	1000 U	1100 U	37 U	35 U	35 U
SVOCs	Caprolactam	590 U	5100 U	5400 U	190 U	180 U	180 U
SVOCs	Carbazole	23 U	200 U	210 U	7.6 U	7.2 U	7 U
SVOCs	Chrysene	7.6 J	200 U	210 U	7.6 U	7.2 U	7 U
SVOCs	Di-n-butylphthalate	110 U	1000 U	1100 U	37 U	35 U	35 U
SVOCs	Di-n-octylphthalate	110 U	1000 U	1100 U	37 U	35 U	35 U
SVOCs	Dibenz(a,h)anthracene	23 U	200 U	210 U	7.6 U	7.2 U	7 U
SVOCs	Dibenzofuran	110 U	1000 U	1100 U	37 U	35 U	35 U
SVOCs	Diethylphthalate	110 U	1000 U	1100 U	37 U	35 U	35 U

Created by: KMS 2/5/2020
Checked by: MAD 02/06/2020
revised CR 2/27/20

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-705		SB-705		SB-705		SB-705		SB-705		SB-705	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX	
		Qc Code	FS		FD		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate		110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	Diphenylamine													
SVOCs	Fluoranthene		11	J	200	U	210	U	7.6	U	7.2	U	7	U
SVOCs	Fluorene		23	U	200	U	210	U	7.6	U	7.2	U	7	U
SVOCs	Hexachlorobenzene		23	U	200	U	210	U	7.6	U	7.2	U	7	U
SVOCs	Hexachlorocyclopentadiene		110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	Hexachloroethane		110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	Indeno(1,2,3-cd)pyrene		23	U	200	U	210	U	7.6	U	7.2	U	7	U
SVOCs	Isophorone		110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	N-Nitrosodi-n-propylamine		23	U	200	U	210	U	7.6	U	7.2	U	7	U
SVOCs	N-Nitrosodimethylamine		110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	N-Nitrosodiphenylamine		400		2500		2700		37	U	35	U	35	U
SVOCs	Nitrobenzene		230	U	2000	U	2100	U	76	U	72	U	70	U
SVOCs	Pentachlorophenol		590	U	5100	U	5400	U	190	U	180	U	180	U
SVOCs	Phenanthrene		7.8	J	200	U	210	U	7.6	U	7.2	U	7	U
SVOCs	Phenol		110	U	1000	U	1100	U	37	U	35	U	35	U
SVOCs	Phthalic anhydride		56000	UJ	61000	UJ	65000	UJ	11000	UJ	11000	UJ	11000	UJ
SVOCs	Pyrene		12	J	200	U	210	U	7.6	U	7.2	U	7	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-706	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
	Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX		OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	1-Methylnaphthalene	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	2,2'-Dichlorodiisopropylether	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	2,3,4,6-Tetrachlorophenol	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	2,4,5-Trichlorophenol	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	2,4,6-Trichlorophenol	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	2,4-Dichlorophenol	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	2,4-Dimethylphenol	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	2,4-Dinitrophenol	720	U	3500	U	360	U	720	U	400	U	360	U
SVOCs	2,4-Dinitrotoluene	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	2,6-Dinitrotoluene	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	2-Chloronaphthalene	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	2-Chlorophenol	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	2-Methylnaphthalene	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	2-Methylphenol	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	2-Nitroaniline	370	U	1800	U	180	U	370	U	200	U	180	U
SVOCs	2-Nitrophenol	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	3 & 4 Methylphenol	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	3,3'-Dichlorobenzidine	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	3-Nitroaniline	370	U	1800	U	180	U	370	U	200	U	180	U
SVOCs	4,6-Dinitro-2-methylphenol	370	U	1800	U	180	U	370	U	200	U	180	U
SVOCs	4-Bromophenyl phenyl ether	72	U	190	J	36	U	72	U	40	U	36	U
SVOCs	4-Chloro-3-methylphenol	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	4-Chloroaniline	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	4-Chlorophenyl phenyl ether	72	U	350	U	36	U	72	U	40	U	36	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-706	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
	Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX		OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	4-Nitroaniline	370	U	1800	U	180	U	370	U	200	U	180	U
SVOCs	4-Nitrophenol	370	U	1800	U	180	U	370	U	200	U	180	U
SVOCs	Acenaphthene	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	Acenaphthylene	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	Acetophenone	4.4	J	720	U	72	U	150	U	81	U	72	U
SVOCs	Aniline	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	Anthracene	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	Atrazine	150	U	720	U	72	U	150	U	81	U	72	U
SVOCs	Azobenzene	360	U	3600	U	360	U	350	U	2000	U	360	U
SVOCs	Benzaldehyde	150	R	720	R	72	R	150	R	81	R	72	R
SVOCs	Benzo(a)anthracene	5.3	J	72	U	7.2	U	15	U	3.6	J	7.2	U
SVOCs	Benzo(a)pyrene	4.7	J	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	Benzo(b)fluoranthene	6.8	J	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	Benzo(ghi)perylene	3.8	J	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	Benzo(k)fluoranthene	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	Benzoic Acid	370	U	1800	U	180	U	370	U	200	U	180	U
SVOCs	Benzyl alcohol	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	Biphenyl	5.3	J	5500		36	U	72	U	910		36	U
SVOCs	Bis(2-Chloroethoxy)methane	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	Bis(2-Chloroethyl)ether	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	Bis(2-Ethylhexyl)phthalate	770		370000		170	J	210	J	120000		240	J
SVOCs	Butylbenzylphthalate	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	Caprolactam	370	U	1800	U	180	U	370	U	200	U	180	U
SVOCs	Carbazole	15	U	55	J	7.2	U	15	U	8.9		7.2	U
SVOCs	Chrysene	5.6	J	72	U	7.2	U	15	U	4	J	7.2	U
SVOCs	Di-n-butylphthalate	72	U	2100		36	U	72	U	360		36	U
SVOCs	Di-n-octylphthalate	72	U	350	U	36	U	72	U	47		36	U
SVOCs	Dibenz(a,h)anthracene	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	Dibenzofuran	72	U	29	J	36	U	72	U	4.6	J	36	U
SVOCs	Diethylphthalate	72	U	350	U	36	U	72	U	40	U	36	U

Created by: KMS 2/5/2020
Checked by: MAD 02/06/2020
revised CR 2/27/20

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-706	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
	Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX		OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	Diphenylamine												
SVOCs	Fluoranthene	6.6	J	46	J	7.2	U	15	U	12		7.2	U
SVOCs	Fluorene	15	U	72	U	7.2	U	15	U	3.6	J	7.2	U
SVOCs	Hexachlorobenzene	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	Hexachlorocyclopentadiene	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	Hexachloroethane	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	Indeno(1,2,3-cd)pyrene	3.2	J	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	Isophorone	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	N-Nitrosodi-n-propylamine	15	U	72	U	7.2	U	15	U	8.1	U	7.2	U
SVOCs	N-Nitrosodimethylamine	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	N-Nitrosodiphenylamine	52	J	28000	J	36	U	25	J	6200	J	36	U
SVOCs	Nitrobenzene	150	U	710	U	72	U	150	U	80	U	72	U
SVOCs	Pentachlorophenol	370	U	1800	U	180	U	370	U	200	U	180	U
SVOCs	Phenanthrene	4.5	J	150		4.5	J	4.5	J	28		2	J
SVOCs	Phenol	72	U	350	U	36	U	72	U	40	U	36	U
SVOCs	Phthalic anhydride	11000	UJ	110000	UJ	11000	UJ	11000	UJ	60000	UJ	11000	UJ
SVOCs	Pyrene	6.9	J	68	J	7.2	U	15	U	15		7.2	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-706	SB-707	SB-707	SB-707	SB-707	SB-707
	Lab SDG	480-162353-1	480-162353-1	480-162353-1	480-162353-1	480-162353-1	480-162353-1
	Sample Date	11/6/2019	11/7/2019	11/7/2019	11/7/2019	11/7/2019	11/7/2019
	Sample ID	OC-SB-706-26/27-XXX	OC-SB-707-0.0/2.0-XXX	OC-SB-707-2.0/4.0-XXX	OC-SB-707-4.0/6.0-XXX	OC-SB-707-6.0/8.0-DUP	OC-SB-707-6.0/8.0-XXX
	Qc Code	FS	FS	FS	FS	FD	FS
	Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Method C	Parameter	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	1-Methylnaphthalene	7.1 U	8.4 J	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	2,2'-Dichlorodiisopropylether	7.1 U	33 U	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	2,3,4,6-Tetrachlorophenol	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	2,4,5-Trichlorophenol	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	2,4,6-Trichlorophenol	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	2,4-Dichlorophenol	7.1 U	33 U	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	2,4-Dimethylphenol	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	2,4-Dinitrophenol	350 U	1600 U	360 U	350 U	350 U	340 U
SVOCs	2,4-Dinitrotoluene	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	2,6-Dinitrotoluene	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	2-Chloronaphthalene	7.1 U	33 U	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	2-Chlorophenol	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	2-Methylnaphthalene	7.1 U	10 J	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	2-Methylphenol	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	2-Nitroaniline	180 U	820 U	190 U	180 U	180 U	180 U
SVOCs	2-Nitrophenol	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	3 & 4 Methylphenol	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	3,3'-Dichlorobenzidine	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	3-Nitroaniline	180 U	820 U	190 U	180 U	180 U	180 U
SVOCs	4,6-Dinitro-2-methylphenol	180 U	820 U	190 U	180 U	180 U	180 U
SVOCs	4-Bromophenyl phenyl ether	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	4-Chloro-3-methylphenol	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	4-Chloroaniline	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	4-Chlorophenyl phenyl ether	35 U	160 U	36 U	35 U	35 U	34 U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-706	SB-707	SB-707	SB-707	SB-707	SB-707
	Lab SDG	480-162353-1	480-162353-1	480-162353-1	480-162353-1	480-162353-1	480-162353-1
	Sample Date	11/6/2019	11/7/2019	11/7/2019	11/7/2019	11/7/2019	11/7/2019
	Sample ID	OC-SB-706-26/27-XXX	OC-SB-707-0.0/2.0-XXX	OC-SB-707-2.0/4.0-XXX	OC-SB-707-4.0/6.0-XXX	OC-SB-707-6.0/8.0-DUP	OC-SB-707-6.0/8.0-XXX
	Qc Code	FS	FS	FS	FS	FD	FS
	Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Method C	Parameter	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier
SVOCs	4-Nitroaniline	180 U	820 U	190 U	180 U	180 U	180 U
SVOCs	4-Nitrophenol	180 U	820 U	190 U	180 U	180 U	180 U
SVOCs	Acenaphthene	7.1 U	33 U	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	Acenaphthylene	7.1 U	33 U	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	Acetophenone	71 U	330 U	73 U	72 U	71 U	69 U
SVOCs	Aniline	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	Anthracene	7.1 U	33 U	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	Atrazine	71 U	330 U	73 U	72 U	71 U	69 U
SVOCs	Azobenzene	350 U	410 U	360 U	360 U	350 U	350 U
SVOCs	Benzaldehyde	71 R	330 R	73 R	72 R	71 R	69 R
SVOCs	Benzo(a)anthracene	7.1 U	17 J	1.4 J	7.2 U	7.1 U	6.9 U
SVOCs	Benzo(a)pyrene	7.1 U	11 J	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	Benzo(b)fluoranthene	7.1 U	22 J	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	Benzo(ghi)perylene	7.1 U	16 J	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	Benzo(k)fluoranthene	7.1 U	33 U	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	Benzoic Acid	180 U	820 U	190 U	180 U	180 R	180 R
SVOCs	Benzyl alcohol	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	Biphenyl	35 U	19 J	36 U	35 U	35 U	34 U
SVOCs	Bis(2-Chloroethoxy)methane	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	Bis(2-Chloroethyl)ether	7.1 U	33 U	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	Bis(2-Ethylhexyl)phthalate	350 U	8100	500	2400	350 U	340 U
SVOCs	Butylbenzylphthalate	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	Caprolactam	180 U	820 U	190 U	180 U	180 U	180 U
SVOCs	Carbazole	7.1 U	33 U	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	Chrysene	7.1 U	19 J	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	Di-n-butylphthalate	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	Di-n-octylphthalate	35 U	160 U	36 U	23 J	35 U	34 U
SVOCs	Dibenz(a,h)anthracene	7.1 U	33 U	7.3 U	7.2 U	7.1 U	6.9 U
SVOCs	Dibenzofuran	35 U	160 U	36 U	35 U	35 U	34 U
SVOCs	Diethylphthalate	35 U	160 U	36 U	35 U	35 U	34 U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-706		SB-707		SB-707		SB-707		SB-707		SB-707	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
	Sample Date	11/6/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
	Sample ID	OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX		OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX		OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX	
	Qc Code	FS		FS		FS		FS		FD		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate	35	U	160	U	36	U	35	U	35	U	34	U
SVOCs	Diphenylamine												
SVOCs	Fluoranthene	7.1	U	21	J	7.3	U	7.2	U	7.1	U	6.9	U
SVOCs	Fluorene	7.1	U	33	U	7.3	U	7.2	U	7.1	U	6.9	U
SVOCs	Hexachlorobenzene	7.1	U	33	U	7.3	U	7.2	U	7.1	U	6.9	U
SVOCs	Hexachlorocyclopentadiene	35	U	160	U	36	U	35	U	35	U	34	U
SVOCs	Hexachloroethane	35	U	160	U	36	U	35	U	35	U	34	U
SVOCs	Indeno(1,2,3-cd)pyrene	7.1	U	17	J	7.3	U	7.2	U	7.1	U	6.9	U
SVOCs	Isophorone	35	U	160	U	36	U	35	U	35	U	34	U
SVOCs	N-Nitrosodi-n-propylamine	7.1	U	33	U	7.3	U	7.2	U	7.1	U	6.9	U
SVOCs	N-Nitrosodimethylamine	35	U	160	U	36	U	35	U	35	U	34	U
SVOCs	N-Nitrosodiphenylamine	35	U	510		18	J	35	U	35	U	34	U
SVOCs	Nitrobenzene	71	U	320	U	73	U	72	U	71	U	69	U
SVOCs	Pentachlorophenol	180	U	820	U	190	U	180	U	180	U	180	U
SVOCs	Phenanthrene	7.1	U	16	J	3.3	J	2.6	J	2.1	J	2.5	J
SVOCs	Phenol	35	U	160	U	36	U	35	U	35	U	34	U
SVOCs	Phthalic anhydride	11000	UJ	12000	UJ	11000	UJ	11000	UJ	10000	UJ	11000	UJ
SVOCs	Pyrene	7.1	U	31	J	1.7	J	7.2	U	7.1	U	6.9	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-707		SB-707		SB-707		SB-708		SB-708		SB-708	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162140-1		480-162140-1		480-162140-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/4/2019		11/4/2019		11/4/2019	
	Sample ID	OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	1-Methylnaphthalene	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SVOCs	2,2'-Dichlorodiisopropylether	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SVOCs	2,3,4,6-Tetrachlorophenol	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	2,4,5-Trichlorophenol	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	2,4,6-Trichlorophenol	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	2,4-Dichlorophenol	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SVOCs	2,4-Dimethylphenol	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	2,4-Dinitrophenol	360	U	370	U	350	U	360	U	380	U	360	U
SVOCs	2,4-Dinitrotoluene	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	2,6-Dinitrotoluene	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	2-Chloronaphthalene	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SVOCs	2-Chlorophenol	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	2-Methylnaphthalene	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SVOCs	2-Methylphenol	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	2-Nitroaniline	180	U	190	U	180	U	180	U	190	U	190	U
SVOCs	2-Nitrophenol	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	3 & 4 Methylphenol	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	3,3'-Dichlorobenzidine	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	3-Nitroaniline	180	U	190	U	180	U	180	U	190	U	190	U
SVOCs	4,6-Dinitro-2-methylphenol	180	U	190	U	180	U	180	U	190	U	190	U
SVOCs	4-Bromophenyl phenyl ether	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	4-Chloro-3-methylphenol	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	4-Chloroaniline	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	4-Chlorophenyl phenyl ether	36	U	37	U	35	U	36	U	38	U	36	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-707		SB-707		SB-707		SB-708		SB-708		SB-708	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162140-1		480-162140-1		480-162140-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/4/2019		11/4/2019		11/4/2019	
	Sample ID	OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	4-Nitroaniline	180	U	190	U	180	U	180	U	190	U	190	U
SVOCs	4-Nitrophenol	180	U	190	U	180	U	180	U	190	U	190	U
SVOCs	Acenaphthene	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SVOCs	Acenaphthylene	7.2	U	7.5	U	7.1	U	1.6	J	7.7	U	7.4	U
SVOCs	Acetophenone	72	U	75	U	71	U	3.4	J	77	U	74	U
SVOCs	Aniline	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	Anthracene	7.2	U	7.5	U	7.1	U	2.6	J	7.7	U	7.4	U
SVOCs	Atrazine	72	U	75	U	71	U	72	U	77	U	74	U
SVOCs	Azobenzene	360	U	370	U	350	U	360	U	380	U	360	U
SVOCs	Benzaldehyde	72	R	75	R	71	R	72	R	77	R	74	R
SVOCs	Benzo(a)anthracene	7.2	U	7.5	U	7.1	U	10		1.7	J	7.4	U
SVOCs	Benzo(a)pyrene	7.2	U	7.5	U	7.1	U	8.5		7.7	U	7.4	U
SVOCs	Benzo(b)fluoranthene	7.2	U	7.5	U	7.1	U	17		7.7	U	7.4	U
SVOCs	Benzo(ghi)perylene	7.2	U	7.5	U	7.1	U	6.7	J	7.7	U	7.4	U
SVOCs	Benzo(k)fluoranthene	7.2	U	7.5	U	7.1	U	4.5	J	7.7	U	7.4	U
SVOCs	Benzoic Acid	180	U	190	U	180	U	180	U	190	U	190	U
SVOCs	Benzyl alcohol	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	Biphenyl	36	U	37	U	35	U	3.5	J	38	U	36	U
SVOCs	Bis(2-Chloroethoxy)methane	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	Bis(2-Chloroethyl)ether	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SVOCs	Bis(2-Ethylhexyl)phthalate	360	U	370	U	350	U	500		72	J	57	J
SVOCs	Butylbenzylphthalate	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	Caprolactam	180	U	190	U	180	U	180	U	190	U	190	U
SVOCs	Carbazole	7.2	U	7.5	U	7.1	U	1.9	J	7.7	U	7.4	U
SVOCs	Chrysene	7.2	U	7.5	U	7.1	U	16		2.1	J	7.4	U
SVOCs	Di-n-butylphthalate	36	U	37	U	35	U	18	J	38	U	36	U
SVOCs	Di-n-octylphthalate	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	Dibenz(a,h)anthracene	7.2	U	7.5	U	7.1	U	2.7	J	7.7	U	7.4	U
SVOCs	Dibenzofuran	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	Diethylphthalate	36	U	37	U	35	U	36	U	20	J	25	J

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Checked by: MAD 02/06/2020
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Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-707		SB-707		SB-707		SB-708		SB-708		SB-708	
	Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162140-1		480-162140-1		480-162140-1	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/4/2019		11/4/2019		11/4/2019	
	Sample ID	OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	Diphenylamine												
SVOCs	Fluoranthene	7.2	U	7.5	U	7.1	U	9.8		2.8	J	7.4	U
SVOCs	Fluorene	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SVOCs	Hexachlorobenzene	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SVOCs	Hexachlorocyclopentadiene	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	Hexachloroethane	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	Indeno(1,2,3-cd)pyrene	7.2	U	7.5	U	7.1	U	5.9	J	7.7	U	7.4	U
SVOCs	Isophorone	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	N-Nitrosodi-n-propylamine	7.2	U	7.5	U	7.1	U	7.2	U	7.7	U	7.4	U
SVOCs	N-Nitrosodimethylamine	36	U	37	U	35	U	36	U	38	U	36	U
SVOCs	N-Nitrosodiphenylamine	36	U	37	U	35	U	100		38	U	36	U
SVOCs	Nitrobenzene	72	U	75	U	70	U	72	U	76	U	73	U
SVOCs	Pentachlorophenol	180	U	190	U	180	U	180	U	190	U	190	U
SVOCs	Phenanthrene	7.2	U	7.5	U	7.1	U	7.3		2.9	J	2.3	J
SVOCs	Phenol	36	U	37	U	35	U	13	J	38	U	36	U
SVOCs	Phthalic anhydride	11000	UJ	11000	UJ	11000	UJ	11000	UJ	12000	UJ	11000	UJ
SVOCs	Pyrene	7.2	U	7.5	U	7.1	U	10		2.9	J	7.4	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-708		SB-708		SB-708		SB-708		SB-708		SB-708	
	Lab SDG	480-162140-1		480-162140-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
	Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
	Sample ID	OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	1-Methylnaphthalene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	2,2'-Dichlorodiisopropylether	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	2,3,4,6-Tetrachlorophenol	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	2,4,5-Trichlorophenol	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	2,4,6-Trichlorophenol	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	2,4-Dichlorophenol	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	2,4-Dimethylphenol	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	2,4-Dinitrophenol	350	U	340	U	340	U	380	U	360	U	350	U
SVOCs	2,4-Dinitrotoluene	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	2,6-Dinitrotoluene	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	2-Chloronaphthalene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	2-Chlorophenol	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	2-Methylnaphthalene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	2-Methylphenol	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	2-Nitroaniline	180	U	180	U	180	UJ	200	U	180	UJ	180	UJ
SVOCs	2-Nitrophenol	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	3 & 4 Methylphenol	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	3,3'-Dichlorobenzidine	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	3-Nitroaniline	180	U	180	U	180	U	200	U	180	U	180	U
SVOCs	4,6-Dinitro-2-methylphenol	180	U	180	U	180	U	200	U	180	U	180	U
SVOCs	4-Bromophenyl phenyl ether	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	4-Chloro-3-methylphenol	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	4-Chloroaniline	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	4-Chlorophenyl phenyl ether	35	U	34	U	34	U	38	U	36	U	35	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-708		SB-708		SB-708		SB-708		SB-708		SB-708	
	Lab SDG	480-162140-1		480-162140-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
	Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
	Sample ID	OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	4-Nitroaniline	180	U	180	U	180	U	200	U	180	U	180	U
SVOCs	4-Nitrophenol	180	U	180	U	180	UJ	200	UJ	180	UJ	180	UJ
SVOCs	Acenaphthene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	Acenaphthylene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	Acetophenone	71	U	70	U	69	U	78	U	72	U	72	U
SVOCs	Aniline	17	J	34	U	34	U	38	U	36	U	35	U
SVOCs	Anthracene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	Atrazine	71	U	70	U	69	U	78	U	72	U	72	U
SVOCs	Azobenzene	340	U	330	U	350	U	380	U	350	U	360	U
SVOCs	Benzaldehyde	71	R	70	R	69	R	78	R	72	R	72	R
SVOCs	Benzo(a)anthracene	1.6	J	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	Benzo(a)pyrene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	Benzo(b)fluoranthene	2.1	J	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	Benzo(ghi)perylene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	Benzo(k)fluoranthene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	Benzoic Acid	180	U	180	U	180	U	200	U	180	U	180	U
SVOCs	Benzyl alcohol	35	U	34	U	34	U	38	U	2.9	J	35	U
SVOCs	Biphenyl	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	Bis(2-Chloroethoxy)methane	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	Bis(2-Chloroethyl)ether	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	Bis(2-Ethylhexyl)phthalate	2900		340	U	340	U	380	U	360	U	350	U
SVOCs	Butylbenzylphthalate	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	Caprolactam	180	U	180	U	180	U	200	U	180	U	180	U
SVOCs	Carbazole	2.2	J	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	Chrysene	2.7	J	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	Di-n-butylphthalate	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	Di-n-octylphthalate	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	Dibenz(a,h)anthracene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs	Dibenzofuran	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs	Diethylphthalate	35	U	34	U	34	U	38	U	36	U	35	U

Created by: KMS 2/5/2020
Checked by: MAD 02/06/2020
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Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-708		SB-708		SB-708		SB-708		SB-708		SB-708	
		Lab SDG	480-162140-1		480-162140-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method	C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs		Dimethylphthalate	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs		Diphenylamine												
SVOCs		Fluoranthene	3.1	J	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs		Fluorene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs		Hexachlorobenzene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs		Hexachlorocyclopentadiene	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs		Hexachloroethane	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs		Indeno(1,2,3-cd)pyrene	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs		Isophorone	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs		N-Nitrosodi-n-propylamine	7.1	U	7	U	6.9	U	7.8	U	7.2	U	7.2	U
SVOCs		N-Nitrosodimethylamine	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs		N-Nitrosodiphenylamine	280		34	U	34	U	38	U	36	U	35	U
SVOCs		Nitrobenzene	71	U	69	U	69	U	78	U	72	U	72	U
SVOCs		Pentachlorophenol	180	U	180	U	180	U	200	U	180	U	180	U
SVOCs		Phenanthrene	2.3	J	7	U	6.9	U	2.8	J	7.2	U	7.2	U
SVOCs		Phenol	35	U	34	U	34	U	38	U	36	U	35	U
SVOCs		Phthalic anhydride	10000	UJ	10000	UJ	11000	UJ	12000	UJ	11000	UJ	11000	UJ
SVOCs		Pyrene	4.1	J	7	U	6.9	U	7.8	U	7.2	U	7.2	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-709	
	Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
	Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX		OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX	
	Qc Code	FS		FS		FS		FS		FD		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	1-Methylnaphthalene	8	U	23	U	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	2,2'-Dichlorodiisopropylether	8	U	23	U	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	2,3,4,6-Tetrachlorophenol	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	2,4,5-Trichlorophenol	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	2,4,6-Trichlorophenol	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	2,4-Dichlorophenol	8	U	23	U	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	2,4-Dimethylphenol	39	U	110	U	3.9	J	38	U	38	U	39	U
SVOCs	2,4-Dinitrophenol	390	U	1100	U	380	U	380	U	380	U	390	U
SVOCs	2,4-Dinitrotoluene	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	2,6-Dinitrotoluene	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	2-Chloronaphthalene	8	U	23	U	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	2-Chlorophenol	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	2-Methylnaphthalene	8	U	23	U	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	2-Methylphenol	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	2-Nitroaniline	200	U	580	U	200	U	190	U	200	U	200	U
SVOCs	2-Nitrophenol	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	3 & 4 Methylphenol	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	3,3'-Dichlorobenzidine	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	3-Nitroaniline	200	U	580	U	200	U	190	U	200	U	200	U
SVOCs	4,6-Dinitro-2-methylphenol	200	U	580	U	200	U	190	U	200	U	200	U
SVOCs	4-Bromophenyl phenyl ether	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	4-Chloro-3-methylphenol	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	4-Chloroaniline	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	4-Chlorophenyl phenyl ether	39	U	110	U	38	U	38	U	38	U	39	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-709	
	Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
	Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX		OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX	
	Qc Code	FS		FS		FS		FS		FD		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	4-Nitroaniline	200	U	580	U	200	U	190	U	200	U	200	U
SVOCs	4-Nitrophenol	200	U	580	U	200	U	190	U	200	U	200	U
SVOCs	Acenaphthene	8	U	23	U	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	Acenaphthylene	8	U	23	U	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	Acetophenone	4.1	J	230	U	8.3	J	77	U	77	U	78	U
SVOCs	Aniline	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	Anthracene	8	U	23	U	2.3	J	7.7	U	7.7	U	7.8	U
SVOCs	Atrazine	80	U	230	U	77	U	77	U	77	U	78	U
SVOCs	Azobenzene	390	U	380	U	380	U	380	U	380	U	380	U
SVOCs	Benzaldehyde	80	R	230	R	77	R	77	R	77	R	78	R
SVOCs	Benzo(a)anthracene	9.4		26		8.5		7.7	U	7.7	U	7.8	U
SVOCs	Benzo(a)pyrene	8.9		22	J	7.5	J	7.7	U	7.7	U	7.8	U
SVOCs	Benzo(b)fluoranthene	12		28		13		7.7	U	7.7	U	7.8	U
SVOCs	Benzo(ghi)perylene	7.4	J	13	J	6.5	J	7.7	U	7.7	U	7.8	U
SVOCs	Benzo(k)fluoranthene	5.2	J	11	J	4.3	J	7.7	U	7.7	U	7.8	U
SVOCs	Benzoic Acid	200	U	580	U	200	U	190	U	200	R	200	R
SVOCs	Benzyl alcohol	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	Biphenyl	4.4	J	10	J	7	J	3.4	J	38	U	39	U
SVOCs	Bis(2-Chloroethoxy)methane	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	Bis(2-Chloroethyl)ether	8	U	23	U	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	Bis(2-Ethylhexyl)phthalate	940		6300		6900		6700		380	U	390	U
SVOCs	Butylbenzylphthalate	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	Caprolactam	200	U	580	U	200	U	190	U	200	U	200	U
SVOCs	Carbazole	8	U	5.7	J	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	Chrysene	12		27		12		7.7	U	7.7	U	7.8	U
SVOCs	Di-n-butylphthalate	39	U	72	J	29	J	38	U	38	U	39	U
SVOCs	Di-n-octylphthalate	61		110	U	38	U	38	U	38	U	39	U
SVOCs	Dibenz(a,h)anthracene	2.1	J	23	U	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	Dibenzofuran	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	Diethylphthalate	39	U	110	U	38	U	38	U	38	U	39	U

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revised CR 2/27/20

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-709	
	Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
	Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX		OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX	
	Qc Code	FS		FS		FS		FS		FD		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	Diphenylamine												
SVOCs	Fluoranthene	14		35		16		7.7	U	7.7	U	7.8	U
SVOCs	Fluorene	8	U	23	U	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	Hexachlorobenzene	8	U	23	U	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	Hexachlorocyclopentadiene	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	Hexachloroethane	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	Indeno(1,2,3-cd)pyrene	6.3	J	13	J	6.5	J	7.7	U	7.7	U	7.8	U
SVOCs	Isophorone	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	N-Nitrosodi-n-propylamine	8	U	23	U	7.7	U	7.7	U	7.7	U	7.8	U
SVOCs	N-Nitrosodimethylamine	39	U	110	U	38	U	38	U	38	U	39	U
SVOCs	N-Nitrosodiphenylamine	49		1600		450		27	J	38	U	39	U
SVOCs	Nitrobenzene	79	U	230	U	77	U	76	U	77	U	78	U
SVOCs	Pentachlorophenol	200	U	580	U	200	U	190	U	200	U	200	U
SVOCs	Phenanthrene	8.3		15	J	9.3		2.5	J	2.1	J	3.6	J
SVOCs	Phenol	80		53	J	340		38	U	38	U	39	U
SVOCs	Phthalic anhydride	12000	UJ	11000	UJ	12000	UJ	12000	UJ	11000	UJ	12000	UJ
SVOCs	Pyrene	14		34		16		1.8	J	7.7	U	7.8	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-709		SB-709		SB-710		SB-710		SB-710		SB-710	
	Lab SDG	480-162315-1		480-162315-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
	Sample Date	11/6/2019		11/6/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
	Sample ID	OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX		OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	1-Methylnaphthalene	7.2	U	7.2	U	8.5	U	7.5	U	7.5	U	7.3	U
SVOCs	2,2'-Dichlorodiisopropylether	7.2	U	7.2	U	8.5	U	7.5	U	7.5	U	7.3	U
SVOCs	2,3,4,6-Tetrachlorophenol	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	2,4,5-Trichlorophenol	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	2,4,6-Trichlorophenol	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	2,4-Dichlorophenol	7.2	U	7.2	U	8.5	U	7.5	U	7.5	U	7.3	U
SVOCs	2,4-Dimethylphenol	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	2,4-Dinitrophenol	350	U	360	U	420	U	370	U	370	U	360	U
SVOCs	2,4-Dinitrotoluene	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	2,6-Dinitrotoluene	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	2-Chloronaphthalene	7.2	U	7.2	U	8.5	U	7.5	U	7.5	U	7.3	U
SVOCs	2-Chlorophenol	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	2-Methylnaphthalene	7.2	U	7.2	U	8.5	U	7.5	U	7.5	U	7.3	U
SVOCs	2-Methylphenol	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	2-Nitroaniline	180	U	180	U	220	UJ	190	UJ	190	UJ	190	U
SVOCs	2-Nitrophenol	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	3 & 4 Methylphenol	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	3,3'-Dichlorobenzidine	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	3-Nitroaniline	180	U	180	U	220	U	190	U	190	U	190	U
SVOCs	4,6-Dinitro-2-methylphenol	180	U	180	U	220	U	190	U	190	U	190	U
SVOCs	4-Bromophenyl phenyl ether	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	4-Chloro-3-methylphenol	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	4-Chloroaniline	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	4-Chlorophenyl phenyl ether	35	U	36	U	42	U	37	U	37	U	36	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-709	SB-709	SB-710	SB-710	SB-710	SB-710
	Lab SDG	480-162315-1	480-162315-1	480-162199-1	480-162199-1	480-162199-1	480-162199-1
	Sample Date	11/6/2019	11/6/2019	11/4/2019	11/4/2019	11/4/2019	11/4/2019
	Sample ID	OC-SB-709-16/17-XXX	OC-SB-709-32/33-XXX	OC-SB-710-2.0/4.0-XXX	OC-SB-710-4.0/6.0-XXX	OC-SB-710-6.0/8.0-XXX	OC-SB-710-8.0/10-XXX
	Qc Code	FS	FS	FS	FS	FS	FS
	Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Method C	Parameter	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier	Result Qualifier
SVOCs	4-Nitroaniline	180 U	180 U	220 U	190 U	190 U	190 U
SVOCs	4-Nitrophenol	180 U	180 U	220 UJ	190 UJ	190 UJ	190 UJ
SVOCs	Acenaphthene	7.2 U	7.2 U	8.5 U	7.5 U	7.5 U	7.3 U
SVOCs	Acenaphthylene	7.2 U	7.2 U	8.5 U	7.5 U	7.5 U	7.3 U
SVOCs	Acetophenone	72 U	72 U	85 U	75 U	75 U	73 U
SVOCs	Aniline	35 U	36 U	42 U	37 U	37 U	36 U
SVOCs	Anthracene	7.2 U	7.2 U	8.5 U	7.5 U	7.5 U	7.3 U
SVOCs	Atrazine	72 U	72 U	85 U	75 U	75 U	73 U
SVOCs	Azobenzene	360 U	350 U	420 U	370 U	370 U	350 U
SVOCs	Benzaldehyde	72 R	72 R	85 R	75 R	75 R	73 R
SVOCs	Benzo(a)anthracene	7.2 U	7.2 U	3.8 J	5.7 J	7.5 U	7.3 U
SVOCs	Benzo(a)pyrene	7.2 U	7.2 U	4.4 J	4.7 J	7.5 U	7.3 U
SVOCs	Benzo(b)fluoranthene	7.2 U	7.2 U	6.3 J	5.8 J	7.5 U	7.3 U
SVOCs	Benzo(ghi)perylene	7.2 U	7.2 U	4.1 J	3.2 J	7.5 U	7.3 U
SVOCs	Benzo(k)fluoranthene	7.2 U	7.2 U	8.5 U	7.5 U	7.5 U	7.3 U
SVOCs	Benzoic Acid	180 U	180 U	220 U	190 U	190 U	190 U
SVOCs	Benzyl alcohol	35 U	36 U	42 U	37 U	37 U	36 U
SVOCs	Biphenyl	35 U	36 U	42 U	4.4 J	37 U	36 U
SVOCs	Bis(2-Chloroethoxy)methane	35 U	36 U	42 U	37 U	37 U	36 U
SVOCs	Bis(2-Chloroethyl)ether	7.2 U	7.2 U	8.5 U	7.5 U	7.5 U	7.3 U
SVOCs	Bis(2-Ethylhexyl)phthalate	50 J	360 U	300 J	1000	370 U	120 J
SVOCs	Butylbenzylphthalate	35 U	36 U	42 U	37 U	37 U	36 U
SVOCs	Caprolactam	180 U	180 U	220 U	190 U	190 U	190 U
SVOCs	Carbazole	7.2 U	7.2 U	8.5 U	7.5 U	7.5 U	7.3 U
SVOCs	Chrysene	7.2 U	7.2 U	5.9 J	5.8 J	7.5 U	7.3 U
SVOCs	Di-n-butylphthalate	35 U	36 U	42 U	37 U	37 U	36 U
SVOCs	Di-n-octylphthalate	35 U	36 U	42 U	37 U	37 U	36 U
SVOCs	Dibenz(a,h)anthracene	7.2 U	7.2 U	8.5 U	7.5 U	7.5 U	7.3 U
SVOCs	Dibenzofuran	35 U	36 U	42 U	37 U	37 U	36 U
SVOCs	Diethylphthalate	35 U	36 U	42 U	37 U	37 U	36 U

Created by: KMS 2/5/2020
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Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-709		SB-709		SB-710		SB-710		SB-710		SB-710	
	Lab SDG	480-162315-1		480-162315-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
	Sample Date	11/6/2019		11/6/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
	Sample ID	OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX		OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	Diphenylamine												
SVOCs	Fluoranthene	7.2	U	7.2	U	6.7	J	10		7.5	U	7.3	U
SVOCs	Fluorene	7.2	U	7.2	U	8.5	U	7.5	U	7.5	U	7.3	U
SVOCs	Hexachlorobenzene	7.2	U	7.2	U	8.5	U	7.5	U	7.5	U	7.3	U
SVOCs	Hexachlorocyclopentadiene	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	Hexachloroethane	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	Indeno(1,2,3-cd)pyrene	7.2	U	7.2	U	3.8	J	2.9	J	7.5	U	7.3	U
SVOCs	Isophorone	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	N-Nitrosodi-n-propylamine	7.2	U	7.2	U	8.5	U	7.5	U	7.5	U	7.3	U
SVOCs	N-Nitrosodimethylamine	35	U	36	U	42	U	37	U	37	U	36	U
SVOCs	N-Nitrosodiphenylamine	35	U	36	U	35	J	62		37	U	36	U
SVOCs	Nitrobenzene	72	U	72	U	84	U	75	U	75	U	73	U
SVOCs	Pentachlorophenol	180	U	180	U	220	U	190	U	190	U	190	U
SVOCs	Phenanthrene	7.2	U	7.2	U	3.9	J	7.9		7.5	U	2.2	J
SVOCs	Phenol	35	U	36	U	42	U	11	J	37	U	36	U
SVOCs	Phthalic anhydride	11000	UJ	11000	UJ	13000	UJ	11000	UJ	11000	UJ	11000	UJ
SVOCs	Pyrene	7.2	U	7.2	U	6.6	J	8.9		7.5	U	7.3	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-710		SB-710		SB-711		SB-711		SB-711		SB-711	
	Lab SDG	480-162199-1		480-162199-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
	Sample Date	11/5/2019		11/5/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
	Sample ID	OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	1-Methylnaphthalene	8.2	U	7.2	U	8	U	53	J	15	U	7.6	U
SVOCs	2,2'-Dichlorodiisopropylether	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SVOCs	2,3,4,6-Tetrachlorophenol	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	2,4,5-Trichlorophenol	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	2,4,6-Trichlorophenol	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	2,4-Dichlorophenol	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SVOCs	2,4-Dimethylphenol	40	U	35	U	40	U	920	U	12	J	38	U
SVOCs	2,4-Dinitrophenol	400	U	350	U	400	UJ	9200	U	710	U	380	U
SVOCs	2,4-Dinitrotoluene	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	2,6-Dinitrotoluene	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	2-Chloronaphthalene	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SVOCs	2-Chlorophenol	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	2-Methylnaphthalene	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SVOCs	2-Methylphenol	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	2-Nitroaniline	210	UJ	180	UJ	200	U	4700	U	370	U	190	U
SVOCs	2-Nitrophenol	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	3 & 4 Methylphenol	40	U	35	U	40	U	920	U	27	J	38	U
SVOCs	3,3'-Dichlorobenzidine	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	3-Nitroaniline	210	U	180	U	200	U	4700	U	370	U	190	U
SVOCs	4,6-Dinitro-2-methylphenol	210	U	180	U	200	U	4700	U	370	U	190	U
SVOCs	4-Bromophenyl phenyl ether	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	4-Chloro-3-methylphenol	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	4-Chloroaniline	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	4-Chlorophenyl phenyl ether	40	U	35	U	40	U	920	U	71	U	38	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-710		SB-710		SB-711		SB-711		SB-711		SB-711	
	Lab SDG	480-162199-1		480-162199-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
	Sample Date	11/5/2019		11/5/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
	Sample ID	OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	4-Nitroaniline	210	U	180	U	200	U	4700	U	370	U	190	U
SVOCs	4-Nitrophenol	210	UJ	180	UJ	200	U	4700	U	370	U	190	U
SVOCs	Acenaphthene	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SVOCs	Acenaphthylene	8.2	U	7.2	U	1.8	J	190	U	15	U	7.6	U
SVOCs	Acetophenone	82	U	72	U	80	U	1900	U	150	U	76	U
SVOCs	Aniline	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	Anthracene	8.2	U	7.2	U	6.3	J	60	J	4.3	J	7.6	U
SVOCs	Atrazine	82	U	72	U	80	U	1900	U	150	U	76	U
SVOCs	Azobenzene	400	U	360	U	400	U	7500	U	1800	U	1900	U
SVOCs	Benzaldehyde	82	R	72	R	80	R	1900	U	150	U	76	U
SVOCs	Benzo(a)anthracene	8.2	U	7.2	U	22		190	U	9.9	J	7.6	U
SVOCs	Benzo(a)pyrene	8.2	U	7.2	U	17		190	U	15	U	7.6	U
SVOCs	Benzo(b)fluoranthene	8.2	U	7.2	U	25		190	U	19		7.6	U
SVOCs	Benzo(ghi)perylene	8.2	U	7.2	U	11		190	U	15	U	7.6	U
SVOCs	Benzo(k)fluoranthene	8.2	U	7.2	U	8.8		190	U	8.3	J	7.6	U
SVOCs	Benzoic Acid	210	U	180	U	200	R	4700	U	370	U	190	U
SVOCs	Benzyl alcohol	40	U	35	U	40	U	920	U	71	U	59	
SVOCs	Biphenyl	40	U	35	U	7.1	J	14000		75		38	U
SVOCs	Bis(2-Chloroethoxy)methane	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	Bis(2-Chloroethyl)ether	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SVOCs	Bis(2-Ethylhexyl)phthalate	400	U	350	U	4900		420000		19000		56	J
SVOCs	Butylbenzylphthalate	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	Caprolactam	210	U	180	U	200	U	4700	U	370	U	190	U
SVOCs	Carbazole	8.2	U	7.2	U	3.5	J	190	U	15	U	7.6	U
SVOCs	Chrysene	8.2	U	7.2	U	27		190	U	20		7.6	U
SVOCs	Di-n-butylphthalate	40	U	35	U	21	J	920	U	71	U	38	U
SVOCs	Di-n-octylphthalate	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	Dibenz(a,h)anthracene	8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SVOCs	Dibenzofuran	40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	Diethylphthalate	40	U	35	U	40	U	920	U	71	U	38	U

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Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-710		SB-710		SB-711		SB-711		SB-711		SB-711	
		Lab SDG	480-162199-1		480-162199-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/5/2019		11/5/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate		40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	Diphenylamine													
SVOCs	Fluoranthene		8.2	U	7.2	U	46		160	J	23		7.6	U
SVOCs	Fluorene		8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SVOCs	Hexachlorobenzene		8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SVOCs	Hexachlorocyclopentadiene		40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	Hexachloroethane		40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	Indeno(1,2,3-cd)pyrene		8.2	U	7.2	U	11		190	U	15	U	7.6	U
SVOCs	Isophorone		40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	N-Nitrosodi-n-propylamine		8.2	U	7.2	U	8	U	190	U	15	U	7.6	U
SVOCs	N-Nitrosodimethylamine		40	U	35	U	40	U	920	U	71	U	38	U
SVOCs	N-Nitrosodiphenylamine		40	U	35	U	40	U	54000		1700		31	J
SVOCs	Nitrobenzene		81	U	72	U	80	U	1900	U	140	U	76	U
SVOCs	Pentachlorophenol		210	U	180	U	200	UJ	4700	U	370	U	190	U
SVOCs	Phenanthrene		8.2	U	7.2	U	21		660		15		7.6	U
SVOCs	Phenol		40	U	35	U	40	U	920	U	8800		120	
SVOCs	Phthalic anhydride		12000	UJ	11000	UJ	12000	UJ	230000	UJ	54000	UJ	57000	UJ
SVOCs	Pyrene		8.2	U	7.2	U	40		190	U	20		7.6	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-711		SB-711		SB-711		SB-712		SB-712		SB-712	
	Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
	Sample Date	11/12/2019		11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019	
	Sample ID	OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	1-Methylnaphthalene	8.7	U	7.3	U	7.2	U	40	U	7.3	U	2.1	J
SVOCs	2,2'-Dichlorodiisopropylether	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U
SVOCs	2,3,4,6-Tetrachlorophenol	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	2,4,5-Trichlorophenol	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	2,4,6-Trichlorophenol	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	2,4-Dichlorophenol	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U
SVOCs	2,4-Dimethylphenol	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	2,4-Dinitrophenol	430	U	360	U	350	U	2000	U	360	U	370	U
SVOCs	2,4-Dinitrotoluene	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	2,6-Dinitrotoluene	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	2-Chloronaphthalene	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U
SVOCs	2-Chlorophenol	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	2-Methylnaphthalene	2.7	J	7.3	U	7.2	U	40	U	7.3	U	2.3	J
SVOCs	2-Methylphenol	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	2-Nitroaniline	220	U	180	U	180	U	1000	U	190	U	190	U
SVOCs	2-Nitrophenol	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	3 & 4 Methylphenol	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	3,3'-Dichlorobenzidine	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	3-Nitroaniline	220	U	180	U	180	U	1000	U	190	U	190	U
SVOCs	4,6-Dinitro-2-methylphenol	220	U	180	U	180	U	1000	U	190	U	190	U
SVOCs	4-Bromophenyl phenyl ether	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	4-Chloro-3-methylphenol	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	4-Chloroaniline	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	4-Chlorophenyl phenyl ether	43	U	36	U	35	U	200	U	36	U	37	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-711		SB-711		SB-711		SB-712		SB-712		SB-712	
	Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
	Sample Date	11/12/2019		11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019	
	Sample ID	OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	4-Nitroaniline	220	U	180	U	180	U	1000	U	190	U	190	U
SVOCs	4-Nitrophenol	220	U	180	U	180	U	1000	U	190	U	190	U
SVOCs	Acenaphthene	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U
SVOCs	Acenaphthylene	8.7	U	7.3	U	7.2	U	40	U	7.3	U	4.7	J
SVOCs	Acetophenone	87	U	73	U	72	U	400	U	73	U	4.4	J
SVOCs	Aniline	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	Anthracene	8.7	U	2.3	J	2	J	40	U	2.6	J	4.3	J
SVOCs	Atrazine	87	U	73	U	72	U	400	U	73	U	75	U
SVOCs	Azobenzene	420	U	350	U	350	U	390	U	360	U	370	U
SVOCs	Benzaldehyde	87	U	73	U	72	U	400	U	73	U	6.7	J
SVOCs	Benzo(a)anthracene	2.2	J	10		9.7		11	J	7.6		20	
SVOCs	Benzo(a)pyrene	8.7	U	6	J	4.9	J	40	U	9.5		23	
SVOCs	Benzo(b)fluoranthene	8.7	U	7.9		5.7	J	14	J	12		39	
SVOCs	Benzo(ghi)perylene	8.7	U	3.2	J	2.1	J	40	U	8.2		24	
SVOCs	Benzo(k)fluoranthene	8.7	U	7.3	U	7.2	U	40	U	3.7	J	13	
SVOCs	Benzoic Acid	220	U	180	U	180	U	1000	U	190	U	190	U
SVOCs	Benzyl alcohol	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	Biphenyl	43	U	36	U	35	U	9.7	J	1.7	J	3.4	J
SVOCs	Bis(2-Chloroethoxy)methane	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	Bis(2-Chloroethyl)ether	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U
SVOCs	Bis(2-Ethylhexyl)phthalate	210	J	360	U	48	J	2100		43	J	570	
SVOCs	Butylbenzylphthalate	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	Caprolactam	220	U	180	U	180	U	1000	U	190	U	190	U
SVOCs	Carbazole	8.7	U	1.9	J	7.2	U	40	U	1.7	J	2.4	J
SVOCs	Chrysene	2.6	J	9.9		9.3		12	J	8.6		27	
SVOCs	Di-n-butylphthalate	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	Di-n-octylphthalate	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	Dibenz(a,h)anthracene	8.7	U	7.3	U	7.2	U	40	U	7.3	U	6.1	J
SVOCs	Dibenzofuran	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	Diethylphthalate	43	U	36	U	35	U	200	U	36	U	37	U

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Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Location	SB-711		SB-711		SB-711		SB-712		SB-712		SB-712	
	Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
	Sample Date	11/12/2019		11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019	
	Sample ID	OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	Diphenylamine												
SVOCs	Fluoranthene	4.8	J	13		8.5		19	J	18		30	
SVOCs	Fluorene	8.7	U	7.3	U	7.2	U	40	U	7.3	U	2	J
SVOCs	Hexachlorobenzene	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U
SVOCs	Hexachlorocyclopentadiene	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	Hexachloroethane	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	Indeno(1,2,3-cd)pyrene	8.7	U	2.7	J	1.7	J	40	U	6.5	J	21	
SVOCs	Isophorone	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	N-Nitrosodi-n-propylamine	8.7	U	7.3	U	7.2	U	40	U	7.3	U	7.5	U
SVOCs	N-Nitrosodimethylamine	43	U	36	U	35	U	200	U	36	U	37	U
SVOCs	N-Nitrosodiphenylamine	43	U	36	U	35	U	200	U	36	U	72	
SVOCs	Nitrobenzene	86	U	72	U	72	U	400	U	73	U	75	U
SVOCs	Pentachlorophenol	220	U	180	U	180	U	1000	U	190	U	190	U
SVOCs	Phenanthrene	8.1	J	8.5		7.1	J	40	U	10		17	
SVOCs	Phenol	43	U	36	U	35	U	200	U	36	U	14	J
SVOCs	Phthalic anhydride	13000	UJ	11000	UJ	11000	UJ	12000	UJ	11000	UJ	11000	UJ
SVOCs	Pyrene	4.8	J	12		9.2		17	J	15		26	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-712		SB-712		SB-712		SB-712	
		Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX		OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Qc Code	FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	1,2,4,5-Tetrachlorobenzene		110	U	36	U	35	U	36	U
SVOCs	1-Methylnaphthalene		22	U	7.4	U	7.2	U	7.3	U
SVOCs	2,2'-Dichlorodiisopropylether		22	U	7.4	U	7.2	U	7.3	U
SVOCs	2,3,4,6-Tetrachlorophenol		110	U	36	U	35	U	36	U
SVOCs	2,4,5-Trichlorophenol		110	U	36	U	35	U	36	U
SVOCs	2,4,6-Trichlorophenol		110	U	36	U	35	U	36	U
SVOCs	2,4-Dichlorophenol		22	U	7.4	U	7.2	U	7.3	U
SVOCs	2,4-Dimethylphenol		110	U	36	U	35	U	36	U
SVOCs	2,4-Dinitrophenol		1100	U	360	U	350	U	360	U
SVOCs	2,4-Dinitrotoluene		110	U	36	U	35	U	36	U
SVOCs	2,6-Dinitrotoluene		110	U	36	U	35	U	36	U
SVOCs	2-Chloronaphthalene		22	U	7.4	U	7.2	U	7.3	U
SVOCs	2-Chlorophenol		110	U	36	U	35	U	36	U
SVOCs	2-Methylnaphthalene		22	U	7.4	U	7.2	U	7.3	U
SVOCs	2-Methylphenol		110	U	36	U	35	U	36	U
SVOCs	2-Nitroaniline		570	U	190	U	180	U	190	U
SVOCs	2-Nitrophenol		110	U	36	U	35	U	36	U
SVOCs	3 & 4 Methylphenol		110	U	36	U	35	U	36	U
SVOCs	3,3'-Dichlorobenzidine		110	U	36	U	35	U	36	U
SVOCs	3-Nitroaniline		570	U	190	U	180	U	190	U
SVOCs	4,6-Dinitro-2-methylphenol		570	U	190	U	180	U	190	U
SVOCs	4-Bromophenyl phenyl ether		110	U	36	U	35	U	36	U
SVOCs	4-Chloro-3-methylphenol		110	U	36	U	35	U	36	U
SVOCs	4-Chloroaniline		110	U	36	U	35	U	36	U
SVOCs	4-Chlorophenyl phenyl ether		110	U	36	U	35	U	36	U

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-712		SB-712		SB-712		SB-712	
		Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX		OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Qc Code	FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	4-Nitroaniline		570	U	190	U	180	U	190	U
SVOCs	4-Nitrophenol		570	U	190	U	180	U	190	U
SVOCs	Acenaphthene		17	J	7.4	U	7.2	U	7.3	U
SVOCs	Acenaphthylene		6.3	J	7.4	U	7.2	U	7.3	U
SVOCs	Acetophenone		220	U	74	U	72	U	73	U
SVOCs	Aniline		110	U	36	U	35	U	36	U
SVOCs	Anthracene		36		7.4	U	7.2	U	7.3	U
SVOCs	Atrazine		220	U	74	U	72	U	73	U
SVOCs	Azobenzene		1800	U	360	U	360	U	360	U
SVOCs	Benzaldehyde		220	U	74	U	72	U	73	U
SVOCs	Benzo(a)anthracene		72		7.4	U	7.2	U	7.3	U
SVOCs	Benzo(a)pyrene		67		7.4	U	7.2	U	7.3	U
SVOCs	Benzo(b)fluoranthene		68		7.4	U	7.2	U	7.3	U
SVOCs	Benzo(ghi)perylene		56		7.4	U	7.2	U	7.3	U
SVOCs	Benzo(k)fluoranthene		32		7.4	U	7.2	U	7.3	U
SVOCs	Benzoic Acid		570	U	190	U	180	U	190	U
SVOCs	Benzyl alcohol		110	U	36	U	35	U	36	U
SVOCs	Biphenyl		110	U	36	U	35	U	36	U
SVOCs	Bis(2-Chloroethoxy)methane		110	U	36	U	35	U	36	U
SVOCs	Bis(2-Chloroethyl)ether		22	U	7.4	U	7.2	U	7.3	U
SVOCs	Bis(2-Ethylhexyl)phthalate		1200		140	J	350	U	360	U
SVOCs	Butylbenzylphthalate		110	U	36	U	35	U	36	U
SVOCs	Caprolactam		570	U	190	U	180	U	190	U
SVOCs	Carbazole		8.1	J	7.4	U	7.2	U	7.3	U
SVOCs	Chrysene		75		7.4	U	7.2	U	7.3	U
SVOCs	Di-n-butylphthalate		110	U	36	U	35	U	36	U
SVOCs	Di-n-octylphthalate		110	U	36	U	35	U	36	U
SVOCs	Dibenz(a,h)anthracene		12	J	7.4	U	7.2	U	7.3	U
SVOCs	Dibenzofuran		9.4	J	36	U	35	U	36	U
SVOCs	Diethylphthalate		110	U	36	U	35	U	36	U

Created by: KMS 2/5/2020
Checked by: MAD 02/06/2020
revised CR 2/27/20

Table 2.2 - Final Results Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-712		SB-712		SB-712		SB-712	
		Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX		OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Qc Code	FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg	
Method C	Parameter		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs	Dimethylphthalate		110	U	36	U	35	U	36	U
SVOCs	Diphenylamine									
SVOCs	Fluoranthene		120		7.4	U	7.2	U	7.3	U
SVOCs	Fluorene		12	J	7.4	U	7.2	U	7.3	U
SVOCs	Hexachlorobenzene		22	U	7.4	U	7.2	U	7.3	U
SVOCs	Hexachlorocyclopentadiene		110	U	36	U	35	U	36	U
SVOCs	Hexachloroethane		110	U	36	U	35	U	36	U
SVOCs	Indeno(1,2,3-cd)pyrene		38		7.4	U	7.2	U	7.3	U
SVOCs	Isophorone		110	U	36	U	35	U	36	U
SVOCs	N-Nitrosodi-n-propylamine		22	U	7.4	U	7.2	U	7.3	U
SVOCs	N-Nitrosodimethylamine		110	U	36	U	35	U	36	U
SVOCs	N-Nitrosodiphenylamine		130		36	U	35	U	36	U
SVOCs	Nitrobenzene		220	U	73	U	72	U	73	U
SVOCs	Pentachlorophenol		570	U	190	U	180	U	190	U
SVOCs	Phenanthrene		93		7.4	U	7.2	U	2.1	J
SVOCs	Phenol		110	U	36	U	35	U	36	U
SVOCs	Phthalic anhydride		54000	UJ	11000	UJ	11000	UJ	11000	UJ
SVOCs	Pyrene		150		7.4	U	7.2	U	7.3	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	QC		QC		QC		QC		SB-701		SB-701	
		Lab SDG	480-162353-1		480-162353-1		480-162515-1		480-162572-1		480-162513-1		480-162513-1	
		Sample Date	11/7/2019		11/7/2019		11/11/2019		11/12/2019		11/11/2019		11/11/2019	
		Sample ID	OC-EBK-01-XXX		OC-EBK-02-XXX		OC-EBK-03-XXX		OC-EBK-04-XXX		OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX	
		Qc Code	EB		EB		EB		EB		FD		FS	
		Units	mg/l		mg/l		mg/l		mg/l		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	0	U	0	U	0	U	0	U	8,200		9,900	
Metals	Antimony	T	0.02	U	0.02	U	0.02	U	0.02	U	0.53	J-	0.63	J-
Metals	Arsenic	T	0.01	U	0.01	U	0.015	U	0.015	U	10		8.6	
Metals	Barium	T	0.01	U	0.01	U	0.002	U	0.002	U	49	J+	71	J+
Metals	Beryllium	T	0.001	U	0.001	U	0.002	U	0.002	U	0.34		0.46	J
Metals	Cadmium	T	0.001	U	0.001	U	0.002	U	0.002	U	0.35		0.37	
Metals	Calcium	T	0	J	1	U	0	J	0	J	24,000		28,000	
Metals	Chromium	T	0.005	U	0.0033	J	0.004	U	0.004	U	120	J+	72	J+
Metals	Cobalt	T	0.0078		0.004	U	0.004	U	0.004	U	5.2		3.9	
Metals	Copper	T	0.032		0.038		0.0023	J	0.0051	J	9.9		10	
Metals	Iron	T	0		0		0	U	0	U	11,000		10,000	
Metals	Lead	T	0.005	U	0.005	U	0.01	U	0.01	U	12		11	
Metals	Magnesium	T	0	U	0	U	0	U	0	U	2,900	J+	3,700	J+
Metals	Manganese	T	0.0059		0.0029	J	0.003	U	0.003	U	150	J	180	J
Metals	Mercury	T	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.036		0.031	J
Metals	Nickel	T	0.01	U	0.01	U	0.01	U	0.01	U	11		11	
Metals	Potassium	T	1	U	1	U	1	U	0	J	1,100	J+	1,200	J+
Metals	Selenium	T	0.01	U	0.01	U	0.025	U	0.025	U	4.9	U	4.8	U
Metals	Silver	T	0.005	U	0.005	U	0.006	U	0.006	U	0.73	U	0.72	U
Metals	Sodium	T	1	U	1	U	1	U	1	U	130	J	150	J
Metals	Thallium	T	0.02	U	0.02	U	0.02	U	0.02	U	7.3	U	7.2	U
Metals	Tin	T	0.01	U	0.01	U	0.01	U	0.01	U	1.1	J	0.72	J
Metals	Vanadium	T	0.01	U	0.01	U	0.005	U	0.005	U	18	J+	19	J+
Metals	Zinc	T	0.012	J	0.0089	J	0.0063	J	0.0029	J	28	J+	26	J+

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
T= total
EB = equipment blank
TB = trip blank

Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-701		SB-701		SB-701		SB-701		SB-701		SB-701	
		Lab SDG	480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162513-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	3,400		4,000		4,700		7,400		13,000		5,200	
Metals	Antimony	T	19	U	17	U	18	U	17	U	0.85	J	1.1	J
Metals	Arsenic	T	3.5		1.9	J	0.76	J	7.3		2.4		11	
Metals	Barium	T	9.9		7.5		7		46		58		16	
Metals	Beryllium	T	0.16	J	0.18	J	0.16	J	0.33		0.58	J	0.31	
Metals	Cadmium	T	0.25	U	0.22	U	0.24	U	0.17	J	0.22	U	0.23	U
Metals	Calcium	T	1,100		1,100		2,100		44,000		7,500		1,300	
Metals	Chromium	T	12		14		8.1		200		460		580	
Metals	Cobalt	T	3		1.4		1.1		3.5		11		2.1	
Metals	Copper	T	2.9		1.6		0.75	J	8.2		27		7.7	
Metals	Iron	T	4,700		3,700		3,200		8,800		22,000		15,000	
Metals	Lead	T	1.9		1.9		2.5		7.8		3.7		3.8	
Metals	Magnesium	T	1,200		1,200		1,000		2,400		8,700		1,600	
Metals	Manganese	T	45		41		50		120		340		100	
Metals	Mercury	T	0.024	U	0.023	U	0.024	U	0.069		0.02	U	0.022	U
Metals	Nickel	T	6.3		5.2	J	4.1	J	11		15		7.3	
Metals	Potassium	T	530		400		340		920		4,100		550	
Metals	Selenium	T	5	U	4.4	U	4.9	U	4.4	U	4.4	U	4.6	U
Metals	Silver	T	0.75	U	0.67	U	0.73	U	0.66	U	0.66	U	0.69	U
Metals	Sodium	T	73	J	75	J	97	J	160		1,100		240	
Metals	Thallium	T	7.5	U	6.7	U	7.3	U	6.6	U	6.6	U	6.9	U
Metals	Tin	T	2.5	U	2.2	U	2.4	U	1.1	J	0.69	J	0.61	J
Metals	Vanadium	T	6.6		6		6.1		16		58		21	
Metals	Zinc	T	10		8.4		7		27		36		12	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
T= total

Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-702	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	9,200		9,000		11,000		10,000		6,300		11,000	
Metals	Antimony	T	17	U	16	U	17	U	16	U	0.55	J	0.74	J
Metals	Arsenic	T	5.1		7.6		9.7		11		26		3.8	
Metals	Barium	T	46		33		41		41		29		41	
Metals	Beryllium	T	0.5		0.44		0.65		0.55		0.28		5.9	
Metals	Cadmium	T	0.036	J	0.21	U	0.22	U	0.22	U	0.23	U	0.22	U
Metals	Calcium	T	14,000		3,800		2,800		2,300		1,400		5,000	
Metals	Chromium	T	32		20		34		42		22		580	
Metals	Cobalt	T	5.6		4.1		6.5		6		7		13	
Metals	Copper	T	8.2		9.3		9.4		12		9.5		29	
Metals	Iron	T	13,000		9,800		13,000		13,000		15,000		20,000	
Metals	Lead	T	12		22		7.4		14		9.3		5	
Metals	Magnesium	T	4,000		2,600		3,900		4,500		3,600		6,300	
Metals	Manganese	T	270		130		200		200		250		220	
Metals	Mercury	T	0.041		0.11		0.011	J	0.02	J	0.022	U	0.021	U
Metals	Nickel	T	8.2		10		23		23		31		15	
Metals	Potassium	T	1,300		1,400		1,800		1,800		1,500		2,100	
Metals	Selenium	T	4.6	U	4.3	U	0.61	J	4.4	U	4.6	U	4.4	U
Metals	Silver	T	0.69	U	0.64	U	0.66	U	0.65	U	0.68	U	0.66	U
Metals	Sodium	T	220		130	J	160		130	J	110	J	340	
Metals	Thallium	T	6.9	U	6.4	U	6.6	U	6.5	U	6.8	U	6.6	U
Metals	Tin	T	0.91	J	0.69	J	0.82	J	1.2	J	0.62	J	0.61	J
Metals	Vanadium	T	25		18		23		22		16		58	
Metals	Zinc	T	30		28		28		33		26		32	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
T= total

Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-702		SB-703		SB-703		SB-703		SB-703		SB-703	
		Lab SDG	480-162426-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
		Sample Date	11/8/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019	
		Sample ID	OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX		OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX	
		Qc Code	FS		FS		FD		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	3,700		9,000		6,700	J+	6,500	J+	4,700		4,600	
Metals	Antimony	T	18	U	20	U	18	U	18	U	19	U	18	U
Metals	Arsenic	T	6.5		13		4.7		4.1		3.4		7.5	
Metals	Barium	T	24		89	J	15	J-	12	J-	11	J	10	J
Metals	Beryllium	T	0.15	J	0.39		0.24		0.21	J	0.19	J	0.22	J
Metals	Cadmium	T	0.23	U	0.3	J	0.11	J	0.06	J	0.26	U	0.25	U
Metals	Calcium	T	2,200		92,000		6,300	J+	5,900	J+	3,800		2,000	
Metals	Chromium	T	64		180		20	J+	14	J+	6.8		9.9	
Metals	Cobalt	T	3.2		3.5		2.6		2.2		2.4		2.4	
Metals	Copper	T	7		9.2		5.3	J	2.9	J	2.1		2.9	
Metals	Iron	T	8,000		9,200		6,400	J+	5,000	J+	5,200		7,900	
Metals	Lead	T	10		9.7		6.4		3.6		2.3		2.6	
Metals	Magnesium	T	1,700		2,500		1,300	J+	1,100	J+	1,100		1,800	
Metals	Manganese	T	72		110		76	J+	63	J+	61		89	
Metals	Mercury	T	0.022	U	0.037		0.025		0.032		0.024	U	0.025	U
Metals	Nickel	T	3.8	J	8.9		8		7		4.6	J	7.3	
Metals	Potassium	T	1,100		980		660		550		430		580	
Metals	Selenium	T	0.54	J	5.3	U	4.7	U	4.9	U	5.2	U	4.9	U
Metals	Silver	T	0.7	U	0.8	U	0.71	U	0.73	U	0.77	U	0.74	U
Metals	Sodium	T	200		160	J	170	U	170	U	180	U	170	U
Metals	Thallium	T	7	U	8	U	7.1	U	7.3	U	7.7	U	7.4	U
Metals	Tin	T	2.3	U	1.1	J	0.73	J	2.4	U	2.6	U	2.5	U
Metals	Vanadium	T	17		16		9.7		8.4		7.8		8.9	
Metals	Zinc	T	11		22		29		24		10		11	

Notes:
U = undetected
J = estimated value
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T= total

Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-703		SB-703		SB-703		SB-704		SB-704		SB-704	
		Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/5/2019		11/5/2019		11/5/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX		OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	6,100		1,100		4,800		7,700		5,600		4,800	
Metals	Antimony	T	16	U	17	U	17	U	19	U	18	U	16	U
Metals	Arsenic	T	4.2		0.91	J	3.3		17		5.4		4.8	
Metals	Barium	T	15	J	20	J	14	J	61		11		12	
Metals	Beryllium	T	0.3		0.059	J	0.14	J	0.38		0.27		0.17	J
Metals	Cadmium	T	0.22	U	0.044	J	0.23	U	0.45		0.058	J	0.22	U
Metals	Calcium	T	1,200		4,800		5,400		110,000		3,700		2,200	
Metals	Chromium	T	52		10		190		140		8.6		13	
Metals	Cobalt	T	2.8		0.62		4.3		3.7		2.2		2.3	
Metals	Copper	T	7.3		0.5	J	19		8.5		0.84	J	3.9	
Metals	Iron	T	7,600		1,400		11,000		10,000		3,800		6,200	
Metals	Lead	T	3.6		1.6		3		8.3		3.1		2.7	
Metals	Magnesium	T	1,800		250		3,100		2,300		820		1,700	
Metals	Manganese	T	73		32		110		93		31		68	
Metals	Mercury	T	0.022	U	0.021	U	0.008	J	0.035		0.023	U	0.022	U
Metals	Nickel	T	7.5		0.9	J	5.4	J	8.6		4.7	J	7.8	
Metals	Potassium	T	670		330		820		770		410		640	
Metals	Selenium	T	4.3	U	4.6	U	4.5	U	5	U	4.7	U	4.4	U
Metals	Silver	T	0.65	U	0.68	U	0.68	U	0.75	U	0.71	U	0.66	U
Metals	Sodium	T	150	U	160	U	260		190		80	J	130	J
Metals	Thallium	T	6.5	U	6.8	U	6.8	U	7.5	U	7.1	U	6.6	U
Metals	Tin	T	2.2	U	2.3	U	2.3	U	0.97	J	0.51	J	2.2	U
Metals	Vanadium	T	12		3.6		27		18		7.5		9.4	
Metals	Zinc	T	17		2.9		15		22		10		13	

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Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-704		SB-704		SB-704		SB-704		SB-704		SB-705	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/8/2019	
		Sample ID	OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	15,000		9,200		5,200		3,500		6,800		5,100	
Metals	Antimony	T	16	U	16	U	17	U	17	U	17	U	17	U
Metals	Arsenic	T	11		7.8		3.1		4.5		14		14	
Metals	Barium	T	79		37		18		10		22		12	
Metals	Beryllium	T	0.67	J	0.5	J	0.18	J	0.16	J	0.33		0.28	
Metals	Cadmium	T	0.21	U	0.21	U	0.22	U	0.039	J	0.22	U	0.17	J
Metals	Calcium	T	2,100		1,800		2,100		2,400		1,700		1,200	
Metals	Chromium	T	63		97		58		300		310		13	
Metals	Cobalt	T	6.1		4.4		2.9		3.6		7.1		1.9	
Metals	Copper	T	14		11		4.8		12		17		4.5	
Metals	Iron	T	20,000		13,000		9,600		5,300		17,000		6,400	
Metals	Lead	T	5.9		5.2		4.1		2.1		4.2		3.9	
Metals	Magnesium	T	5,200		3,100		2,500		1,600		2,800		1,600	
Metals	Manganese	T	210		130		91		98		120		83	
Metals	Mercury	T	0.021	U	0.02	U	0.01	J	0.022	U	0.022	U	0.022	U
Metals	Nickel	T	18		11		7		6.9		14		6.1	
Metals	Potassium	T	4,300		1,700		740		460		1,300		650	
Metals	Selenium	T	4.3	U	4.2	U	4.4	U	4.6	U	4.5	U	0.52	J
Metals	Silver	T	0.64	U	0.64	U	0.66	U	0.69	U	0.67	U	0.69	U
Metals	Sodium	T	280		240		100	J	2,600		110	J	90	J
Metals	Thallium	T	6.4	U	6.4	U	6.6	U	6.9	U	6.7	U	6.9	U
Metals	Tin	T	0.92	J	0.59	J	2.2	U	2.3	U	0.66	J	0.52	J
Metals	Vanadium	T	34		21		14		9.3		26		9.3	
Metals	Zinc	T	42		27		15		8.6		24		11	

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Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-705		SB-705		SB-705		SB-705		SB-705		SB-705	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX	
		Qc Code	FS		FD		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	5,400		5,700	J+	5,900	J+	3,700		5,800		9,700	
Metals	Antimony	T	17	U	19	U	20	U	17	U	16	U	17	U
Metals	Arsenic	T	7.1		7.1		6.6		6.5		4.4		3.6	
Metals	Barium	T	17		15		16		9.3		23		52	
Metals	Beryllium	T	0.22		0.24	J	0.23	J	0.14	J	0.34	J	0.4	J
Metals	Cadmium	T	0.26		0.43		0.45		0.23	U	0.21	U	0.22	U
Metals	Calcium	T	1,600		3,500	J+	3,600	J+	1,200		1,800		3,300	
Metals	Chromium	T	21		130	J	77	J	410		250		330	
Metals	Cobalt	T	2.4		2.4		2.9		2.1		3.9		7.4	
Metals	Copper	T	5		6.4		5.5		5		11		20	
Metals	Iron	T	6,100		7,100	J+	7,700	J+	4,900		9,000		16,000	
Metals	Lead	T	6.3		8.9		7.9		2.2		3.2		3	
Metals	Magnesium	T	1,800		1,500		1,900		920		2,500		6,900	
Metals	Manganese	T	60		88	J+	98	J+	55		100		170	
Metals	Mercury	T	0.028		0.031		0.026	J	0.022	U	0.022	U	0.02	U
Metals	Nickel	T	7.6		6.9		8.1		4.7	J	11		17	
Metals	Potassium	T	970		570		700		380		950		2,600	
Metals	Selenium	T	4.5	U	5	U	5.5	U	0.79	J	4.3	U	4.5	U
Metals	Silver	T	0.67	U	0.74	U	0.82	U	0.68	U	0.64	U	0.67	U
Metals	Sodium	T	60	J	58	J	67	J	69	J	140	J	170	
Metals	Thallium	T	6.7	U	7.4	U	8.2	U	6.8	U	6.4	U	6.7	U
Metals	Tin	T	2.2	U	0.57	J	0.69	J	2.3	U	2.1	U	0.53	J
Metals	Vanadium	T	10		11		12		7		16		34	
Metals	Zinc	T	25		22		22		7.5		18		25	

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Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-706	
		Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX		OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	**Parameter**	**Fraction**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	5,000		13,000		9,000		11,000		3,800		5,400	
Metals	Antimony	T	0.63	J	1.1	J	0.95	J	83	U	18	U	0.6	J
Metals	Arsenic	T	11		7.6		6.2		17		3.2		3.3	
Metals	Barium	T	16		43		34		41		10		25	
Metals	Beryllium	T	0.27		0.39		0.35		0.48		0.14	J	0.24	
Metals	Cadmium	T	0.5		0.22	U	0.23	U	0.22	U	0.24	U	0.22	U
Metals	Calcium	T	1,600		3,500		1,700		3,800		1,500		770	
Metals	Chromium	T	19		200		890		1300		310		460	
Metals	Cobalt	T	2.2		9.1		4.4		6.8		1.6		3.3	
Metals	Copper	T	5.7		27		11		25		3.5		9.9	
Metals	Iron	T	7,000		16,000		12,000		23,000		4,500		11,000	
Metals	Lead	T	4.7		8.2		5.6		21		3.4		3	
Metals	Magnesium	T	1,700		6,200		2,700		4,200		1,100		1,700	
Metals	Manganese	T	87		210		130		180		53		89	
Metals	Mercury	T	0.011	J	0.09		0.022	U	0.022	U	0.065		0.01	J
Metals	Nickel	T	6.3		23		12		17		4	J	7	
Metals	Potassium	T	750		2,000		1,500		2,000		460		730	
Metals	Selenium	T	0.82	J	4.4	U	4.6	U	4.4	U	4.8	U	4.4	U
Metals	Silver	T	0.66	U	0.66	U	0.68	U	0.66	U	0.71	U	0.66	U
Metals	Sodium	T	82	J	220		210		330		58	J	97	J
Metals	Thallium	T	6.6	U	6.6	U	6.8	U	6.6	U	7.1	U	6.6	U
Metals	Tin	T	0.59	J	0.78	J	2.3	U	0.81	J	2.4	U	2.2	U
Metals	Vanadium	T	10		40		19		35		8.3		18	
Metals	Zinc	T	14		27		23		46		9.5		19	

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Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-706		SB-707		SB-707		SB-707		SB-707		SB-707	
		Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
		Sample Date	11/6/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX		OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX		OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FS		FD		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	**Parameter**	**Fraction**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	8,100		8,300		14,000		6,400		8,200	J+	7,400	J+
Metals	Antimony	T	1.3	J	1	J	1.2	J	15	U	0.62	J-	0.65	J-
Metals	Arsenic	T	3.1		33		29		5		3.5		3.6	
Metals	Barium	T	42		28		55		16		26		26	
Metals	Beryllium	T	0.23		0.38		0.62		0.32		0.38		0.4	
Metals	Cadmium	T	0.22	U	0.18	J	0.22	U	0.051	J	0.21	U	0.22	U
Metals	Calcium	T	3,200		12,000		3,700		7,000		2,700		2,400	
Metals	Chromium	T	460		79		44		120		84	J-	83	J-
Metals	Cobalt	T	6.2		5.7		13		3.2		3.7		3.2	
Metals	Copper	T	39		11		22		12		11		11	
Metals	Iron	T	14,000		16,000		19,000		7,700		10,000		9,500	
Metals	Lead	T	3.8		11		14		4.8		5.4		5.5	
Metals	Magnesium	T	3,900		3,000		6,400		3,200		2,900		2,500	
Metals	Manganese	T	140		110		310		150		180	J+	160	J+
Metals	Mercury	T	0.0089	J	0.042		0.022	U	0.0086	J	0.021	U	0.022	U
Metals	Nickel	T	12		15		40		13		10		8.9	
Metals	Potassium	T	1,500		890		2,700		750		1,700		1,400	
Metals	Selenium	T	4.3	U	5	U	4.4	U	4.1	U	4.2	U	4.4	U
Metals	Silver	T	0.65	U	0.75	U	0.66	U	0.62	U	0.63	U	0.66	U
Metals	Sodium	T	290		86	J	170		130	J	310		240	
Metals	Thallium	T	6.5	U	7.5	U	6.6	U	6.2	U	6.3	U	6.6	U
Metals	Tin	T	2.2	U	0.61	J	0.84	J	2.1	U	0.57	J	0.57	J
Metals	Vanadium	T	35		19		33		15		19	J	17	J
Metals	Zinc	T	26		28		43		16		23		21	

Notes:
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T= total

Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-707		SB-707		SB-707		SB-708		SB-708		SB-708	
		Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162140-1		480-162140-1		480-162140-1	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	7,700		14,000		2,700		8,600		5,200		11,000	
Metals	Antimony	T	0.5	J	1	J	17	U	0.72	J	18	U	1.1	J
Metals	Arsenic	T	2.4		3.7		1.4	J	17		6.3		16	
Metals	Barium	T	25		60		15		54		16		47	
Metals	Beryllium	T	0.38		0.48		0.14	J	0.43		0.24		0.34	
Metals	Cadmium	T	0.23	U	0.23	U	0.22	U	0.035	J	0.16	J	0.036	J
Metals	Calcium	T	3,300		4,400		950		7,900		2,400		2,300	
Metals	Chromium	T	72		170		100		26		40		40	
Metals	Cobalt	T	3.8		6.2		1.2		5.8		2.8		7.4	
Metals	Copper	T	9.6		13		3.9		11		5.2		15	
Metals	Iron	T	7,800		16,000		4,500		11,000		5,700		16,000	
Metals	Lead	T	4.3		9.2		1.7		7.5		4.4		7.2	
Metals	Magnesium	T	2,500		4,900		960		3,200		1,700		7,300	
Metals	Manganese	T	120		170		36		170		77		190	
Metals	Mercury	T	0.021	U	0.02	J	0.011	J	0.016	J	0.012	J	0.022	U
Metals	Nickel	T	9.8		19		3.2	J	18		9.5		33	
Metals	Potassium	T	1,300		2,600		710		1,700		780		2,800	
Metals	Selenium	T	4.5	U	4.5	U	4.5	U	4.2	U	4.7	U	4.6	U
Metals	Silver	T	0.68	U	0.68	U	0.67	U	0.63	U	0.71	U	0.7	U
Metals	Sodium	T	370		470		110	J	200		63	J	160	
Metals	Thallium	T	6.8	U	6.8	U	6.7	U	6.3	U	7.1	U	7	U
Metals	Tin	T	0.5	J	0.85	J	2.2	U	0.65	J	2.4	U	0.59	J
Metals	Vanadium	T	15		32		8.6		18		9.9		28	
Metals	Zinc	T	15		40		7.8		22		17		35	

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Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-708		SB-708		SB-708		SB-708		SB-708		SB-708	
		Lab SDG	480-162140-1		480-162140-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	7,300		12,000		9,500		2,300		4,800		8,800	
Metals	Antimony	T	16	U	0.57	J	0.77	J	17	U	16	U	0.91	J
Metals	Arsenic	T	2.9		3.2		3.8		0.75	J	1.2	J	2.3	
Metals	Barium	T	23		45		15	J+	15		23		58	
Metals	Beryllium	T	0.34		0.52		0.36		0.085	J	0.16	J	0.27	
Metals	Cadmium	T	0.2	J	0.14	J	0.21	U	0.23	U	0.22	U	0.22	U
Metals	Calcium	T	3,700		2,900		1,200	J+	910		1,500		2,300	
Metals	Chromium	T	18		31		150	J-	140		400		270	
Metals	Cobalt	T	2.9		6.6		5.6		0.87		2.4		4	
Metals	Copper	T	10		17		15	J-	2		9.3		9	
Metals	Iron	T	6,900		12,000		14,000		9,200		7,200		15,000	
Metals	Lead	T	4.5		6.2		3		2		2.3		5.4	
Metals	Magnesium	T	2,100		3,800		5,200	J-	1,000		2,500		4,100	
Metals	Manganese	T	110		140		100	J-	42		90		140	
Metals	Mercury	T	0.019	U	0.019	U	0.022	U	0.021	U	0.012	J	0.021	U
Metals	Nickel	T	9		19		17		2.8	J	8.6		12	
Metals	Potassium	T	1,100		2,400		1,000	J+	1,700		1,400		3,000	
Metals	Selenium	T	4.4	U	4.1	U	1.3	J	4.6	U	4.3	U	0.61	J
Metals	Silver	T	0.66	U	0.61	U	0.63	U	0.69	U	0.65	U	0.65	U
Metals	Sodium	T	86	J	470		81	J	230		380		300	
Metals	Thallium	T	6.6	U	6.1	U	6.3	U	6.9	U	6.5	U	6.5	U
Metals	Tin	T	0.52	J	0.96	J	2.1	U	2.3	U	2.2	U	0.68	J
Metals	Vanadium	T	17		36		31	J-	9.1		16		33	
Metals	Zinc	T	23		37		23		7.2		15		26	

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Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-709	
		Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX		OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX	
		Qc Code	FS		FS		FS		FS		FD		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	8,400		5,200		7,500		5,000		8,300		10,000	
Metals	Antimony	T	19	U	18	U	17	U	18	U	16	U	18	U
Metals	Arsenic	T	7.6		5.6		6		3.8		4.8		7	
Metals	Barium	T	49	J	13	J	21	J	12	J	46	J-	49	J-
Metals	Beryllium	T	0.3		0.18	J	0.25	J	0.22	J	0.36	J	0.52	
Metals	Cadmium	T	0.13	J	0.6	J	0.29	J	0.24	U	0.22	U	0.24	U
Metals	Calcium	T	11,000		4,600		4,200		550		1,500		2,200	
Metals	Chromium	T	63		29		39		420		17		21	
Metals	Cobalt	T	3.7		2.6		4.6		2.1		6.5		6.6	
Metals	Copper	T	7.7		4.8		11		5		9.2		11	
Metals	Iron	T	10,000		5,900		8,100		5,300		9,900		13,000	
Metals	Lead	T	8.2		5		6.2		5.7		5.7		7.1	
Metals	Magnesium	T	3,100		1,400		2,600		1,300		3,000	J-	3,300	J-
Metals	Manganese	T	150		53		100		45		120	J-	130	J-
Metals	Mercury	T	0.022	J	0.042		0.041		0.014	J	0.021	U	0.024	U
Metals	Nickel	T	10		7.4		14		7.1		14		13	
Metals	Potassium	T	1,000		540		1,000		580		1,800		1,600	
Metals	Selenium	T	5	U	4.7	U	4.5	U	4.9	U	4.4	U	4.9	U
Metals	Silver	T	0.75	U	0.7	U	0.67	U	0.73	U	0.66	U	0.73	U
Metals	Sodium	T	170	U	160	U	160	U	170	U	150	U	150	J
Metals	Thallium	T	7.5	U	7	U	6.7	U	7.3	U	6.6	U	7.3	U
Metals	Tin	T	2.5	U	0.5	J	0.62	J	2.4	U	0.5	J	0.77	J
Metals	Vanadium	T	16		10		16		8.2		18		23	
Metals	Zinc	T	21		18		20		17		24	J-	28	J-

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Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-709		SB-709		SB-710		SB-710		SB-710		SB-710	
		Lab SDG	480-162315-1		480-162315-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
		Sample Date	11/6/2019		11/6/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX		OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	9,700		12,000		7,300		5,800		2,100		6,500	
Metals	Antimony	T	16	U	17	U	19	U	0.56	J	17	U	17	U
Metals	Arsenic	T	4.2		0.97	J	10		9.2		2.1	J	2	J
Metals	Barium	T	81	J	53	J	43		24		14		14	
Metals	Beryllium	T	0.28	J	2.2	U	0.32		0.21	J	0.08	J	0.27	
Metals	Cadmium	T	0.22	U	0.22	U	0.1	J	0.05	J	0.04	J	1.9	
Metals	Calcium	T	2,800		8,700		11,000		2,800		1,100		950	
Metals	Chromium	T	44		420		140		41		10		12	
Metals	Cobalt	T	6.8		13		4.6		3.7		0.79		3.2	
Metals	Copper	T	9		29		14		7.5		3.8		8.6	
Metals	Iron	T	15,000		21,000		9,900		8,700		3,200		5,300	
Metals	Lead	T	4.7		5.7		7.4		4.4		1.9		4.8	
Metals	Magnesium	T	4,500		10,000		3,000		3,000		840		1,900	
Metals	Manganese	T	200		270		170		130		47		69	
Metals	Mercury	T	0.022	U	0.021	U	0.021	J	0.01	J	0.022	U	0.02	U
Metals	Nickel	T	14		60		14		14		2.5	J	10	
Metals	Potassium	T	3,500		2,700		1,700		1,200		650		810	
Metals	Selenium	T	4.3	U	4.4	U	5.2	U	4.7	U	4.5	U	0.57	J
Metals	Silver	T	0.65	U	0.67	U	0.78	U	0.7	U	0.67	U	0.67	U
Metals	Sodium	T	160		870		250		130	J	81	J	110	J
Metals	Thallium	T	6.5	U	6.7	U	7.8	U	7	U	6.7	U	6.7	U
Metals	Tin	T	0.47	J	0.57	J	0.74	J	0.51	J	2.2	U	2.2	U
Metals	Vanadium	T	28		53		18		13		5.2		9.9	
Metals	Zinc	T	35		39		28		19		6.4		21	

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Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-710		SB-710		SB-711		SB-711		SB-711		SB-711	
		Lab SDG	480-162199-1		480-162199-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/5/2019		11/5/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	**Parameter**	**Fraction**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	3,900		12,000		8,200		4,000		8,100	J	3,100	
Metals	Antimony	T	19	U	1.2	J	0.64	J	17	U	0.45	J-	17	U
Metals	Arsenic	T	8.9		8.4		8.1		3.9		12		0.91	J
Metals	Barium	T	26		46		73		18		32		6.6	
Metals	Beryllium	T	0.17	J	0.35		0.34		0.16	J	0.36		0.11	J
Metals	Cadmium	T	0.25	U	0.21	U	0.34		9.3		2.5		0.79	
Metals	Calcium	T	1,500		6,400		30,000		1,200		4,100	J-	1,000	
Metals	Chromium	T	310		740		95		28		63	J+	5.9	
Metals	Cobalt	T	2.1		15		3.9		1.5		5.4		0.92	
Metals	Copper	T	7		25		8.6		4.3		12		2.8	
Metals	Iron	T	11,000		26,000		9,300		5,300		11,000		2,800	
Metals	Lead	T	4.9		5.6		8.1		5.7		13		1.7	
Metals	Magnesium	T	1,400		11,000		3,400		940		2,800		860	
Metals	Manganese	T	72		290		160		45		140	J+	42	
Metals	Mercury	T	0.025	U	0.0093	J	0.035		0.029		0.19		0.024	U
Metals	Nickel	T	7.1		39		9.2		6.4		16		4.6	J
Metals	Potassium	T	1,900		2,300		1,200		460		1,500		440	
Metals	Selenium	T	5.1	U	0.58	J	1.1	J	0.5	J	0.58	J	4.5	U
Metals	Silver	T	0.76	U	0.62	U	0.76	U	0.7	U	0.65	U	0.68	U
Metals	Sodium	T	380		1,300		140	J	87	J	180	J	81	J
Metals	Thallium	T	7.6	U	6.2	U	7.6	U	7	U	6.5	U	6.8	U
Metals	Tin	T	0.55	J	0.75	J	0.76	J	2.3	U	0.86	J	2.3	U
Metals	Vanadium	T	16		60		16		7.4		19		5.2	
Metals	Zinc	T	12		46		25		63		78	J+	8.8	

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Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-711		SB-711		SB-711		SB-712		SB-712		SB-712	
		Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/12/2019		11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	3,000		13,000		6,900		8,100		10,000		8,400	
Metals	Antimony	T	20	U	0.52	J	16	U	18	U	16	U	16	U
Metals	Arsenic	T	1.5	J	1.6	J	2.8		7.7		8.9		7.5	
Metals	Barium	T	11		110		21		61		43		34	
Metals	Beryllium	T	0.12	J	0.29		0.38		0.36		0.54		0.37	
Metals	Cadmium	T	0.054	J	0.21	U	0.21	U	0.16	J	0.062	J	0.067	J
Metals	Calcium	T	1,300		3,000		1,400		22,000		4,100		15,000	
Metals	Chromium	T	5.3		260		250		78		35		38	
Metals	Cobalt	T	1		8.4		3.3		4.2		5.8		3.7	
Metals	Copper	T	3.6		28		14		11		11		11	
Metals	Iron	T	2,700		16,000		7,900		9,800		11,000		8,900	
Metals	Lead	T	1.7		2.5		4		12		6.3		20	
Metals	Magnesium	T	900		11,000		2,100		3,300		3,800		2,200	
Metals	Manganese	T	45		270		110		160		190		130	
Metals	Mercury	T	0.025	U	0.022	U	0.021	U	0.048		0.021	U	0.069	
Metals	Nickel	T	4.5	J	17		9.8		10		24		9.3	
Metals	Potassium	T	620		7,100		970		1,500		2,100		1,500	
Metals	Selenium	T	0.7	J	4.1	U	0.46	J	4.8	U	0.55	J	4.3	U
Metals	Silver	T	0.81	U	0.62	U	0.64	U	0.73	U	0.65	U	0.65	U
Metals	Sodium	T	95	J	350		82	J	170		200		170	
Metals	Thallium	T	8.1	U	6.2	U	6.4	U	7.3	U	6.5	U	6.5	U
Metals	Tin	T	2.7	U	0.76	J	2.1	U	0.69	J	0.84	J	0.72	J
Metals	Vanadium	T	5.4		38		12		19		22		17	
Metals	Zinc	T	9.2		37		21		25		24		24	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
T= total

Table 2.3 - Final Results Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO	
		Location	SB-712		SB-712		SB-712		SB-712	
		Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX		OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Qc Code	FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg	
Method	Parameter	Fraction	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Aluminum	T	10,000		4,500		10,000		2,500	
Metals	Antimony	T	0.86	J	0.53	J	1.5	J	16	U
Metals	Arsenic	T	13		5.5		4.1		4.5	
Metals	Barium	T	41		15		71		18	
Metals	Beryllium	T	0.5		0.16	J	0.27		0.097	J
Metals	Cadmium	T	0.098	J	0.22	U	0.22	U	0.21	U
Metals	Calcium	T	3,300		1,500		12,000		850	
Metals	Chromium	T	38		130		250		32	
Metals	Cobalt	T	7.1		2.5		18		1.4	
Metals	Copper	T	23		4.8		64		2.2	
Metals	Iron	T	13,000		7,700		28,000		5,000	
Metals	Lead	T	19		2.8		2.8		2	
Metals	Magnesium	T	4,000		2,600		5,700		1,300	
Metals	Manganese	T	210		120		310		58	
Metals	Mercury	T	0.087		0.021	U	0.02	U	0.021	U
Metals	Nickel	T	21		11		15		4.7	J
Metals	Potassium	T	1,800		1,200		3,300		940	
Metals	Selenium	T	4.4	U	4.4	U	0.58	J	4.2	U
Metals	Silver	T	0.66	U	0.66	U	0.65	U	0.63	U
Metals	Sodium	T	220		110	J	1,500		92	J
Metals	Thallium	T	6.6	U	6.6	U	6.5	U	6.3	U
Metals	Tin	T	1.6	J	2.2	U	0.87	J	2.1	U
Metals	Vanadium	T	25		12		110		7.9	
Metals	Zinc	T	41		15		48		7.4	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
T= total

Table 2.4 - Final Results Summary - TCLP Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
			Location	SB-701		SB-702		SB-703		SB-704		SB-705		SB-706	
			Lab SDG	480-162513-1		480-162426-1		480-162315-1		480-162426-1		480-162426-1		480-162353-1	
			Sample Date	11/11/2019		11/8/2019		11/5/2019		11/7/2019		11/8/2019		11/6/2019	
			Sample ID	OC-SB-701-0.0/10-XXX		OC-SB-702-0.0/10-XXX		OC-SB-703-0.0/10-XXX		OC-SB-704-0.0/10-XXX		OC-SB-705-0.0/10-XXX		OC-SB-706-0.0/10-XXX	
			Qc Code	FS		FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Fraction**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Arsenic	C	mg/l	0.0097	J	0.0077	J	0.015	U	0.011	J	0.017		0.015	U
Metals	Barium	C	mg/l	0.21	J	0.2	J	0.2	J	0.18	J	0.15	J	0.19	J
Metals	Cadmium	C	mg/l	0.0011	J	0.002	U	0.00061	J	0.0014	J	0.0047		0.0028	
Metals	Chromium	C	mg/l	0.13		0.017	J	0.095		0.24		0.19		0.18	
Metals	Lead	C	mg/l	0.011	J	0.012	J	0.012	J	0.012	J	0.0097	J	0.014	J
Metals	Mercury	C	mg/l	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.0002	UJ
Metals	Selenium	C	mg/l	0.025	U	0.025	U	0.025	U	0.025	U	0.025	U	0.025	U
Metals	Silver	C	mg/l	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
C = TCLP extract

Table 2.4 - Final Results Summary - TCLP Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Lab ID	TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO		TALBFLO	
			Location	SB-707		SB-708		SB-709		SB-710		SB-711		SB-712	
			Lab SDG	480-162353-1		480-162140-1		480-162315-1		480-162199-1		480-162572-1		480-162572-1	
			Sample Date	11/7/2019		11/4/2019		11/6/2019		11/4/2019		11/12/2019		11/11/2019	
			Sample ID	OC-SB-707-0.0/10-XXX		OC-SB-708-0.0/10-XXX		OC-SB-709-0.0/10-XXX		OC-SB-710-0.0/10XXX		OC-SB-711-0.0/10-XXX		OC-SB-712-0.0/10-DUP	
			Qc Code	FS		FS		FS		FS		FS		FD	
Method Class	**Parameter**	**Fraction**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Arsenic	C	mg/l	0.035	J+	0.015	U	0.015	U	0.015		0.012	J	0.011	J
Metals	Barium	C	mg/l	0.15	J	0.45	J	0.27	J	0.23	J	0.28	J	0.26	J
Metals	Cadmium	C	mg/l	0.0018	J	0.002	U	0.0037		0.0016	J	0.0025		0.0015	J
Metals	Chromium	C	mg/l	0.057		0.035		0.056		0.045		0.1		0.15	
Metals	Lead	C	mg/l	0.027		0.02	U	0.015	J	0.0068	J	0.011	J	0.022	J
Metals	Mercury	C	mg/l	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U
Metals	Selenium	C	mg/l	0.025	U	0.025	U	0.025	U	0.025	U	0.025	U	0.025	U
Metals	Silver	C	mg/l	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
C = TCLP extract

Table 2.4 - Final Results Summary - TCLP Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Lab ID	TALBFLO	
			Location	SB-712	
			Lab SDG	480-162572-1	
			Sample Date	11/11/2019	
			Sample ID	OC-SB-712-0.0/10-XXX	
			Qc Code	FS	
Method Class	**Parameter**	**Fraction**	**Units**	Result	Qualifier
Metals	Arsenic	C	mg/l	0.013	J
Metals	Barium	C	mg/l	0.29	J
Metals	Cadmium	C	mg/l	0.0012	J
Metals	Chromium	C	mg/l	0.12	
Metals	Lead	C	mg/l	0.059	J
Metals	Mercury	C	mg/l	0.0002	U
Metals	Selenium	C	mg/l	0.025	U
Metals	Silver	C	mg/l	0.006	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
C = TCLP extract

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-701		SB-701		SB-701		SB-701		SB-701		SB-701	
		Lab SDG	2074150		2074150		2074150		2074150		2074150		2074150	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX		OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX	
		Qc Code	FD		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		2.5		2.8		0.98		0.73		0.66		3.7	
pH Units	pH		7.78	J	7.25	J	7.95	J	8.23	J	8.19	J	8.53	J
mV	ORP		399		415		356		347		352		367	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-701		SB-701		SB-702		SB-702		SB-702		SB-702	
		Lab SDG	2074150		2074150		2073916		2073916		2073916		2073916	
		Sample Date	11/11/2019		11/11/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX		OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		22.6		8.9		1.6		0.98		0.71		0.55	
pH Units	pH		7.47	J	7.43	J	11.3	J	8.15	J	6.74	J	7.63	J
mV	ORP		373		356		204		320		419		411	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-702		SB-702		SB-702		SB-703		SB-703		SB-703	
		Lab SDG	2073916		2073916		2073916		2073905		2073905		2073905	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/5/2019		11/5/2019		11/5/2019	
		Sample ID	OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX		OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX		OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX	
		Qc Code	FS		FS		FS		FS		FD		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		0.44	U	7.5		1		5.8		2.3	J	0.7	J
pH Units	pH		8.06	J	6.49	J	7.34	J	10.4	J	9.31	J	8.61	J
mV	ORP		344		373		326		266		263		321	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-703		SB-703		SB-703		SB-703		SB-703		SB-704	
		Lab SDG	2073905		2073905		2073905		2073905		2073905		2073916	
		Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/7/2019	
		Sample ID	OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		0.29	J	0.37	J	3.2		0.41	J	9.8		4.1	
pH Units	pH		7.57	J	7.93	J	8.13	J	8.71	J	5.19	J	10.6	J
mV	ORP		326		322		320		313		334		260	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-704		SB-704		SB-704		SB-704		SB-704		SB-704	
		Lab SDG	2073916		2073916		2073916		2073916		2073916		2073916	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX		OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		0.49	U	0.46	U	2.4		5.3		1.3		6.3	
pH Units	pH		8.91	J	8.48	J	8.43	J	8.28	J	9.08	J	5.63	J
mV	ORP		345		215		268		293		271		319	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-704		SB-705		SB-705		SB-705		SB-705		SB-705	
		Lab SDG	2073916		2073916		2073916		2073916		2073916		2073916	
		Sample Date	11/7/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX		OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FD		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		4.1		0.46	U	1.1		2.7	J	1.5	J	7.4	
pH Units	pH		7.07	J	8.29	J	7.24	J	7.43	J	7.34	J	7.89	J
mV	ORP		420		334		358		373		385		355	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-705		SB-705		SB-706		SB-706		SB-706		SB-706	
		Lab SDG	2073916		2073916		2073662		2073662		2073662		2073662	
		Sample Date	11/8/2019		11/8/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX		OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX		OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		9.9		4.2		0.95		2.9		6.6		20.8	
pH Units	pH		7.94	J	7.91	J	7.44	J	6.98	J	6.77	J	7.33	J
mV	ORP		351		385		337		275		420		400	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-706		SB-706		SB-706		SB-707		SB-707		SB-707	
		Lab SDG	2073662		2073662		2073662		2073662		2073662		2073662	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX		OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX		OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		3.6		4.7		5.6		2.7		1		7.6	
pH Units	pH		6.63	J	7.09	J	7.03	J	7.19	J	7.34	J	7.38	J
mV	ORP		214		325		397		375		379		380	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-707		SB-707		SB-707		SB-707		SB-707		SB-708	
		Lab SDG	2073662		2073662		2073662		2073662		2073662		2072711	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/4/2019	
		Sample ID	OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX	
		Qc Code	FD		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		2.9		3.4		4.2		5.5		5.5		4.9	
pH Units	pH		7.97	J	7.91	J	7.22	J	8.27	J	8.64	J	10.1	J
mV	ORP		361		362		402		351		340		85.5	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-708		SB-708		SB-708		SB-708		SB-708		SB-708	
		Lab SDG	2072711		2072711		2072711		2072711		2072990		2072990	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX		OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		0.7		0.76		0.72		0.8		2.6		7.9	
pH Units	pH		7.52	J	7.95	J	7.21	J	7.57	J	7.25	J	5.55	J
mV	ORP		257		280		306		298		307		323	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-708		SB-708		SB-709		SB-709		SB-709		SB-709	
		Lab SDG	2072990		2072990		2073905		2073905		2073905		2073905	
		Sample Date	11/4/2019		11/4/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX		OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX		OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		6		11.4		2.2		1.2		1.7		8	
pH Units	pH		6.02	J	6.15	J	7.74	J	7.4	J	6.86	J	6.43	J
mV	ORP		318		313		415		413		266		313	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-709		SB-709		SB-709		SB-709		SB-710		SB-710	
		Lab SDG	2073905		2073905		2073905		2073905		2072990		2072990	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX		OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX	
		Qc Code	FD		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		0.7		0.74		3.9		6.7		2		1.2	
pH Units	pH		5.81	J	6.04	J	7.68	J	6.85	J	7.99	J	7.56	J
mV	ORP		427		391		421		394		371		253	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-710		SB-710		SB-710		SB-710		SB-711		SB-711	
		Lab SDG	2072990		2072990		2072990		2072990		2074385		2074385	
		Sample Date	11/4/2019		11/4/2019		11/5/2019		11/5/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX		OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		0.79		0.61		8.5		7.3		5.1		0.49	
pH Units	pH		8.37	J	7.16	J	6.36	J	4.57	J	10.1	J	8.45	J
mV	ORP		228		298		363		387		311		323	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-711		SB-711		SB-711		SB-711		SB-711		SB-712	
		Lab SDG	2074385		2074385		2074385		2074385		2074385		2074385	
		Sample Date	11/12/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019		11/11/2019	
		Sample ID	OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX		OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		0.74		0.18	J	0.37	J	10.1		5.7		5.5	
pH Units	pH		8.29	J	8.75	J	8.01	J	7.74	J	7.34	J	9.88	J
mV	ORP		333		362		381		394		397		318	

Table 2.5 - Final Results Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-712		SB-712		SB-712		SB-712		SB-712		SB-712	
		Lab SDG	2074385		2074385		2074385		2074385		2074385		2074385	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX		OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX		OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		0.71		0.56		1.4		2.8		16.8		1	
pH Units	pH		8.84	J	7.84	J	7.73	J	7.42	J	7.79	J	8.76	J
mV	ORP		321		341		345		411		337		300	

Table 2.5 - Final Results Summary - QC Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST	
		Location	QC		QC		QC		QC	
		Lab SDG	2073662		2073662		2074032		2074262	
		Sample Date	11/7/2019		11/7/2019		11/11/2019		11/12/2019	
		Sample ID	OC-EBK-01-XXX		OC-EBK-02-XXX		OC-EBK-03-XXX		OC-EBK-04-XXX	
		Qc Code	EB		EB		EB		EB	
		Units	ug/l		ug/l		ug/l		ug/l	
Method Class	Parameter		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Metals	Chromium, Hexavalent		10	U	10	U	10	U	10	U

Notes:

U = undetected

J = estimated value

J+ = estimated biased high

J- = estimated biased low

R = rejected/unusable

FS= field sample

FD = field duplicate

EB = equipment blank

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-701		SB-701		SB-701		SB-701		SB-701	
		Lab SDG	2074150		2074150		2074150		2074150		2074150	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX		OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX	
		Qc Code	FD		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg										
Inorganics & Wet Chem	Sulfate	mg/kg										
Inorganics & Wet Chem	Ammonia	mg/kg										
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	19		18.1		19.5		14.8		18	
Moisture/Solids	Percent Solids	Percent										

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-701		SB-701		SB-701		SB-701		SB-701	
		Lab SDG	2074150		2074150		2074150		480-162513-1		480-162513-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX		OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FD		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg							12	UJ	12	UJ
Inorganics & Wet Chem	Sulfate	mg/kg							13000	J	12000	J
Inorganics & Wet Chem	Ammonia	mg/kg							6.5		4.7	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	16.4		6.7		18.2		18.9		18.4	
Moisture/Solids	Percent Solids	Percent							81.1		81.6	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-701		SB-701		SB-701		SB-701		SB-701	
		Lab SDG	480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162513-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-0.0/10-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	12	UJ	11	UJ	12	UJ	11	UJ		
Inorganics & Wet Chem	Sulfate	mg/kg	250	J	130	J	230	J	15000	J		
Inorganics & Wet Chem	Ammonia	mg/kg	27		21		35		28			
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg									10	U
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg									10	UJ
Inorganics & Wet Chem	Ignitability	mm/sec									2.2	U
Inorganics & Wet Chem	pH (Corrosivity)	pH Units									8.4	J
Moisture/Solids	Percent Moisture	Percent	16.8		13.7		18.3		12.9			
Moisture/Solids	Percent Solids	Percent	83.2		86.3		81.7		87.1			

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-701		SB-701		SB-702		SB-702		SB-702	
		Lab SDG	480-162513-1		480-162513-1		2073916		2073916		2073916	
		Sample Date	11/11/2019		11/11/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX		OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	390	J	11	UJ						
Inorganics & Wet Chem	Sulfate	mg/kg	3900	J	190	J						
Inorganics & Wet Chem	Ammonia	mg/kg	210		25							
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	6.7		10.5		14.6		7.4		8.7	
Moisture/Solids	Percent Solids	Percent	93.3		89.5							

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-702		SB-702		SB-702		SB-702		SB-702	
		Lab SDG	2073916		2073916		2073916		2073916		480-162426-1	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX		OC-SB-702-28/29-XXX		OC-SB-702-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg									9.3	J
Inorganics & Wet Chem	Sulfate	mg/kg									610	J
Inorganics & Wet Chem	Ammonia	mg/kg									4	J
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	9.8		8.6		9		5.5		14.3	
Moisture/Solids	Percent Solids	Percent									85.7	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-702		SB-702		SB-702		SB-702		SB-702	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-0.0/10-XXX		OC-SB-702-8.0/10-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	10	UJ	11	UJ	11	UJ			10	U
Inorganics & Wet Chem	Sulfate	mg/kg	3000	J	6100	J	730	J			180	
Inorganics & Wet Chem	Ammonia	mg/kg	6		6		7.8				13	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg							10	U		
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg							10	U		
Inorganics & Wet Chem	Ignitability	mm/sec							2.2	U		
Inorganics & Wet Chem	pH (Corrosivity)	pH Units							7.4	J		
Moisture/Solids	Percent Moisture	Percent	6.4		11		10				8.3	
Moisture/Solids	Percent Solids	Percent	93.6		89		90				91.7	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-702		SB-702		SB-703		SB-703		SB-703	
		Lab SDG	480-162426-1		480-162426-1		2073905		2073905		2073905	
		Sample Date	11/8/2019		11/8/2019		11/5/2019		11/5/2019		11/5/2019	
		Sample ID	OC-SB-702-34/35-XXX		OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX		OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX	
		Qc Code	FS		FS		FS		FD		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	5.8	J	5.3	J						
Inorganics & Wet Chem	Sulfate	mg/kg	1000		140							
Inorganics & Wet Chem	Ammonia	mg/kg	41		11							
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	7.6		12.5		25.8		22.5		16	
Moisture/Solids	Percent Solids	Percent	92.4		87.5							

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-703		SB-703		SB-703		SB-703		SB-703	
		Lab SDG	2073905		2073905		2073905		2073905		2073905	
		Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019	
		Sample ID	OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg										
Inorganics & Wet Chem	Sulfate	mg/kg										
Inorganics & Wet Chem	Ammonia	mg/kg										
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	25.8		15		15.1		14.2		12.2	
Moisture/Solids	Percent Solids	Percent										

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-703		SB-703		SB-703		SB-703		SB-703	
		Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
		Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019	
		Sample ID	OC-SB-703-0.0/2.0-XXX		OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-0.0/10-XXX	
		Qc Code	FS		FD		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	5.4	J	11	U	12	U	12	U		
Inorganics & Wet Chem	Sulfate	mg/kg	18000		16000		10000		430			
Inorganics & Wet Chem	Ammonia	mg/kg	7		10		12		7.9			
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg									10	U
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg									10	UJ
Inorganics & Wet Chem	Ignitability	mm/sec									2.2	U
Inorganics & Wet Chem	pH (Corrosivity)	pH Units									5.4	J
Moisture/Solids	Percent Moisture	Percent	23.1		13		17.6		21			
Moisture/Solids	Percent Solids	Percent	76.9		87		82.4		79			

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-703		SB-703		SB-703		SB-703		SB-704	
		Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		2073916	
		Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/7/2019	
		Sample ID	OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	5.8	J	9.2	J	11	U	210			
Inorganics & Wet Chem	Sulfate	mg/kg	180		160		16000		1300			
Inorganics & Wet Chem	Ammonia	mg/kg	10		10		5.1		130			
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	20		10.8		10.5		8.3		28.5	
Moisture/Solids	Percent Solids	Percent	80		89.2		89.5		91.7			

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-704		SB-704		SB-704		SB-704		SB-704	
		Lab SDG	2073916		2073916		2073916		2073916		2073916	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX		OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg										
Inorganics & Wet Chem	Sulfate	mg/kg										
Inorganics & Wet Chem	Ammonia	mg/kg										
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	16.9		12.4		9.2		7.4		7.2	
Moisture/Solids	Percent Solids	Percent										

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-704		SB-704		SB-704		SB-704		SB-704	
		Lab SDG	2073916		2073916		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-704-0.0/2.0-XXX		OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg					4.7	J	11	UJ	11	UJ
Inorganics & Wet Chem	Sulfate	mg/kg					18000	J	16000	J	760	J
Inorganics & Wet Chem	Ammonia	mg/kg					15		44		40	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	11.9		12.4		19.8		13.2		10.6	
Moisture/Solids	Percent Solids	Percent					80.2		86.8		89.4	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-704		SB-704		SB-704		SB-704		SB-704	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-0.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	11	UJ	4.8	J			10	UJ	1300	J
Inorganics & Wet Chem	Sulfate	mg/kg	530	J	150	J			68	J	6100	J
Inorganics & Wet Chem	Ammonia	mg/kg	46		41				29		620	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg					10	U				
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg					10	UJ				
Inorganics & Wet Chem	Ignitability	mm/sec					2.2	U				
Inorganics & Wet Chem	pH (Corrosivity)	pH Units					7.7	J				
Moisture/Solids	Percent Moisture	Percent	8.2		6.8				5.7		9.5	
Moisture/Solids	Percent Solids	Percent	91.8		93.2				94.3		90.5	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-704		SB-705		SB-705		SB-705		SB-705	
		Lab SDG	480-162426-1		2073916		2073916		2073916		2073916	
		Sample Date	11/7/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX		OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FD		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	11	UJ								
Inorganics & Wet Chem	Sulfate	mg/kg	270	J								
Inorganics & Wet Chem	Ammonia	mg/kg	40									
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	8.4		12.2		10.8		15.1		15.6	
Moisture/Solids	Percent Solids	Percent	91.6									

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-705		SB-705		SB-705		SB-705		SB-705	
		Lab SDG	2073916		2073916		2073916		480-162426-1		480-162426-1	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX		OC-SB-705-0.0/2.0-XXX		OC-SB-705-2.0/4.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg							11	UJ	11	UJ
Inorganics & Wet Chem	Sulfate	mg/kg							77	J	1400	J
Inorganics & Wet Chem	Ammonia	mg/kg							3.8	J	5.8	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	10.1		13.5		12.8		12.3		10.6	
Moisture/Solids	Percent Solids	Percent							87.7		89.4	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-705		SB-705		SB-705		SB-705		SB-705	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-705-0.0/10-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX	
		Qc Code	FS		FD		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg			12	U	13	U	11	U	11	U
Inorganics & Wet Chem	Sulfate	mg/kg			3400	J	3400	J	160		190	
Inorganics & Wet Chem	Ammonia	mg/kg			11		7.5		8.2		29	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg	10	U								
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg	10	U								
Inorganics & Wet Chem	Ignitability	mm/sec	2.2	U								
Inorganics & Wet Chem	pH (Corrosivity)	pH Units	7.6	J								
Moisture/Solids	Percent Moisture	Percent			19.1		24		13.5		9.3	
Moisture/Solids	Percent Solids	Percent			80.9		76		86.5		90.7	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-705		SB-706		SB-706		SB-706		SB-706	
		Lab SDG	480-162426-1		2073662		2073662		2073662		2073662	
		Sample Date	11/8/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-705-17/18-XXX		OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX		OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	5.4	J								
Inorganics & Wet Chem	Sulfate	mg/kg	200	J								
Inorganics & Wet Chem	Ammonia	mg/kg	39									
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	7.6		8.8		12.9		11.2		10.7	
Moisture/Solids	Percent Solids	Percent	92.4									

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-706		SB-706		SB-706		SB-706		SB-706	
		Lab SDG	2073662		2073662		2073662		480-162353-1		480-162353-1	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX		OC-SB-706-26/27-XXX		OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg							11	UJ	11	UJ
Inorganics & Wet Chem	Sulfate	mg/kg							1000	J-	410	J
Inorganics & Wet Chem	Ammonia	mg/kg							10		14	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	19.1		10.1		12.8		11.4		9.1	
Moisture/Solids	Percent Solids	Percent							88.6		90.9	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-706		SB-706		SB-706		SB-706		SB-706	
		Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-0.0/10-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	7	J	4.8	J			12	UJ	11	UJ
Inorganics & Wet Chem	Sulfate	mg/kg	120	J	160	J			290	J	66	J
Inorganics & Wet Chem	Ammonia	mg/kg	9.6		12				11		11	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg					10	U				
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg					10	U				
Inorganics & Wet Chem	Ignitability	mm/sec					2.2	U				
Inorganics & Wet Chem	pH (Corrosivity)	pH Units					6.1	J				
Moisture/Solids	Percent Moisture	Percent	9.5		8.6				18.6		8.8	
Moisture/Solids	Percent Solids	Percent	90.5		91.4				81.4		91.2	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-706		SB-707		SB-707		SB-707		SB-707	
		Lab SDG	480-162353-1		2073662		2073662		2073662		2073662	
		Sample Date	11/6/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX		OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX		OC-SB-707-6.0/8.0-DUP	
		Qc Code	FS		FS		FS		FS		FD	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	15	J								
Inorganics & Wet Chem	Sulfate	mg/kg	140	J								
Inorganics & Wet Chem	Ammonia	mg/kg	12									
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	7.9		19.1		14.5		7.8		6.9	
Moisture/Solids	Percent Solids	Percent	92.1									

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-707		SB-707		SB-707		SB-707		SB-707	
		Lab SDG	2073662		2073662		2073662		2073662		480-162353-1	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-707-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg									5.2	J
Inorganics & Wet Chem	Sulfate	mg/kg									170	J
Inorganics & Wet Chem	Ammonia	mg/kg									6	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	6.5		9.9		22.4		6.8		19.2	
Moisture/Solids	Percent Solids	Percent									80.8	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-707		SB-707		SB-707		SB-707		SB-707	
		Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX		OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX	
		Qc Code	FS		FS		FD		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	11	UJ	11	UJ	5.6	J	4.1	J	9.9	J
Inorganics & Wet Chem	Sulfate	mg/kg	2100	J	7100	J	150		130	J	190	
Inorganics & Wet Chem	Ammonia	mg/kg	13		6.5		5.5	J-	5.6	J-	7.5	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	8.9		8.2		6.2		6.1		8.2	
Moisture/Solids	Percent Solids	Percent	91.1		91.8		93.8		93.9		91.8	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-707		SB-707		SB-707		SB-708		SB-708	
		Lab SDG	480-162353-1		480-162353-1		480-162353-1		2072711		2072711	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-707-0.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg			11	U	11	U				
Inorganics & Wet Chem	Sulfate	mg/kg			53		46					
Inorganics & Wet Chem	Ammonia	mg/kg			17		18					
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg	10	U								
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg	10	UJ								
Inorganics & Wet Chem	Ignitability	mm/sec	2.2	U								
Inorganics & Wet Chem	pH (Corrosivity)	pH Units	7.4	J								
Moisture/Solids	Percent Moisture	Percent			11.7		6.3		19.7		15.1	
Moisture/Solids	Percent Solids	Percent			88.3		93.7					

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-708		SB-708		SB-708		SB-708		SB-708	
		Lab SDG	2072711		2072711		2072711		2072990		2072990	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-708-4.0/6.0-XXX		OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg										
Inorganics & Wet Chem	Sulfate	mg/kg										
Inorganics & Wet Chem	Ammonia	mg/kg										
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	9.9		8.7		5.8		10.4		17	
Moisture/Solids	Percent Solids	Percent										

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-708		SB-708		SB-708		SB-708		SB-708	
		Lab SDG	2072990		2072990		480-162140-1		480-162140-1		480-162140-1	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg					11	UJ	12	UJ	11	UJ
Inorganics & Wet Chem	Sulfate	mg/kg					430	J	590	J	190	J
Inorganics & Wet Chem	Ammonia	mg/kg					7.3	U	18		6.6	U
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	15.9		12.1		10		15.6		10.9	
Moisture/Solids	Percent Solids	Percent					90		84.4		89.1	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-708		SB-708		SB-708		SB-708		SB-708	
		Lab SDG	480-162140-1		480-162140-1		480-162140-1		480-162199-1		480-162199-1	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-0.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	10	UJ	10	UJ			11	UJ	70	J
Inorganics & Wet Chem	Sulfate	mg/kg	1800	J	57	J			35	J	460	J
Inorganics & Wet Chem	Ammonia	mg/kg	15		9.9	U			8.5		62	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg					10	U				
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg					10	UJ				
Inorganics & Wet Chem	Ignitability	mm/sec					2.2	U				
Inorganics & Wet Chem	pH (Corrosivity)	pH Units					5.8	J				
Moisture/Solids	Percent Moisture	Percent	5.7		3.7				6.5		13.9	
Moisture/Solids	Percent Solids	Percent	94.3		96.3				93.5		86.1	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-708		SB-708		SB-709		SB-709		SB-709	
		Lab SDG	480-162199-1		480-162199-1		2073905		2073905		2073905	
		Sample Date	11/4/2019		11/4/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX		OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX		OC-SB-709-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	210	J	7.2	J						
Inorganics & Wet Chem	Sulfate	mg/kg	1200	J	100	J						
Inorganics & Wet Chem	Ammonia	mg/kg	150		17							
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	8		8.8		18		15.5		28.5	
Moisture/Solids	Percent Solids	Percent	92		91.2							

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-709		SB-709		SB-709		SB-709		SB-709	
		Lab SDG	2073905		2073905		2073905		2073905		2073905	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX		OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX	
		Qc Code	FS		FD		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg										
Inorganics & Wet Chem	Sulfate	mg/kg										
Inorganics & Wet Chem	Ammonia	mg/kg										
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	13.4		12.1		13.6		12.8		8.6	
Moisture/Solids	Percent Solids	Percent										

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-709		SB-709		SB-709		SB-709		SB-709	
		Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX		OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP	
		Qc Code	FS		FS		FS		FS		FD	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	12	U	11	U	12	U	17		11	U
Inorganics & Wet Chem	Sulfate	mg/kg	1300		12000		63		150		140	
Inorganics & Wet Chem	Ammonia	mg/kg	4.1	J	7.6		15		3.5	J	14	J
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	16.5		14.3		14.5		15		14	
Moisture/Solids	Percent Solids	Percent	83.5		85.7		85.5		85		86	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-709		SB-709		SB-709		SB-709		SB-710	
		Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		2072990	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/4/2019	
		Sample ID	OC-SB-709-8.0/10-XXX		OC-SB-709-0.0/10-XXX		OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	12	U			11	U	11	U		
Inorganics & Wet Chem	Sulfate	mg/kg	110				890		320			
Inorganics & Wet Chem	Ammonia	mg/kg	6.7	J			8.6		150			
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg			10	U						
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg			10	U						
Inorganics & Wet Chem	Ignitability	mm/sec			2.2	U						
Inorganics & Wet Chem	pH (Corrosivity)	pH Units			6.3	J						
Moisture/Solids	Percent Moisture	Percent	14.4				9.3		7.8		13	
Moisture/Solids	Percent Solids	Percent	85.6				90.7		92.2			

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-710		SB-710		SB-710		SB-710		SB-710	
		Lab SDG	2072990		2072990		2072990		2072990		2072990	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/5/2019		11/5/2019	
		Sample ID	OC-SB-710-4.0/6.0-XXX		OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX		OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg										
Inorganics & Wet Chem	Sulfate	mg/kg										
Inorganics & Wet Chem	Ammonia	mg/kg										
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	14		13.7		7.4		20.2		7.9	
Moisture/Solids	Percent Solids	Percent										

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-710		SB-710		SB-710		SB-710		SB-710	
		Lab SDG	480-162199-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX		OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX		OC-SB-710-0.0/10XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	19	J	6.9	J	11	UJ	11	UJ		
Inorganics & Wet Chem	Sulfate	mg/kg	3900	J	6400	J	170	J	71	J		
Inorganics & Wet Chem	Ammonia	mg/kg	15		12		18		14			
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg									10	U
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg									10	UJ
Inorganics & Wet Chem	Ignitability	mm/sec									2.2	U
Inorganics & Wet Chem	pH (Corrosivity)	pH Units									5.5	J
Moisture/Solids	Percent Moisture	Percent	22.6		12.4		12.3		8.4			
Moisture/Solids	Percent Solids	Percent	77.4		87.6		87.7		91.6			

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-710		SB-710		SB-711		SB-711		SB-711	
		Lab SDG	480-162199-1		480-162199-1		2074385		2074385		2074385	
		Sample Date	11/5/2019		11/5/2019		11/12/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	57	J	670	J						
Inorganics & Wet Chem	Sulfate	mg/kg	1100	J	3700	J						
Inorganics & Wet Chem	Ammonia	mg/kg	52		58							
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	18.6		8		16.4		11.6		9.4	
Moisture/Solids	Percent Solids	Percent	81.4		92							

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-711		SB-711		SB-711		SB-711		SB-711	
		Lab SDG	2074385		2074385		2074385		2074385		480-162572-1	
		Sample Date	11/12/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-711-6.0/8.0-XXX		OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-711-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg									12	UJ
Inorganics & Wet Chem	Sulfate	mg/kg									1800	J
Inorganics & Wet Chem	Ammonia	mg/kg									14	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	16		18.3		8.4		7.8		18.9	
Moisture/Solids	Percent Solids	Percent									81.1	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-711		SB-711		SB-711		SB-711		SB-711	
		Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/12/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX		OC-SB-711-8.0/10-XXX		OC-SB-711-0.0/10-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	11	UJ	11	UJ	12	UJ	7.2	J		
Inorganics & Wet Chem	Sulfate	mg/kg	290	J	2400	J	12	J	43	J		
Inorganics & Wet Chem	Ammonia	mg/kg	42		8.8		58		50			
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg									10	U
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg									10	U
Inorganics & Wet Chem	Ignitability	mm/sec									2.2	U
Inorganics & Wet Chem	pH (Corrosivity)	pH Units									8.5	J
Moisture/Solids	Percent Moisture	Percent	12.7		9.4		14.9		23.8			
Moisture/Solids	Percent Solids	Percent	87.3		90.6		85.1		76.2			

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-711		SB-711		SB-712		SB-712		SB-712	
		Lab SDG	480-162572-1		480-162572-1		2074385		2074385		2074385	
		Sample Date	11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	42	J	11	UJ						
Inorganics & Wet Chem	Sulfate	mg/kg	500	J	13	J						
Inorganics & Wet Chem	Ammonia	mg/kg	42		9.2							
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	7.9		8.1		14.8		8.4		9.5	
Moisture/Solids	Percent Solids	Percent	92.1		91.9							

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-712		SB-712		SB-712		SB-712		SB-712	
		Lab SDG	2074385		2074385		2074385		2074385		480-162572-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX		OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX		OC-SB-712-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg									12	UJ
Inorganics & Wet Chem	Sulfate	mg/kg									4000	J
Inorganics & Wet Chem	Ammonia	mg/kg									4.4	J
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg										
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg										
Inorganics & Wet Chem	Ignitability	mm/sec										
Inorganics & Wet Chem	pH (Corrosivity)	pH Units										
Moisture/Solids	Percent Moisture	Percent	11		11.8		8.2		10		17.6	
Moisture/Solids	Percent Solids	Percent									82.4	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-712		SB-712		SB-712		SB-712		SB-712	
		Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX		OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX		OC-SB-712-0.0/10-DUP	
		Qc Code	FS		FS		FS		FS		FD	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg	6.8	J	11	UJ	12	J	6.7	J		
Inorganics & Wet Chem	Sulfate	mg/kg	520	J	12000	J	1500	J	180	J		
Inorganics & Wet Chem	Ammonia	mg/kg	3.6	J	18		11		9.9			
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg									10	U
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg									10	UJ
Inorganics & Wet Chem	Ignitability	mm/sec									2.2	U
Inorganics & Wet Chem	pH (Corrosivity)	pH Units									8.9	J
Moisture/Solids	Percent Moisture	Percent	10.9		11		11		10.2			
Moisture/Solids	Percent Solids	Percent	89.1		89		89		89.8			

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Location	SB-712		SB-712		SB-712	
		Lab SDG	480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-0.0/10-XXX		OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Qc Code	FS		FS		FS	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/kg			250	J	11	UJ
Inorganics & Wet Chem	Sulfate	mg/kg			3700	J	43	J
Inorganics & Wet Chem	Ammonia	mg/kg			140		5.9	
Inorganics & Wet Chem	Cyanide, Reactive	mg/kg	10	U				
Inorganics & Wet Chem	Sulfide, Reactive	mg/kg	10	UJ				
Inorganics & Wet Chem	Ignitability	mm/sec	2.2	U				
Inorganics & Wet Chem	pH (Corrosivity)	pH Units	8.9	J				
Moisture/Solids	Percent Moisture	Percent			8		9.3	
Moisture/Solids	Percent Solids	Percent			92		90.7	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.6 - Final Results Summary - QC General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-PIT		TA-PIT		TA-PIT		TA-PIT	
		Location	QC		QC		QC		QC	
		Lab SDG	480-162353-1		480-162353-1		480-162515-1		480-162572-1	
		Sample Date	11/7/2019		11/7/2019		11/11/2019		11/12/2019	
		Sample ID	OC-EBK-01-XXX		OC-EBK-02-XXX		OC-EBK-03-XXX		OC-EBK-04-XXX	
		Qc Code	EB		EB		EB		EB	
Method Class	**Parameter**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Inorganics & Wet Chem	Chloride	mg/l	1	U	1	U	1	U	1	U
Inorganics & Wet Chem	Sulfate	mg/l	1	U	1	U	1	U	1	U
Inorganics & Wet Chem	Ammonia	mg/l	1.5		0.19	J	0.19	J	0.27	

Notes:

U = undetected

J = estimated value

J+ = estimated biased high

J- = estimated biased low

R = rejected/unusable

FS= field sample

FD = field duplicate

EB = equipment blank

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	QC		QC		QC		QC		SB-701		SB-701	
		Lab SDG	480-162353-1		480-162353-1		480-162515-1		480-162572-1		480-162513-1		480-162513-1	
		Sample Date	11/7/2019		11/7/2019		11/11/2019		11/12/2019		11/11/2019		11/11/2019	
		Sample ID	OC-EBK-01-XXX		OC-EBK-02-XXX		OC-EBK-03-XXX		OC-EBK-04-XXX		OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX	
		Qc Code	EB		EB		EB		EB		FD		FS	
		Units	mg/l		mg/l		mg/l		mg/l		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		0.05	U	0.05	U	0.05	U	0.05	U	2500	UJ	2500	UJ

Notes:

U = undetected

J = estimated value

J+ = estimated biased high

J- = estimated biased low

R = rejected/unusable

FS= field sample

FD = field duplicate

EB = equipment blank

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-701		SB-701		SB-701		SB-701		SB-701		SB-701	
		Lab SDG	480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162513-1		480-162513-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2400	UJ	2300	UJ	1500	J	1600	J	5300	J	2200	UJ

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-702		SB-702		SB-702		SB-702		SB-702		SB-702	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2300	U	1500	J	2200	UJ	2200	UJ	2200	UJ	2200	UJ

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-702		SB-703		SB-703		SB-703		SB-703		SB-703	
		Lab SDG	480-162426-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
		Sample Date	11/8/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019	
		Sample ID	OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX		OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX	
		Qc Code	FS		FS		FD		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2300	UJ	1800	J	4900	J	2900	J	2500	U	2500	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-703		SB-703		SB-703		SB-704		SB-704		SB-704	
		Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/5/2019		11/5/2019		11/5/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-703-8.0/10-XXX		OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX		OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2200	U	2200	U	1300	J	2500	U	2700		2200	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-704		SB-704		SB-704		SB-704		SB-704		SB-705	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/8/2019	
		Sample ID	OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2200	U	1600	J	2100	U	1600	J	2200	U	1400	J

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-705		SB-705		SB-705		SB-705		SB-705		SB-705	
		Lab SDG	480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1		480-162426-1	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX	
		Qc Code	FS		FD		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2200	U	7200	J	5400	J	1500	J	2200	UJ	2200	UJ

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-706	
		Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX		OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2300	UJ	2200	UJ	2200	UJ	2200	UJ	2400	J	2200	UJ

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-706		SB-707		SB-707		SB-707		SB-707		SB-707	
		Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1		480-162353-1	
		Sample Date	11/6/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX		OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX		OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FS		FD		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2200	UJ	3200	J	2200	UJ	2200	UJ	2100	UJ	1300	J

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-707		SB-707		SB-707		SB-708		SB-708		SB-708	
		Lab SDG	480-162353-1		480-162353-1		480-162353-1		480-162140-1		480-162140-1		480-162140-1	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-707-8.0/10-XXX		OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		1500	J	2300	UJ	2100	UJ	2200	UJ	2400	UJ	2200	UJ

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-708		SB-708		SB-708		SB-708		SB-708		SB-708	
		Lab SDG	480-162140-1		480-162140-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2100	UJ	2100	UJ	2100	UJ	2300	UJ	1900	J	2200	UJ

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-709	
		Lab SDG	480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1		480-162315-1	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX		OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX	
		Qc Code	FS		FS		FS		FS		FD		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2400	U	2100	J	2900	J	2400	UJ	2300	UJ	2300	UJ

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-709		SB-709		SB-710		SB-710		SB-710		SB-710	
		Lab SDG	480-162315-1		480-162315-1		480-162199-1		480-162199-1		480-162199-1		480-162199-1	
		Sample Date	11/6/2019		11/6/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX		OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		3300	J	2300	J	2000	J	4000	J	11000	J	2200	UJ

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-710		SB-710		SB-711		SB-711		SB-711		SB-711	
		Lab SDG	480-162199-1		480-162199-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/5/2019		11/5/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2500	UJ	3700	J	2500	UJ	2900	J	1500	J	2300	UJ

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-711		SB-711		SB-711		SB-712		SB-712		SB-712	
		Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/12/2019		11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2600	UJ	4700	J	2200	UJ	2400	UJ	2100	J	2000	J

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.7 - Final Results Summary - Formaldehyde
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	TA-NC		TA-NC		TA-NC		TA-NC	
		Location	SB-712		SB-712		SB-712		SB-712	
		Lab SDG	480-162572-1		480-162572-1		480-162572-1		480-162572-1	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX		OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Qc Code	FS		FS		FS		FS	
		Units	ug/kg		ug/kg		ug/kg		ug/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aldehydes	Formaldehyde		2600	J	2200	UJ	6100	J	2200	UJ

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	QC		QC		QC		QC		SB-701	
		Lab SDG	2073662		2073662		2074032		2074262		2074150	
		Sample Date	11/7/2019		11/7/2019		11/11/2019		11/12/2019		11/11/2019	
		Sample ID	OC-EBK-01-XXX		OC-EBK-02-XXX		OC-EBK-03-XXX		OC-EBK-04-XXX		OC-SB-701-0.0/2.0-DUP	
		Qc Code	EB		EB		EB		EB		FD	
		Units	ug/l		ug/l		ug/l		ug/l		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		0.5	U	0.5	U	0.5	U	0.5	U	5.7	J
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		0.8	U	0.8	U	0.8	U	0.8	U	6.1	U
Hydrazine/aldehydes	UDMH		0.8	U	0.8	U	0.8	U	0.8	U	6.1	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-701		SB-701		SB-701		SB-701		SB-701	
		Lab SDG	2074150		2074150		2074150		2074150		2074150	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-701-0.0/2.0-XXX		OC-SB-701-8.0/10-XXX		OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		5.3	J	2.2	J	1.7	J	2.8	J	11	
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		6.1	U	6.2	U	5.9	U	6	U	6	U
Hydrazine/aldehydes	UDMH		6.1	U	6.2	U	5.9	U	6	U	6	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-701		SB-701		SB-702		SB-702		SB-702	
		Lab SDG	2074150		2074150		2073916		2073916		2073916	
		Sample Date	11/11/2019		11/11/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX		OC-SB-702-0.0/2.0-XXX		OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		5.3	U	1.8	J	5.8	U	1.5	J	5.4	U
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.3	U	6.1	U	5.8	U	5.3	U	5.4	U
Hydrazine/aldehydes	UDMH		5.3	U	6.1	U	5.8	U	5.3	U	5.4	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-702		SB-702		SB-702		SB-702		SB-703	
		Lab SDG	2073916		2073916		2073916		2073916		2073905	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/5/2019	
		Sample ID	OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX		OC-SB-702-28/29-XXX		OC-SB-703-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		5.5	U	2.1	J	5.5	U	5.5		6.7	U
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.5	U	5.4	U	5.5	U	5.3	U	6.7	U
Hydrazine/aldehydes	UDMH		5.5	U	5.4	U	5.5	U	5.3	U	6.7	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-703		SB-703		SB-703		SB-703		SB-703	
		Lab SDG	2073905		2073905		2073905		2073905		2073905	
		Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019	
		Sample ID	OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX	
		Qc Code	FD		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		4.2	J	7.4	J	6.6	U	5.8	U	5.8	U
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		6.4	U	5.8	U	6.6	U	5.8	UJ	5.8	UJ
Hydrazine/aldehydes	UDMH		6.4	U	5.8	U	6.6	U	5.8	U	5.8	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-703		SB-703		SB-704		SB-704		SB-704	
		Lab SDG	2073905		2073905		2073916		2073916		2073916	
		Sample Date	11/5/2019		11/5/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX		OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		5.8	U	9.4		86		19		1.3	J
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.8	U	5.6	U	7	UJ	6	UJ	5.7	U
Hydrazine/aldehydes	UDMH		5.8	U	5.6	U	7	U	6	U	5.7	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-704		SB-704		SB-704		SB-704		SB-704	
		Lab SDG	2073916		2073916		2073916		2073916		2073916	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-704-6.0/8.0-XXX		OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		5.5	U	1.7	J	5.3	U	5.6	U	5.7	U
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.5	U	5.3	U	5.3	UJ	5.6	U	5.7	UJ
Hydrazine/aldehydes	UDMH		5.5	U	5.3	U	5.3	U	5.6	U	5.7	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-705		SB-705		SB-705		SB-705		SB-705	
		Lab SDG	2073916		2073916		2073916		2073916		2073916	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
		Sample ID	OC-SB-705-0.0/2.0-XXX		OC-SB-705-2.0/4.0-XXX		OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX	
		Qc Code	FS		FS		FD		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		5.6	U	5.6	U	5.8	UJ	1.7	J	5.5	U
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.6	U	5.6	U	5.8	UJ	5.8	UJ	5.5	U
Hydrazine/aldehydes	UDMH		5.6	U	5.6	U	5.8	U	5.8	U	5.5	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-705		SB-705		SB-706		SB-706		SB-706	
		Lab SDG	2073916		2073916		2073662		2073662		2073662	
		Sample Date	11/8/2019		11/8/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX		OC-SB-706-0.0/2.0-XXX		OC-SB-706-2.0/4.0-XXX		OC-SB-706-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		5.8	U	5.7	U	5.4	U	5.7	U	5.6	U
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.8	U	5.7	U	5.4	U	5.7	U	5.6	U
Hydrazine/aldehydes	UDMH		5.8	U	5.7	U	5.4	U	5.7	U	5.6	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-706		SB-706		SB-706		SB-706		SB-707	
		Lab SDG	2073662		2073662		2073662		2073662		2073662	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/7/2019	
		Sample ID	OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX		OC-SB-706-26/27-XXX		OC-SB-707-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		5.5	U	6.1	U	5.6	U	5.6	U	5.6	J
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.5	U	6.1	U	5.6	U	5.6	U	6.1	U
Hydrazine/aldehydes	UDMH		5.5	U	6.1	U	5.6	U	5.6	U	6.1	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-707		SB-707		SB-707		SB-707		SB-707	
		Lab SDG	2073662		2073662		2073662		2073662		2073662	
		Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX		OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX	
		Qc Code	FS		FS		FD		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		2	J	9.3		2.6	J	2.7	J	1.7	J
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.8	U	5.4	U	5.4	U	5.3	U	5.5	U
Hydrazine/aldehydes	UDMH		5.8	U	5.4	U	5.4	U	5.3	U	5.5	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-707		SB-707		SB-708		SB-708		SB-708	
		Lab SDG	2073662		2073662		2072711		2072711		2072711	
		Sample Date	11/7/2019		11/7/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX		OC-SB-708-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		6.3	U	5.4	U	6.4		5.9	U	5.5	U
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		6.3	U	5.4	U	6.2	UJ	5.9	UJ	5.5	UJ
Hydrazine/aldehydes	UDMH		6.3	U	5.4	U	6.2	U	5.9	U	5.5	U

Notes:
U = undetected
J = estimated value
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Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-708		SB-708		SB-708		SB-708		SB-708	
		Lab SDG	2072711		2072711		2072990		2072990		2072990	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		5.5	U	5.3	UJ	5.6	UJ	1.5	J	5.9	UJ
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.5	UJ	5.3	UJ	5.6	UJ	6	UJ	5.9	UJ
Hydrazine/aldehydes	UDMH		5.5	U	5.3	U	5.6	U	6	U	5.9	U

Notes:
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Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-708		SB-709		SB-709		SB-709		SB-709	
		Lab SDG	2072990		2073905		2073905		2073905		2073905	
		Sample Date	11/4/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-708-22/24-XXX		OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX		OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		2.4	J	6.1	U	5.8	U	6.9	U	5.7	U
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.7	UJ	6.1	UJ	5.8	UJ	6.9	UJ	5.7	UJ
Hydrazine/aldehydes	UDMH		5.7	U	6.1	U	5.8	U	6.9	U	5.7	U

Notes:
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J = estimated value
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Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-709		SB-709		SB-709		SB-709		SB-710	
		Lab SDG	2073905		2073905		2073905		2073905		2072990	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/4/2019	
		Sample ID	OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX		OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX	
		Qc Code	FD		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		5.6	UJ	5.7	UJ	4.9	J	5.4	U	5.7	UJ
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.6	UJ	5.7	UJ	5.6	UJ	5.4	UJ	5.7	UJ
Hydrazine/aldehydes	UDMH		5.6	U	5.7	U	5.6	U	5.4	U	5.7	U

Notes:
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Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-710		SB-710		SB-710		SB-710		SB-710	
		Lab SDG	2072990		2072990		2072990		2072990		2072990	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/5/2019		11/5/2019	
		Sample ID	OC-SB-710-4.0/6.0-XXX		OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX		OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		1.8	J	1.6	J	1.8	J	1.7	J	1.9	J
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.8	UJ	5.8	UJ	5.4	UJ	6.3	UJ	5.4	UJ
Hydrazine/aldehydes	UDMH		5.8	U	5.8	U	5.4	U	6.3	U	5.4	U

Notes:
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J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
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Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-711		SB-711		SB-711		SB-711		SB-711	
		Lab SDG	2074385		2074385		2074385		2074385		2074385	
		Sample Date	11/12/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX		OC-SB-711-8.0/10-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		1.9	J	13		5.7		5.9	U	6	U
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.9	U	5.6	U	5.5	U	5.9	U	6	U
Hydrazine/aldehydes	UDMH		5.9	U	5.6	U	5.5	U	5.9	U	6	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-711		SB-711		SB-712		SB-712		SB-712	
		Lab SDG	2074385		2074385		2074385		2074385		2074385	
		Sample Date	11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX	
		Qc Code	FS		FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		5.5	U	5.3	U	3.8	J	7.7		5.5	U
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.5	U	5.3	U	5.8	U	5.5	U	5.5	U
Hydrazine/aldehydes	UDMH		5.5	U	5.3	U	5.8	U	5.5	U	5.5	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.8 - Final Results Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	LANCAST		LANCAST		LANCAST		LANCAST	
		Location	SB-712		SB-712		SB-712		SB-712	
		Lab SDG	2074385		2074385		2074385		2074385	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX		OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
		Qc Code	FS		FS		FS		FS	
		Units	ng/g		ng/g		ng/g		ng/g	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Hydrazine/aldehydes	Hydrazine		5.6	U	5.6	U	5.4	U	5.5	U
Hydrazine/aldehydes	Monomethylhydrazine (MMH)		5.6	U	5.6	U	5.4	U	5.5	U
Hydrazine/aldehydes	UDMH		5.6	U	5.6	U	5.4	U	5.5	U

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate
EB = equipment blank

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Lab ID	KATAHDIN		KATAHDIN		KATAHDIN		KATAHDIN		KATAHDIN		KATAHDIN	
	Location	QC		QC		QC		QC		SB-708		SB-708	
	Lab SDG	TM1916		TM1916		TM2018		TM2019		TM1675		TM1675	
	Sample Date	11/7/2019		11/7/2019		11/11/2019		11/12/2019		11/4/2019		11/4/2019	
	Sample ID	OC-EBK-01-XXX		OC-EBK-02-XXX		OC-EBK-03-XXX		OC-EBK-04-XXX		OC-SB-708-0.0/2.0-XXX		OC-SB-708-2.0/4.0-XXX	
	Qc Code	EB		EB		EB		EB		FS		FS	
	Units	mg/l		mg/l		mg/l		mg/l		mg/kg		mg/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide	0.02	U	0.02	U	0.02	U	0.02	U	0.2	U	0.21	U
Moisture/Solids	Percent Solids									89		88	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	KATAHDIN		KATAHDIN		KATAHDIN		Katahdin		Katahdin		Katahdin	
		Location	SB-708		SB-708		SB-708		SB-701		SB-701		SB-701	
		Lab SDG	TM1675		TM1675		TM1675		TM2017		TM2017		TM2017	
		Sample Date	11/4/2019		11/4/2019		11/4/2019		11/11/2019		11/11/2019		11/11/2019	
		Sample ID	OC-SB-708-4.0/6.0-XXX		OC-SB-708-6.0/8.0-XXX		OC-SB-708-8.0/10-XXX		OC-SB-701-0.0/2.0-DUP		OC-SB-701-0.0/2.0-XXX		OC-SB-701-8.0/10-XXX	
		Qc Code	FS		FS		FS		FD		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide		0.18	U	0.21	U	0.21	U	0.18	U	0.18	U	0.16	U
Moisture/Solids	Percent Solids		93		93		93		82		81		85	

Notes:
U = undetected
J = estimated value
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FD = field duplicate

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
		Location	SB-701		SB-701		SB-701		SB-701		SB-701		SB-702	
		Lab SDG	TM2017		TM2017		TM2017		TM2017		TM2017		TM1920	
		Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/11/2019		11/8/2019	
		Sample ID	OC-SB-701-6.0/8.0-XXX		OC-SB-701-4.0/6.0-XXX		OC-SB-701-2.0/4.0-XXX		OC-SB-701-31/32-XXX		OC-SB-701-20/21-XXX		OC-SB-702-0.0/2.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide		0.15	U	0.22	U	0.2	U	0.17	U	0.17	U	0.16	U
Moisture/Solids	Percent Solids		88		82		85		94		87		91	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
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FD = field duplicate

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
	Location	SB-702		SB-702		SB-702		SB-702		SB-702	
	Lab SDG	TM1920		TM1920		TM1920		TM1920		TM1920	
	Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019	
	Sample ID	OC-SB-702-2.0/4.0-XXX		OC-SB-702-4.0/6.0-XXX		OC-SB-702-6.0/8.0-XXX		OC-SB-702-8.0/10-XXX		OC-SB-702-34/35-XXX	OC-SB-702-28/29-XXX
	Qc Code	FS		FS		FS		FS		FS	FS
	Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	mg/kg
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide	0.16	U	0.17	U	0.15	U	0.14	U	0.14	U	0.17	U
Moisture/Solids	Percent Solids	93		91		91		93		92		94	

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Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
	Location	SB-703		SB-703		SB-703		SB-703		SB-703		SB-703	
	Lab SDG	TM1922		TM1922		TM1922		TM1922		TM1922		TM1922	
	Sample Date	11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019	
	Sample ID	OC-SB-703-0.0/2.0-XXX		OC-SB-703-2.0/4.0-DUP		OC-SB-703-2.0/4.0-XXX		OC-SB-703-4.0/6.0-XXX		OC-SB-703-6.0/8.0-XXX		OC-SB-703-8.0/10-XXX	
	Qc Code	FS		FD		FS		FS		FS		FS	
	Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide	0.18	U	0.19	U	0.2	U	0.2	U	0.2	U	0.2	U
Moisture/Solids	Percent Solids	75		81		83		74		82		87	

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Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
		Location	SB-703		SB-703		SB-704		SB-704		SB-704		SB-704	
		Lab SDG	TM1922		TM1922		TM1920		TM1920		TM1920		TM1920	
		Sample Date	11/5/2019		11/5/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
		Sample ID	OC-SB-703-17/18-XXX		OC-SB-703-30/32-XXX		OC-SB-704-0.0/2.0-XXX		OC-SB-704-2.0/4.0-XXX		OC-SB-704-4.0/6.0-XXX		OC-SB-704-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide		0.18	U	0.19	U	0.26	U	0.18	U	0.18	U	0.15	U
Moisture/Solids	Percent Solids		90		86		75		84		88		93	

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Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
	Location	SB-704		SB-704		SB-704		SB-704		SB-705		SB-705	
	Lab SDG	TM1920		TM1920		TM1920		TM1920		TM1920		TM1920	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/8/2019		11/8/2019	
	Sample ID	OC-SB-704-8.0/10-XXX		OC-SB-704-12/13-XXX		OC-SB-704-33/34-XXX		OC-SB-704-19/20-XXX		OC-SB-705-0.0/2.0-XXX		OC-SB-705-2.0/4.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide	0.18	U	0.16	U	0.14	U	0.16	U	0.17	U	0.17	U
Moisture/Solids	Percent Solids	94		93		92		91		90		90	

Notes:
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J = estimated value
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J- = estimated biased low
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FS= field sample
FD = field duplicate

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
		Location	SB-705		SB-705		SB-705		SB-705		SB-705		SB-706	
		Lab SDG	TM1920		TM1920		TM1920		TM1920		TM1920		TM1921	
		Sample Date	11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/8/2019		11/6/2019	
		Sample ID	OC-SB-705-4.0/6.0-DUP		OC-SB-705-4.0/6.0-XXX		OC-SB-705-6.0/8.0-XXX		OC-SB-705-8.0/10-XXX		OC-SB-705-17/18-XXX		OC-SB-706-0.0/2.0-XXX	
		Qc Code	FD		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide		0.17	U	0.2	U	0.15	U	0.2	U	0.19	U	0.2	U
Moisture/Solids	Percent Solids		82		83		88		92		91		90	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
		Location	SB-706		SB-706		SB-706		SB-706		SB-706		SB-706	
		Lab SDG	TM1921		TM1921		TM1921		TM1921		TM1921		TM1921	
		Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
		Sample ID	OC-SB-706-2.0/4.0-XXX		OC-SB-706-4.0/6.0-XXX		OC-SB-706-6.0/8.0-XXX		OC-SB-706-10/12-XXX		OC-SB-706-20/22-XXX		OC-SB-706-26/27-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide		0.18	U	0.16	U	0.17	U	0.23	U	0.16	U	0.17	U
Moisture/Solids	Percent Solids		91		90		90		73		92		93	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
	Location	SB-707		SB-707		SB-707		SB-707		SB-707		SB-707	
	Lab SDG	TM1921		TM1921		TM1921		TM1921		TM1921		TM1921	
	Sample Date	11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019		11/7/2019	
	Sample ID	OC-SB-707-0.0/2.0-XXX		OC-SB-707-2.0/4.0-XXX		OC-SB-707-4.0/6.0-XXX		OC-SB-707-6.0/8.0-DUP		OC-SB-707-6.0/8.0-XXX		OC-SB-707-8.0/10-XXX	
	Qc Code	FS		FS		FS		FD		FS		FS	
	Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide	0.17	U	0.22	U	0.16	U	0.16	U	0.15	U	0.14	U
Moisture/Solids	Percent Solids	79		86		92		93		94		92	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
		Location	SB-707		SB-707		SB-708		SB-708		SB-708		SB-708	
		Lab SDG	TM1921		TM1921		TM1711		TM1711		TM1711		TM1711	
		Sample Date	11/7/2019		11/7/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-707-12/13-XXX		OC-SB-707-15/17-XXX		OC-SB-708-16/18-XXX		OC-SB-708-28/30-XXX		OC-SB-708-33/34-XXX		OC-SB-708-22/24-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide		0.19	U	0.18	U	0.19	U	0.23	U	0.19	U	0.22	U
Moisture/Solids	Percent Solids		90		94		95		86		92		91	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
	Location	SB-709		SB-709		SB-709		SB-709		SB-709		SB-709	
	Lab SDG	TM1922		TM1922		TM1922		TM1922		TM1922		TM1922	
	Sample Date	11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019		11/6/2019	
	Sample ID	OC-SB-709-0.0/2.0-XXX		OC-SB-709-2.0/4.0-XXX		OC-SB-709-4.0/6.0-XXX		OC-SB-709-6.0/8.0-XXX		OC-SB-709-8.0/10-DUP		OC-SB-709-8.0/10-XXX	
	Qc Code	FS		FS		FS		FS		FD		FS	
	Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide	0.2	U	0.21	U	0.2	U	0.19	U	0.18	U	0.18	U
Moisture/Solids	Percent Solids	84		84		86		85		89		90	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
		Location	SB-709		SB-709		SB-710		SB-710		SB-710		SB-710	
		Lab SDG	TM1922		TM1922		TM1711		TM1711		TM1711		TM1711	
		Sample Date	11/6/2019		11/6/2019		11/4/2019		11/4/2019		11/4/2019		11/4/2019	
		Sample ID	OC-SB-709-16/17-XXX		OC-SB-709-32/33-XXX		OC-SB-710-2.0/4.0-XXX		OC-SB-710-4.0/6.0-XXX		OC-SB-710-6.0/8.0-XXX		OC-SB-710-8.0/10-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide		0.18	U	0.2	U	0.23	U	0.21	U	0.2	U	0.22	U
Moisture/Solids	Percent Solids		92		91		85		87		88		92	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

		Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
		Location	SB-710		SB-710		SB-711		SB-711		SB-711		SB-711	
		Lab SDG	TM1711		TM1711		TM2016		TM2016		TM2016		TM2016	
		Sample Date	11/5/2019		11/5/2019		11/12/2019		11/12/2019		11/12/2019		11/12/2019	
		Sample ID	OC-SB-710-23/24-XXX		OC-SB-710-36/37-XXX		OC-SB-711-0.0/2.0-XXX		OC-SB-711-4.0/6.0-XXX		OC-SB-711-2.0/4.0-XXX		OC-SB-711-6.0/8.0-XXX	
		Qc Code	FS		FS		FS		FS		FS		FS	
		Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide		0.23	U	0.2	U	0.2	U	0.17	U	0.19	U	0.17	U
Moisture/Solids	Percent Solids		83		93		82		87		90		85	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Lab ID	Katahdin		Katahdin		Katahdin		Katahdin		Katahdin		Katahdin	
	Location	SB-711		SB-711		SB-711		SB-712		SB-712		SB-712	
	Lab SDG	TM2016		TM2016		TM2016		TM2016		TM2016		TM2016	
	Sample Date	11/12/2019		11/12/2019		11/12/2019		11/11/2019		11/11/2019		11/11/2019	
	Sample ID	OC-SB-711-8.0/10-XXX		OC-SB-711-35/36-XXX		OC-SB-711-18/19-XXX		OC-SB-712-0.0/2.0-XXX		OC-SB-712-2.0/4.0-XXX		OC-SB-712-4.0/6.0-XXX	
	Qc Code	FS		FS		FS		FS		FS		FS	
	Units	mg/kg		mg/kg		mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide	0.16	U	0.13	U	0.16	U	0.19	U	0.19	U	0.18	U
Moisture/Solids	Percent Solids	76		94		93		84		90		91	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 2.9 - Final Results Summary - Dimethylformamide
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

	Lab ID	Katahdin		Katahdin		Katahdin		Katahdin	
	Location	SB-712		SB-712		SB-712		SB-712	
	Lab SDG	TM2016		TM2016		TM2016		TM2016	
	Sample Date	11/11/2019		11/11/2019		11/11/2019		11/11/2019	
	Sample ID	OC-SB-712-6.0/8.0-XXX		OC-SB-712-8.0/10-XXX		OC-SB-712-37/38-XXX		OC-SB-712-23/24-XXX	
	Qc Code	FS		FS		FS		FS	
	Units	mg/kg		mg/kg		mg/kg		mg/kg	
Method Class	**Parameter**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
DMF	Dimethylformamide	0.21	U	0.22	U	0.15	U	0.78	
Moisture/Solids	Percent Solids	89		89		92		92	

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable
FS= field sample
FD = field duplicate

Table 3.1 - Data Validation Action Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162140-1	SW8260C	SB-708	480-162140-3	OC-SB-708-2.0/4.0-XXX	2-Butanone	11	J *	11	J+	LCS-H	ug/kg	TALBFLO
480-162140-1	SW8260C	SB-708	480-162140-2	OC-SB-708-0.0/2.0-XXX	Chloroform	0.51	J B	6.4	U	BL1	ug/kg	TALBFLO
480-162140-1	SW8260C	SB-708	480-162140-5	OC-SB-708-6.0/8.0-XXX	Chloroform	0.24	J B	3.9	U	Bl1	ug/kg	TALBFLO
480-162140-1	SW8260C	SB-708	480-162140-6	OC-SB-708-8.0/10-XXX	Chloroform	0.29	J B	4.3	U	BL1	ug/kg	TALBFLO
480-162199-1	SW8260C	SB-708	480-162199-1	OC-SB-708-16/18-XXX	2-Butanone	4.1	J *	4.1	J+	LCS-H	ug/kg	TALBFLO
480-162199-1	SW8260C	SB-708	480-162199-4	OC-SB-708-33/34-XXX	2-Butanone	5.5	J *	5.5	J+	LCS-H	ug/kg	TALBFLO
480-162199-1	SW8260C	SB-710	480-162199-9	OC-SB-710-4.0/6.0-XXX	2-Butanone	7	J *	7	J+	LCS-H	ug/kg	TALBFLO
480-162199-1	SW8260C	SB-710	480-162199-10	OC-SB-710-6.0/8.0-XXX	2-Butanone	18	J *	18	J+	LCS-H	ug/kg	TALBFLO
480-162199-1	SW8260C	SB-708	480-162199-2	OC-SB-708-22/24-XXX	Chloroform	0.25	J B	3.6	U	BL1	ug/kg	TALBFLO
480-162199-1	SW8260C	SB-708	480-162199-4	OC-SB-708-33/34-XXX	Chloroform	0.55	J B	3.4	U	BL1	ug/kg	TALBFLO
480-162199-1	SW8260C	SB-710	480-162199-6	OC-SB-710-2.0/4.0-XXX	Chloroform	0.34	J B	4.8	U	BL1	ug/kg	TALBFLO
480-162199-1	SW8260C	SB-710	480-162199-7	OC-SB-710-23/24-XXX	Chloroform	0.45	J B	4.6	U	BL1	ug/kg	TALBFLO
480-162199-1	SW8260C	SB-710	480-162199-8	OC-SB-710-36/37-XXX	Chloroform	0.92	J B	3.7	U	BL1	ug/kg	TALBFLO
480-162199-1	SW8260C	SB-710	480-162199-9	OC-SB-710-4.0/6.0-XXX	Chloroform	0.23	J B	3.7	U	BL1	ug/kg	TALBFLO
480-162199-1	SW8260C	SB-710	480-162199-10	OC-SB-710-6.0/8.0-XXX	Chloroform	0.25	J B	3.7	U	BL1	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,1,1,2-Tetrachloroethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,1,1,2-Tetrachloroethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,1,1-Trichloroethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,1,1-Trichloroethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,1,2,2-Tetrachloroethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,1,2,2-Tetrachloroethane	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	1,1,2,2-Tetrachloroethane	4.9	U	4.9	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	1,1,2,2-Tetrachloroethane	3.7	U F1	3.7	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,1,2-Trichloro-1,2,2-Trifluoroethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,1,2-Trichloro-1,2,2-Trifluoroethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,1,2-Trichloroethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,1,2-Trichloroethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,1-Dichloroethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,1-Dichloroethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,1-Dichloroethene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,1-Dichloroethene	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,1-Dichloropropene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,1-Dichloropropene	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,2,3-Trichlorobenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,2,3-Trichlorobenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO

Table 3.1 - Data Validation Action Summary - VOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,2,3-Trichloropropane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,2,3-Trichloropropane	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	1,2,3-Trichloropropane	4.9	U	4.9	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	1,2,3-Trichloropropane	3.7	U F1	3.7	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,2,4-Trichlorobenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,2,4-Trichlorobenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,2,4-Trimethylbenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,2,4-Trimethylbenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,2-Dibromo-3-chloropropane	20	U	20	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,2-Dibromo-3-chloropropane	22	U F1	22	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	1,2-Dibromo-3-chloropropane	25	U	25	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	1,2-Dibromo-3-chloropropane	18	U F1	18	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,2-Dibromoethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,2-Dibromoethane	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	1,2-Dibromoethane	4.9	U	4.9	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	1,2-Dibromoethane	3.7	U F1	3.7	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,2-Dichlorobenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,2-Dichlorobenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,2-Dichloroethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,2-Dichloroethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,2-Dichloropropane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,2-Dichloropropane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,3,5-Trimethylbenzene	0.27	J	0.27	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,3,5-Trimethylbenzene	0.37	J F1	0.37	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,3-Dichlorobenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,3-Dichlorobenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,3-Dichloropropane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,3-Dichloropropane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	1,3-Dichloropropane	4.9	U	4.9	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	1,3-Dichloropropane	3.7	U F1	3.7	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,4-Dichlorobenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,4-Dichlorobenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	1,4-Dioxane	200	U	200	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	1,4-Dioxane	220	U	220	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	1,4-Dioxane	250	U	250	UJ	MS-L	ug/kg	TALBFLO

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Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162315-1	SW8260C	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	1,4-Dioxane	180	U F1	180	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	2,2-Dichloropropane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	2,2-Dichloropropane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	2,4,4-Trimethyl-1-pentene	1.4	J	1.4	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	2,4,4-Trimethyl-1-pentene	1.7	J F1	1.7	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	2,4,4-Trimethyl-2-pentene	0.46	J	0.46	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	2,4,4-Trimethyl-2-pentene	0.67	J F1	0.67	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	2-Butanone	9.5	J *	9.5	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	2-Butanone	10	J *	10	J	LCS-H, MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-5	OC-SB-709-4.0/6.0-XXX	2-Butanone	16	J *	16	J+	LCS-H	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	2-Chlorotoluene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	2-Chlorotoluene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	2-Hexanone	20	U	20	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	2-Hexanone	22	U F1	22	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	2-Hexanone	25	U	25	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	2-Hexanone	18	U F1	18	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	4-Chlorotoluene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	4-Chlorotoluene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	4-iso-Propyltoluene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	4-iso-Propyltoluene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	4-Methyl-2-pentanone	20	U	20	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	4-Methyl-2-pentanone	22	U F1	22	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	4-Methyl-2-pentanone	25	U	25	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	4-Methyl-2-pentanone	18	U F1	18	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Acetic acid, methyl ester	40	U	40	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Acetic acid, methyl ester	44	U	44	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Acetic acid, methyl ester	49	U	49	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Acetic acid, methyl ester	37	U F1	37	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Acetone	43	J	43	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Acetone	37	J	37	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Acetone	10	J	10	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Acetone	11	J F1	11	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Benzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Benzene	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO

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Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Bromobenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Bromobenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Bromochloromethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Bromochloromethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Bromodichloromethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Bromodichloromethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Bromoform	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Bromoform	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Bromomethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Bromomethane	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Butane, 2-methoxy-2-methyl-	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Butane, 2-methoxy-2-methyl-	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Carbon disulfide	6.5		6.5	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Carbon disulfide	4.4		4.4	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Carbon tetrachloride	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Carbon tetrachloride	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Chlorobenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Chlorobenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Chloroethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Chloroethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-10	OC-SB-703-0.0/2.0-XXX	Chloroform	0.35	J B	4.7	U	BL1	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Chloroform	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Chloroform	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-14	OC-SB-703-30/32-XXX	Chloroform	1.4	J B	3	U	BL1	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-4	OC-SB-709-32/33-XXX	Chloroform	0.33	J B	4.2	U	BL1	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-5	OC-SB-709-4.0/6.0-XXX	Chloroform	0.3	J B	4.4	U	BL1	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Chloromethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Chloromethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	cis-1,2-Dichloroethene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	cis-1,2-Dichloroethene	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	cis-1,3-Dichloropropene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	cis-1,3-Dichloropropene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Cyclohexane	20	U	20	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Cyclohexane	22	U F1	22	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Dibromochloromethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO

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480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Dibromochloromethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Dibromomethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Dibromomethane	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Dichlorodifluoromethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Dichlorodifluoromethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Diethyl ether	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Diethyl ether	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Ethylbenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Ethylbenzene	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Ethyl-t-Butyl Ether	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Ethyl-t-Butyl Ether	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Hexachlorobutadiene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Hexachlorobutadiene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Isopropyl ether	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Isopropyl ether	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Isopropylbenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Isopropylbenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Methyl cyclohexane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Methyl cyclohexane	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Methyl Tertbutyl Ether	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Methyl Tertbutyl Ether	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Methylene chloride	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Methylene chloride	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Naphthalene	20	U	20	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Naphthalene	1	J F1 B	22	UJ	BL1, MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-14	OC-SB-703-30/32-XXX	Naphthalene	0.42	J B	15	U	BL1	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Naphthalene	25	U	25	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Naphthalene	18	U F1	18	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	n-Butylbenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	n-Butylbenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Propylbenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Propylbenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	sec-Butylbenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	sec-Butylbenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Styrene	4	U	4	UJ	MS-L	ug/kg	TALBFLO

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Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Styrene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	tert-Butylbenzene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	tert-Butylbenzene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Tetrachloroethene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Tetrachloroethene	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Tetrahydrofuran	40	U	40	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Tetrahydrofuran	44	U F1	44	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Tetrahydrofuran	49	U	49	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Tetrahydrofuran	37	U F1	37	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Toluene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Toluene	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	trans-1,2-Dichloroethene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	trans-1,2-Dichloroethene	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	trans-1,3-Dichloropropene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	trans-1,3-Dichloropropene	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Trichloroethene	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Trichloroethene	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Trichlorofluoromethane	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Trichlorofluoromethane	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Vinyl chloride	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Vinyl chloride	4.4	U	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Xylene, o	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Xylene, o	4.4	U F1	4.4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Xylenes (m&p)	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Xylenes (m&p)	0.77	J F1	0.77	J-	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Xylenes, Total	4	U	4	UJ	MS-L	ug/kg	TALBFLO
480-162315-1	SW8260C	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Xylenes, Total	0.77	J	0.77	J-	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	1,1,2,2-Tetrachloroethane	4.1	U	4.1	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	1,1,2,2-Tetrachloroethane	3.8	U F1	3.8	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	1,2,3-Trichlorobenzene	4.1	U	4.1	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	1,2,3-Trichlorobenzene	3.8	U F1	3.8	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	1,2,3-Trichloropropane	4.1	U	4.1	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	1,2,3-Trichloropropane	3.8	U F1	3.8	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	1,2-Dibromo-3-chloropropane	20	U	20	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	1,2-Dibromo-3-chloropropane	19	U F1	19	UJ	MS-L	ug/kg	TALBFLO

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Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	1,2-Dibromoethane	4.1	U	4.1	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	1,2-Dibromoethane	3.8	U F1	3.8	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	1,3-Dichloropropane	4.1	U	4.1	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	1,3-Dichloropropane	3.8	U F1	3.8	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	1,4-Dioxane	200	U	200	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	1,4-Dioxane	190	U F1	190	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-706	480-162353-3	OC-SB-706-10/12-XXX	2-Butanone	17	J *	17	J+	LCS-H	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-706	480-162353-4	OC-SB-706-2.0/4.0-XXX	2-Butanone	15	J *	15	J+	LCS-H	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-10	OC-SB-707-2.0/4.0-XXX	2-Butanone	21	*	21	J+	LCS-H	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	2-Hexanone	20	U	20	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	2-Hexanone	19	U F1	19	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	4-Methyl-2-pentanone	20	U	20	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	4-Methyl-2-pentanone	19	U F1	19	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Acetic acid, methyl ester	41	U	41	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Acetic acid, methyl ester	38	U F1	38	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-706	480-162353-3	OC-SB-706-10/12-XXX	Acetone	71	J	210	U	BL2	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-706	480-162353-4	OC-SB-706-2.0/4.0-XXX	Acetone	59	J	210	U	BL2	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-706	480-162353-5	OC-SB-706-20/22-XXX	Acetone	22	J	250	U	BL2	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-706	480-162353-6	OC-SB-706-26/27-XXX	Acetone	10	J	150	U	BL2	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-706	480-162353-7	OC-SB-706-4.0/6.0-XXX	Acetone	30	J	190	U	BL2	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-706	480-162353-8	OC-SB-706-6.0/8.0-XXX	Acetone	14	J	190	U	BL2	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-9	OC-SB-707-0.0/2.0-XXX	Acetone	64	J	260	U	BL2	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-14	OC-SB-707-12/13-XXX	Acetone	16	J	250	U	BL2	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-15	OC-SB-707-15/17-XXX	Acetone	7.4	J	220	U	BL2	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-10	OC-SB-707-2.0/4.0-XXX	Acetone	74	J	200	U	BL2	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-11	OC-SB-707-4.0/6.0-XXX	Acetone	17	J	210	U	BL2	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Acetone	27	J	200	UJ	BL2, MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Acetone	11	J F1	190	UJ	BL2, MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-17	OC-SB-707-8.0/10-XXX	Acetone	13	J	190	U	BL2	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Hexachlorobutadiene	4.1	U	4.1	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Hexachlorobutadiene	3.8	U F1	3.8	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-706	480-162353-3	OC-SB-706-10/12-XXX	Naphthalene	0.95	J B	21	U	BL1	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Naphthalene	20	U	20	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Naphthalene	19	U F1	19	UJ	MS-L	ug/kg	TALBFLO
480-162353-1	SW8260C	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Tetrahydrofuran	41	U	41	UJ	MS-L	ug/kg	TALBFLO

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480-162353-1	SW8260C	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Tetrahydrofuran	38	U F1	38	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	1,1,2,2-Tetrachloroethane	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	1,1,2,2-Tetrachloroethane	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	1,2,3-Trichlorobenzene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	1,2,3-Trichlorobenzene	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	1,2,3-Trichloropropane	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	1,2,3-Trichloropropane	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	1,2,4-Trichlorobenzene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	1,2,4-Trichlorobenzene	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	1,2,4-Trimethylbenzene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	1,2,4-Trimethylbenzene	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	1,2-Dibromo-3-chloropropane	23	U	23	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	1,2-Dibromo-3-chloropropane	24	U F1	24	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	1,2-Dichlorobenzene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	1,2-Dichlorobenzene	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	1,3-Dichlorobenzene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	1,3-Dichlorobenzene	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	1,4-Dichlorobenzene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	1,4-Dichlorobenzene	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	2,4,4-Trimethyl-1-pentene	11		11	J-	MS-L, MS-RPD	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	2,4,4-Trimethyl-1-pentene	7.4	F1 F2	7.4	J-	MS-L, MS-RPD	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	2,4,4-Trimethyl-2-pentene	3.8	J	3.8	J-	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	2,4,4-Trimethyl-2-pentene	2.3	J F1	2.3	J-	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-702	480-162426-14	OC-SB-702-2.0/4.0-XXX	2-Butanone	14	J *	14	J+	LCS-H	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-702	480-162426-15	OC-SB-702-4.0/6.0-XXX	2-Butanone	29	*	29	J+	LCS-H	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-702	480-162426-16	OC-SB-702-6.0/8.0-XXX	2-Butanone	4.4	J *	4.4	J+	LCS-H	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-2	OC-SB-704-0.0/2.0-XXX	2-Butanone	17	J *	17	J+	LCS-H	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-5	OC-SB-704-2.0/4.0-XXX	2-Butanone	23	J *	23	J+	LCS-H	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-7	OC-SB-704-4.0/6.0-XXX	2-Butanone	64	*	64	J+	LCS-H	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-8	OC-SB-704-6.0/8.0-XXX	2-Butanone	9.6	J *	9.6	J+	LCS-H	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-9	OC-SB-704-8.0/10-XXX	2-Butanone	29	*	29	J+	LCS-H	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-12	OC-SB-705-2.0/4.0-XXX	2-Butanone	14	J *	14	J+	LCS-H	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	2-Butanone	32	*	32	J+	LCS-H	ug/kg	TALBFLO

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480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	2-Butanone	20	J *	20	J+	LCS-H	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-20	OC-SB-705-6.0/8.0-XXX	2-Butanone	560	*	560	J+	LCS-H	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	2-Hexanone	23	U	23	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	2-Hexanone	24	U F1	24	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	4-iso-Propyltoluene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	4-iso-Propyltoluene	0.52	J F1	0.52	J-	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	4-Methyl-2-pentanone	23	U	23	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	4-Methyl-2-pentanone	24	U F1	24	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Acetic acid, methyl ester	150		150	J+	MS-H, FD	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Acetic acid, methyl ester	48	U F1	48	UJ	FD	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Acetone	69	J	69	J-	MS-L, MS-RPD	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Acetone	74	J F1 F2	74	J-	MS-L, MS-RPD	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-702	480-162426-13	OC-SB-702-0.0/2.0-XXX	Chloroform	0.37	J B	4.7	U	BL1	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-6	OC-SB-704-33/34-XXX	Chloroform	0.34	J B	4.3	U	BL1	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Hexachlorobutadiene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Hexachlorobutadiene	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Methyl cyclohexane	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Methyl cyclohexane	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-702	480-162426-13	OC-SB-702-0.0/2.0-XXX	Methylene chloride	6.5	B	6.5	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-702	480-162426-14	OC-SB-702-2.0/4.0-XXX	Methylene chloride	5.6	B	5.6	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-702	480-162426-24	OC-SB-702-28/29-XXX	Methylene chloride	21	B	21	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-702	480-162426-25	OC-SB-702-34/35-XXX	Methylene chloride	57	B	57	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-702	480-162426-15	OC-SB-702-4.0/6.0-XXX	Methylene chloride	8.4	B	8.4	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-702	480-162426-16	OC-SB-702-6.0/8.0-XXX	Methylene chloride	4.5	B	4.5	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-702	480-162426-26	OC-SB-702-8.0/10-XXX	Methylene chloride	20	B	20	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-2	OC-SB-704-0.0/2.0-XXX	Methylene chloride	14	B	14	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-3	OC-SB-704-12/13-XXX	Methylene chloride	7.8	B	7.8	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-4	OC-SB-704-19/20-XXX	Methylene chloride	6.7	B	6.7	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-5	OC-SB-704-2.0/4.0-XXX	Methylene chloride	11	B	11	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-6	OC-SB-704-33/34-XXX	Methylene chloride	7.2	B	7.2	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-7	OC-SB-704-4.0/6.0-XXX	Methylene chloride	6.1	B	6.1	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-8	OC-SB-704-6.0/8.0-XXX	Methylene chloride	4.7	B	4.7	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-704	480-162426-9	OC-SB-704-8.0/10-XXX	Methylene chloride	8.8	B	8.8	U	BL1, BL2	ug/kg	TALBFLO

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480-162426-1	SW8260C	SB-705	480-162426-11	OC-SB-705-0.0/2.0-XXX	Methylene chloride	9.7	B	9.7	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-17	OC-SB-705-17/18-XXX	Methylene chloride	9.1	B	9.1	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-12	OC-SB-705-2.0/4.0-XXX	Methylene chloride	6.2	B	6.2	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Methylene chloride	6.9	B	6.9	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Methylene chloride	7.3	B	7.3	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-20	OC-SB-705-6.0/8.0-XXX	Methylene chloride	29	B	29	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-21	OC-SB-705-8.0/10-XXX	Methylene chloride	26	B	26	U	BL1, BL2	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Naphthalene	23	U	23	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Naphthalene	24	U F1	24	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	n-Butylbenzene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	n-Butylbenzene	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Propylbenzene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Propylbenzene	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	sec-Butylbenzene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	sec-Butylbenzene	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Styrene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Styrene	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	tert-Butylbenzene	4.7	U	4.7	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	tert-Butylbenzene	4.8	U F1	4.8	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Tetrahydrofuran	47	U	47	UJ	MS-L	ug/kg	TALBFLO
480-162426-1	SW8260C	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Tetrahydrofuran	48	U F1	48	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	1,1,2,2-Tetrachloroethane	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	1,1,2,2-Tetrachloroethane	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	1,1,2-Trichloroethane	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	1,1,2-Trichloroethane	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	1,2,3-Trichlorobenzene	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	1,2,3-Trichlorobenzene	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	1,2,3-Trichloropropane	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	1,2,3-Trichloropropane	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	1,2,4-Trichlorobenzene	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	1,2,4-Trichlorobenzene	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	1,2-Dibromo-3-chloropropane	29	U	29	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	1,2-Dibromo-3-chloropropane	22	U F1	22	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	1,2-Dibromoethane	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	1,2-Dibromoethane	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO

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480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	1,2-Dichlorobenzene	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	1,2-Dichlorobenzene	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	1,3-Dichloropropane	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	1,3-Dichloropropane	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	1,4-Dichlorobenzene	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	1,4-Dichlorobenzene	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	1,4-Dioxane	290	U	290	UJ	MS-L, MS-RPD	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	1,4-Dioxane	220	U F1 F2	220	UJ	MS-L, MS-RPD	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	2,4,4-Trimethyl-1-pentene	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	2,4,4-Trimethyl-1-pentene	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	2,4,4-Trimethyl-2-pentene	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	2,4,4-Trimethyl-2-pentene	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-4	OC-SB-701-2.0/4.0-XXX	2-Butanone	21	J *	21	J+	LCS-H	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-6	OC-SB-701-4.0/6.0-XXX	2-Butanone	23	J *	23	J+	LCS-H	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	2-Hexanone	29	U	29	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	2-Hexanone	22	U F1	22	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	4-iso-Propyltoluene	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	4-iso-Propyltoluene	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Acetic acid, methyl ester	58	U	58	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Acetic acid, methyl ester	43	U F1	43	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Acetone	7.4	J	7.4	J-	MS-L, MS-RPD, FD	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Acetone	14	J F1 F2	14	J-	MS-L, MS-RPD, FD	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Bromoform	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Bromoform	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Hexachlorobutadiene	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Hexachlorobutadiene	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Methyl cyclohexane	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Methyl cyclohexane	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Methylene chloride	18	B	18	U	BL1, BL2	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Methylene chloride	19	B	19	U	BL1, BL2	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-4	OC-SB-701-2.0/4.0-XXX	Methylene chloride	26	B	26	U	BL1, BL2	ug/kg	TALBFLO

Table 3.1 - Data Validation Action Summary - VOCs
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Olin Chemical Superfund Site
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Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162513-1	SW8260C	SB-701	480-162513-9	OC-SB-701-20/21-XXX	Methylene chloride	26	B	26	U	BL1, BL2	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-5	OC-SB-701-31/32-XXX	Methylene chloride	15	B	15	U	BL1, BL2	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-6	OC-SB-701-4.0/6.0-XXX	Methylene chloride	17	B	17	U	BL1, BL2	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-7	OC-SB-701-6.0/8.0-XXX	Methylene chloride	25	B	25	U	BL1, BL2	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-8	OC-SB-701-8.0/10-XXX	Methylene chloride	26	B	26	U	BL1, BL2	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Naphthalene	29	U	29	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Naphthalene	22	U F1	22	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	n-Butylbenzene	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	n-Butylbenzene	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	sec-Butylbenzene	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	sec-Butylbenzene	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	tert-Butylbenzene	5.8	U	5.8	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	tert-Butylbenzene	4.3	U F1	4.3	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Tetrahydrofuran	58	U	58	UJ	MS-L	ug/kg	TALBFLO
480-162513-1	SW8260C	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Tetrahydrofuran	43	U F1	43	UJ	MS-L	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-16	OC-SB-711-6.0/8.0-XXX	2-Butanone	5.7	J *	5.7	J+	LCS-H	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-7	OC-SB-712-2.0/4.0-XXX	2-Butanone	6.9	J *	6.9	J+	LCS-H	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-1	OC-SB-711-0.0/2.0-XXX	Acetone	14	J	300	U	BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-13	OC-SB-711-18/19-XXX	Acetone	7.3	J	200	U	BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-14	OC-SB-711-35/36-XXX	Acetone	16	J	190	U	BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-16	OC-SB-711-6.0/8.0-XXX	Acetone	23	J *	240	UJ	BL2, LCS-RPD	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-6	OC-SB-712-0.0/2.0-XXX	Acetone	21	J	230	U	BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-7	OC-SB-712-2.0/4.0-XXX	Acetone	42	J	220	U	BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-8	OC-SB-712-23/24-XXX	Acetone	16	J	210	U	BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-9	OC-SB-712-37/38-XXX	Acetone	14	J	210	U	BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-10	OC-SB-712-4.0/6.0-XXX	Acetone	27	J	260	U	BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-11	OC-SB-712-6.0/8.0-XXX	Acetone	57	J	220	U	BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-12	OC-SB-712-8.0/10-XXX	Acetone	14	J	210	U	BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-2	OC-SB-711-2.0/4.0-XXX	Bromomethane	1900	U *	1900	UJ	LCS-L	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-3	OC-SB-711-4.0/6.0-XXX	Bromomethane	1000	U *	1000	UJ	LCS-L	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-17	OC-SB-711-8.0/10-XXX	Bromomethane	1200	U *	1200	UJ	LCS-L	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-2	OC-SB-711-2.0/4.0-XXX	Chloroethane	1900	U *	1900	UJ	LCS-L	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-3	OC-SB-711-4.0/6.0-XXX	Chloroethane	1000	U *	1000	UJ	LCS-L	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-17	OC-SB-711-8.0/10-XXX	Chloroethane	1200	U *	1200	UJ	LCS-L	ug/kg	TALBFLO

Table 3.1 - Data Validation Action Summary - VOCs
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Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162572-1	SW8260C	SB-711	480-162572-16	OC-SB-711-6.0/8.0-XXX	Chloroform	0.6	J B	4.7	U	BL1	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-16	OC-SB-711-6.0/8.0-XXX	Dichlorodifluoromethane	4.7	U *	4.7	UJ	LCS-RPD	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-1	OC-SB-711-0.0/2.0-XXX	Methylene chloride	26	* B	26	U	BL1, BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-13	OC-SB-711-18/19-XXX	Methylene chloride	30	* B	30	U	BL1, BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-14	OC-SB-711-35/36-XXX	Methylene chloride	17	* B	17	U	BL1, BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-711	480-162572-16	OC-SB-711-6.0/8.0-XXX	Methylene chloride	10	B	10	U	BL1, BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-6	OC-SB-712-0.0/2.0-XXX	Methylene chloride	27	* B	27	U	BL1, BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-7	OC-SB-712-2.0/4.0-XXX	Methylene chloride	20	* B	20	U	BL1, BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-8	OC-SB-712-23/24-XXX	Methylene chloride	23	* B	23	U	BL1, BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-9	OC-SB-712-37/38-XXX	Methylene chloride	20	* B	20	U	BL1, BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-10	OC-SB-712-4.0/6.0-XXX	Methylene chloride	22	* B	22	U	BL1, BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-11	OC-SB-712-6.0/8.0-XXX	Methylene chloride	21	* B	21	U	BL1, BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-12	OC-SB-712-8.0/10-XXX	Methylene chloride	24	* B	24	U	BL1, BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-8	OC-SB-712-23/24-XXX	Toluene	0.75	J	4.2	U	BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-9	OC-SB-712-37/38-XXX	Toluene	0.35	J	4.3	U	BL2	ug/kg	TALBFLO
480-162572-1	SW8260C	SB-712	480-162572-10	OC-SB-712-4.0/6.0-XXX	Toluene	0.42	J	5.3	U	BL2	ug/kg	TALBFLO

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable

BL1	method BLank qualifier
BL2	field BLank qualifier
FD	Field Duplicate precision goal exceeded
LCSH	Lab Control Sample recovery High
LCSL	Lab Control Sample recovery Low
LCSRPD	Lab Control Sample/Lab Control Sample Duplicate Relative Percent Difference precision goal exceeded
MSH	Matrix Spike and/or Matrix Spike duplicate recovery High
MSL	Matrix Spike and/or Matrix Spike duplicate recovery Low
MSRPD	Matrix Spike and/or Matrix Spike duplicate Relative Percent Difference precision goal exceeded

Table 3.2 - Data Validation Action Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162140-1	SW8270D	SB-708	480-162140-2	OC-SB-708-0.0/2.0-XXX	Benzaldehyde	72	U *	72	R	LCSL	ug/kg	TA-PIT
480-162140-1	SW8270D	SB-708	480-162140-2	OC-SB-708-0.0/2.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162140-1	SW8270D	SB-708	480-162140-3	OC-SB-708-2.0/4.0-XXX	Benzaldehyde	77	U *	77	R	LCSL	ug/kg	TA-PIT
480-162140-1	SW8270D	SB-708	480-162140-3	OC-SB-708-2.0/4.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162140-1	SW8270D	SB-708	480-162140-4	OC-SB-708-4.0/6.0-XXX	Benzaldehyde	74	U *	74	R	LCSL	ug/kg	TA-PIT
480-162140-1	SW8270D	SB-708	480-162140-4	OC-SB-708-4.0/6.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162140-1	SW8270D	SB-708	480-162140-5	OC-SB-708-6.0/8.0-XXX	Benzaldehyde	71	U *	71	R	LCSL	ug/kg	TA-PIT
480-162140-1	SW8270D	SB-708	480-162140-5	OC-SB-708-6.0/8.0-XXX	Phthalic anhydride	10000	U	10000	UJ	LCSM	ug/kg	TALBFLO
480-162140-1	SW8270D	SB-708	480-162140-6	OC-SB-708-8.0/10-XXX	Benzaldehyde	70	U *	70	R	LCSL	ug/kg	TA-PIT
480-162140-1	SW8270D	SB-708	480-162140-6	OC-SB-708-8.0/10-XXX	Phthalic anhydride	10000	U	10000	UJ	LCSM	ug/kg	TALBFLO
480-162199-1	SW8270D	SB-708	480-162199-1	OC-SB-708-16/18-XXX	2-Nitroaniline	180	U	180	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-708	480-162199-1	OC-SB-708-16/18-XXX	4-Nitrophenol	180	U	180	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Benzaldehyde	69	U *	69	R	LCSL	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162199-1	SW8270D	SB-708	480-162199-2	OC-SB-708-22/24-XXX	2-Nitroaniline	180	U	180	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-708	480-162199-2	OC-SB-708-22/24-XXX	4-Nitrophenol	180	U	180	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-708	480-162199-2	OC-SB-708-22/24-XXX	Benzaldehyde	72	U *	72	R	LCSL	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-708	480-162199-2	OC-SB-708-22/24-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162199-1	SW8270D	SB-708	480-162199-3	OC-SB-708-28/30-XXX	4-Nitrophenol	200	U	200	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-708	480-162199-3	OC-SB-708-28/30-XXX	Benzaldehyde	78	U *	78	R	LCSL	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-708	480-162199-3	OC-SB-708-28/30-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162199-1	SW8270D	SB-708	480-162199-4	OC-SB-708-33/34-XXX	2-Nitroaniline	180	U	180	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-708	480-162199-4	OC-SB-708-33/34-XXX	4-Nitrophenol	180	U	180	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-708	480-162199-4	OC-SB-708-33/34-XXX	Benzaldehyde	72	U *	72	R	LCSL	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-708	480-162199-4	OC-SB-708-33/34-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162199-1	SW8270D	SB-710	480-162199-6	OC-SB-710-2.0/4.0-XXX	2-Nitroaniline	220	U	220	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-6	OC-SB-710-2.0/4.0-XXX	4-Nitrophenol	220	U	220	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-6	OC-SB-710-2.0/4.0-XXX	Benzaldehyde	85	U *	85	R	LCSL	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-6	OC-SB-710-2.0/4.0-XXX	Phthalic anhydride	13000	U	13000	UJ	LCSM	ug/kg	TALBFLO
480-162199-1	SW8270D	SB-710	480-162199-7	OC-SB-710-23/24-XXX	2-Nitroaniline	210	U	210	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-7	OC-SB-710-23/24-XXX	4-Nitrophenol	210	U	210	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-7	OC-SB-710-23/24-XXX	Benzaldehyde	82	U *	82	R	LCSL	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-7	OC-SB-710-23/24-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162199-1	SW8270D	SB-710	480-162199-8	OC-SB-710-36/37-XXX	2-Nitroaniline	180	U	180	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-8	OC-SB-710-36/37-XXX	4-Nitrophenol	180	U	180	UJ	CCV%D	ug/kg	TA-PIT

Table 3.2 - Data Validation Action Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162199-1	SW8270D	SB-710	480-162199-8	OC-SB-710-36/37-XXX	Benzaldehyde	72	U *	72	R	LCSL	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-8	OC-SB-710-36/37-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162199-1	SW8270D	SB-710	480-162199-9	OC-SB-710-4.0/6.0-XXX	2-Nitroaniline	190	U	190	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-9	OC-SB-710-4.0/6.0-XXX	4-Nitrophenol	190	U	190	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-9	OC-SB-710-4.0/6.0-XXX	Benzaldehyde	75	U *	75	R	LCSL	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-9	OC-SB-710-4.0/6.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162199-1	SW8270D	SB-710	480-162199-10	OC-SB-710-6.0/8.0-XXX	2-Nitroaniline	190	U	190	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-10	OC-SB-710-6.0/8.0-XXX	4-Nitrophenol	190	U	190	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-10	OC-SB-710-6.0/8.0-XXX	Benzaldehyde	75	U *	75	R	LCSL	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-10	OC-SB-710-6.0/8.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162199-1	SW8270D	SB-710	480-162199-11	OC-SB-710-8.0/10-XXX	4-Nitrophenol	190	U	190	UJ	CCV%D	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-11	OC-SB-710-8.0/10-XXX	Benzaldehyde	73	U *	73	R	LCSL	ug/kg	TA-PIT
480-162199-1	SW8270D	SB-710	480-162199-11	OC-SB-710-8.0/10-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-703	480-162315-10	OC-SB-703-0.0/2.0-XXX	Phthalic anhydride	13000	U	13000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-703	480-162315-11	OC-SB-703-17/18-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	2,4-Dinitrophenol	380	U	380	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	4,6-Dinitro-2-methylphenol	200	U	200	R	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Benzaldehyde	5.8	J	5.8	J-	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Benzoic Acid	50	J	50	J-	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Bis(2-Ethylhexyl)phthalate	1400		1400	J	FD	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Hexachlorocyclopentadiene	38	U	38	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	N-Nitrosodiphenylamine	350		350	J	FD	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Pentachlorophenol	200	U	200	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	2,4-Dinitrophenol	390	U F1	390	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	4,6-Dinitro-2-methylphenol	200	U F1	200	R	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Benzaldehyde	79	U F1	79	R	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Benzoic Acid	200	U F1	200	R	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Bis(2-Ethylhexyl)phthalate	650	F1	650	J	FD	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Hexachlorocyclopentadiene	39	U F1	39	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	N-Nitrosodiphenylamine	130		130	J	FD	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Pentachlorophenol	200	U F1 F2	200	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-703	480-162315-14	OC-SB-703-30/32-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-703	480-162315-15	OC-SB-703-4.0/6.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO

Table 3.2 - Data Validation Action Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
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Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162315-1	SW8270D	SB-703	480-162315-16	OC-SB-703-6.0/8.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	1,2,4,5-Tetrachlorobenzene	36	U	36	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	2,4-Dinitrophenol	360	U F1	360	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	4-Chloroaniline	36	U F1	36	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	Acetophenone	73	U F1	73	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	Aniline	36	U F1	36	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	Benzaldehyde	73	U F1	73	R	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	Benzoic Acid	180	U F1	180	R	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	Bis(2-Chloroethyl)ether	7.3	U F1	7.3	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	Hexachlorocyclopentadiene	36	U	36	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	Hexachloroethane	36	U F1	36	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	Nitrobenzene	72	U F1	72	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	N-Nitrosodimethylamine	36	U F1	36	UJ	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-709	480-162315-18	OC-SB-709-0.0/2.0-XXX	Benzaldehyde	80	U *	80	R	LCSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-709	480-162315-18	OC-SB-709-0.0/2.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-709	480-162315-2	OC-SB-709-16/17-XXX	Benzaldehyde	72	U *	72	R	LCSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-709	480-162315-2	OC-SB-709-16/17-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-709	480-162315-3	OC-SB-709-2.0/4.0-XXX	Benzaldehyde	230	U *	230	R	LCSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-709	480-162315-3	OC-SB-709-2.0/4.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-709	480-162315-4	OC-SB-709-32/33-XXX	Benzaldehyde	72	U *	72	R	LCSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-709	480-162315-4	OC-SB-709-32/33-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-709	480-162315-5	OC-SB-709-4.0/6.0-XXX	Benzaldehyde	77	U *	77	R	LCSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-709	480-162315-5	OC-SB-709-4.0/6.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-709	480-162315-6	OC-SB-709-6.0/8.0-XXX	Benzaldehyde	77	U *	77	R	LCSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-709	480-162315-6	OC-SB-709-6.0/8.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Benzaldehyde	77	U *	77	R	LCSL, MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Benzoic Acid	200	U	200	R	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162315-1	SW8270D	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Benzaldehyde	78	U *	78	R	LCSL, MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Benzoic Acid	200	U F1	200	R	MSL	ug/kg	TA-PIT
480-162315-1	SW8270D	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-706	480-162353-2	OC-SB-706-0.0/2.0-XXX	Benzaldehyde	150	U *	150	R	LCSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-706	480-162353-2	OC-SB-706-0.0/2.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-706	480-162353-3	OC-SB-706-10/12-XXX	Benzaldehyde	81	U *	81	R	LCSL	ug/kg	TA-PIT

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Data Validation Report
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Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162353-1	SW8270D	SB-706	480-162353-3	OC-SB-706-10/12-XXX	Phthalic anhydride	60000	U	60000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-706	480-162353-4	OC-SB-706-2.0/4.0-XXX	Benzaldehyde	720	U *	720	R	LCSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-706	480-162353-4	OC-SB-706-2.0/4.0-XXX	Phthalic anhydride	110000	U	110000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-706	480-162353-5	OC-SB-706-20/22-XXX	Benzaldehyde	72	U *	72	R	LCSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-706	480-162353-5	OC-SB-706-20/22-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-706	480-162353-6	OC-SB-706-26/27-XXX	Benzaldehyde	71	U *	71	R	LCSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-706	480-162353-6	OC-SB-706-26/27-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-706	480-162353-7	OC-SB-706-4.0/6.0-XXX	Benzaldehyde	72	U *	72	R	LCSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-706	480-162353-7	OC-SB-706-4.0/6.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-706	480-162353-8	OC-SB-706-6.0/8.0-XXX	Benzaldehyde	150	U *	150	R	LCSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-706	480-162353-8	OC-SB-706-6.0/8.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-707	480-162353-9	OC-SB-707-0.0/2.0-XXX	Benzaldehyde	330	U *	330	R	LCSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-707	480-162353-9	OC-SB-707-0.0/2.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-707	480-162353-14	OC-SB-707-12/13-XXX	Benzaldehyde	75	U *	75	R	LCSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-707	480-162353-14	OC-SB-707-12/13-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-707	480-162353-15	OC-SB-707-15/17-XXX	Benzaldehyde	71	U *	71	R	LCSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-707	480-162353-15	OC-SB-707-15/17-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-707	480-162353-10	OC-SB-707-2.0/4.0-XXX	Benzaldehyde	73	U *	73	R	LCSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-707	480-162353-10	OC-SB-707-2.0/4.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-707	480-162353-11	OC-SB-707-4.0/6.0-XXX	Benzaldehyde	72	U *	72	R	LCSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-707	480-162353-11	OC-SB-707-4.0/6.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Benzaldehyde	71	U *	71	R	LCSL, MSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Benzoic Acid	180	U	180	R	MSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Phthalic anhydride	10000	U	10000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Benzaldehyde	69	U * F1	69	R	LCSL, MSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Benzoic Acid	180	U F1	180	R	MSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162353-1	SW8270D	SB-707	480-162353-17	OC-SB-707-8.0/10-XXX	Benzaldehyde	72	U	72	R	LCSL	ug/kg	TA-PIT
480-162353-1	SW8270D	SB-707	480-162353-17	OC-SB-707-8.0/10-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-702	480-162426-13	OC-SB-702-0.0/2.0-XXX	Benzaldehyde	77	U *	77	R	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-702	480-162426-13	OC-SB-702-0.0/2.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-702	480-162426-14	OC-SB-702-2.0/4.0-XXX	Benzaldehyde	71	U *	71	R	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-702	480-162426-14	OC-SB-702-2.0/4.0-XXX	Phthalic anhydride	10000	U	10000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-702	480-162426-24	OC-SB-702-28/29-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-702	480-162426-25	OC-SB-702-34/35-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO

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Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162426-1	SW8270D	SB-702	480-162426-15	OC-SB-702-4.0/6.0-XXX	Benzaldehyde	75	U *	75	R	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-702	480-162426-15	OC-SB-702-4.0/6.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-702	480-162426-16	OC-SB-702-6.0/8.0-XXX	Benzaldehyde	150	U *	150	R	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-702	480-162426-16	OC-SB-702-6.0/8.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-702	480-162426-26	OC-SB-702-8.0/10-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-704	480-162426-2	OC-SB-704-0.0/2.0-XXX	2,3,4,6-Tetrachlorophenol	84	U F1 F2	84	UJ	MSL, MSRPD	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-2	OC-SB-704-0.0/2.0-XXX	2,4,6-Trichlorophenol	84	U F1 F2	84	UJ	MSL, MSRPD	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-2	OC-SB-704-0.0/2.0-XXX	4,6-Dinitro-2-methylphenol	430	U F1 F2	430	UJ	MSL, MSRPD	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-2	OC-SB-704-0.0/2.0-XXX	4-Nitrophenol	430	U F2	430	UJ	MSL, MSRPD	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-2	OC-SB-704-0.0/2.0-XXX	Benzaldehyde	170	U * F2	170	R	LCSL, MSL, MSRPD	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-2	OC-SB-704-0.0/2.0-XXX	Benzoic Acid	430	U F1	430	R	MSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-2	OC-SB-704-0.0/2.0-XXX	Pentachlorophenol	430	U F1 F2	430	UJ	MSL, MSRPD	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-2	OC-SB-704-0.0/2.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-704	480-162426-3	OC-SB-704-12/13-XXX	Benzaldehyde	74	U *	74	R	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-3	OC-SB-704-12/13-XXX	Phthalic anhydride	10000	U	10000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-704	480-162426-4	OC-SB-704-19/20-XXX	Benzaldehyde	74	U *	74	R	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-4	OC-SB-704-19/20-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-704	480-162426-5	OC-SB-704-2.0/4.0-XXX	Benzaldehyde	10	J *	10	J-	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-5	OC-SB-704-2.0/4.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	2,3,4,6-Tetrachlorophenol	36	U	36	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	2,4,5-Trichlorophenol	36	U	36	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	2,4,6-Trichlorophenol	36	U	36	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	2,4-Dichlorophenol	7.4	U	7.4	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	2,4-Dimethylphenol	36	U	36	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	2,4-Dinitrophenol	360	U	360	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	2-Chlorophenol	36	U	36	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	2-Methylphenol	36	U	36	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	2-Nitrophenol	36	U	36	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	4,6-Dinitro-2-methylphenol	190	U	190	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	4-Chloro-3-methylphenol	36	U	36	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	3&4-Methylphenol	36	U	36	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	4-Nitrophenol	190	U	190	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	Benzaldehyde	74	U *	74	R	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	Benzoic Acid	190	U	190	UJ	SSL	ug/kg	TA-PIT

Table 3.2 - Data Validation Action Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	Benzyl alcohol	36	U	36	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	Pentachlorophenol	190	U	190	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	Phenol	36	U	36	UJ	SSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-6	OC-SB-704-33/34-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-704	480-162426-7	OC-SB-704-4.0/6.0-XXX	Benzaldehyde	73	U *	73	R	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-7	OC-SB-704-4.0/6.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-704	480-162426-8	OC-SB-704-6.0/8.0-XXX	Benzaldehyde	72	U *	72	R	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-8	OC-SB-704-6.0/8.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-704	480-162426-9	OC-SB-704-8.0/10-XXX	Benzaldehyde	74	U *	74	R	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-704	480-162426-9	OC-SB-704-8.0/10-XXX	Phthalic anhydride	10000	U	10000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-705	480-162426-11	OC-SB-705-0.0/2.0-XXX	Benzaldehyde	78	U *	78	R	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-705	480-162426-11	OC-SB-705-0.0/2.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-705	480-162426-17	OC-SB-705-17/18-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-705	480-162426-12	OC-SB-705-2.0/4.0-XXX	Benzaldehyde	230	U *	230	J-	LCSL	ug/kg	TA-PIT
480-162426-1	SW8270D	SB-705	480-162426-12	OC-SB-705-2.0/4.0-XXX	Phthalic anhydride	56000	U	56000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Phthalic anhydride	61000	U	61000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Phthalic anhydride	65000	U	65000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-705	480-162426-20	OC-SB-705-6.0/8.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162426-1	SW8270D	SB-705	480-162426-21	OC-SB-705-8.0/10-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162513-1	SW8270D	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Benzaldehyde	83	U	83	UJ	MSL	ug/kg	TA-PIT
480-162513-1	SW8270D	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Benzoic Acid	210	U	210	UJ	MSL	ug/kg	TA-PIT
480-162513-1	SW8270D	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Hexachlorocyclopentadiene	41	U	41	UJ	MSL	ug/kg	TA-PIT
480-162513-1	SW8270D	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162513-1	SW8270D	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Benzaldehyde	82	U	82	UJ	MSL	ug/kg	TA-PIT
480-162513-1	SW8270D	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Benzoic Acid	210	U	210	UJ	MSL	ug/kg	TA-PIT
480-162513-1	SW8270D	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Hexachlorocyclopentadiene	40	U	40	UJ	MSL	ug/kg	TA-PIT
480-162513-1	SW8270D	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162513-1	SW8270D	SB-701	480-162513-4	OC-SB-701-2.0/4.0-XXX	Phthalic anhydride	56000	U	56000	UJ	LCSM	ug/kg	TALBFLO
480-162513-1	SW8270D	SB-701	480-162513-9	OC-SB-701-20/21-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162513-1	SW8270D	SB-701	480-162513-5	OC-SB-701-31/32-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162513-1	SW8270D	SB-701	480-162513-6	OC-SB-701-4.0/6.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162513-1	SW8270D	SB-701	480-162513-7	OC-SB-701-6.0/8.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162513-1	SW8270D	SB-701	480-162513-8	OC-SB-701-8.0/10-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-711	480-162572-1	OC-SB-711-0.0/2.0-XXX	2,4-Dinitrophenol	400	U F1	400	UJ	MSL	ug/kg	TA-PIT
480-162572-1	SW8270D	SB-711	480-162572-1	OC-SB-711-0.0/2.0-XXX	Benzaldehyde	80	U F1	80	R	MSL	ug/kg	TA-PIT

Table 3.2 - Data Validation Action Summary - SVOCs
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162572-1	SW8270D	SB-711	480-162572-1	OC-SB-711-0.0/2.0-XXX	Benzoic Acid	200	U F1	200	R	MSL	ug/kg	TA-PIT
480-162572-1	SW8270D	SB-711	480-162572-1	OC-SB-711-0.0/2.0-XXX	Pentachlorophenol	200	U F1	200	UJ	MSL	ug/kg	TA-PIT
480-162572-1	SW8270D	SB-711	480-162572-1	OC-SB-711-0.0/2.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-711	480-162572-13	OC-SB-711-18/19-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-711	480-162572-2	OC-SB-711-2.0/4.0-XXX	Phthalic anhydride	54000	U	54000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-711	480-162572-14	OC-SB-711-35/36-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-711	480-162572-3	OC-SB-711-4.0/6.0-XXX	Phthalic anhydride	230000	U	230000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-711	480-162572-16	OC-SB-711-6.0/8.0-XXX	Phthalic anhydride	57000	U	57000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-711	480-162572-17	OC-SB-711-8.0/10-XXX	Phthalic anhydride	13000	U	13000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-712	480-162572-6	OC-SB-712-0.0/2.0-XXX	Phthalic anhydride	12000	U	12000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-712	480-162572-7	OC-SB-712-2.0/4.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-712	480-162572-8	OC-SB-712-23/24-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-712	480-162572-9	OC-SB-712-37/38-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-712	480-162572-10	OC-SB-712-4.0/6.0-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-712	480-162572-11	OC-SB-712-6.0/8.0-XXX	Phthalic anhydride	54000	U	54000	UJ	LCSM	ug/kg	TALBFLO
480-162572-1	SW8270D	SB-712	480-162572-12	OC-SB-712-8.0/10-XXX	Phthalic anhydride	11000	U	11000	UJ	LCSM	ug/kg	TALBFLO

Notes:

U = undetected	CCVRRF	Continuing Calibration Relative Response Factor low
J = estimated value	FD	Field Duplicate precision goal exceeded
J+ = estimated biased high	LCSL	Lab Control Sample recovery Low
J- = estimated biased low	LCSM	Lab Control Sample Missing
R = rejected/unusable	MSL	Matrix Spike and/or Matrix Spike duplicate recovery Low
	MSRPD	Matrix Spike and/or Matrix Spike duplicate Relative Percent Difference precision goal exceeded
	SSL	Surrogate recovery Low

Table 3.3 - Data Validation Action Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162199-1	SW6010D	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Barium	15	F2 F1	15	J+	MSH	mg/kg	TALBFLO
480-162199-1	SW6010D	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Calcium	1,200	F2 F1 B	1,200	J+	MSH, MSRPD	mg/kg	TALBFLO
480-162199-1	SW6010D	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Chromium	150	F1	150	J-	MSL	mg/kg	TALBFLO
480-162199-1	SW6010D	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Copper	15	F1	15	J-	MSL	mg/kg	TALBFLO
480-162199-1	SW6010D	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Magnesium	5,200	F1	5,200	J-	MSL	mg/kg	TALBFLO
480-162199-1	SW6010D	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Manganese	100	F1	100	J-	MSL	mg/kg	TALBFLO
480-162199-1	SW6010D	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Potassium	1000	F1	1000	J+	MSH	mg/kg	TALBFLO
480-162199-1	SW6010D	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Vanadium	31	F1	31	J-	MSL	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-10	OC-SB-703-0.0/2.0-XXX	Barium	89		89	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-10	OC-SB-703-0.0/2.0-XXX	Cadmium	0.3		0.3	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-11	OC-SB-703-17/18-XXX	Barium	20		20	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-11	OC-SB-703-17/18-XXX	Cadmium	0.044	J	0.044	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-11	OC-SB-703-17/18-XXX	Sodium	110	J B	160	U	BL1	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Aluminum	6700		6700	J+	MSH	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Barium	15		15	J-	MSL, MSRPD, LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Cadmium	0.11	J	0.11	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Calcium	6300	B	6300	J+	MSH, MSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Chromium	20		20	J+	MSH	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Copper	5.3		5.3	J	FD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Iron	6400		6400	J+	MSH	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Magnesium	1300		1300	J+	MSH	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Manganese	76	B	76	J+	MSH	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Sodium	84	J B	170	U	BL1	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Aluminum	6500		6500	J+	MSH	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Barium	12		12	J-	MSL, MSRPD, LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Cadmium	0.06	J	0.06	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Calcium	5900	B	5900	J+	MSH, MSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Chromium	14		14	J+	MSH	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Copper	2.9		2.9	J	FD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Iron	5000		5000	J+	MSH	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Magnesium	1100		1100	J+	MSH	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Manganese	63	B	63	J+	MSH	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Sodium	85	J B	170	U	BL1	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-14	OC-SB-703-30/32-XXX	Barium	14		14	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-15	OC-SB-703-4.0/6.0-XXX	Barium	11		11	J	LCSRPD	mg/kg	TALBFLO

Table 3.3 - Data Validation Action Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162315-1	SW6010D	SB-703	480-162315-15	OC-SB-703-4.0/6.0-XXX	Sodium	71	J B	180	U	BL1	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-16	OC-SB-703-6.0/8.0-XXX	Barium	10		10	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-16	OC-SB-703-6.0/8.0-XXX	Sodium	90	J B	170	U	BL1	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	Barium	15		15	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-703	480-162315-17	OC-SB-703-8.0/10-XXX	Sodium	100	J B	150	U	BL1	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-18	OC-SB-709-0.0/2.0-XXX	Barium	49		49	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-18	OC-SB-709-0.0/2.0-XXX	Cadmium	0.13	J	0.13	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-18	OC-SB-709-0.0/2.0-XXX	Sodium	110	J B	170	U	BL1	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-2	OC-SB-709-16/17-XXX	Barium	81		81	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-3	OC-SB-709-2.0/4.0-XXX	Barium	13		13	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-3	OC-SB-709-2.0/4.0-XXX	Cadmium	0.6		0.6	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-3	OC-SB-709-2.0/4.0-XXX	Sodium	58	J B	160	U	BL1	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-4	OC-SB-709-32/33-XXX	Barium	53		53	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-5	OC-SB-709-4.0/6.0-XXX	Barium	21		21	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-5	OC-SB-709-4.0/6.0-XXX	Cadmium	0.29		0.29	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-5	OC-SB-709-4.0/6.0-XXX	Sodium	100	J B	160	U	BL1	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-6	OC-SB-709-6.0/8.0-XXX	Barium	12		12	J	LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-6	OC-SB-709-6.0/8.0-XXX	Sodium	72	J B	170	U	BL1	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Barium	46		46	J-	MSL, LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Magnesium	3000		3000	J-	MSL	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Manganese	120	B	120	J-	MSL	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Sodium	110	J B	150	U	BL1	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Zinc	24		24	J-	MSL	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Barium	49		49	J-	MSL, LCSRPD	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Magnesium	3300		3300	J-	MSL	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Manganese	130	B	130	J-	MSL	mg/kg	TALBFLO
480-162315-1	SW6010D	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Zinc	28		28	J-	MSL	mg/kg	TALBFLO
480-162353-1	SW6010D	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Aluminum	8200		8200	J+	MSH	mg/kg	TALBFLO
480-162353-1	SW6010D	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Antimony	0.62	J	0.62	J-	MSL	mg/kg	TALBFLO
480-162353-1	SW6010D	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Chromium	84		84	J-	MSL	mg/kg	TALBFLO
480-162353-1	SW6010D	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Manganese	180	B	180	J+	MSH	mg/kg	TALBFLO
480-162353-1	SW6010D	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Vanadium	19		19	J	SD	mg/kg	TALBFLO
480-162353-1	SW6010D	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Aluminum	7400	F1	7400	J+	MSH	mg/kg	TALBFLO
480-162353-1	SW6010D	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Antimony	0.65	J F1	0.65	J-	MSL	mg/kg	TALBFLO
480-162353-1	SW6010D	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Chromium	83	F1	83	J-	MSL	mg/kg	TALBFLO

Table 3.3 - Data Validation Action Summary - Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162353-1	SW6010D	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Manganese	160	F1 B	160	J+	MSH	mg/kg	TALBFLO
480-162353-1	SW6010D	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Vanadium	17		17	J	SD	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-702	480-162426-24	OC-SB-702-28/29-XXX	Antimony	0.56	J B	18	U	BL1	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-702	480-162426-25	OC-SB-702-34/35-XXX	Selenium	0.98	J B	4.4	U	BL1	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-702	480-162426-15	OC-SB-702-4.0/6.0-XXX	Antimony	0.56	J B	17	U	BL1	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-702	480-162426-16	OC-SB-702-6.0/8.0-XXX	Antimony	0.45	J B	16	U	BL1	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-704	480-162426-4	OC-SB-704-19/20-XXX	Antimony	0.63	J B	17	U	BL1	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-17	OC-SB-705-17/18-XXX	Antimony	0.73	J B	17	U	BL1	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Aluminum	5700		5700	J+	MSH	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Calcium	3500	B	3500	J+	MSH	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Chromium	130		130	J	MSL, MSH, MSRPD, FD	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Iron	7100	B	7100	J+	MSH	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Manganese	88	B	88	J+	MSH	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Aluminum	5900	F1	5900	J+	MSH	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Antimony	0.71	J B	20	U	BL1	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Calcium	3600	F1 B	3600	J+	MSH	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Chromium	77	F2 F1	77	J	MSL, MSH, MSRPD, FD	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Iron	7700	F2 F1 B	7700	J+	MSH	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Manganese	98	F2 F1 B	98	J+	MSH	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-20	OC-SB-705-6.0/8.0-XXX	Antimony	0.79	J B	17	U	BL1	mg/kg	TALBFLO
480-162426-1	SW6010D	SB-705	480-162426-21	OC-SB-705-8.0/10-XXX	Antimony	0.62	J B	16	U	BL1	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Antimony	0.53	J	0.53	J-	MSL	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Barium	49		49	J+	MSH	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Chromium	120		120	J+	MSH, FD	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Magnesium	2900		2900	J+	MSH	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Manganese	150		150	J	MSH, PDSL	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Potassium	1100		1100	J+	MSH, MSRPD	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Vanadium	18		18	J+	MSH	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Zinc	28		28	J+	MSH	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Antimony	0.63	J F1	0.63	J-	MSL	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Barium	71	F1	71	J+	MSH	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Chromium	72	F1	72	J+	MSH, FD	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Magnesium	3700	F2 F1	3700	J+	MSH	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Manganese	180	F2 F1	180	J	MSH, PDSL	mg/kg	TALBFLO
480-162513-1	SW7471A	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Mercury	0.031	H	0.031	J	HT	mg/kg	TALBFLO

Table 3.3 - Data Validation Action Summary - Metals
Data Validation Report
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Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162513-1	SW6010D	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Potassium	1200	F2 F1	1200	J+	MSH, MSRPD	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Vanadium	19	F1	19	J+	MSH	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Zinc	26	F1	26	J+	MSH	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-7	OC-SB-701-6.0/8.0-XXX	Selenium	0.49	J B	4.4	U	BL1	mg/kg	TALBFLO
480-162513-1	SW6010D	SB-701	480-162513-8	OC-SB-701-8.0/10-XXX	Selenium	0.56	J B	5	U	BL1	mg/kg	TALBFLO
480-162572-1	SW6010D	SB-711	480-162572-2	OC-SB-711-2.0/4.0-XXX	Aluminum	8100	F1	8100	J	MSH, PDSL	mg/kg	TALBFLO
480-162572-1	SW6010D	SB-711	480-162572-2	OC-SB-711-2.0/4.0-XXX	Antimony	0.45	J F1	0.45	J-	MSL	mg/kg	TALBFLO
480-162572-1	SW6010D	SB-711	480-162572-2	OC-SB-711-2.0/4.0-XXX	Calcium	4100	F1 B	4100	J-	MSL	mg/kg	TALBFLO
480-162572-1	SW6010D	SB-711	480-162572-2	OC-SB-711-2.0/4.0-XXX	Chromium	63	F1	63	J+	MSH	mg/kg	TALBFLO
480-162572-1	SW6010D	SB-711	480-162572-2	OC-SB-711-2.0/4.0-XXX	Manganese	140	F1 B	140	J+	MSH	mg/kg	TALBFLO
480-162572-1	SW6010D	SB-711	480-162572-2	OC-SB-711-2.0/4.0-XXX	Zinc	78	F2 F1	78	J+	MSH, MSRPD	mg/kg	TALBFLO

Notes:

U = undetected	BL1	method BLank qualifier
J = estimated value	FD	Field Duplicate precision goal exceeded
J+ = estimated biased high	HT	Holding Time for prep or analysis exceeded
J- = estimated biased low	LCSRPD	Lab Control Sample/Lab Control Sample Duplicate Relative Percent Difference precision goal exceeded
R = rejected/unusable	LD	Lab Duplicate precision goal exceeded
	MSH	Matrix Spike and/or Matrix Spike duplicate recovery High
	MSL	Matrix Spike and/or Matrix Spike duplicate recovery Low
	MSRPD	Matrix Spike and/or Matrix Spike duplicate Relative Percent Difference precision goal exceeded
	PDSL	Post Digestion Spike recovery Low
	SD	Serial Dilution result exceeds percent difference limit

Table 3.4 - Data Validation Action Summary - TCLP Metals
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162315-1	SW6010C	SB-709	480-162315-1	OC-SB-709-0.0/10-XXX	Arsenic	0.012	J B	0.015	U	BL1	mg/l	TALBFLO
480-162315-1	SW6010C	SB-703	480-162315-9	OC-SB-703-0.0/10-XXX	Arsenic	0.0074	J B	0.015	U	BL1	mg/l	TALBFLO
480-162353-1	SW6010C	SB-706	480-162353-1	OC-SB-706-0.0/10-XXX	Arsenic	0.0088	J B	0.015	U	BL1	mg/l	TALBFLO
480-162353-1	SW7470A	SB-706	480-162353-1	OC-SB-706-0.0/10-XXX	Mercury	0.0002	U F1	0.0002	UJ	MSL	mg/l	TALBFLO
480-162353-1	SW6010C	SB-707	480-162353-13	OC-SB-707-0.0/10-XXX	Arsenic	0.035	B	0.035	J+	BL1	mg/l	TALBFLO
480-162572-1	SW6010C	SB-712	480-162572-4	OC-SB-712-0.0/10-DUP	Lead	0.022		0.022	J	FD	mg/l	TALBFLO
480-162572-1	SW6010C	SB-712	480-162572-5	OC-SB-712-0.0/10-XXX	Lead	0.059		0.059	J	FD	mg/l	TALBFLO

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable

BL1	method BLank qualifier
FD	Field Duplicate precision goal exceeded
MSL	Matrix Spike and/or Matrix Spike duplicate recovery Low

Table 3.5 - Data Validation Action Summary - Hexavalent Chromium
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
2073905	SW7199	SB-703	1198367	OC-SB-703-2.0/4.0-DUP	Chromium, Hexavalent	2.3		2.3	J	FD	mg/kg	LANCAST
2073905	SW7199	SB-703	1198360	OC-SB-703-2.0/4.0-XXX	Chromium, Hexavalent	0.7		0.7	J	FD	mg/kg	LANCAST
2073916	SW7199	SB-702	1198477	OC-SB-702-8.0/10-XXX	Chromium, Hexavalent	0.3	J	0.44	U	BL1	mg/kg	LANCAST
2073916	SW7199	SB-705	1198458	OC-SB-705-0.0/2.0-XXX	Chromium, Hexavalent	0.35	J	0.46	U	BL1	mg/kg	LANCAST
2073916	SW7199	SB-705	1198472	OC-SB-705-4.0/6.0-DUP	Chromium, Hexavalent	2.7		2.7	J	FD	mg/kg	LANCAST
2073916	SW7199	SB-705	1198465	OC-SB-705-4.0/6.0-XXX	Chromium, Hexavalent	1.5		1.5	J	FD	mg/kg	LANCAST

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable

BL1 method BLank qualifier
FD Field Duplicate precision goal exceeded

Table 3.6 - Data Validation Action Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162140-1	E300	SB-708	480-162140-2	OC-SB-708-0.0/2.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162140-1	E300	SB-708	480-162140-2	OC-SB-708-0.0/2.0-XXX	Sulfate	430		430	J	HT	mg/kg	TA-PIT
480-162140-1	E300	SB-708	480-162140-3	OC-SB-708-2.0/4.0-XXX	Chloride	12	U	12	UJ	HT	mg/kg	TA-PIT
480-162140-1	E300	SB-708	480-162140-3	OC-SB-708-2.0/4.0-XXX	Sulfate	590		590	J	HT	mg/kg	TA-PIT
480-162140-1	E300	SB-708	480-162140-4	OC-SB-708-4.0/6.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162140-1	E300	SB-708	480-162140-4	OC-SB-708-4.0/6.0-XXX	Sulfate	190		190	J	HT	mg/kg	TA-PIT
480-162140-1	E300	SB-708	480-162140-5	OC-SB-708-6.0/8.0-XXX	Chloride	10	U	10	UJ	HT	mg/kg	TA-PIT
480-162140-1	E300	SB-708	480-162140-5	OC-SB-708-6.0/8.0-XXX	Sulfate	1800		1800	J	HT	mg/kg	TA-PIT
480-162140-1	E300	SB-708	480-162140-6	OC-SB-708-8.0/10-XXX	Chloride	10	U	10	UJ	HT	mg/kg	TA-PIT
480-162140-1	E300	SB-708	480-162140-6	OC-SB-708-8.0/10-XXX	Sulfate	57		57	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Sulfate	35		35	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-708	480-162199-2	OC-SB-708-22/24-XXX	Chloride	7.2	J	7.2	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-708	480-162199-2	OC-SB-708-22/24-XXX	Sulfate	100		100	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-708	480-162199-3	OC-SB-708-28/30-XXX	Chloride	70		70	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-708	480-162199-3	OC-SB-708-28/30-XXX	Sulfate	460		460	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-708	480-162199-4	OC-SB-708-33/34-XXX	Chloride	210		210	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-708	480-162199-4	OC-SB-708-33/34-XXX	Sulfate	1200		1200	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-710	480-162199-6	OC-SB-710-2.0/4.0-XXX	Chloride	19		19	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-710	480-162199-6	OC-SB-710-2.0/4.0-XXX	Sulfate	3900		3900	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-710	480-162199-7	OC-SB-710-23/24-XXX	Chloride	57		57	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-710	480-162199-7	OC-SB-710-23/24-XXX	Sulfate	1100		1100	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-710	480-162199-8	OC-SB-710-36/37-XXX	Chloride	670		670	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-710	480-162199-8	OC-SB-710-36/37-XXX	Sulfate	3700		3700	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-710	480-162199-9	OC-SB-710-4.0/6.0-XXX	Chloride	6.9	J	6.9	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-710	480-162199-9	OC-SB-710-4.0/6.0-XXX	Sulfate	6400		6400	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-710	480-162199-10	OC-SB-710-6.0/8.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-710	480-162199-10	OC-SB-710-6.0/8.0-XXX	Sulfate	170		170	J	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-710	480-162199-11	OC-SB-710-8.0/10-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162199-1	E300	SB-710	480-162199-11	OC-SB-710-8.0/10-XXX	Sulfate	71		71	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-2	OC-SB-706-0.0/2.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-2	OC-SB-706-0.0/2.0-XXX	Sulfate	1000	F1	1000	J-	HT, MSL	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-3	OC-SB-706-10/12-XXX	Chloride	12	U	12	UJ	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-3	OC-SB-706-10/12-XXX	Sulfate	290		290	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-4	OC-SB-706-2.0/4.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-4	OC-SB-706-2.0/4.0-XXX	Sulfate	410		410	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-5	OC-SB-706-20/22-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-5	OC-SB-706-20/22-XXX	Sulfate	66		66	J	HT	mg/kg	TA-PIT

Table 3.6 - Data Validation Action Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162353-1	E300	SB-706	480-162353-6	OC-SB-706-26/27-XXX	Chloride	15		15	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-6	OC-SB-706-26/27-XXX	Sulfate	140		140	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-7	OC-SB-706-4.0/6.0-XXX	Chloride	7	J	7	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-7	OC-SB-706-4.0/6.0-XXX	Sulfate	120		120	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-8	OC-SB-706-6.0/8.0-XXX	Chloride	4.8	J	4.8	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-706	480-162353-8	OC-SB-706-6.0/8.0-XXX	Sulfate	160		160	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-707	480-162353-9	OC-SB-707-0.0/2.0-XXX	Chloride	5.2	J	5.2	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-707	480-162353-9	OC-SB-707-0.0/2.0-XXX	Sulfate	170		170	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-707	480-162353-10	OC-SB-707-2.0/4.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-707	480-162353-10	OC-SB-707-2.0/4.0-XXX	Sulfate	2100		2100	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-707	480-162353-11	OC-SB-707-4.0/6.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-707	480-162353-11	OC-SB-707-4.0/6.0-XXX	Sulfate	7100		7100	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Chloride	4.1	J	4.1	J	HT	mg/kg	TA-PIT
480-162353-1	E300	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Sulfate	130		130	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-702	480-162426-13	OC-SB-702-0.0/2.0-XXX	Chloride	9.3	J	9.3	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-702	480-162426-13	OC-SB-702-0.0/2.0-XXX	Sulfate	610		610	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-702	480-162426-14	OC-SB-702-2.0/4.0-XXX	Chloride	10	U	10	UJ	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-702	480-162426-14	OC-SB-702-2.0/4.0-XXX	Sulfate	3000		3000	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-702	480-162426-15	OC-SB-702-4.0/6.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-702	480-162426-15	OC-SB-702-4.0/6.0-XXX	Sulfate	6100		6100	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-702	480-162426-16	OC-SB-702-6.0/8.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-702	480-162426-16	OC-SB-702-6.0/8.0-XXX	Sulfate	730		730	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-2	OC-SB-704-0.0/2.0-XXX	Chloride	4.7	J	4.7	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-2	OC-SB-704-0.0/2.0-XXX	Sulfate	18000		18000	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-3	OC-SB-704-12/13-XXX	Chloride	10	U	10	UJ	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-3	OC-SB-704-12/13-XXX	Sulfate	68		68	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-4	OC-SB-704-19/20-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-4	OC-SB-704-19/20-XXX	Sulfate	270		270	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-5	OC-SB-704-2.0/4.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-5	OC-SB-704-2.0/4.0-XXX	Sulfate	16000		16000	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-6	OC-SB-704-33/34-XXX	Chloride	1300		1300	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-6	OC-SB-704-33/34-XXX	Sulfate	6100		6100	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-7	OC-SB-704-4.0/6.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-7	OC-SB-704-4.0/6.0-XXX	Sulfate	760		760	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-8	OC-SB-704-6.0/8.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-8	OC-SB-704-6.0/8.0-XXX	Sulfate	530		530	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-9	OC-SB-704-8.0/10-XXX	Chloride	4.8	J	4.8	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-704	480-162426-9	OC-SB-704-8.0/10-XXX	Sulfate	150		150	J	HT	mg/kg	TA-PIT

Table 3.6 - Data Validation Action Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
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Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162426-1	E300	SB-705	480-162426-11	OC-SB-705-0.0/2.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-705	480-162426-11	OC-SB-705-0.0/2.0-XXX	Sulfate	77		77	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-705	480-162426-17	OC-SB-705-17/18-XXX	Chloride	5.4	J	5.4	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-705	480-162426-17	OC-SB-705-17/18-XXX	Sulfate	200		200	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-705	480-162426-12	OC-SB-705-2.0/4.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-705	480-162426-12	OC-SB-705-2.0/4.0-XXX	Sulfate	1400		1400	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Sulfate	3400		3400	J	HT	mg/kg	TA-PIT
480-162426-1	E300	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Sulfate	3400	F2	3400	J	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Chloride	12	U	12	UJ	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Sulfate	13000		13000	J	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Chloride	12	U	12	UJ	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Sulfate	12000	F2	12000	J	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-4	OC-SB-701-2.0/4.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-4	OC-SB-701-2.0/4.0-XXX	Sulfate	15000		15000	J	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-9	OC-SB-701-20/21-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-9	OC-SB-701-20/21-XXX	Sulfate	190		190	J	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-5	OC-SB-701-31/32-XXX	Chloride	390		390	J	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-5	OC-SB-701-31/32-XXX	Sulfate	3900		3900	J	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-6	OC-SB-701-4.0/6.0-XXX	Chloride	12	U	12	UJ	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-6	OC-SB-701-4.0/6.0-XXX	Sulfate	230		230	J	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-7	OC-SB-701-6.0/8.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-7	OC-SB-701-6.0/8.0-XXX	Sulfate	130		130	J	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-8	OC-SB-701-8.0/10-XXX	Chloride	12	U	12	UJ	HT	mg/kg	TA-PIT
480-162513-1	E300	SB-701	480-162513-8	OC-SB-701-8.0/10-XXX	Sulfate	250		250	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-1	OC-SB-711-0.0/2.0-XXX	Chloride	12	U	12	UJ	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-1	OC-SB-711-0.0/2.0-XXX	Sulfate	1800		1800	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-13	OC-SB-711-18/19-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-13	OC-SB-711-18/19-XXX	Sulfate	13		13	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-2	OC-SB-711-2.0/4.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-2	OC-SB-711-2.0/4.0-XXX	Sulfate	2400		2400	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-14	OC-SB-711-35/36-XXX	Chloride	42		42	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-14	OC-SB-711-35/36-XXX	Sulfate	500		500	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-3	OC-SB-711-4.0/6.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-3	OC-SB-711-4.0/6.0-XXX	Sulfate	290		290	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-16	OC-SB-711-6.0/8.0-XXX	Chloride	12	U	12	UJ	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-16	OC-SB-711-6.0/8.0-XXX	Sulfate	12		12	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-17	OC-SB-711-8.0/10-XXX	Chloride	7.2	J	7.2	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-711	480-162572-17	OC-SB-711-8.0/10-XXX	Sulfate	43		43	J	HT	mg/kg	TA-PIT

Table 3.6 - Data Validation Action Summary - General Chemistry
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162572-1	E300	SB-712	480-162572-6	OC-SB-712-0.0/2.0-XXX	Chloride	12	U	12	UJ	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-6	OC-SB-712-0.0/2.0-XXX	Sulfate	4000		4000	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-7	OC-SB-712-2.0/4.0-XXX	Chloride	6.8	J	6.8	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-7	OC-SB-712-2.0/4.0-XXX	Sulfate	520		520	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-8	OC-SB-712-23/24-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-8	OC-SB-712-23/24-XXX	Sulfate	43		43	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-9	OC-SB-712-37/38-XXX	Chloride	250		250	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-9	OC-SB-712-37/38-XXX	Sulfate	3700		3700	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-10	OC-SB-712-4.0/6.0-XXX	Chloride	11	U	11	UJ	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-10	OC-SB-712-4.0/6.0-XXX	Sulfate	12000		12000	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-11	OC-SB-712-6.0/8.0-XXX	Chloride	12		12	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-11	OC-SB-712-6.0/8.0-XXX	Sulfate	1500		1500	J	HT	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-12	OC-SB-712-8.0/10-XXX	Chloride	6.7	J F2 F1	6.7	J	HT, MSL, MSRPD	mg/kg	TA-PIT
480-162572-1	E300	SB-712	480-162572-12	OC-SB-712-8.0/10-XXX	Sulfate	180	F2 F1	180	J	HT, MSL, MSRPD	mg/kg	TA-PIT
480-162140-1	E350.1	SB-708	480-162140-2	OC-SB-708-0.0/2.0-XXX	Ammonia	7.3	B	7.3	U	BL1	mg/kg	TALBFLO
480-162140-1	E350.1	SB-708	480-162140-4	OC-SB-708-4.0/6.0-XXX	Ammonia	6.6	B	6.6	U	BL1	mg/kg	TALBFLO
480-162140-1	E350.1	SB-708	480-162140-6	OC-SB-708-8.0/10-XXX	Ammonia	9.9	B	9.9	U	BL1	mg/kg	TALBFLO
480-162315-1	E350.1	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Ammonia	14		14	J	FD	mg/kg	TALBFLO
480-162315-1	E350.1	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Ammonia	6.7	B F1	6.7	J	FD	mg/kg	TALBFLO
480-162353-1	E350.1	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Ammonia	5.5	B	5.5	J-	MSL	mg/kg	TALBFLO
480-162353-1	E350.1	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Ammonia	5.6	B F1	5.6	J-	MSL	mg/kg	TALBFLO
480-162140-1	SW9034	SB-708	480-162140-1	OC-SB-708-0.0/10-XXX	Sulfide, Reactive	10	U	10	UJ	HT	mg/kg	TALBFLO
480-162199-1	SW9034	SB-710	480-162199-5	OC-SB-710-0.0/10XXX	Sulfide, Reactive	10	U	10	UJ	HT	mg/kg	TALBFLO
480-162315-1	SW9034	SB-703	480-162315-9	OC-SB-703-0.0/10-XXX	Sulfide, Reactive	10	U	10	UJ	HT	mg/kg	TALBFLO
480-162353-1	SW9034	SB-707	480-162353-13	OC-SB-707-0.0/10-XXX	Sulfide, Reactive	10	U	10	UJ	HT	mg/kg	TALBFLO
480-162426-1	SW9034	SB-704	480-162426-1	OC-SB-704-0.0/10-XXX	Sulfide, Reactive	10	U	10	UJ	HT	mg/kg	TALBFLO
480-162513-1	SW9034	SB-701	480-162513-1	OC-SB-701-0.0/10-XXX	Sulfide, Reactive	10	U	10	UJ	HT	mg/kg	TALBFLO
480-162572-1	SW9034	SB-712	480-162572-4	OC-SB-712-0.0/10-DUP	Sulfide, Reactive	10	U	10	UJ	HT	mg/kg	TALBFLO
480-162572-1	SW9034	SB-712	480-162572-5	OC-SB-712-0.0/10-XXX	Sulfide, Reactive	10	U	10	UJ	HT	mg/kg	TALBFLO

Notes:		
U = undetected	BL1	method BLank qualifier
J = estimated value	FD	Field Duplicate precision goal exceeded
J+ = estimated biased high	HT	Holding Time for prep or analysis exceeded
J- = estimated biased low	MSL	Matrix Spike and/or Matrix Spike duplicate recovery Low
R = rejected/unusable	MSRPD	Matrix Spike and/or Matrix Spike duplicate Relative Percent Difference precision goal exceeded

Table 3.7 - Data Validation Action Summary - Aldehydes
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162140-1	SW8315A	SB-708	480-162140-2	OC-SB-708-0.0/2.0-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162140-1	SW8315A	SB-708	480-162140-3	OC-SB-708-2.0/4.0-XXX	Formaldehyde	2400	U	2400	UJ	LCS-L	ug/kg	TA-NC
480-162140-1	SW8315A	SB-708	480-162140-4	OC-SB-708-4.0/6.0-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162140-1	SW8315A	SB-708	480-162140-5	OC-SB-708-6.0/8.0-XXX	Formaldehyde	2100	U	2100	UJ	LCS-L	ug/kg	TA-NC
480-162140-1	SW8315A	SB-708	480-162140-6	OC-SB-708-8.0/10-XXX	Formaldehyde	2100	U	2100	UJ	LCS-L	ug/kg	TA-NC
480-162199-1	SW8315A	SB-708	480-162199-1	OC-SB-708-16/18-XXX	Formaldehyde	2100	U	2100	UJ	LCS-L	ug/kg	TA-NC
480-162199-1	SW8315A	SB-708	480-162199-2	OC-SB-708-22/24-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162199-1	SW8315A	SB-708	480-162199-3	OC-SB-708-28/30-XXX	Formaldehyde	2300	U	2300	UJ	LCS-L	ug/kg	TA-NC
480-162199-1	SW8315A	SB-708	480-162199-4	OC-SB-708-33/34-XXX	Formaldehyde	1900	J	1900	J	LCS-L	ug/kg	TA-NC
480-162199-1	SW8315A	SB-710	480-162199-6	OC-SB-710-2.0/4.0-XXX	Formaldehyde	2000	J	2000	J	LCS-L	ug/kg	TA-NC
480-162199-1	SW8315A	SB-710	480-162199-7	OC-SB-710-23/24-XXX	Formaldehyde	2500	U	2500	UJ	LCS-L	ug/kg	TA-NC
480-162199-1	SW8315A	SB-710	480-162199-8	OC-SB-710-36/37-XXX	Formaldehyde	3700		3700	J	LCS-L	ug/kg	TA-NC
480-162199-1	SW8315A	SB-710	480-162199-9	OC-SB-710-4.0/6.0-XXX	Formaldehyde	4000		4000	J	LCS-L	ug/kg	TA-NC
480-162199-1	SW8315A	SB-710	480-162199-10	OC-SB-710-6.0/8.0-XXX	Formaldehyde	11000		11000	J	LCS-L	ug/kg	TA-NC
480-162199-1	SW8315A	SB-710	480-162199-11	OC-SB-710-8.0/10-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162315-1	SW8315A	SB-703	480-162315-10	OC-SB-703-0.0/2.0-XXX	Formaldehyde	1800	J	1800	J	LCS-L	ug/kg	TA-NC
480-162315-1	SW8315A	SB-703	480-162315-12	OC-SB-703-2.0/4.0-DUP	Formaldehyde	4900		4900	J	FD, MS-L	ug/kg	TA-NC
480-162315-1	SW8315A	SB-703	480-162315-13	OC-SB-703-2.0/4.0-XXX	Formaldehyde	2900		2900	J	FD, MS-L	ug/kg	TA-NC
480-162315-1	SW8315A	SB-709	480-162315-2	OC-SB-709-16/17-XXX	Formaldehyde	3300		3300	J	LCS-L	ug/kg	TA-NC
480-162315-1	SW8315A	SB-709	480-162315-3	OC-SB-709-2.0/4.0-XXX	Formaldehyde	2100	J	2100	J	LCS-L	ug/kg	TA-NC
480-162315-1	SW8315A	SB-709	480-162315-4	OC-SB-709-32/33-XXX	Formaldehyde	2300		2300	J	LCS-L	ug/kg	TA-NC
480-162315-1	SW8315A	SB-709	480-162315-5	OC-SB-709-4.0/6.0-XXX	Formaldehyde	2900		2900	J	LCS-L	ug/kg	TA-NC
480-162315-1	SW8315A	SB-709	480-162315-6	OC-SB-709-6.0/8.0-XXX	Formaldehyde	2400	U	2400	UJ	LCS-L	ug/kg	TA-NC
480-162315-1	SW8315A	SB-709	480-162315-7	OC-SB-709-8.0/10-DUP	Formaldehyde	2300	U	2300	UJ	LCS-L	ug/kg	TA-NC
480-162315-1	SW8315A	SB-709	480-162315-8	OC-SB-709-8.0/10-XXX	Formaldehyde	2300	U	2300	UJ	LCS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-706	480-162353-2	OC-SB-706-0.0/2.0-XXX	Formaldehyde	2300	U	2300	UJ	LCS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-706	480-162353-3	OC-SB-706-10/12-XXX	Formaldehyde	2400	J	2400	J	LCS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-706	480-162353-4	OC-SB-706-2.0/4.0-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-706	480-162353-5	OC-SB-706-20/22-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-706	480-162353-6	OC-SB-706-26/27-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-706	480-162353-7	OC-SB-706-4.0/6.0-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-706	480-162353-8	OC-SB-706-6.0/8.0-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-707	480-162353-9	OC-SB-707-0.0/2.0-XXX	Formaldehyde	3200		3200	J	LCS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-707	480-162353-14	OC-SB-707-12/13-XXX	Formaldehyde	2300	U	2300	UJ	LCS-L	ug/kg	TA-NC

Table 3.7 - Data Validation Action Summary - Aldehydes
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162353-1	SW8315A	SB-707	480-162353-15	OC-SB-707-15/17-XXX	Formaldehyde	2100	U	2100	UJ	LCS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-707	480-162353-10	OC-SB-707-2.0/4.0-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-707	480-162353-11	OC-SB-707-4.0/6.0-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-707	480-162353-16	OC-SB-707-6.0/8.0-DUP	Formaldehyde	2100	U	2100	UJ	LCS-L, MS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-707	480-162353-12	OC-SB-707-6.0/8.0-XXX	Formaldehyde	1300	J	1300	J	LCS-L, MS-L	ug/kg	TA-NC
480-162353-1	SW8315A	SB-707	480-162353-17	OC-SB-707-8.0/10-XXX	Formaldehyde	1500	J	1500	J	LCS-L	ug/kg	TA-NC
480-162426-1	SW8315A	SB-702	480-162426-24	OC-SB-702-28/29-XXX	Formaldehyde	2300	U	2300	UJ	LCS-L	ug/kg	TA-NC
480-162426-1	SW8315A	SB-702	480-162426-25	OC-SB-702-34/35-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162426-1	SW8315A	SB-702	480-162426-15	OC-SB-702-4.0/6.0-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162426-1	SW8315A	SB-702	480-162426-16	OC-SB-702-6.0/8.0-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162426-1	SW8315A	SB-702	480-162426-26	OC-SB-702-8.0/10-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162426-1	SW8315A	SB-705	480-162426-17	OC-SB-705-17/18-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162426-1	SW8315A	SB-705	480-162426-18	OC-SB-705-4.0/6.0-DUP	Formaldehyde	7200		7200	J	LCS-L	ug/kg	TA-NC
480-162426-1	SW8315A	SB-705	480-162426-19	OC-SB-705-4.0/6.0-XXX	Formaldehyde	5400		5400	J	LCS-L	ug/kg	TA-NC
480-162426-1	SW8315A	SB-705	480-162426-20	OC-SB-705-6.0/8.0-XXX	Formaldehyde	1500	J	1500	J	LCS-L	ug/kg	TA-NC
480-162426-1	SW8315A	SB-705	480-162426-21	OC-SB-705-8.0/10-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162513-1	SW8315A	SB-701	480-162513-2	OC-SB-701-0.0/2.0-DUP	Formaldehyde	2500	U	2500	UJ	LCS-L, MS-L	ug/kg	TA-NC
480-162513-1	SW8315A	SB-701	480-162513-3	OC-SB-701-0.0/2.0-XXX	Formaldehyde	2500	U	2500	UJ	LCS-L, MS-L	ug/kg	TA-NC
480-162513-1	SW8315A	SB-701	480-162513-4	OC-SB-701-2.0/4.0-XXX	Formaldehyde	1600	J	1600	J	LCS-L	ug/kg	TA-NC
480-162513-1	SW8315A	SB-701	480-162513-9	OC-SB-701-20/21-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162513-1	SW8315A	SB-701	480-162513-5	OC-SB-701-31/32-XXX	Formaldehyde	5300		5300	J	LCS-L	ug/kg	TA-NC
480-162513-1	SW8315A	SB-701	480-162513-6	OC-SB-701-4.0/6.0-XXX	Formaldehyde	1500	J	1500	J	LCS-L	ug/kg	TA-NC
480-162513-1	SW8315A	SB-701	480-162513-7	OC-SB-701-6.0/8.0-XXX	Formaldehyde	2300	U	2300	UJ	LCS-L	ug/kg	TA-NC
480-162513-1	SW8315A	SB-701	480-162513-8	OC-SB-701-8.0/10-XXX	Formaldehyde	2400	U	2400	UJ	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-711	480-162572-1	OC-SB-711-0.0/2.0-XXX	Formaldehyde	2500	U	2500	UJ	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-711	480-162572-13	OC-SB-711-18/19-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-711	480-162572-2	OC-SB-711-2.0/4.0-XXX	Formaldehyde	1500	J	1500	J	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-711	480-162572-14	OC-SB-711-35/36-XXX	Formaldehyde	4700		4700	J	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-711	480-162572-3	OC-SB-711-4.0/6.0-XXX	Formaldehyde	2900		2900	J	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-711	480-162572-16	OC-SB-711-6.0/8.0-XXX	Formaldehyde	2300	U	2300	UJ	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-711	480-162572-17	OC-SB-711-8.0/10-XXX	Formaldehyde	2600	U	2600	UJ	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-712	480-162572-6	OC-SB-712-0.0/2.0-XXX	Formaldehyde	2400	U	2400	UJ	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-712	480-162572-7	OC-SB-712-2.0/4.0-XXX	Formaldehyde	2100	J	2100	J	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-712	480-162572-8	OC-SB-712-23/24-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC

Table 3.7 - Data Validation Action Summary - Aldehydes
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
480-162572-1	SW8315A	SB-712	480-162572-9	OC-SB-712-37/38-XXX	Formaldehyde	6100		6100	J	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-712	480-162572-10	OC-SB-712-4.0/6.0-XXX	Formaldehyde	2000	J	2000	J	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-712	480-162572-11	OC-SB-712-6.0/8.0-XXX	Formaldehyde	2600		2600	J	LCS-L	ug/kg	TA-NC
480-162572-1	SW8315A	SB-712	480-162572-12	OC-SB-712-8.0/10-XXX	Formaldehyde	2200	U	2200	UJ	LCS-L	ug/kg	TA-NC

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable

FD Field Duplicate precision goal exceeded
MSL Matrix Spike and/or Matrix Spike duplicate recovery Low
LCSL Lab Control Sample recovery Low

Table 3.8 - Data Validation Action Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
2072711	SW8315A MOD	SB-708	1192772	OC-SB-708-0.0/2.0-XXX	Monomethylhydrazine (MMH)	6.2	U	6.2	UJ	CCV%D	ng/g	LANCAST
2072711	SW8315A MOD	SB-708	1192773	OC-SB-708-2.0/4.0-XXX	Monomethylhydrazine (MMH)	5.9	U	5.9	UJ	CCV%D	ng/g	LANCAST
2072711	SW8315A MOD	SB-708	1192774	OC-SB-708-4.0/6.0-XXX	Monomethylhydrazine (MMH)	5.5	U	5.5	UJ	CCV%D	ng/g	LANCAST
2072711	SW8315A MOD	SB-708	1192775	OC-SB-708-6.0/8.0-XXX	Monomethylhydrazine (MMH)	5.5	U	5.5	UJ	CCV%D	ng/g	LANCAST
2072711	SW8315A MOD	SB-708	1192776	OC-SB-708-8.0/10-XXX	Hydrazine	5.3	U	5.3	UJ	CCV%D	ng/g	LANCAST
2072711	SW8315A MOD	SB-708	1192776	OC-SB-708-8.0/10-XXX	Monomethylhydrazine (MMH)	5.3	U	5.3	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-708	1194018	OC-SB-708-16/18-XXX	Hydrazine	5.6	U	5.6	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-708	1194018	OC-SB-708-16/18-XXX	Monomethylhydrazine (MMH)	5.6	U	5.6	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-708	1194019	OC-SB-708-22/24-XXX	Hydrazine	2.4	J	2.4	J	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-708	1194019	OC-SB-708-22/24-XXX	Monomethylhydrazine (MMH)	5.7	U	5.7	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-708	1194020	OC-SB-708-28/30-XXX	Hydrazine	1.5	J	1.5	J	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-708	1194020	OC-SB-708-28/30-XXX	Monomethylhydrazine (MMH)	6	U	6	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-708	1194021	OC-SB-708-33/34-XXX	Hydrazine	5.9	U	5.9	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-708	1194021	OC-SB-708-33/34-XXX	Monomethylhydrazine (MMH)	5.9	U	5.9	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-710	1194022	OC-SB-710-2.0/4.0-XXX	Hydrazine	5.7	U	5.7	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-710	1194022	OC-SB-710-2.0/4.0-XXX	Monomethylhydrazine (MMH)	5.7	U	5.7	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-710	1194023	OC-SB-710-23/24-XXX	Hydrazine	1.7	J	1.7	J	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-710	1194023	OC-SB-710-23/24-XXX	Monomethylhydrazine (MMH)	6.3	U	6.3	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-710	1194024	OC-SB-710-36/37-XXX	Hydrazine	1.9	J	1.9	J	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-710	1194024	OC-SB-710-36/37-XXX	Monomethylhydrazine (MMH)	5.4	U	5.4	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-710	1194025	OC-SB-710-4.0/6.0-XXX	Hydrazine	1.8	J	1.8	J	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-710	1194025	OC-SB-710-4.0/6.0-XXX	Monomethylhydrazine (MMH)	5.8	U	5.8	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-710	1194026	OC-SB-710-6.0/8.0-XXX	Hydrazine	1.6	J	1.6	J	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-710	1194026	OC-SB-710-6.0/8.0-XXX	Monomethylhydrazine (MMH)	5.8	U	5.8	UJ	CCV%D	ng/g	LANCAST
2072990	SW8315A MOD	SB-710	1194027	OC-SB-710-8.0/10-XXX	Monomethylhydrazine (MMH)	5.4	U	5.4	UJ	CCV%D	ng/g	LANCAST
2073905	SW8315A MOD	SB-703	1198367	OC-SB-703-2.0/4.0-DUP	Hydrazine	4.2	J	4.2	J	MS-L	ng/g	LANCAST
2073905	SW8315A MOD	SB-703	1198360	OC-SB-703-2.0/4.0-XXX	Hydrazine	7.4		7.4	J	MS-L	ng/g	LANCAST
2073905	SW8315A MOD	SB-703	1198370	OC-SB-703-6.0/8.0-XXX	Monomethylhydrazine (MMH)	5.8	U	5.8	UJ	CCV%D	ng/g	LANCAST
2073905	SW8315A MOD	SB-703	1198371	OC-SB-703-8.0/10-XXX	Monomethylhydrazine (MMH)	5.8	U	5.8	UJ	CCV%D	ng/g	LANCAST
2073905	SW8315A MOD	SB-709	1198372	OC-SB-709-0.0/2.0-XXX	Monomethylhydrazine (MMH)	6.1	U	6.1	UJ	CCV%D	ng/g	LANCAST
2073905	SW8315A MOD	SB-709	1198373	OC-SB-709-16/17-XXX	Monomethylhydrazine (MMH)	5.6	U	5.6	UJ	CCV%D	ng/g	LANCAST
2073905	SW8315A MOD	SB-709	1198374	OC-SB-709-2.0/4.0-XXX	Monomethylhydrazine (MMH)	5.8	U	5.8	UJ	CCV%D	ng/g	LANCAST
2073905	SW8315A MOD	SB-709	1198375	OC-SB-709-32/33-XXX	Monomethylhydrazine (MMH)	5.4	U	5.4	UJ	CCV%D	ng/g	LANCAST
2073905	SW8315A MOD	SB-709	1198376	OC-SB-709-4.0/6.0-XXX	Monomethylhydrazine (MMH)	6.9	U	6.9	UJ	CCV%D	ng/g	LANCAST
2073905	SW8315A MOD	SB-709	1198377	OC-SB-709-6.0/8.0-XXX	Monomethylhydrazine (MMH)	5.7	U	5.7	UJ	CCV%D	ng/g	LANCAST
2073905	SW8315A MOD	SB-709	1198385	OC-SB-709-8.0/10-DUP	Hydrazine	5.6	U	5.6	UJ	MS-L	ng/g	LANCAST
2073905	SW8315A MOD	SB-709	1198385	OC-SB-709-8.0/10-DUP	Monomethylhydrazine (MMH)	5.6	U	5.6	UJ	CCV%D	ng/g	LANCAST
2073905	SW8315A MOD	SB-709	1198378	OC-SB-709-8.0/10-XXX	Hydrazine	5.7	U	5.7	UJ	MS-L	ng/g	LANCAST

Table 3.8 - Data Validation Action Summary - Hydrazines
Data Validation Report
November 2019 Containment Area Soil Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab SDG	Analysis Method	Location	Lab Sample ID	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units	Lab ID
2073905	SW8315A MOD	SB-709	1198378	OC-SB-709-8.0/10-XXX	Monomethylhydrazine (MMH)	5.7	U	5.7	UJ	CCV%D	ng/g	LANCAST
2073916	SW8315A MOD	SB-704	1198450	OC-SB-704-0.0/2.0-XXX	Monomethylhydrazine (MMH)	7	U	7	UJ	CCV%D	ng/g	LANCAST
2073916	SW8315A MOD	SB-704	1198451	OC-SB-704-12/13-XXX	Monomethylhydrazine (MMH)	5.3	U	5.3	UJ	CCV%D	ng/g	LANCAST
2073916	SW8315A MOD	SB-704	1198452	OC-SB-704-19/20-XXX	Monomethylhydrazine (MMH)	5.7	U	5.7	UJ	CCV%D	ng/g	LANCAST
2073916	SW8315A MOD	SB-704	1198453	OC-SB-704-2.0/4.0-XXX	Monomethylhydrazine (MMH)	6	U	6	UJ	CCV%D	ng/g	LANCAST
2073916	SW8315A MOD	SB-705	1198472	OC-SB-705-4.0/6.0-DUP	Hydrazine	5.8	U	5.8	UJ	MS-L	ng/g	LANCAST
2073916	SW8315A MOD	SB-705	1198472	OC-SB-705-4.0/6.0-DUP	Monomethylhydrazine (MMH)	5.8	U	5.8	UJ	MS-L	ng/g	LANCAST
2073916	SW8315A MOD	SB-705	1198465	OC-SB-705-4.0/6.0-XXX	Hydrazine	1.7	J	1.7	J	MS-L	ng/g	LANCAST
2073916	SW8315A MOD	SB-705	1198465	OC-SB-705-4.0/6.0-XXX	Monomethylhydrazine (MMH)	5.8	U	5.8	UJ	MS-L	ng/g	LANCAST
2074150	SW8315A MOD	SB-701	1199764	OC-SB-701-0.0/2.0-DUP	Hydrazine	5.7	J	5.7	J	MS-L	ng/g	LANCAST
2074150	SW8315A MOD	SB-701	1199757	OC-SB-701-0.0/2.0-XXX	Hydrazine	5.3	J	5.3	J	MS-L	ng/g	LANCAST

Notes:
U = undetected
J = estimated value
J+ = estimated biased high
J- = estimated biased low
R = rejected/unusable

CCV%D Continuing Calibration Verification percent Difference exceeds goal
MSL Matrix Spike and/or Matrix Spike duplicate recovery Low

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APPENDIX C
DISTRIBUTION OF PRIMARY CONTAMINANTS OF CONCERN (FIGURES FROM WOOD, 2019B)

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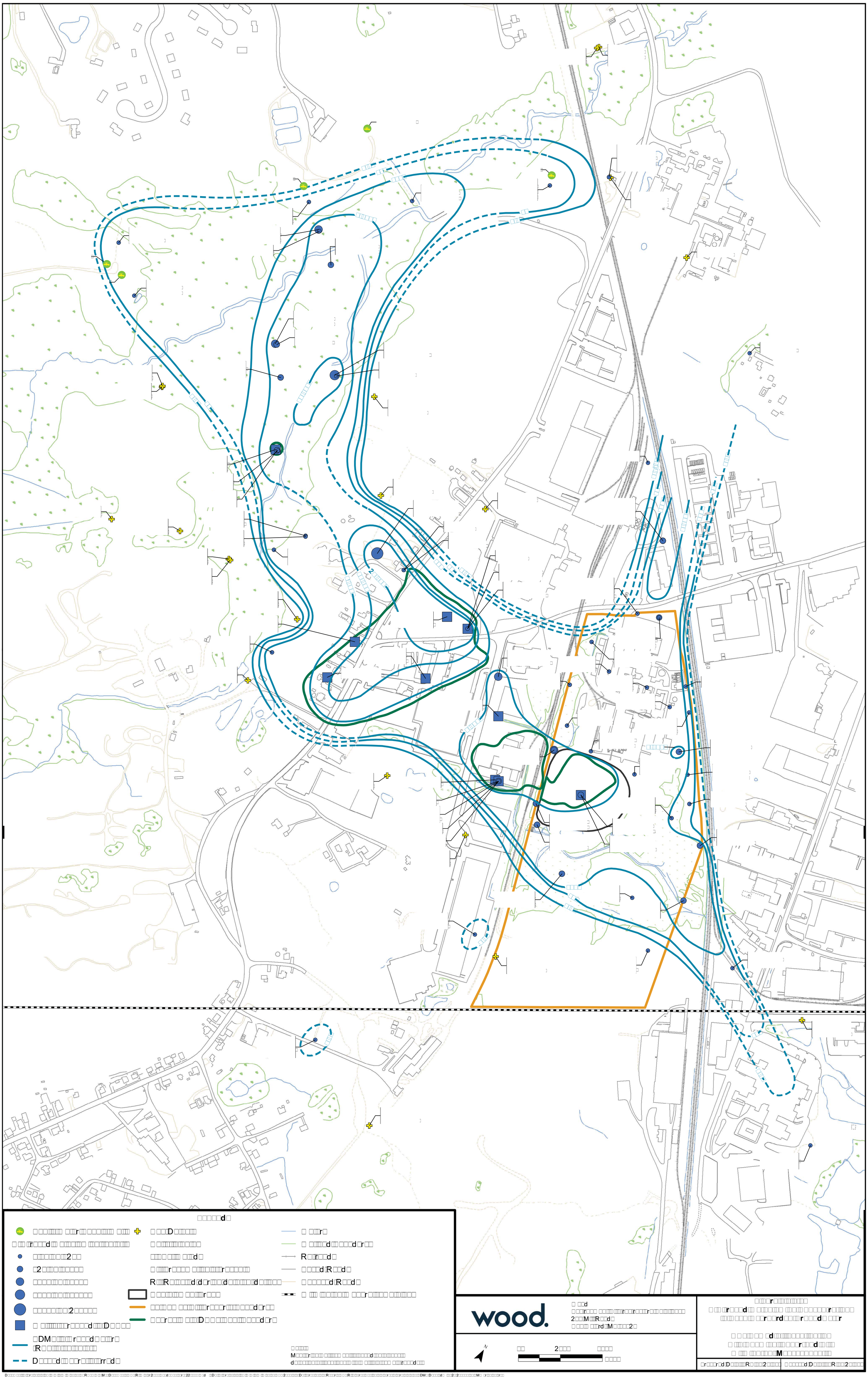
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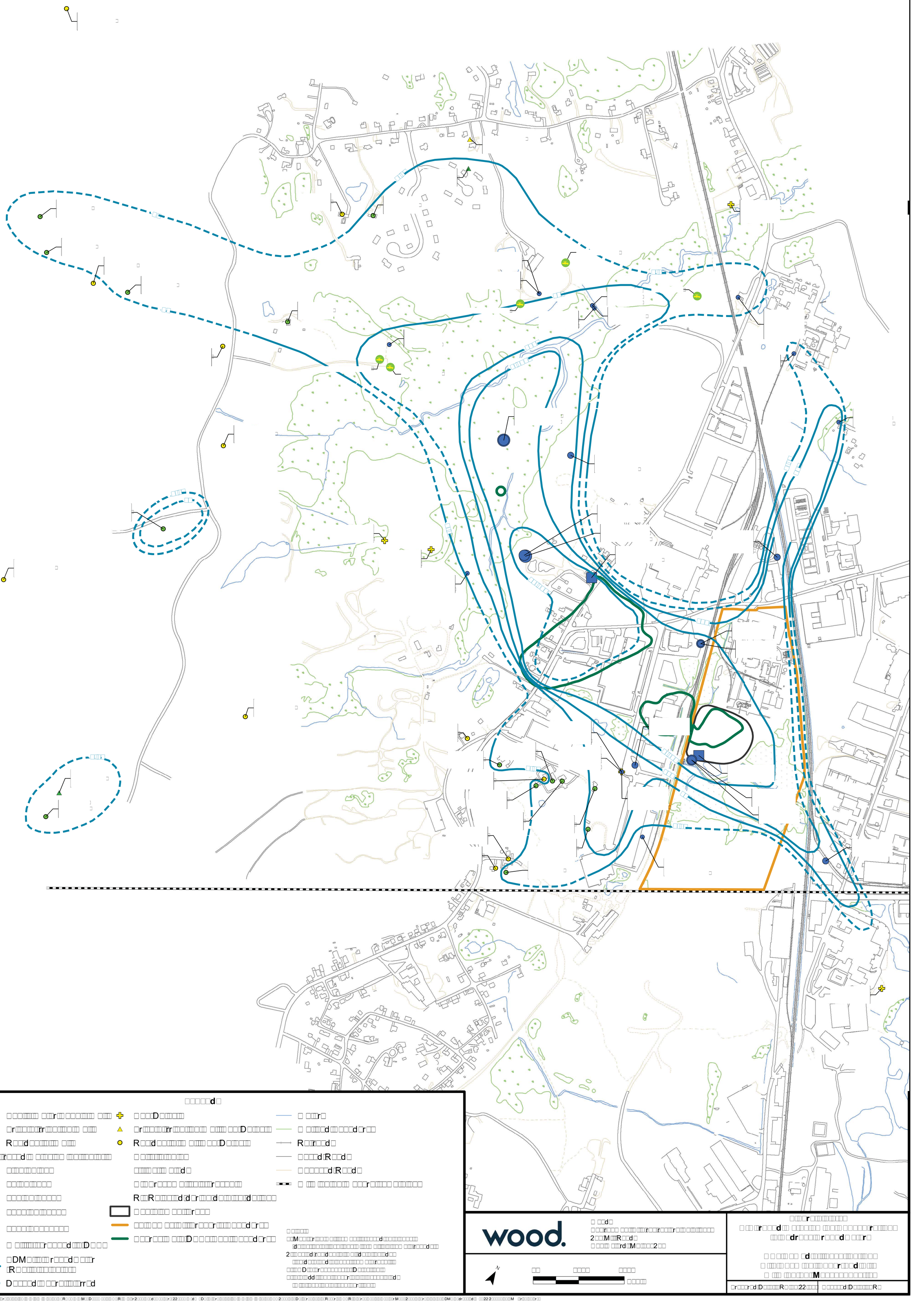
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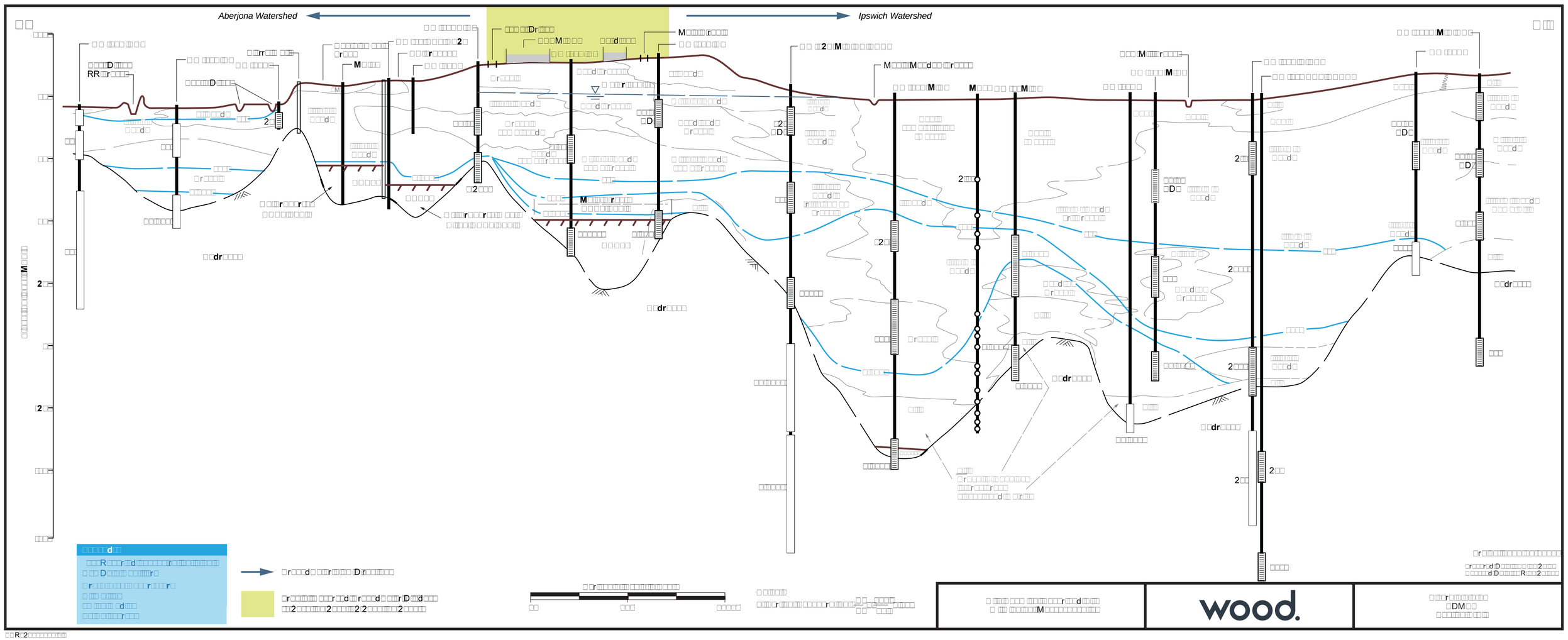
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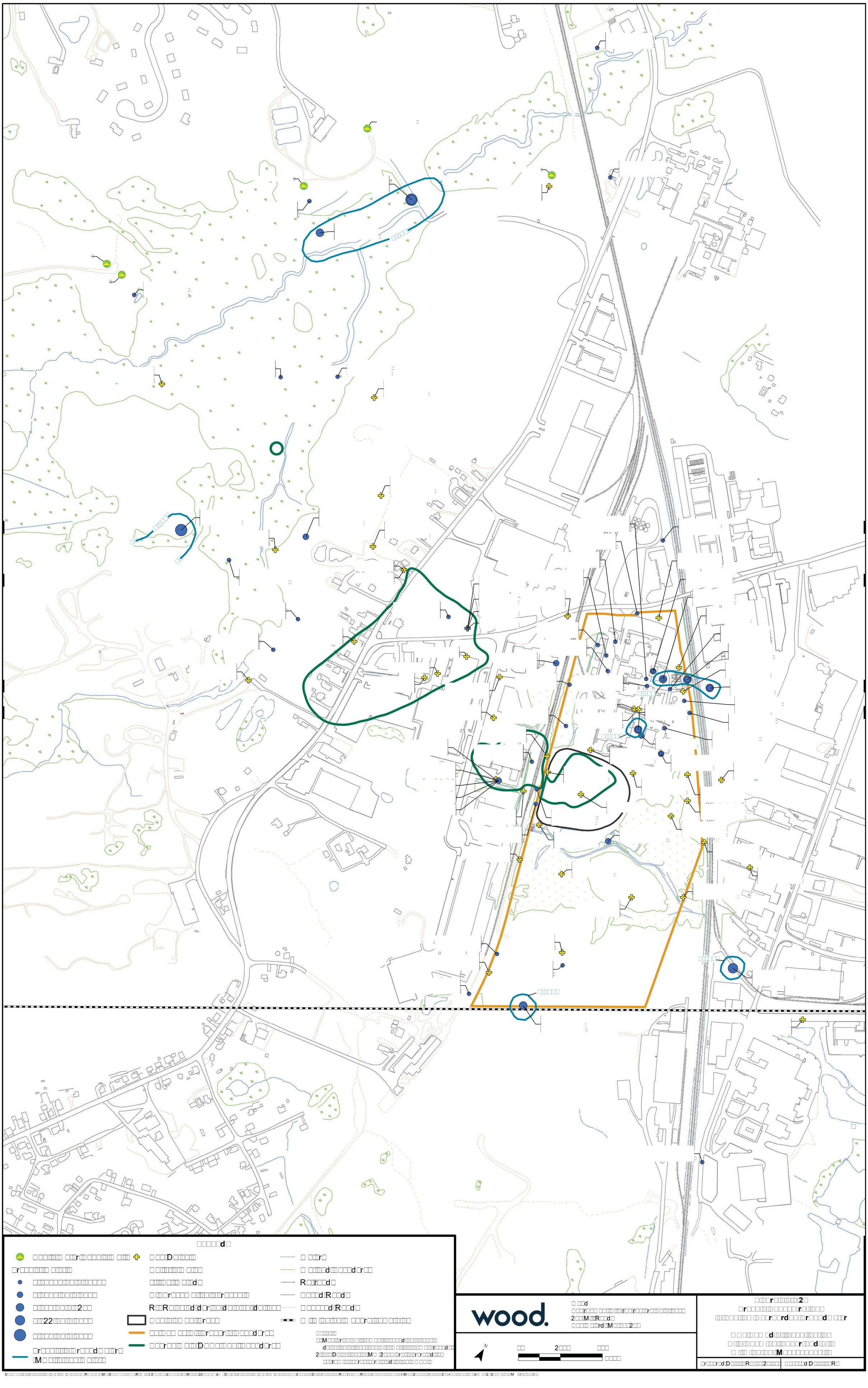

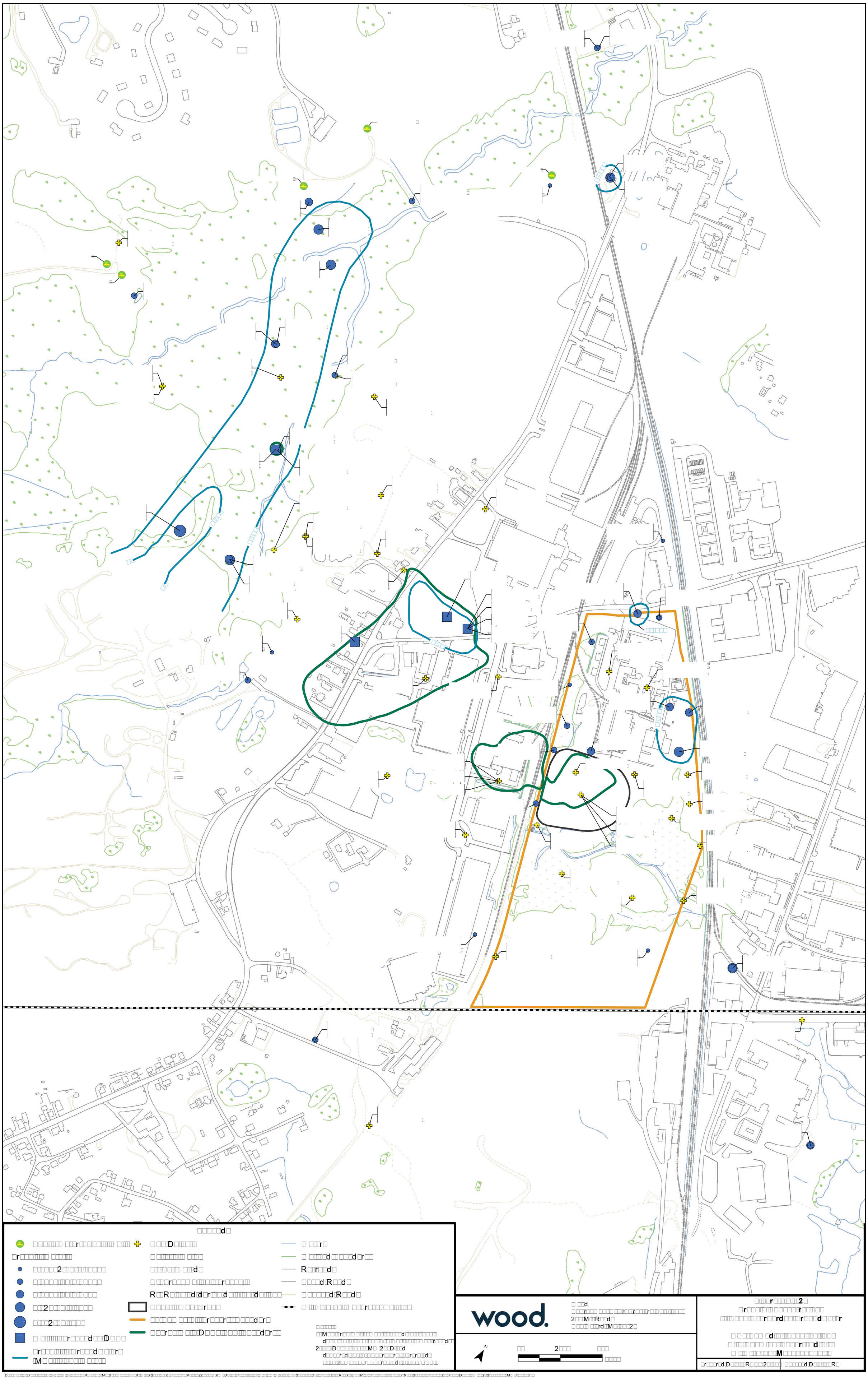

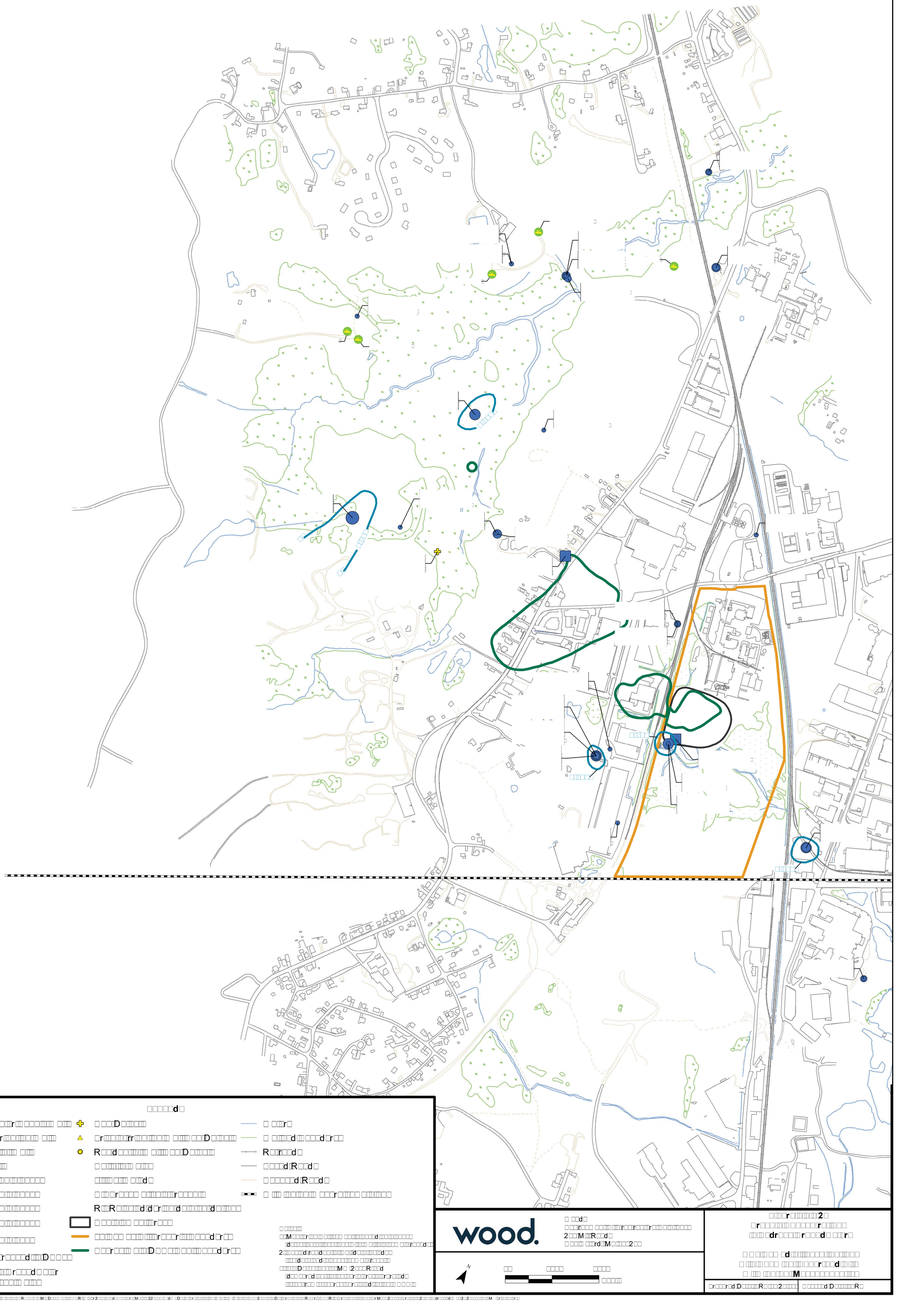
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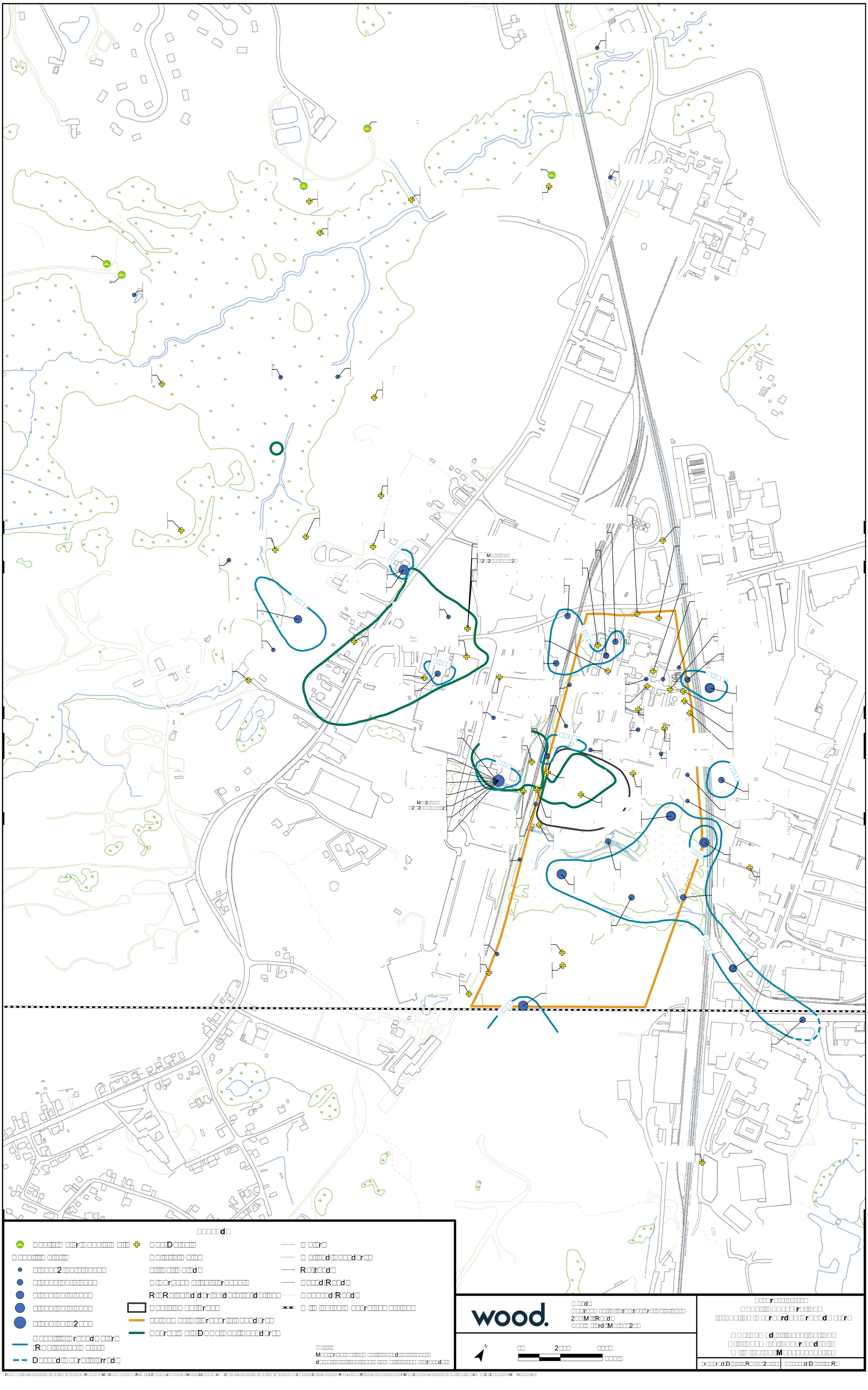
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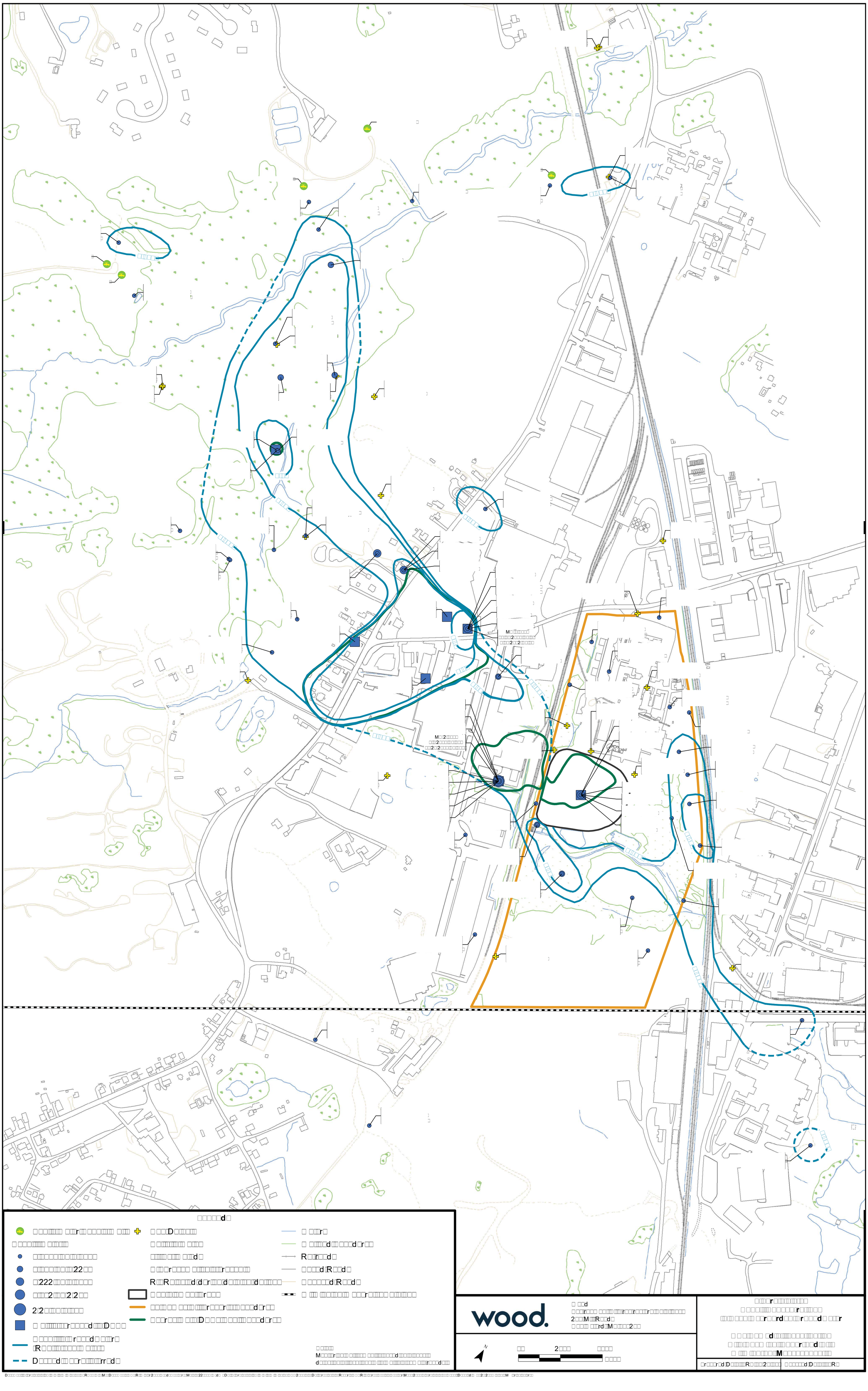
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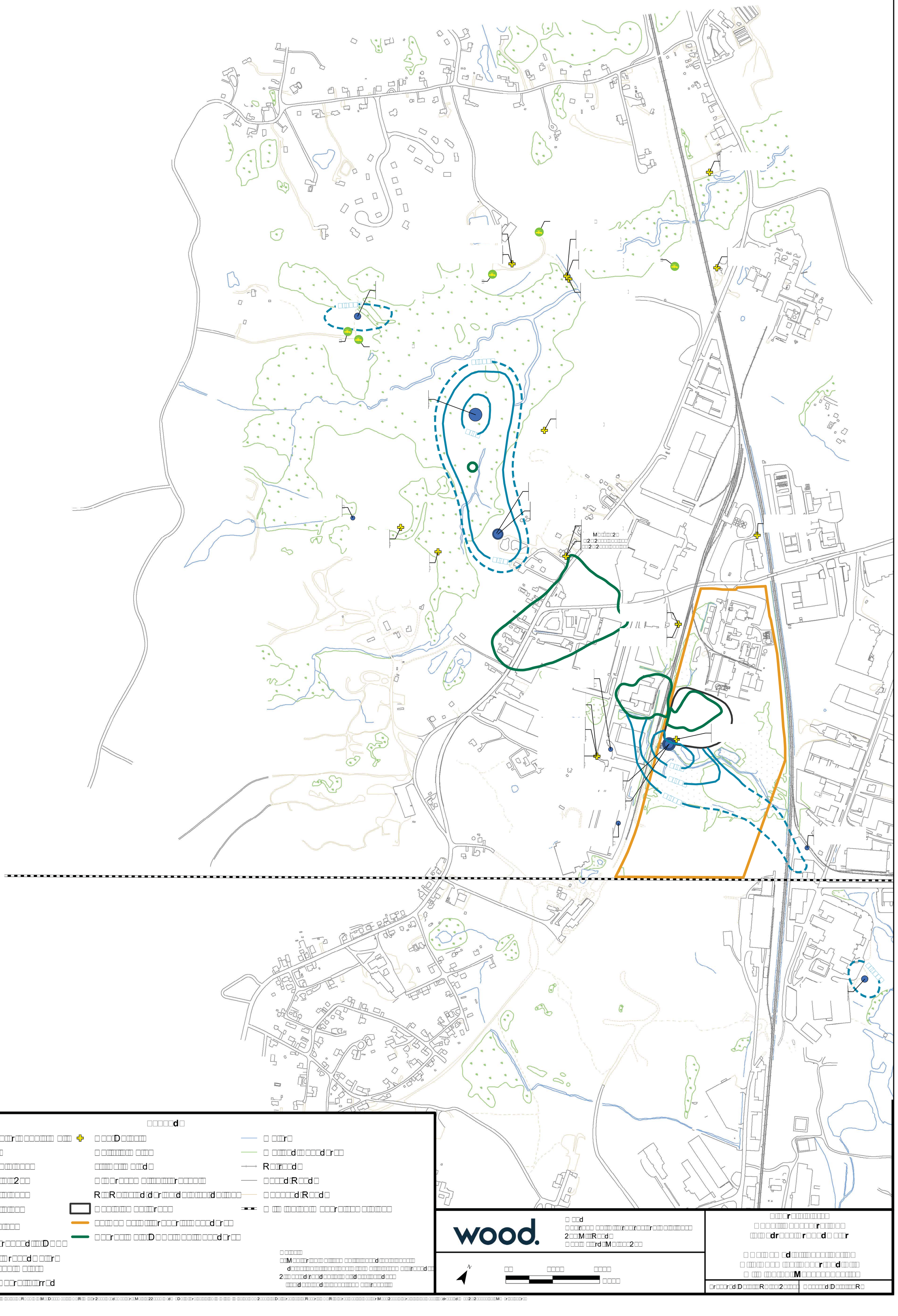
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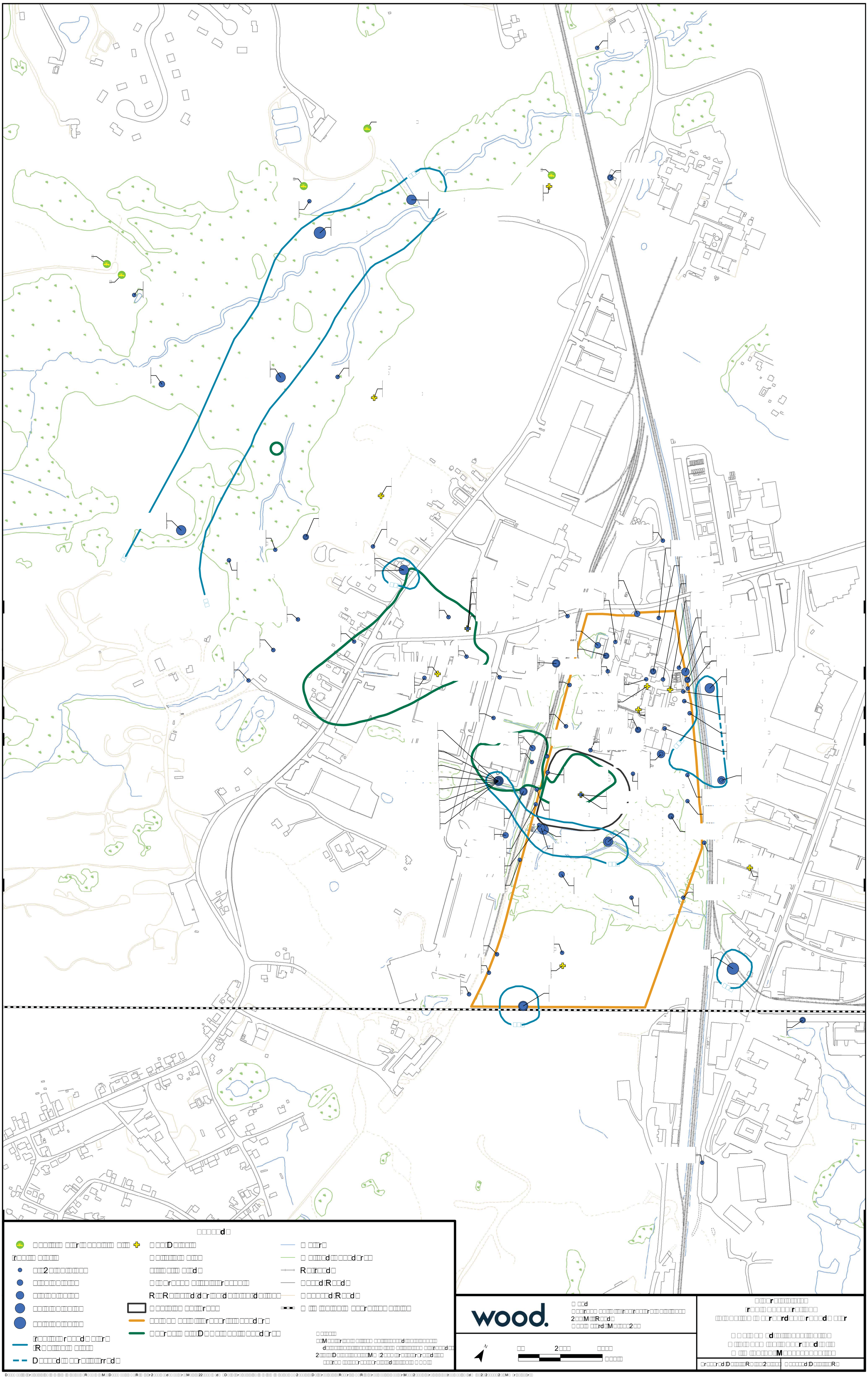

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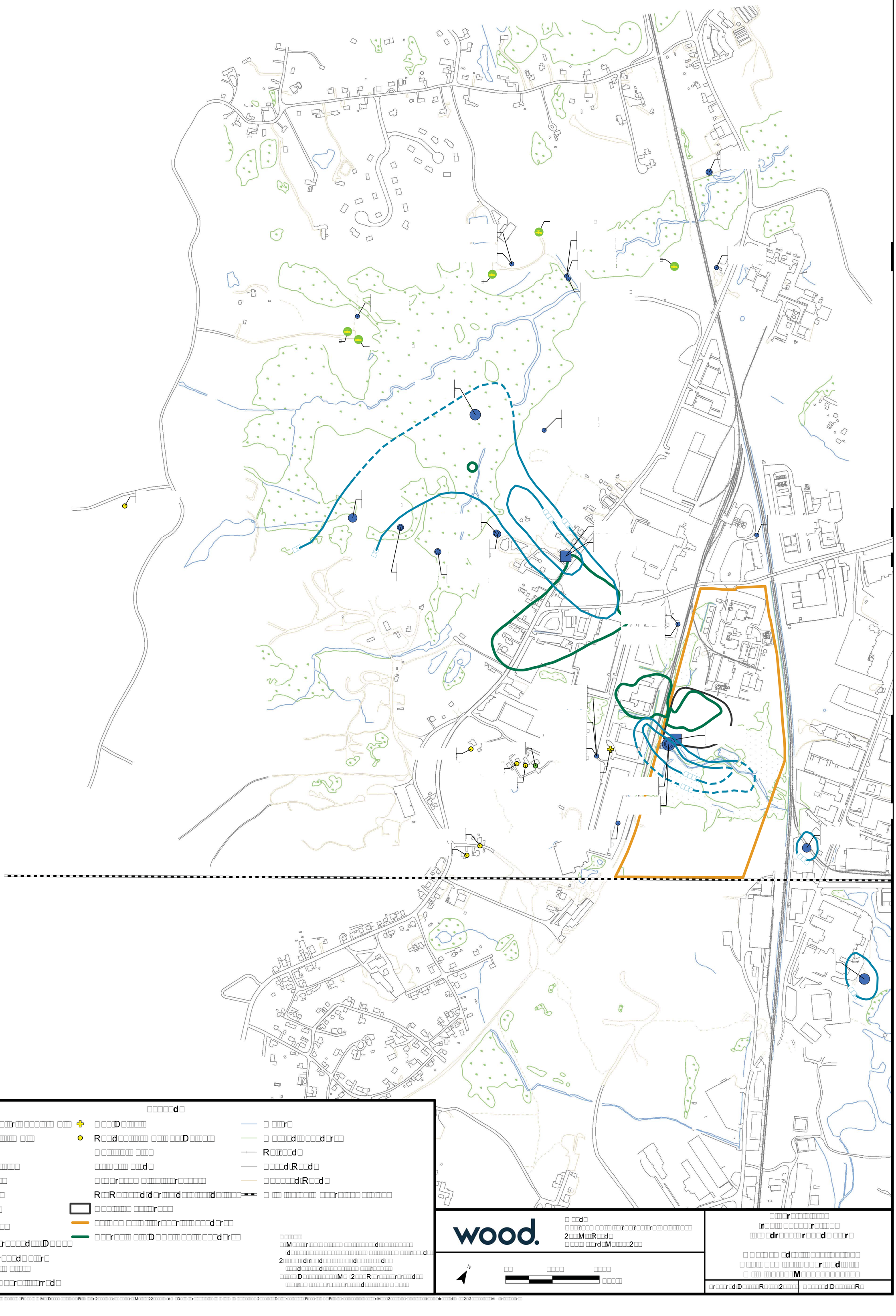
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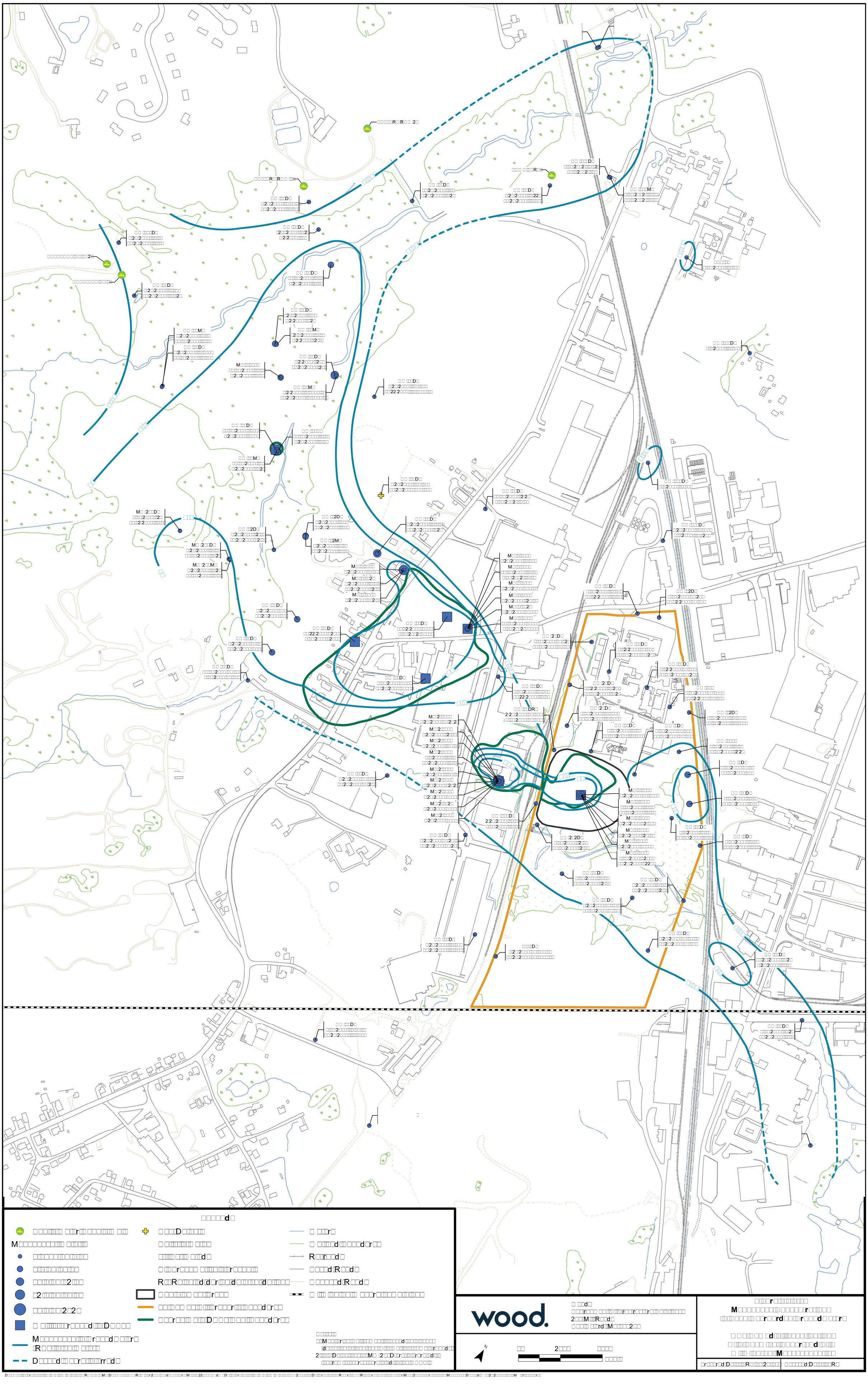
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Proposed Development Boundary

Proposed Development Infrastructure

- Proposed Wind Turbine Generator
- Proposed Battery Energy Storage System (BESS)
- Proposed Substation
- Proposed Temporary Construction Compound
- Proposed Permanent Access Track
- Proposed Temporary Access Track
- Proposed Underground Cable Route
- Proposed Overhead Line Route
- Proposed Permanent Meteorological Mast
- Proposed Temporary Meteorological Mast
- Proposed Permanent Crane Hardstanding
- Proposed Temporary Crane Hardstanding
- Proposed Borrow Pit
- Proposed Temporary Laydown Area
- Proposed Temporary Concrete Batching Plant
- Proposed Site Entrance
- Proposed Temporary Site Entrance
- Proposed Access Gate
- Proposed Passing Place
- Proposed Felling
- Proposed Forestry Replanting
- Proposed Habitat Management Area
- Proposed Peatland Restoration Area
- Proposed Biodiversity Enhancement Area
- Proposed Water Crossing
- Proposed Temporary Water Crossing
- Proposed Footpath Diversion
- Proposed Core Path Diversion
- Proposed Temporary Footpath Diversion
- Proposed Temporary Core Path Diversion
- Proposed Temporary Footpath Closure
- Proposed Temporary Core Path Closure
- Proposed Temporary Road Closure
- Proposed Temporary Traffic Management Area
- Proposed Temporary Passing Place
- Proposed Temporary Road Widening
- Proposed Temporary Road Junction Improvement
- Proposed Temporary Road Junction Reinstatement
- Proposed Temporary Road Junction Removal
- Proposed Temporary Road Junction

APPENDIX D
DAPL TREATMENT TRAIN

APPENDIX D

DAPL Treatment Train

Below is the list of assumptions developed by Olin Corporation to develop the on-site dense aqueous phase liquid (DAPL) treatment train and cost estimates. This list was sent to the U.S. Environmental Protection Agency (EPA) on Wednesday, February 12, 2020 and is incorporated in the DAPL Alternatives Comparison Memo.

- Estimated on-Site DAPL treatment cost: **$1.31/gallon** [assumed volume within the three DAPL pools: 15,000,000 gallons]. The cost includes capital, operations and maintenance (O&M), and sludge/solids disposal. Cost does not include labor.

- DAPL Treatment train: Lime precipitation of metals and dewatering/disposal of sludge; Stripping of volatile organic compounds (VOCs) and ammonia; ultraviolet (UV) photooxidation of n-nitrosodimethylamine (NDMA); and evaporation of remaining water and disposal of the resulting residual solids.

- Sludge cake (metals precipitate) and evaporated solids will be non-hazardous.

- Transport and disposal of solids/sludge: $100/ton.

- Average sulfate concentration in DAPL: 20,000 mg/L, based on available data.

- Air stripper will be designed for 99.9% ammonia removal, as NDMA removal is assumed to be required in the downstream process.

- Effluent ammonia concentration from ammonia stripper will be low enough to avoid issues with NDMA removal.

- 95% UV transmittance in the influent.

- DAPL will be evaporated to 20% of its original volume and will be a solid for off-site transportation/disposal.

- Evaporated solids will have a specific gravity of 1.5.

Note - The feasibility of constructing a full-scale DAPL treatment system will have to be verified/confirmed during a pilot test and/or bench-scale study.