

Superfund Records Center

STATE: WINTHROP

BREAK: 8.3

OTHER: 522235

**Fifth Five-Year Review Report for
Winthrop Landfill Superfund Site
Town of Winthrop
Kennebec County, Maine**



**PREPARED BY:
United States Environmental Protection Agency
Region I – New England
Boston, Massachusetts**



James T. Owens, III, Director
Office of Site Remediation and Restoration
U.S. Environmental Protection Agency – New England

9/19/12
Date



TABLE OF CONTENTS

List of Acronyms and Abbreviations.....iii
 Executive Summary.....iv
 Five-Year Review Summary Form.....vii

1.0 Introduction.....1
 2.0 Site Chronology.....2
 3.0 Background.....5
 4.0 Remedial Actions.....8
 5.0 Progress Since Last Five-Year Review.....17
 6.0 Five-Year Review Process.....22
 7.0 Technical Assessment.....25
 8.0 Issues.....34
 9.0 Recommendations and Follow-Up Actions.....34
 10.0 Protectiveness Statements.....35
 11.0 Next Review.....36

TABLES

Table 1 Chronology of Site Events.....2
 Table 2 Issues.....34
 Table 3 Recommendations and Follow-Up Actions.....34

ATTACHMENTS

Attachment 1 Site Map
 Attachment 2 Sampling Locations
 Attachment 3 Remedial Action Plan (RAP) Table 1
 Attachment 4 Remedial Action Plan (RAP) Table 2
 Attachment 5 Landfill Monitoring Systems
 Attachment 6 EPA and DEP Approved Alternate Concentration Limits and
 Protective Concentration Limits
 Attachment 7 Signs Posted at Hoyt Brook Seep Area
 Attachment 8 List of Documents Reviewed
 Attachment 9 Public Meeting Agenda, June 26, 2012
 Attachment 10 Groundwater, Surface Water, and Sediment Detections in 2011 and
 2012
 Attachment 11 Comparison of Current ACLs to Current MCLs and MEGs
 Attachment 12 ME DEP Comment Letter, Dated September 18, 2012

LIST OF ACRONYMS AND ABBREVIATIONS

ACRONYM DEFINITION

ACL	Alternate Concentration Limit
AMEC	AMEC Environment and Infrastructure
AOC	Administrative Order by Consent
ARARs	Applicable or Relevant and Appropriate Requirements
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSF	Cancer Slope Factor
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
gpm	gallons per minute
GWETS	Groundwater Extraction and Treatment System
MCLs	Maximum Contaminant Levels
MCLG	Maximum Contaminant Level Goal
ME DEP	Maine Department of Environmental Protection
MEG	Maine Maximum Exposure Guidelines for Drinking Water
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation & Maintenance
OU	Operable Unit
PCL	Protective Concentration Limit
ppb	parts per billion
ppm	parts per million
PRP	Potentially Responsible Party
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RAOs	Remedial Action Objectives
RAP	Remedial Action Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision (previously known as a “Superfund Enforcement Decision Document”)
SARA	Superfund Amendments and Reauthorization Act of 1986
TCE	trichloroethylene
UTC	United Technologies Corporation
VES	Vapor Extraction System
VOCs	Volatile Organic Compounds
WasteLAN	The Regional database related to the Comprehensive Environmental Response, Compensation, and Liability Information System
WLCAG	Winthrop Landfill Citizens Action Group

EXECUTIVE SUMMARY

The Winthrop Landfill Superfund Site, located in the Town of Winthrop, Kennebec County, Maine, was included on the National Priorities List in 1983. The potentially responsible parties (PRPs) are performing all remedial work at the Site pursuant to a 1986 Consent Decree.

The remedy selected to address contamination at the Site, as outlined in the November 22, 1985 Superfund Enforcement Decision Document (aka Record of Decision, or ROD), includes:

- extension of an alternate water supply to area residents;
- construction of a chain link fence around the landfill and imposition of deed restrictions prohibiting use of the landfill for activities other than the remedial action;
- prohibition of groundwater withdrawal for purposes other than remedial action;
- prohibition of excavation within the landfill, except for residential construction or remedial action;
- quarterly sampling of monitoring points in sensitive areas;
- grading and placement of a Resource Conservation and Recovery Act (RCRA) cap over the entire landfill;
- completion of engineering design work (geologic, hydrogeologic, treatability pilot studies); and
- establishment of an Alternate Concentration Limit (ACL) for each contaminant in groundwater.

If the ACLs are exceeded, the ROD provides for the installation and operation of a groundwater extraction and treatment system (GWETS). An Explanation of Significant Differences (ESD) was also signed on October 20, 1993, which documented the inclusion of a vapor extraction system (VES) as a component of the GWETS. Following ACL exceedances, the VES and GWETS were installed and began operation in 1994 and 1995, respectively.

The Site achieved construction completion when the Preliminary Close Out Report was signed on December 23, 1997. On September 29, 1998, the United States Environmental Protection Agency (EPA) determined that the remedy was Operational and Functional, and documented this in an Interim Remedial Action (RA) Report.

The VES was decommissioned in 2000. The GWETS continued operation through 2002, at which point it was shut down for a rebound evaluation. During the rebound evaluation, a Vinyl Chloride Contingency Plan was implemented to monitor vinyl chloride in groundwater and soil gas in the southern flowpath and evaluate potential vapor migration into indoor air, and conduct remediation activities, as necessary. Remediation has not been required since implementation of the Contingency Plan in 2003.

Data gathered before, during, and after the period of GWETS operation indicated that, while the GWETS had been effective in addressing most contaminants in groundwater, its continued operation would not significantly affect widespread elevated arsenic concentrations. Supplemental evaluations of the potential risk from vapor intrusion, screening level evaluations of human health and ecological risks posed by contaminants at all points of exposure, and additional sampling events and evaluations at the points of exposure were conducted.

In August 2006, EPA, in conjunction with the Maine Department of Environmental Protection (ME DEP) and the PRPs, held an open house followed by a public meeting to discuss and distribute a draft ESD. The draft ESD proposed to decommission the GWETS in light of the fact that its operation was no longer necessary to treat contaminants other than arsenic and the fact that it would not be effective in treating arsenic. EPA collected public comments on the draft ESD through October 16, 2006.

EPA issued the final ESD on February 14, 2007, permitting decommissioning of the GWETS and allowing arsenic in groundwater to be addressed through natural processes over an extended period of time. The ESD requires the development and implementation of a plan to monitor and remediate points of exposure as necessary, including arsenic accumulation in sediment, to ensure continued protection of human health and the environment. The ESD also requires continued monitoring and, as necessary, evaluation and remediation of the risk posed by potential vapor intrusion.

At this point in time, the only location where the EPA and ME DEP (collectively, “the Agencies”) have determined there is a need for further remedial action to address potential risk to human health is the Hoyt Brook seep area, located approximately 500 feet to the north of the landfill, where arsenic levels in sediment are the highest, and where arsenic-contaminated sediment is exposed to the air for much of the recreational season. Since the last five-year review report, the PRPs have conducted a number of sampling efforts in an effort to continue delineating the extent of arsenic in sediment at the seep areas. At the Hoyt Brook seep area, data shows arsenic concentrations exceed PCLs in sediment near the seep area and up to approximately 50 feet downstream of the seep. Potential risk in this area exists for a young child, who may directly contact the sediment and be exposed through dermal absorption or incidental ingestion of contaminants in sediment. Caution signs were posted at the Hoyt Brook seep area in February 2007 and supplemented with no-swimming signs in November 2010.

In addition, since the last five-year review, the Agencies and the PRPs have also been working to identify and quantify the potential risk to a swimmer posed by arsenic in algae and flocculent that accumulates in the Annabessacook Lake seep area, located approximately 500 feet to the south of the landfill. The Agencies determined that no action was required to address potential risk from algae/flocculent, but that sampling would continue on a five-year basis, to be conducted the years prior to five-year reviews, or as determined necessary by the Agencies.

In early 2012, EPA Region 1, in conjunction with its Headquarters office in Washington, D.C. and the U.S. Department of Justice, finalized its determination that a ROD Amendment would be required to implement remedial activities at the points of exposure, specifically, remedial activity needed to address arsenic-contaminated sediment at the Hoyt Brook seep area, and that the CD would also require modification before any remedial work could begin. (The original ROD does not include any remedy for contaminated sediment, and never addressed sediment as a separate media.)

The remedy at the Winthrop Landfill Superfund Site currently protects human health and the environment in the short-term because an alternate water supply has been extended to area residents and a Town Ordinance prohibiting groundwater use is in place. The landfill is capped, a fence has been erected around the landfill, and access to the landfill is controlled by the PRPs. With the exception of one or two small parcels not owned by the Town, all parcels within the landfill are subject to institutional controls which prevent disturbance of the cap. The cap and fencing are performing as intended and routine maintenance and repair activities continue on a regular basis. Monitoring of groundwater, surface water, and sediment is ongoing, including monitoring of vinyl chloride in the southern flowpath, and monitoring of algae/flocculent in the Annabessacook Lake seep area.

Remediation is required to address potential human health risk posed by arsenic-contaminated sediment at the Hoyt Brook seep area and ensure long-term protectiveness, however, a ROD Amendment and modification of the CD are required prior to the start of any remedial work. The property owner is aware of the potential risk from sediment, and the public is notified during every public meeting of the potential risk from sediment in the Hoyt Brook seep area. Caution signs are posted at the Hoyt Brook seep area advising passers-by to avoid contact with sediment, and no-swimming signs are also posted in the area.

In order for the remedy to be protective in the long-term, follow-up actions are required. The Agencies will continue to coordinate with the Town to ensure that deed notices or, if possible, Declaration of Environmental Covenants, are recorded for the privately owned parcel(s) within the landfill, as required. The Agencies will continue to work with the PRPs to develop the necessary documentation required for a ROD Amendment and modification of the CD. Following ROD Amendment and CD modification, remediation of arsenic-contaminated sediment at Hoyt Brook will be initiated.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Winthrop Landfill Superfund Site		
EPA ID: MED980504435		
Region: 1	State: ME	City/County: Winthrop/Kennebec
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	Has the site achieved construction completion? Yes (12/23/1997)	
REVIEW STATUS		
Lead agency: EPA If "Other Federal Agency" was selected above, enter Agency name:		
Author name (Federal or State Project Manager): Anni Loughlin		
Author affiliation: EPA Remedial Project Manager		
Review period: 4/5/2012 to 8/13/2012		
Date of site inspection: 6/26/2012		
Type of review: Policy		
Review number: 5		
Triggering action date: 9/21/2007		
Due date (five years after triggering action date): 9/21/2012		

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review: - NA -

Issues and Recommendations Identified in the Five-Year Review:

OU(s): NA	Issue Category: Institutional Controls			
	Issue: Deed notices on private properties never filed; further protections may be required.			
	Recommendation: Agencies to discuss need to comply with CD requirements with Town. Private owners will be requested to implement deed notice, or preferably, Declaration of Environmental Covenant to provide additional protections for the cap portion of the remedy.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Town of Winthrop (PRP)	EPA & ME DEP	9/30/2014

OU(s): NA	Issue Category: Monitoring			
	Issue: Exceedance of PCL for arsenic in sediment at Hoyt Brook requires remediation.			
	Recommendation: ROD Amendment and modification of CD are required. Agencies to work with PRPs on Focused Feasibility Study prior to ROD Amendment. As soon as CD modification is entered in court, implement remediation at Hoyt Brook.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	EPA & ME DEP; followed by PRPs	EPA & ME DEP	ROD Amendment by 9/30/2013, CD modification by 9/30/2014, CD entry and start of remediation by 6/30/2015.

Sitewide Protectiveness Statement (if applicable)

For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.

Protectiveness Determination:
Short-term Protective

Addendum Due Date (if applicable):

Protectiveness Statement: The remedy at the Winthrop Landfill Superfund Site currently protects human health and the environment in the short-term because an alternate water supply has been extended to area residents and a Town Ordinance prohibiting groundwater use is in place. The landfill is capped, a fence has been erected around the landfill, and access to the landfill is controlled by the PRPs. With the exception of one or two small parcels not owned by the Town, all parcels within the landfill are subject to institutional controls which prevent disturbance of the cap. The cap and fencing are performing as intended and routine maintenance and repair activities continue on a regular basis. Monitoring of groundwater, surface water, and sediment is ongoing, including monitoring of vinyl chloride in the southern flowpath, and monitoring of algae/flocculent in the Annabessacook Lake seep area. At the Hoyt Brook seep area, the property owner is aware of the potential risk from sediment, and the public is notified during every public meeting of the potential risk from sediment in the Hoyt Brook seep area. Caution signs are posted at the Hoyt Brook seep area advising passers-by to avoid contact with sediment, and no-swimming signs are also posted in the area.

In order for the remedy to be protective in the long-term, follow-up actions are required. The Agencies will continue to coordinate with the Town to ensure that deed notices or, if possible, Declaration of Environmental Covenants, are recorded for the privately owned parcel(s) within the landfill, as required. The Agencies will continue to work with the PRPs to develop the necessary documentation required for a ROD Amendment and modification of the CD. Following ROD Amendment and CD modification, remediation of arsenic-contaminated sediment at Hoyt Brook will be initiated.

1.0 INTRODUCTION

The purpose of this five-year review is to determine whether the remedy for the Winthrop Landfill Superfund Site is protective of human health and the environment. The methods, findings and conclusions of this review are documented in this Five-Year Review Report. In addition, this report identifies any issues found during the preparation of this five-year review along with recommendations to address such issues.

The United States Environmental Protection Agency (EPA) must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121(c), as amended, states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The agency interpreted this requirement further in the NCP; part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

EPA Region I conducted a five-year review of the remedial actions implemented at the Winthrop Landfill Superfund Site in the Town of Winthrop, Kennebec County, Maine. This review was conducted from April 2012 through August 2012. This report documents the results of the review.

This is the fifth five-year review for the Winthrop Landfill Site. The triggering action for this review is the date of the fourth five-year review, as shown in EPA's WasteLAN database: September 21, 2007. This review is required by policy as the Superfund Enforcement Decision Document (or, Record of Decision or ROD) was signed before October 17, 1986, the effective date of the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the remedial action will leave hazardous substances, pollutants, or contaminants on-site above levels that allow for unlimited use and unrestricted exposure. (Five-year reviews are required by statute only for certain sites where the ROD was signed after the effective date of SARA.) The Maine Department of Environmental Protection and EPA's Office of Emergency and Remedial Response reviewed this document.

2.0 SITE CHRONOLOGY

The chronology of the Site, including all significant Site events and dates is included in Table 1.

Note that the Superfund Enforcement Decision Document (ROD) provided for numerous actions, all of which were covered under one operable unit (OU) only. EPA's older tracking systems utilized in the 1980's did not allow for phasing of a remedy under one OU to track accomplishments. At that time, the remedy was divided into three OU's to allow for easier tracking of the different phases of the remedy, including the cap, the Alternate Concentration Limits, and the Groundwater Extraction and Treatment and Vapor Extraction Systems. The definitions of accomplishments have also changed, which adds to the discrepancies in the current tracking system.

While EPA's WasteLAN system currently shows three separate OUs, this report provides for start and completion dates of Site-wide activities.

Table 1: Chronology of Site Events	
Event	Date
Residential and industrial waste disposal on Site	1930 to 1982
Volatile organic compounds detected in residential well	1980
Proposal to National Priorities List (NPL)	October 23, 1981
Final Listing on NPL	September 8, 1983
Remedial Investigation/Feasibility Study	1981 to 1985
Administrative Order by Consent	June 6, 1984
Public water distribution system installed to all private residences	1984 to 1987
Town of Winthrop enacts Ordinance prohibiting groundwater withdrawal and groundwater use and certain excavation within the Site.	October 9, 1985
Superfund Enforcement Decision Document (aka "ROD") signed	November 22, 1985
Consent Decree entered	March 23, 1986
Quarterly monitoring program begins	March 23, 1986
Remedial Design Start	March 24, 1986
Remedial Action Start	November 19, 1986
Fence installation and cap construction completed, except for one area of slope failure	October 21, 1987
Investigation of slope failure, and slope reconstruction	1989
Town of Winthrop revises its October 9, 1985 ordinance to the Ground Water and Air Protection Ordinance.	April 3, 1991
Remedial Design Complete	March 24, 1992
EPA approves landfill cap	June 23, 1992
Potentially Responsible Parties (PRPs) submit ACL Demonstration Report and revisions	1992

First Five-Year Review	October 9, 1992
EPA and ME DEP Decision Document accepts PRP's revised ACL Demonstration Report	March 10, 1993
Explanation of Significant Differences documenting inclusion of a Vapor Extraction System (VES); construction of VES begins	October 20, 1993
EPA and ME DEP conditionally approve a 100% design report for the Groundwater Extraction and Treatment System (GWETS); construction begins	April 28, 1994
Landfill cap settlement reported and repairs completed	1994
Operation of the VES begins	October 1994
Operation of the GWETS begins	March 1995
Recharge trench installed to supplement GWETS	December 1995
Re-injection well reconstructed	June 1996
PRPs excavate a large area of exposed arsenic-contaminated sediment from Annabessacook Lake	October 1996
EPA and ME DEP conduct final inspection	October 24, 1996
Second Five-Year Review	September 30, 1997
PRPs installed two groundwater extraction wells at an identified hot spot on the landfill	October 1997
PRPs excavate arsenic-contaminated sediment from Hoyt Brook	December 1997
Preliminary Close-Out Report Amendment (Construction Completion Determination)	December 23, 1997
PRPs re-configure VES system	January 1998 to March 1998
PRPs repair landfill cap depressions caused by VES	September 1998
Remedial Action Complete (Operational & Functional Determination; Interim RA Report)	September 29, 1998
Operations & Maintenance Begins	September 29, 1998
VES reaches limit of effective remediation and is discontinued	2000
Meeting among Agencies and PRPs to discuss GWETS rebound evaluation	November 29, 2001
Public meeting on Site to discuss conceptual plan for GWETS rebound evaluation, Site visit	August 21, 2002
Third Five-Year Review	September 30, 2002
Start of GWETS Rebound Evaluation, GWETS shutdown	November 2002
Implementation of Contingency Plan, Vinyl Chloride Reactivation Criterion Exceedance, in response to vinyl chloride detections in the southern flowpath	October 2003
EPA human health and ecological risk screening evaluations of risks at points of exposure	April 2006
Evaluation of soil vapor pathway in the southern flowpath	June 2006
Evaluation of sediment occurrence, toxicity testing, and surface water and sediment delineation at points of exposure	June-July 2006

Post-GWETS Engineering Evaluation and Cost Analysis	August 2006
Public meeting to discuss and distribute draft ESD	August 28, 2006
Public comment period for draft ESD (extended at request of public)	August 28 – October 16, 2006
Supplemental Hoyt Brook delineation sampling for arsenic	November 2006
Explanation of Significant Differences outlining decommissioning of the GWETS and attainment of the arsenic ACL through natural processes, a requirement to monitor, evaluate, and if warranted, remediate, contaminants at points of exposure, and a requirement to continue monitoring and, as necessary, evaluate and remediate any risk posed by potential vapor intrusion	February 14, 2007
Posting of caution signs in sediment at Hoyt Brook seep	June 4, 2007
Wetland delineation at Hoyt Brook seep	July 2007
Fourth Five-Year Review	September 21, 2007
Arsenic profiling (horizontal and vertical) at Hoyt Brook seep	September 2008 – January 2009
Arsenic in sediment delineation at Annabessacook Lake seep	November 2008 – January 2009
PRPs submit first remedial alternative analysis report for Hoyt Brook seep	March 2009
Annabessacook Lake algae survey and sampling	September 2009
PRPs begin algae observation at Annabessacook Lake seep	April 2010
PRP sampling of algae in surface water at Annabessacook Lake seep	May 2010 & August 2010
PRP seep and stream flow measurements at Hoyt Brook seep	May 2010 & August 2010
PRP sediment sampling at Annabessacook Lake seep for arsenic toxicity testing	May 2010
“No swimming” signs posted alongside caution signs at Hoyt Brook seep	November 2010
Revised remedial alternative analysis report for Hoyt Brook seep	May 2011
PRP algae observation and sampling at Annabessacook Lake seep	May 2011 – September 2011
Revised remedial alternative analysis report for Hoyt Brook seep	August 2011
Public notice regarding start of Fifth Five-Year Review published in <i>Kennebec Journal</i>	May 24, 2012
Public meeting at Winthrop Town Hall regarding Site status, upcoming fifth five-year review, and need for ROD Amendment and CD modification	June 26, 2012

3.0 BACKGROUND

Physical Characteristics.

The Winthrop Landfill Superfund Site is located at 294 Annabessacook Road in the Town of Winthrop, Kennebec County, Maine. The landfill consists of two contiguous parcels with a total surface area of approximately 20 acres, and is situated along the east side of Annabessacook Road. An 11.5 acre sphagnum bog is located directly to the east of the Site. A 6 acre cattail marsh and Hoyt Brook are located to the north. The Site is also located along the western shore of 1,420-acre Annabessacook Lake, a large controlled reservoir which is located in the upper reaches of the Cobbossee Watershed. Lower reaches of the watershed provide backup municipal water supplies for Augusta, Maine. Groundwater flow from the Site discharges primarily to Annabessacook Lake, approximately 500 feet to the south of the landfill, and secondarily to Hoyt Brook, approximately 500 feet to the north of the landfill.

The Site is located approximately two miles away from the center of the Town of Winthrop. There are approximately 21 residential homes in close proximity to the landfill (within 300 to 400 feet). Figures provided in Attachment 1 and Attachment 2 to this report show the general location of the Site and a more detailed map of the area.

Land and Resource Use.

The Site was excavated in the 1920's as a sand and gravel pit, then operated as the Winthrop Town Dump from 1930 to 1982. The Site is currently inactive.

The current land use for the surrounding area is mainly residential, with some areas of limited commercial use (i.e., an auto repair shop). Annabessacook Lake is used for recreational purposes, such as swimming, fishing, and boating. Hoyt Brook use is occasional and primarily for recreational boating via canoe or kayak within the vicinity of the Site.

Residential homes near the Site originally obtained their drinking water from private residential wells. In 1980, volatile organic compounds (VOCs) were detected in a residential well south of the landfill. Area residents have since been connected to a permanent public water supply, and all groundwater use and certain excavation in the area is prohibited.

History of Contamination.

The Site was first excavated in the 1920s as a sand and gravel pit, then operated as the Winthrop Town Dump, accepting residential and industrial waste disposal from 1930 to 1982. Disposal of hazardous wastes occurred in the northern portion of the landfill from the early to mid-1970s. Until the mid-1970s, wastes were also burned periodically. From the mid-1970s to 1982, the southern portion of the Site operated as a sanitary landfill. After 1982, the Site has been and continues to be inactive.

It is estimated that over 3 million gallons of chemical wastes, consisting mostly of organic compounds, were disposed at the Site. Free liquid wastes were dumped and burned periodically, and wastes in drums were also dumped.

In 1980, VOCs were detected in a residential well south of the landfill. Subsequent sampling detected Site-related contaminants in groundwater to the northeast, east, and south of the landfill at levels up to 400 parts per million (ppm).

Initial Response.

The Site was listed on the National Priorities List (NPL) on October 23, 1981. Under an Administrative Order by Consent (AOC), the Town of Winthrop and Inmont Corporation installed a permanent public water supply to area residents in 1984.

On October 9, 1985, the Town of Winthrop enacted an ordinance to prohibit groundwater withdrawal and to prohibit all groundwater use and certain excavation within the Site. This ordinance was revised April 3, 1991, to include additional areas utilized by the PRPs during remediation, and to provide further excavation control in areas potentially impacted by landfill gas migration.

The Remedial Investigation/Feasibility Study (RI/FS) was conducted from 1981 to 1985. The RI determined that liquid chemical wastes were migrating from the landfill in shallow and deep groundwater in three separate flows. One deep residential well was found to be contaminated, with potential for there to also be contamination in other wells in the area. Low concentrations of organic contaminants were found in lake sediments south of the landfill and organic contaminants were detected in groundwater within the bedrock beneath the Site. At the time, there were approximately 21 homes in proximity of the landfill. Residents also raised concerns over impact to surface water in Annabessacook Lake, and impacts to the nearby bog and marsh.

The Superfund Enforcement Decision Document was issued on November 22, 1985. (Note that this type of decision document would later come to be called a "Record of Decision or "ROD" -- this acronym will be used for the remainder of this report.) Based on this ROD, a Consent Decree (CD) was entered on March 23, 1986, among EPA, the Maine Department of Environmental Protection (ME DEP), Inmont Corporation as a generator, and the Town of Winthrop, Maine, Everett Savage and Glenda H. Savage as owners and operators of the landfill. The CD designates Inmont Corporation as the lead PRP. The Town of Winthrop and the Savages granted access to their portions of the Site. The Site is currently PRP-lead.

Inmont Corporation, the lead PRP, was subsequently purchased by BASF Corporation. United Technologies Corporation (UTC), as the former owner of Inmont and on behalf of BASF Corporation, has taken responsibility for conducting Site work pursuant to the CD. Currently, AMEC Environment and Infrastructure (AMEC, formerly MACTEC

Engineering and Consulting) is performing all remedial work at the Site on behalf of UTC, including landfill cap post-closure work, and monitoring of groundwater, surface water, and sediment.

Although all parties that signed the CD are technically “PRPs,” where the remainder of this report refers to PRPs, this generally means UTC.

Basis for Taking Action.

The ROD concluded that potential threats to human health and the environment could primarily occur via ingestion of contaminated groundwater, physical contact with wastes, discharge of contaminants to surface waters, and migration of contaminated groundwater off-site. Ingestion of contaminated groundwater was determined to be the primary threat to human health, particularly due to the levels of carcinogens detected in a well serving two residences. Included in that well were the following compounds:

Compound	Maximum Reported Concentration, Parts Per Billion (ppb)
Tetrahydrofuran	720
Dimethylformamide	500
Methylene chloride	57
trans-1,2-Dichloroethylene	31
Trichloroethylene	10
1,1,1-Trichloroethane	6
1,1-Dichloroethane	22
Vinyl chloride	3.2

The Site monitoring program subsequently included the following landfill constituents:

2,4-Dinitrophenol	Ethylbenzene	Styrene
Diethylphthalate	Methylene chloride	Total Xylenes
Chrysene (*)	Fluorotrichloromethane	Tetrahydrofuran
Benzene	Tetrachloroethylene	Di-2-ethylhexyl adipate
1,1-Dichloroethane	Toluene	Dimethylformamide
1,2-Dichloroethane	Trichloroethylene	2-Methoxyethanol
1,1,1-Trichloroethane	Vinyl chloride	Zinc
Chloroethane	Acetone	Nickel
1,1-Dichloroethylene	2-Butanone	Arsenic
trans-1,2-Dichloroethylene	4-Methyl-2-pentanone	Phenol
1,2-Dichloropropane	2-Hexanone	

* Chrysene was later removed from the monitoring program, as described in the March 10, 1993 EPA/ME DEP Decision Document.

4.0 REMEDIAL ACTIONS

Remedy Selection.

Remedial action objectives for the Site included the following:

- to protect public health by providing uncontaminated water supplies for residents in currently contaminated areas and areas in which there was potential for contamination of groundwater supplies;
- to protect public health by minimizing the potential for human contact with contaminants via inhalation, ingestion or dermal contact;
- to protect the environment by minimizing the potential for discharge to Annabessacook Lake, Hoyt Brook, the sphagnum bog, and the cattail marsh of contaminants already in groundwater and contaminants which continue to be released from the landfill; and
- to minimize further degradation of groundwater resources.

As outlined in the November 22, 1985 ROD, the selected remedy for the Winthrop Landfill Superfund Site included:

- extension of an alternate water supply to area residents;
- construction of a chain link fence around the landfill and imposition of deed restrictions prohibiting use of the landfill for activities other than the remedial action;
- prohibition of groundwater withdrawal for purposes other than remedial action;
- prohibition of excavation within the landfill, except for residential construction or remedial action;
- quarterly sampling of monitoring points in sensitive areas;
- grading and placement of a Resource Conservation and Recovery Act (RCRA) cap over the entire landfill;
- completion of engineering design work (geologic, hydrogeologic, treatability pilot studies); and
- establishment of an Alternate Concentration Limit (ACL) for each contaminant in groundwater.

If the ACLs were exceeded, the ROD provided for the installation and operation of a groundwater extraction and treatment system (GWETS). An Explanation of Significant Differences (ESD) was also signed on October 20, 1993, which documented the inclusion of a vapor extraction system (VES) as a component of the GWETS. A second ESD was signed on February 14, 2007 which outlined decommissioning of the GWETS and attainment of the arsenic ACL through natural processes, a requirement to monitor, evaluate, and if warranted, remediate, contaminants at points of exposure, and a requirement to continue monitoring and, as necessary, evaluate and remediate any risk posed by potential vapor intrusion.

Remedy Implementation.

As previously outlined, under an AOC, the Town of Winthrop and Inmont Corporation installed a permanent public water supply to area residents in 1984. (One remaining residence was connected in 1987.) On October 9, 1985, the Town of Winthrop enacted an ordinance to prohibit groundwater withdrawal and to prohibit all groundwater use and certain excavation within the Site. This ordinance was revised April 3, 1991, to include additional areas utilized by the PRPs during remediation, and to provide further excavation control in areas potentially impacted by landfill gas migration. New residences in the area have all been connected to the water line in accordance with the Town's Ordinance. During the previous five-year review, UTC's contractor, MACTEC, undertook a records review and conducted discussions with several area residents to confirm that all residences within the Town of Winthrop's Groundwater and Air Protection Zone are connected to the municipal water source.

A monitoring program was implemented in March 1986, which specified a quarterly monitoring program for 37 samples at specified groundwater, surface water, and sediment locations with analysis for 32 landfill constituents as listed in Remedial Action Plan (RAP) Table 1 (see Attachment 3). The RAP also required annual analysis for a second list of constituents, RAP Table 2 (see Attachment 4), to identify whether additional constituents should be added to RAP Table 1. The monitoring program has subsequently been modified several times, with current monitoring locations on Attachment 2.

After completion of engineering studies, landfill cap design began in March 1986. Cap design was completed with the approval of the Remedial Action Work Plan submitted on November 19, 1986. Cap construction was completed in September 1987 except for one area of slope failure. The vegetative layer and fence installation were completed in October 1987. In April 1989, the PRPs began investigating the area of slope failure and determined that slippage occurred because the ground around a nearby bog was weaker than expected and it could not adequately support the weight of the cap. Slope reconstruction was completed in November 1989, in accordance with construction plans and specifications approved by EPA and ME DEP. EPA approved the cap on June 23, 1992, and post-closure monitoring of the cap has continued since that time. Settlement of the landfill cap was reported in July 1994, and the PRPs made repairs as necessary. Current landfill monitoring systems are shown on Attachment 5.

In 1988, the PRPs began a wetlands enhancement project in Annabessacook Lake to the north of the Site, which consisted of a wild rice planting intended to compensate for landfill cover encroachment into the sphagnum bog. The PRPs continued to annually seed the area until 1995, when EPA and ME DEP approved a two-year cessation of planting activities. In 1998, the Agencies concurred that no further wetlands compensation action was needed.

The PRPs submitted an ACL Demonstration Report on April 15, 1992; EPA and ME DEP disapproved all proposed ACLs. On September 25, 1992, the PRPs submitted a revised ACL Demonstration Report which EPA and ME DEP accepted in a Decision Document signed March 10, 1993. ACLs were set at the point of compliance, the edge of the solid waste disposal area. Protective Concentration Limits (PCLs) were set for the points of exposure, where contaminated groundwater could come into contact with a potential human or ecological receptor in surface water or sediment (see Attachment 6).

The ACLs were set at Maximum Contaminant Levels (MCLs) for most contaminants of concern. If an MCL had not been promulgated, a human health risk-based drinking water guideline was used, such as the State of Maine's Maximum Exposure Guidelines (MEGs). If ACLs set at the MCL were determined to not protect ecological receptors at the points of exposure, an ecologically derived guideline was used instead. Surface water PCLs were also set at MCLs for most contaminants, with the same aforementioned caveats. PCLs were also set for sediment at groundwater discharge points.

Arsenic was recognized in the 1993 Decision Document as being a ubiquitous, naturally-occurring compound, for which background concentrations often exceed health based guidelines. The ACL for arsenic in groundwater was set at 30 ppb. The PCL for arsenic in sediment was set at 31,000 ppb (31 ppm, or 31 mg/kg). The PCL for arsenic in surface water was to be set as a background concentration, not less 0.77 ppb and not to exceed 30 ppb in surface or groundwater. In March 1994, ME DEP approved a PCL of 5 ppb for arsenic in surface water; EPA concurred with this decision in June 1995.

Contamination from the Site did accumulate in sufficient quantities in sediments at the Annabessacook Lake seep area to cause an exceedance of PCLs for arsenic in sediment. In October 1996, the PRPs excavated a large area of exposed contaminated sediment. Geotextile fabric and riprap material were placed over the excavated area to cover the area and bring it back to original grade. A similar exceedance was present in a smaller affected portion of nearby Hoyt Brook, and the PRPs excavated this area in December 1997.

Design of a Groundwater Treatment and Extraction System (GWETS) was ongoing during the design and implementation of ACLs. After the determination that a GWETS system would be necessary due to ACL exceedances in groundwater, formal design plans were submitted to EPA and ME DEP. EPA and ME DEP conditionally approved a 100% design report on April 28, 1994 and construction began shortly thereafter. All extraction and re-injection wells, including all necessary underground piping, were placed at the Site and an on-site treatment plant building was constructed.

Operation of the GWETS began in March 1995, and was required to continue until ACLs were achieved in groundwater outside the landfill boundary. The GWETS was designed to hydraulically isolate groundwater underneath the landfill and to remediate groundwater constituents. Groundwater was extracted from the central portion of the landfill and

treated to remove VOCs, N,N-dimethylformamide, iron, and arsenic. The treated water was re-injected at the landfill northern and southern boundaries to create artificial groundwater mounds that enhanced the size of the capture zone of the extraction system.

The GWETS system consisted of one extraction well (EW-2) located in the center of the landfill pumping at a maximum of 65 gallons per minute (gpm) and five recharge wells, two at the north end of the landfill accepting treatment plant effluent at 30 and 5 gpm respectively, two at the south end accepting 5 gpm total, and one in the southern flowpath accepting 25 gpm. In December 1995, a recharge trench was installed to supplement the system, and another recharge well was installed in June 1996. In October 1997, the PRPs installed two additional extraction wells at an identified hot spot on the landfill in an attempt to maximize efficiency and expedite shutdown of the GWETS. However, when detected concentrations were much lower than the initial investigations, the PRPs determined that operating these wells as permanent extraction wells would not result in significant mass removal of contamination, and operation of these wells ceased.

The PRPs had also investigated the use of a VES to supplement any groundwater treatment. Soil and gas analyses showed that residual VOCs remained within soils and refuse above the water table. Studies indicated that removal of the VOCs above the water table was possible, and that inclusion of the VES component should reduce the GWETS operation time. The PRPs submitted a VES Final Design in August 1993, and on October 20, 1993, EPA documented the inclusion of the VES in the remedial action by issuing an Explanation of Significant Differences.

The full-scale VES design consisted of 42 vapor extraction wells installed in refuse material and 32 vapor extraction wells installed in natural soils above the groundwater table. A separate VES treatment building was installed on-site and includes two treatment technologies: a thermal oxidizer was used to treat methane during the first 100 days of initial operations, and remaining VOCs were treated by carbon filtration. In October 1993, the PRPs began installation of the vapor extraction wells, manifold pipe network and the VES building. VES process equipment was installed during the summer of 1994 and the system was started in October 1994. The PRPs continued to make repairs to ongoing divots and depressions that occurred in the landfill cap because of operation of the VES.

EPA and ME DEP conducted final inspections of the Site on October 24, 1996 and determined that the PRP contractors had constructed the remedy in accordance with remedial design plans and specifications approved by the Agencies. Final designs contained construction quality assurance programs to verify that the work met the ROD and design requirements. EPA and ME DEP staff had performed oversight of all construction activities and design of monitoring programs and the ACLs during the remedial action; EPA's contractors also provided oversight of all construction activities, as well as significant oversight of quarterly monitoring activities, from 1984 - 1997. EPA and ME DEP confirmed in a Site visit on August 3, 1998 that minor items associated with ongoing maintenance had been completed.

The Site achieved construction completion when the Preliminary Close Out Report was signed on December 23, 1997. On September 29, 1998, EPA determined that the remedy was Operational and Functional, and documented this in an Interim RA Report. The Operational and Functional determination for the Site triggered the start of Site-wide Operations and Maintenance (O&M).

GWETS Operation and Maintenance, and 2007 Explanation of Significant Differences.

The PRPs continued operation of the VES through 1999, reconfiguring the system in early 1998 to extract soil vapor only from an identified hot spot on the landfill. Between 1994 and 1999, the VES removed an estimated 3,181 pounds of non-methane VOCs. In 2000, the VES was decommissioned after a determination that it had reached the limit of effective remediation for organic vapors, and that VOC concentrations had not rebounded after a temporary shutdown of the system.

The PRPs continued GWETS operation through November 2002. Throughout this time, sampling indicated that the system was achieving performance standards and that the effluent met established cleanup levels. 1,1-Dichloroethane was the last organic compound to be detected above the ACL in extracted groundwater in March 1999. The only constituent that continued to be detected above the ACL in extracted groundwater was arsenic.

In November 2002, following a public meeting and public comment period, the Agencies approved a temporary shutdown of the GWETS to allow for a rebound evaluation to observe Site conditions under non-pumping conditions and evaluate how effective the operation of the GWETS had been on the contaminated groundwater plume. During the rebound evaluation, vinyl chloride was detected at one well in the southern flowpath above the criterion which had been established for reactivation of the system. In order to allow the rebound evaluation to continue, but still maintain protection of human health and the environment, the Agencies approved a Vinyl Chloride Contingency Plan submitted by the PRPs which outlined definitive response actions to a confirmed exceedance of the reactivation criteria. The Contingency Plan also established action levels for evaluating potential vapor migration into indoor air, and required remediation in the southern flowpath if data indicated that migration was likely. Since implementation of the Contingency Plan in 2003, remediation has not been required.

In August of 2006, EPA, in conjunction with ME DEP, UTC, and UTC's contractor, MACTEC, held an open house followed by a public meeting to discuss and distribute a draft ESD allowing the GWETS to be permanently decommissioned. As stated in the ESD, the Agencies had determined that the GWETS was no longer necessary to treat contaminants other than arsenic, and that it would not be effective in treating arsenic. Specifically, extensive data gathered from before, during, and after the period of GWETS operation showed that removal/treatment of contamination by the GWETS had led to significantly reduced concentrations of all contaminants other than arsenic in the northern and southern flowpaths, to the point that ACLs had been or would soon be achieved. By

contrast, arsenic continued to be found in groundwater at most downgradient wells at concentrations comparable to those measured prior to GWETS operation, and at levels significantly above the ACL.

As explained in the ESD, the Agencies believed that the widespread elevated arsenic levels reflected the mobilization of naturally occurring arsenic into groundwater, which was the result of a change in the aquifer underlying the landfill to anaerobic/reducing conditions. The anaerobic/reducing conditions in the aquifer were in turn caused by the degradation of organic waste in the landfill, an ongoing process which was expected to persist for decades to centuries. These facts, supported by the results of the rebound evaluation, indicated that continued operation of the GWETS would not have any significant effect on arsenic concentrations in the future.

The ESD described alternative methods evaluated by the PRPs to address the remaining problem of arsenic in groundwater, including technologies to accelerate the process of waste degradation, technologies to return the aquifer to aerobic conditions, technologies to immobilize dissolved arsenic, and technologies to capture dissolved arsenic in groundwater prior to its discharge in the lake and brook. Each of these approaches was considered inadvisable due to technical challenges, cost considerations, and/or the fact that the remedy would not be permanent. The conclusion reached was that there are no currently available technologies which could address mobilization of naturally occurring arsenic in a cost-effective and reliable manner.

EPA collected public comments through October 16, 2006, and finalized the ESD on February 14, 2007. Pursuant to the final ESD, arsenic in groundwater is expected to be addressed through natural processes over an extended period of time. To ensure continued protection of human health and the environment, the ESD also required the development and implementation of a plan to monitor and remediate points of exposure as necessary, including arsenic accumulation in sediment. By 2007, arsenic above the PCL had accumulated in sediment at all points of exposure, most notably the Hoyt Brook seep area and the Annabessacook Lake seep area.

In 2006, the Agencies also conducted a supplemental evaluation of existing Site data to determine if there was a potential risk to occupants of buildings in the southern flowpath from vapor intrusion of vinyl chloride or other VOCs. At this time, the Agencies have determined that current Site conditions do not present an unacceptable risk via the vapor intrusion pathway, but that continued monitoring, evaluation, and remediation if necessary, is required to ensure that changes in conditions do not present an unacceptable risk in the future from vinyl chloride or any other Site-related contaminants.

In 2006, EPA also performed screening level evaluations of human health and ecological risks posed by Site-related contaminants at all points of exposure. Throughout 2006, UTC and its contractor, MACTEC, conducted a number of additional sampling events and evaluations in order to help the Agencies further assess human health and ecological risk at the points of exposure.

The PRPs decommissioned the GWETS in late 2007-early 2008, and submitted a Hazardous Waste Generator Closure Certification to ME DEP in March 2008. UTC transferred the former GWETS and VES buildings to the Town of Winthrop in April 2008.

Current Status.

For the last several years, the locations posing the most potential risk to human health and the environment have been the points of exposure, where naturally-occurring arsenic and other metals, mobilized by groundwater flow from the landfill, precipitates at seep areas where the groundwater flow daylight at a surface water body. Arsenic and other metals then accumulate in sediment at these points of exposure, and concentrations can increase to levels that pose a potential risk. These points of exposure include the Annabessacook Lake seep area located approximately 500 feet south of the landfill, the Hoyt Brook seep area located approximately 500 feet north of the landfill, Sphagnum Bog/Seep East located immediately adjacent to the eastern landfill boundary, and Cattail Marsh/Seep Marsh located immediately adjacent to the northern landfill boundary. The potential human health risk from arsenic-contaminated sediment at all points of exposure includes adults and young children who may contact the sediment directly and be exposed. Sediments that are continually submerged from year to year were not considered to be accessible. At this point in time, the only location where the Agencies have determined there is a need for remedial action to address potential risk to human health is the Hoyt Brook seep area, where arsenic levels in sediment are the highest, and where arsenic-contaminated sediment is exposed to the air for much of the recreational season.

To specifically address the ongoing discharge of arsenic at points of exposure, and any future exceedance at points of exposure of the PCL for any Site-related contaminant, the February 2007 ESD required the development and implementation of a Point of Exposure Monitoring and Remediation Work Plan. However, in early 2012, EPA Region 1, in conjunction with its Headquarters office in Washington, D.C. and the U.S. Department of Justice, finalized its determination that a ROD Amendment would be required to implement remedial activities at the points of exposure, specifically remedial activity needed to address arsenic-contaminated sediment at the Hoyt Brook seep area, and that the CD would also require modification before any remedial work could begin. (The original ROD does not include any remedy for contaminated sediment, and never addressed sediment as a separate media.)

Prior to the determination that a ROD Amendment and CD modification are required, the PRPs had submitted a number of Remedial Alternative Evaluation Reports for the Hoyt Brook seep area, which is currently the only point of exposure that requires remedial action. The Agencies are currently working with the PRPs to modify these documents into a Focused Feasibility Study that will be used as a support document for any upcoming ROD Amendment.

Since the last five-year review report, UTC and its contractor, AMEC, have conducted a number of sampling events in an effort to continue delineating the extent of arsenic in sediment at the seep areas. At the Hoyt Brook seep area, data shows arsenic concentrations exceed PCLs in sediment near the seep area and up to approximately 50 feet downstream of the seep. Potential risk in this area exists for adults or young children who may directly contact the sediment and be exposed through dermal absorption or incidental ingestion of contaminants in sediment. Caution signs were posted at the Hoyt Brook seep area in February 2007 and supplemented with no-swimming signs in November 2010. (See Attachment 7 for sign content.) The public is notified during every public meeting of the potential risk from sediment in the Hoyt Brook seep area. The owner of the property on which the seep area is located is also aware of the potential risk from sediment.

The Agencies and the PRPs have also been working to identify and quantify the potential risk to a swimmer posed by algae and flocculent that accumulates in the Annabessacook Lake seep area. In 2009, a lake-wide algae survey, including sampling throughout various parts of Annabessacook Lake, indicated that algae mats were observed in many portions of Annabessacook Lake. Algae growing in the seep area were co-located with accumulated flocculent, an orange, pasty material consisting of naturally-occurring metals precipitating out of solution onto the surface of rocks and sediment. Although all samples of algae from all sections of Annabessacook Lake contained arsenic, the mixed algae/flocculent sample taken directly from the seep area contained arsenic at greater concentrations. In 2010 and 2011, the PRPs observed that algae/flocculent accumulates throughout the year, and then appears to break apart and dissipate during the winter season.

In 2010, the Agencies and the PRPs developed an initial plan to assess risk to waders and swimmers in the area via incidental ingestion of algae/flocculent mats that broke away from the seep area due to disturbances from wind or passing boats. The sampling goal was to create a screening or “worst-case” scenario in which adult or child might encounter and accidentally swallow bits of algae/flocculent during recreational activities throughout the recreational season near the Annabessacook Lake seep area. Risk calculations based on samples taken in May and August 2010 and using conservative assumptions resulted in a cancer risk that slightly exceeds the State of Maine’s acceptable risk range.

In 2011, the Agencies and the PRPs developed a refined study to represent a more realistic, but still appropriately conservative exposure scenario for recreational activities. The PRPs sampled algae/flocculent monthly between May and September 2011, collecting a larger number of samples for risk calculations. Supplemental risk calculations used very conservative assumptions about the number of recreational days in the water, assuming that a swimmer was always swimming in disturbed water in the same direction as algae travel, and would incidentally ingest algae/flocculent material during every day of swimming. The calculations indicated that the estimated cancer risk is within or below EPA’s allowable risk range and the ME DEP risk limit, and that the non-cancer Hazard Index is below EPA and ME DEP’s limits. The Agencies determined that

no action was required to address potential risk from algae/flocculent, but that sampling would continue on a five-year basis, to be conducted the years prior to five-year reviews, or as determined necessary by the Agencies.

In May of each year, UTC's contractor, AMEC, also conducts surface water sampling in the area of the Annabessacook Lake seep and provides the data to EPA for a determination on potential risks to residents via recreational use. To date, EPA's human health risk staff has consistently determined that the levels of contaminants in surface water are unlikely to cause negative health impacts to people who will swim or wade in the lake. Detections appear to be decreasing, and in May 2011 and May 2012, none of the tested constituents were detected at all.

UTC and its contractor, AMEC, continue to conduct Site-wide monitoring of groundwater, surface water and sediment in accordance with the post-closure monitoring program. When the monitoring program was implemented in March 1986, the program specified quarterly sampling for groundwater, surface water, and sediment locations. In November 1998, the post-closure monitoring program was revised to reduce monitoring from quarterly to semi-annually in May and October, and to reduce the number of locations and constituents sampled based on historical detections. In October 2008, the post-closure monitoring program was revised again to delete performance monitoring of the GWETS and VES systems. At that time, the frequency for sampling of RAP Table 2 parameters also changed from annually to once every five years, with a contingency plan to address unforeseen problems or changes in the data. RAP Table 2 parameters were most recently sampled in May 2011. Groundwater results indicated exceedances of Maine MEGs for iron and sodium; the Agencies agreed that re-sampling of these compounds was not required because iron and sodium are both common and naturally-occurring, are not contaminants of concern at the Site, and because all area residents are on public water. There were also detections of sulfate and chloride below their respective criteria, and detections of calcium, magnesium, and potassium, none of which have any applicable criteria.

Vinyl chloride monitoring of groundwater and soil gas in the southern flowpath also continues in accordance with the Vinyl Chloride Contingency Plan, and in accordance with the February 2007 ESD, which requires continued monitoring and, as necessary, evaluation and remediation of the risk posed by potential vapor intrusion. Recent vinyl chloride sampling results show ongoing stable and slightly decreasing low-level concentrations in the southern flowpath; VOCs have not posed a vapor intrusion threat to area structures, and remediation has not been required. In June 2010, changes were also incorporated into the vapor intrusion contingency monitoring section of the post-closure monitoring plan; this included changes in target monitoring levels based on historical data, and also changing to a shallower monitoring well at one well cluster to more accurately assess potential vapor intrusion risk.

The PRPs also continue to perform O&M work on the cap as necessary. Visual monitoring of the landfill occurs at least twice per year to check for the following: evidence of erosion; cap differential settlement; the condition of fence gates, locks, and

signs; condition of the vegetative cover; condition of gas probes and groundwater monitoring wells; condition of drainage structures; and the condition of roads and surrounding residential properties. During 2011 inspections, all gates were observed to be locked and in good condition, and the landfill fence was repaired along the southern side. All warning signs had recently been replaced and were in good condition. Two culverts were observed to be in good structural condition and free of obstructions. All Site-wide monitoring locations were observed to be in good condition.

Subsequent cap inspection work was ongoing as of July 2012. Earlier in the summer, UTC's contractor, AMEC, found a long narrow potential "crack" on the eastern slope by the SED-304 gate location. During the June 26, 2012 Site inspection, AMEC and the Agencies observed a narrow gap between the grass with no hole or depth to the crack. ME DEP visited the area again on July 13, 2012 and observed no significant change. AMEC is currently in the process of conducting a quantitative assessment of the slope, and will be taking inclinometer readings on a monthly basis through the end of the calendar year.

An off-site landfill gas monitoring program is conducted to identify any subsurface gas migration, and recent landfill gas monitoring indicated no methane detections at off-site locations. AMEC regularly contacts the Town of Winthrop Code Enforcement Officer to assess whether any new building permit applications were submitted in order to evaluate compliance with air and groundwater provisions of the Town's Ordinance. In 2011, the Town issued several new building permits for a nearby parcel, which has been cleared for residential structures. The property owner has hired an independent consultant to evaluate potential health and safety risks associated with construction on the parcel.

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

In the fourth five-year review, dated September 21, 2007, EPA certified that the remedy selected for this Site remains protective of human health and the environment.

The last five-year review stated that exceedances at Points of Exposure required additional evaluation, and that exceedances of arsenic in sediment at the Hoyt Brook seep area required remediation. Pursuant to the 2007 ESD, the Agencies had planned to work with the PRPs to develop a Point of Exposure Monitoring and Remediation Work Plan. Following completion of the Work Plan, remediation of arsenic-contaminated sediment at Hoyt Brook would be initiated, and all other point of exposure areas would be evaluated in accordance with the Work Plan. Currently, the Hoyt Brook seep area is still the only point of exposure that requires remediation.

As previously noted, EPA determined in 2012 that a ROD Amendment would be required to implement remedial activities at the points of exposure, specifically remedial activity needed to address arsenic-contaminated sediment at the Hoyt Brook seep area, and that the CD would also require modification before any remedial work could begin. The

Agencies are currently working with the PRPs to modify these documents into a Focused Feasibility Study that will be used as a support document for any upcoming ROD Amendment. EPA expects to finalize the ROD Amendment by September 2013.

Since the last five-year review report, the PRPs have conducted a number of sampling efforts in an effort to continue delineating the extent of arsenic in sediment at the seep areas. At the Hoyt Brook seep area, the PRPs conducted both horizontal and vertical arsenic profiling in September 2008 and January 2009, finding that most contaminated sediment is located on a shallow portion of the bank above the surface of the brook, stretching along the bank about 50 feet. Most of the highest levels of arsenic are within the first six inches of depth. Arsenic was found in sediment at levels ranging from approximately 3 mg/kg up to a maximum of 4899 mg/kg in surficial sediment, well above the PCL of 31 mg/kg.

Potential risks in this area were conservatively estimated for adults and young children who may visit the contaminated sediment areas up to three times per week during the warmer months. Exposure can occur from dermal contact with, and incidental ingestion of, the contaminated sediment. Locations where groundwater seeps come out of the ground at this seep area are usually located above the water line of the brook, leading to much of the arsenic-contaminated sediment being exposed to air and accessible to individuals visiting the area. EPA's exposure scenario assumes that adults and young children access the area 42 days/year (three times/week for 14 weeks) for 30 years, and will dermally contact and incidentally ingest sediment during each visit.

EPA's exposure scenario is conservative. While there is no physical barrier to prevent people from accessing the area on foot or by boat, the property is privately owned, wooded, and undeveloped. The area is most frequently accessed by recreational boaters via kayak or canoe. Caution signs were posted at the Hoyt Brook seep area in February 2007 advising passers-by to avoid contact with sediment, and no-swimming signs were also posted in the area in November 2010 (see Attachment 7). The nearest home is located approximately 500 feet away. The public is notified during every public meeting of the potential risk from sediment in the Hoyt Brook seep area. The owner of the property on which the seep area is located is also aware of the potential risk associated with exposure to sediment.

The PRPs first submitted a remedial alternative analysis report for the Hoyt Brook seep area in March 2009, revising the report in May 2011 and August 2011. As part of ongoing discussions regarding potential remedial alternatives for the area, the PRPs raised the possibility of channeling the seep underground via a layer of crushed gravel directly into the brook, thereby keeping the seep from being exposed to air where arsenic would precipitate and accumulate more readily. In order to address the potential ecological risk from the flow of seep water directly entering the brook, the PRPs took seep and stream flow measurements in May and August 2010, and conducted dilution calculations to assess whether this action might result in elevated arsenic concentrations

in surface water. The PRPs and Agencies concluded that the flow of seep water directly into Hoyt Brook will not result in an exceedance of surface water protection criteria and does not appear to pose a risk to aquatic organisms.

Although no-swimming signs were posted in this area, the Agencies do not believe that regular recreational swimming is a reasonable assumption in the Hoyt Brook seep area because of the location (one must trespass through undeveloped land in order to access the area), the relative narrowness of the brook in this and surrounding areas upstream and downstream, and because of the lack of a beach-type area to access the brook. Swimming was not considered an exposure pathway and therefore potential risk was not evaluated.

The only major ecological risk from arsenic-contaminated sediment in this area is to benthic invertebrates. There is no evidence that the area provides critical habitat to threatened or endangered species, and there is an unlikely risk to fish from contaminated sediment. The Agencies have already determined that action is needed at the Hoyt Brook seep area due to human health risk. Any remedy to address human health risk will also address the current ecological risk to benthic invertebrates.

In order to assess potential future risk to the benthic community from contaminated sediment at Hoyt Brook seep area, as well as assess current and future risk from contaminated sediment at the Annabessacook Lake seep area, the PRPs conducted Site-specific toxicity testing of sediments in 2010. The results, which apply to both the Lake and the Brook, concluded that there is no risk to benthic organisms from arsenic in sediment at concentrations as high as 108 ppm.

At the Annabessacook Lake seep area, the PRPs conducted sampling in November 2008 and January 2009 to delineate arsenic in sediment. A large portion of the active seep areas in Annabessacook Lake are under riprap, which essentially prevents access to most arsenic-contaminated sediment. Sediment containing arsenic over the PCL of 31 ppm is generally limited to locations underneath riprap, or extends from shore to approximately 180 feet out. Most of the sediment areas not under riprap are far from shore and under water, making the sediment inaccessible for direct contact.

One area closer to shore had shown a PCL exceedance for arsenic of 960 ppm. Re-sampling indicated levels were below the PCL, and additional re-sampling in 2012 confirmed the re-sampling results.

In 2012, additional orange-colored iron staining was observed outside of the riprap area, near sampling location SED-108, where a seep location exists. In July 2012, the PRPs collected sediment samples at SED-108, and at six additional locations near SED-108 including locations inside the stained area and outside the stained area up to 110 feet away from SED-108. Two locations 20 and 25 feet away from SED-108 had arsenic results exceeding the PCL at 79 and 76 ppm, respectively. Both sampling locations were submerged under more than 2 feet of water, and located within the iron-stained area. The Agencies concluded that exposure to arsenic in sediment is not occurring and therefore

does not pose a human health risk. The Agencies agreed that sediment sampling for arsenic should continue at three of the additional locations near SED-108 during the regular monitoring events (twice per year).

At the Annabessacook Lake seep area only, the Agencies also assessed the potential risk to a swimmer. Arsenic and other contaminants in surface water tend to quickly precipitate or dilute. As previously noted, the PRPs sample surface water in May of each year, and EPA has determined that the levels of contaminants in surface water remain below levels of health concern for people who swim or wade in the lake. Detections of Site-related contaminants appear to be decreasing, and in May 2011 and May 2012, none of the tested constituents were detected at all. There is also no significant ecological risk from arsenic in surface water.

Beginning in 2009, the Agencies and the PRPs began working to identify and quantify the potential risk to a swimmer posed by algae and flocculent that accumulates in the Annabessacook Lake seep area. As previously discussed, the most recent evaluation indicates that the estimated cancer risk is within or below EPA's allowable risk range and the ME DEP risk limit, and that the non-cancer Hazard Index is below EPA and ME DEP's limits. The Agencies determined that no action was required to address potential risk from algae/flocculent, but that sampling would continue every five years, or as determined necessary by the Agencies.

EPA's ecological risk review of algae/flocculent results concluded that the material is unlikely to pose an ecological risk, due to questions regarding bioaccumulation of arsenic and the fact that bottom-feeding fish are unlikely to stay exclusively in the seep area.

As noted previously, Site-specific toxicity testing of sediments concluded there is no risk to benthic organisms from arsenic in sediment at concentrations as high as 108 ppm. There are locations in the Annabessacook Lake seep area where concentrations exceed 108 ppm, however, most of these areas are under riprap, which does not contain areas of true lake bed sediment large enough to sustain a viable benthic community (only small pockets of sediment were found amongst the stones that comprise the riprap). There are areas outside of the riprap that also exceed 108 ppm, but concentrations of arsenic decrease significantly within a short distance from the edge of the riprap area, and the average of all arsenic concentrations in the sediments surrounding the riprap area is well below 108 ppm. EPA believes it is unlikely that the individual locations where arsenic exceeds 108 ppm outside of the riprap area are posing a population-level ecological risk to any benthic organisms within Annabessacook Lake. Monitoring of this area will continue in the future.

In 2011, the Agencies received a request for fish testing. The Agencies agree that arsenic in fish is unlikely to be an exposure pathway of concern because any contamination in surface water is quickly diluted, bottom-feeding fish are unlikely to continuously feed directly in the seep area, and because of questions regarding bioaccumulation of arsenic in fish. In response to the request, EPA is evaluating the potential for harm to fish populations as well as potential human health risks from consumption of fish. EPA's

evaluation includes a review of current scientific literature on bioaccumulation and bioconcentration of arsenic in freshwater fish species; and conservative estimates of the range of possible arsenic levels in fish in the Annabessacook Lake and Hoyt Brook seep areas based on surface water and sediment data from these areas and on information from the literature review. High-end estimates of possible concentrations of arsenic in fish are well below the level at which effects might be observed in fish populations. Therefore, under current conditions, any arsenic accumulation in fish in/around either seep area would not likely result in adverse effects in the fish population. EPA also considered human consumption of fish by combining the high-end estimates of arsenic in fish with conservative estimates of fish consumption. EPA concluded that the cancer and non-cancer risk from eating fish found near the seep areas is extremely low and does not warrant an action or further investigation. A report on this issue is pending.

At a June 26, 2012 public meeting, EPA relayed the results of the fish evaluation, and also made residents aware of state-wide advisories significantly limiting consumption of many freshwater fish due to contaminants unrelated to the Site, such as mercury, PCBs, dioxins, and DDT.

At the other potential points of exposure, Sphagnum Bog/Seep East and Cattail Marsh/Seep Marsh, the frequency of exposure is lower because the areas are much harder to physically access, and therefore the potential for risk to human health is lower. Contamination in surface water and sediment is found in more discrete areas and at lower levels than at the Annabessacook Lake and Hoyt Brook seep areas, and tends to be limited to arsenic, nickel and zinc. The Seep East area is also comprised of mostly root mat material, with small pockets of sediment located within and below the root mat, making sediment difficult to access. In 2006, human health and ecological risk screenings determined there was no likely risk to human health or the environment. The potential risk at these areas was re-reviewed as part of the five-year review effort with the same conclusion that there is there is no likely risk to human health or the environment.

The last five-year review also noted the need for a notice in the deed or, if possible, a Declaration of Environmental Covenant, for a privately owned parcel within the landfill boundary. While an existing Declaration of Covenant, dated 2005, addresses a Town-owned property over which the bulk of the Winthrop Landfill is located, the Winthrop Landfill is also located on a separate, smaller parcel previously owned by two individual potentially responsible parties, Glenda H. Savage and Everett Savage, both of whom signed the original 1986 Consent Decree. Unbeknownst to the Agencies, these individuals had transferred their property ownership to other parties many years ago.

The Agencies discussed this matter with the Town of Winthrop in late 2008. The Town sent a letter to Glenda Savage who appeared to be the property owner at that time, but a family member responded to the Town disputing ownership of the parcel. Glenda Savage passed away in 2009, but still appears to be the owner of the parcel. In 2008, the Agencies also identified a third potential parcel that may require a deed notice.

These issues have yet to be resolved. While the public is protected from on-site contaminants because a fence around the landfill impedes access and control of the Site is in the hands of the Town of Winthrop, the lack of a notice on the remaining deed(s) calls into question the long-term protectiveness of the remedy.

No further recommendations were identified by the fourth five-year review.

6.0 FIVE-YEAR REVIEW PROCESS

This five-year review was conducted in accordance with EPA's guidance document, "Comprehensive Five-Year Review Guidance," EPA 540-R-01-007, dated June 2001. Tasks completed as part of this five-year review include review of pertinent Site-related documents, an inspection of the Site, discussions with ME DEP, the PRPs and community members, and a review of the current status of regulatory or other relevant standards.

Document Review.

Site-related documents reviewed as part of this effort are listed in Attachment 8. Additionally, this review included review of recent post-closure monitoring reports and data.

Community Involvement/Interviews.

This is the Site's fifth five-year review. A public notice announcing the start of the fifth five-year review was published in the Kennebec Journal on May 24, 2012. Community involvement activities were conducted on a limited basis only, given the age of the Site, the level of citizen interest in recent years, and recent activities involving the community on other issues. Individual citizen interviews were not conducted. The area around the Site is largely rural, and owners of homes along the shore of Annabessacook Lake generate most of the interest.

On June 26, 2012, EPA, in conjunction with ME DEP and UTC and its contractor, AMEC, conducted a public meeting at Winthrop Town Hall to discuss overall status at the Site. Most attendants were local residents, including representatives from the Winthrop Landfill Citizens Action Group (WLCAG). The five-year review was on the meeting agenda (see Attachment 9). EPA described the ongoing five-year review process and encouraged anyone with additional concerns they thought should be addressed to contact EPA. While EPA received no specific correspondence regarding the five-year review process, EPA did exchange several messages with WLCAG members to follow up on Lake sampling issues.

During the public meeting, and also separately with WLCAG and affected landowners, EPA, ME DEP and UTC/AMEC informed citizens of the need to exercise caution near the seep areas, especially near exposed contaminated sediments at the Hoyt Brook seep area.

Apart from ongoing discussions with WLCAG and affected landowners, EPA and ME DEP have received a very limited number of calls pertaining to the Site in recent years, most of which are from citizens interested in buying property near the Site or Annabessacook Lake, or regarding issues at Annabessacook Lake that are not within the scope of the Superfund Site. The Agencies received several calls and correspondence in 2011 regarding cutting of trees and future residential development at a parcel located adjacent to and southwest of the landfill. The Agencies determined much of this activity was outside the scope of the Superfund Site, but did notify the Town and the developer of other environmental laws that might apply, including proximity to a nearby wetland.

Since December 2007, the public information repository has been located at Winthrop Town Hall. During the last several years, the repository has been updated with recent reports regarding all major Site investigations. A current version of the monitoring report has also been placed in the repository each year for the last several years.

The completed fifth five-year review report for this Site will be sent to the information repository and mailed directly to the Town and community leaders. A notice of its availability will be published in the local newspaper.

Data Reviewed.

The five-year review included review of recent post-closure monitoring reports and data, including sampling results of arsenic in surface water, sediment, and algae/flocculent. Apart from the arsenic results as previously described, there are no new data that require additional investigation or action.

As outlined in Attachment 10, which highlights exceedances detected in 2011 and the first half of 2012, arsenic continues to exceed the ACL and PCL at numerous locations. Within the two groundwater plumes downgradient of the landfill, VOCs that continue to be detected above ACLs in groundwater are:

- 1,1-dichloroethane, found in deep monitoring well MW-8A and deep monitoring well MW-212A in the southern groundwater flow path, and
- vinyl chloride, found in the southern flowpath, at monitoring well MW-5A.

1,1-Dichloroethane was present at declining levels in the northern and southern flowpaths during GWETS operation and levels continue to decrease. This compound only exceeded the ACL in the deepest well in two well clusters, and was not detected in the shallow well of each cluster. Current levels in groundwater do not present a human health risk.

Levels of vinyl chloride have remained fairly steady, but appear to be declining somewhat. A contingency plan outlined in the post-closure monitoring report outlines definitive response actions within the southern flowpath at several groundwater and soil gas monitoring locations, and establishes action levels for evaluating potential vapor migration into indoor air and requires remediation if data indicate that migration is likely. Since implementation of the contingency plan in 2003, remediation has not been required, and the Agencies believe that current Site conditions do not present an unacceptable risk via the vapor intrusion pathway from vinyl chloride or other VOCs.

While RAP Table 2 sampling in May 2011 indicated exceedances of Maine MEGs for iron and sodium, the Agencies agreed re-sampling of these compounds was not required because iron and sodium are both common and naturally-occurring, are not contaminants of concern at the Site, and because all area residents are on public water. There were also detections of sulfate and chloride below their respective criteria, and detections of calcium, magnesium, and potassium, none of which have any applicable criteria.

Site Inspection.

EPA, ME DEP, and UTC's contractor, AMEC, most recently conducted a Site inspection on June 26, 2012, which included all points of exposure, including the seeps at Annabessacook Lake, Hoyt Brook, Sphagnum Bog, and Cattail Marsh, as well as the landfill cap itself. Also attending the Site inspection were Jeff Woolston, Winthrop Town Manager, and Priscilla Jenkins, a member of Winthrop's Town Council.

During the Site inspection, at the Annabessacook Lake seep area, attendees observed a "newer" area of orange iron staining to the east of the stone jetty. The PRPs conducted additional sampling for arsenic in sediment as previously described, and the Agencies have determined that there is no current risk from arsenic in sediment. Sampling of additional locations will continue in this area.

On the landfill cap, AMEC pointed out an area where they believed a long narrow potential "crack" had been reported during the previous month. Upon further inspection, a narrow gap between the grasses was discovered, however there was no hole or depth to the crack. ME DEP visited the area again on July 13, 2012 and observed no significant change. AMEC is currently conducting a quantitative assessment of the slope, and will be taking inclinometer readings on a monthly basis through the end of the calendar year.

All other areas of the remedy appeared to be unchanged. The fence and signs posted around the Site were in good condition. The signs posted at the Hoyt Brook seep area were in excellent condition. The vegetative cover on the landfill cap was in good condition, except for the narrow gap previously mentioned. There were no signs of vandalism or trespass on the landfill cap or at any of the seep areas. A privately-owned property adjacent to and southwest of the landfill had been cleared for development, but the clearing had no impact on the landfill, fence, or monitoring wells/systems.

7.0 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy, as outlined in the ROD and modified by the ESDs, is operating as designed and as intended by the decision documents. The 1985 ROD outlined the following specific objectives for the remedial response:

- protect public health by providing uncontaminated water supplies for residents,
- protect public health by minimizing the potential for human contact with contaminants,
- protect the environment by minimizing the potential for discharge to surface water bodies, and
- minimize further degradation of groundwater resources.

As required by the 1985 ROD, an alternate water supply was extended to area residents. A 1985 Town Ordinance, modified in 1991, prohibits all groundwater withdrawal, groundwater use, and certain excavation within the Site, as well as excavation control in areas potentially impacted by landfill gas migration. During the previous five-year review, UTC's contractor, MACTEC, undertook a records review and conducted discussions with several area residents to confirm that all residences within the Town of Winthrop's Groundwater and Air Protection Zone are connected to the municipal water source.

The landfill cap and fencing are performing as intended. Routine maintenance and repair activities continue on a regular basis. The most recent cap inspections occurred in May-July 2012, when a small potential crack was identified on the eastern slope. UTC's contractor, AMEC, is currently evaluating this issue, and will implement any necessary measures to repair the cap. AMEC regularly contacts the Town of Winthrop Code Enforcement Officer to assess whether any new building permit applications were submitted in order to evaluate compliance with air and groundwater provisions of the Town's Ordinance.

Beyond the potential crack, no problems with the cap have been identified that fall outside of the range of normal maintenance and repair, and no activities or actions that would violate the Town Ordinance requirements have been identified. These measures have succeeded in preventing direct contact with contaminants in soil and preventing exposure to, or ingestion of, contaminated groundwater.

ACLs were established for each contaminant in groundwater at MCLs, MEGs, or a more stringent ecologically derived guideline. UTC's contractor, AMEC, continues to conduct monitoring of groundwater, surface water, and sediment pursuant to the post-closure monitoring program.

The GWETS operated from 1995 until 2002 when it was shut down for a rebound evaluation. The GWETS effectively removed and treated contamination in the groundwater beneath the landfill, and resulted in significantly reduced concentrations of all contaminants other than arsenic in the northern and southern flowpaths, to the point that ACLs are or will soon be achieved. The VES performed as intended until it was decommissioned in 2000.

As previously outlined, the February 2007 ESD allows the GWETS to be decommissioned in light of the fact that it is no longer necessary to treat contaminants other than arsenic and the fact that it will not be effective in treating arsenic. No cost-effective and reliable technologies are currently available to address arsenic before it is released at the points of exposure.

In addition to decommissioning of the GWETS, the ESD requires monitoring and evaluation of contaminants at points of exposure and, if warranted, remediation of contaminants that pose an unacceptable risk. UTC's contractor, AMEC, currently continues to monitor all points of exposure, including the Annabessacook Lake seep area, the Hoyt Brook seep area, Sphagnum Bog/Seep East, and Cattail Marsh/Seep Marsh. As previously outlined, UTC/AMEC has conducted a great deal of sampling and investigation regarding the Hoyt Brook and Annabessacook Lake seep areas.

The arsenic-contaminated sediment at the Hoyt Brook seep area is the only current area that requires remedial action due to potential risk to human health, but as previously described, a ROD Amendment and modification of the CD are required prior to the start of any such remedial activity. The greatest potential risk in the Hoyt Brook seep area exists for a young child, who may wade into and/or accidentally ingest the contaminated sediment. While there is nothing to prevent access to the area, the property is privately owned, wooded, and undeveloped. Caution signs are posted at the Hoyt Brook seep area advising passers-by to avoid contact with sediment, and no-swimming signs are also posted in the area. The nearest home is located approximately 500 feet away. The area is most frequently accessed by recreational boaters via kayak or canoe. The public is notified during every public meeting of the potential risk from sediment in the Hoyt Brook seep area. The owner of the property on which the seep area is located is also aware of the potential risk associated with exposure to sediment.

The ESD also includes a requirement for continued monitoring and, as necessary, evaluation and remediation of the risk posed by potential vapor intrusion. Vinyl chloride monitoring of groundwater and soil gas in the southern flowpath has continued in accordance with the Vinyl Chloride Contingency Plan since it was implemented in 2003, as modified. Based on data collected to date, vinyl chloride and other VOCs have not posed a vapor intrusion threat to occupants of area structures, and remediation has not been required.

Consistent with the ROD, the Consent Decree required that deed notices be recorded documenting the presence of hazardous waste on property within the landfill. The previous five-year review noted that a notice in the deed to one property on which the

landfill is located was never filed. As previously described, there is some dispute regarding exact ownership of this parcel, and whether a second potential parcel exists that may also require a deed notice. These issues are still outstanding, but do not affect the current protectiveness of the remedy.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

Yes, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. Detail on each of these areas is presented below.

The RAOs for the site are as follows:

- Protect public health by providing uncontaminated water supplies;
- Protect public health by minimizing the potential for human contact with contaminants;
- Protect the environment by minimizing the potential for discharge of contaminants to Annabessacook Lake, Hoyt Brook, the sphagnum bog, and the cattail marsh; and
- Minimize further degradation of groundwater resources.

Changes in Standards. The 1985 ROD, page 38, identifies the following laws, regulations and guidance as applicable to the proposed remedial alternative. Changes in relevant standards since the 1985 ROD and their impact on the protectiveness of the remedy are discussed below.

- Resource Conservation and Recovery Act (RCRA), Part 264. The landfill cap and all subsequent repairs and modifications to the cap were designed in accordance with applicable RCRA requirements. EPA approved the cap on June 23, 1992, and the PRPs continue to perform O&M as necessary.
- Executive Orders 11990 (Wetlands) and 11988 (Floodplains) and guidance outlined under 40 CFR Part 6, Appendix A. Construction of the landfill cap impacted one area of wetlands. In accordance with wetlands requirements, the PRPs began a wetlands enhancement project in 1988 to compensate for the landfill cover encroachment into the bog; the Agencies determined in 1998 that no further wetlands compensation action was needed.

In July 2007, UTC's contractor, MACTEC, conducted a wetland delineation of the Hoyt Brook seep area which confirmed that portions of the seep area were located within a wetland. It also appears that the Hoyt Brook seep area is located in a floodplain. EPA has already determined, based on human health risks, that action is required for the PCL exceedance of arsenic in sediments at Hoyt Brook. A future ROD Amendment will address the remediation of this seep area.

- Clean Water Act. The GWETS met all effluent limits as required. The GWETS was shut down in November 2002, and the ESD issued in February 2007 allowed for decommissioning of the GWETS. There are no activities currently being conducted that trigger requirements under the Clean Water Act.
- Clean Air Act. Past construction activities were conducted to minimize future emissions from the Site. The VES was decommissioned entirely in 2000. There are no activities currently being conducted that trigger requirements under the Clean Air Act.
- Safe Drinking Water Act; EPA Groundwater Protection Strategy. New Applicable or Relevant and Appropriate Requirements (ARARs) promulgated since the 1985 ROD include Maximum Contaminant Levels (MCLs), non-zero Maximum Contaminant Level Goals (MCLGs), and 1992 Maine Maximum Exposure Guidelines for Drinking Water (MEGs). The Maine MEGs have been revised, with the most recent update in September 2011, but the revisions have not been incorporated into the Maine hazardous waste rule (e.g., the revisions are not formal regulations).

The Alternate Concentration Limit remedy required the establishment of a groundwater protection standard for each contaminant to be set at background levels, MCLs or ACLs, which are Site-specific limits that are protective of human health and the environment.

As outlined in the EPA/ME DEP 1993 Decision Document, the ACLs were set at MCLs for most contaminants of concern. If an MCL had not been promulgated, a human health risk-based drinking water guideline was used (i.e., Maine's 1992 MEGs). If ACLs set at the MCL were determined to not protect ecological receptors at the points of exposure, an ecologically derived guideline was used instead. The 1993 Decision Document set the ACL for arsenic at 30 ppb, while recognizing that it was a ubiquitous, naturally-occurring substance, for which background concentrations often exceed health based guidelines.

The table in Attachment 6 outlines the current ACLs and the basis on which they were set, e.g., the MCL, the MEG, a human-health based standard (e.g., "ME DW" or "EPA DW") or "ECO" (an ecologically-derived guideline). The table in Attachment 11 provides a comparison of current ACLs to current MCLs and MEGs.

The only change to an MCL is for arsenic. Since the arsenic ACL was set at 30 ppb, EPA has revised the MCL for arsenic downward from 50 ppb to 10 ppb based on new toxicity information, and the Maine MEG for arsenic in drinking water has also been revised to 10 ppb. The revised toxicity information may call into question the protectiveness of the arsenic ACL. At the same time, it is possible that natural background levels of arsenic in groundwater in the vicinity of the Site, which have yet to be determined, may exceed both the MCL of 10 ppb and the ACL of 30 ppb. Consistent with EPA policy, EPA generally does not clean up contaminants at a Site below natural background concentrations. To address these issues, the 2007 ESD requires that, as levels of arsenic approach the ACL of 30 ppb, or at such other time as determined by

EPA, a study shall be conducted to determine background for arsenic in groundwater for this Site. Based upon the results of that study, the ACL for arsenic maybe revised to the higher of the MCL or background.

The Maine MEGs are periodically updated; however, revisions since 1992 have not been formally incorporated into the Maine hazardous waste rule. Many current MEGs are either new or lower than current and past MCLs. As a result, there are several instances where current MEGs are lower than the current ACL (see Attachment 11). However, ACLs at the Site remain protective of human health, and groundwater in the area has not been used for drinking water since the 1980s, when a water line was extended to the area and the Town enacted an Ordinance prohibiting groundwater use.

The Agencies will continue to monitor compounds with new/revised MEGs to ensure continued protectiveness. All other risk-based cleanup goals as presented in the ROD remain substantively unchanged.

- Pretreatment Standards for Discharge into Publicly Owned Treatment Work. Not applicable.
- State Water Quality Standards; Federal Ambient Water Quality Criteria. The selected remedy was not required to achieve cleanup standards in surface water. However, these state and federal standards are being used to monitor the effectiveness of the remedy. In particular, at points of exposure, where groundwater discharges to surface water, risk-based Protective Concentration Limits have been established using state and federal water quality criteria to ensure that the remedy is properly functioning and that no additional action is warranted to prevent impact to human health and the environment. Based upon a comparison of the Site-wide monitoring data to these standards, the landfill cap and prior operation of the VES and GWETS systems have minimized contaminated groundwater discharge and impacts to surface water to the maximum extent practicable. As previously outlined, a ROD Amendment is required to address arsenic-contaminated sediment at the Hoyt Brook seep area. The ROD Amendment will address state and federal standards and criteria.
- Health Advisories. ARARs based on health advisories are addressed above.

Changes in Exposure Pathways. The only change to human health or ecological exposure pathways is from arsenic-contaminated algae/flocculent at the Annabessacook Lake seep area. As previously described, the Agencies developed sampling methodology to assess the potential risk to a recreational swimmer posed by algae/flocculent, and concluded that no action was required, but that sampling would continue on a five-year basis, or as determined necessary by the Agencies. EPA's ecological risk review of algae/flocculent results also concluded that the material is unlikely to pose an ecological risk.

Apart from algae/flocculent, the basis for the original exposure assumptions remains the same. EPA screening level evaluations of human health and ecological risks posed by contaminants at all points of exposure do consider additional factors related to the exposure pathways (such as accessibility, toxicity, etc.).

There are no changes in land use or the anticipated land use on or near the Site, with the exception of a privately-owned property adjacent to and southwest of the landfill which have been cleared for development. The clearing had no impact on the landfill, fence, or monitoring wells/systems.

No new contaminants or contaminant sources have been identified, nor are there toxic remedy byproducts. As previously identified, capping the landfill did enhance reducing (anoxic) conditions in the underlying aquifer, which resulted in the mobilization of naturally-occurring arsenic and its subsequent discharge to points of exposure. This issue is discussed at length in the February 2007 ESD, and the need for remedial action at the Hoyt Brook seep area will be addressed in a future ROD Amendment.

Changes in Toxicity and Other Contaminant Characteristics; Changes in Risk Assessment Methods.

The 1985 ROD, pages 12-13, summarized the following potential risks:

- Endangerment to the public health through ingestion of contaminated groundwater,
- Endangerment to the public health through physical contact with wastes,
- Endangerment to the aquatic organisms in the wetlands through the discharge of contaminants to these surface waters,
- Endangerment to birds and mammals and to the public health through exposure (dermal contact and ingestion) to contaminants in the wetlands, lake, or brook, and
- Endangerment to the environment, i.e. the wetlands, lake, and brook, and groundwater through the continued migration of contaminated groundwater off-site.

In the early 1990s, risks to Site-specific receptors were addressed through human health and ecological risk assessments in the development of ACLs and PCLs using available toxicity information. More recently, the risks identified in the ROD associated with sediment and surface water at points of exposure were reviewed by EPA in screening level risk evaluations, and these risks will continue to be assessed. (See Section 5.0 for more detail on risk evaluation.) Risks posed by arsenic-contaminated sediment at the Hoyt Brook seep area will be addressed after a ROD Amendment and modification of the CD. Other risks have been addressed through provision of an alternate water supply, implementation of a Town Ordinance, and continued maintenance of the landfill cap.

In order to address new toxicity screening levels, as part of this five-year review, EPA reviewed available data regarding several contaminants as outlined below.

EPA reviewed historic trichloroethylene (TCE) data against new human health screening data for potential vapor intrusion. At the time of the ROD, the maximum detected level of TCE was 10 ppb. The highest detection of TCE in recent years was 3.3 ppb in a landfill monitoring well in 2008; all other detections were below 1 ppb. Based on review of the data and existing detection limits, EPA concluded that vapor intrusion of TCE is not a concern for this Site, and no further sampling or changes to existing detection limits are needed.

EPA also reviewed 2-hexanone data against new toxicity values for this compound. This compound hasn't been detected since 2002 at detection limits well below risk-based goals. No further sampling or changes are required for 2-hexanone.

Last, EPA has a new cleanup goal for manganese in drinking water. Manganese, however, is not a Site contaminant and has not been sampled at the Site since 2004. While manganese levels at that time were higher than the new cleanup goals, groundwater in the area has not been used for drinking water since the 1980s, when a water line was extended to the area and the Town enacted an Ordinance prohibiting groundwater use. EPA would require manganese sampling in groundwater prior to any lifting of the prohibition on groundwater use.

Expected Progress Towards Meeting RAOs. The remedy is progressing as expected, with the exception of the issues regarding arsenic as previously outlined. The February 2007 ESD acknowledges that it is likely to take significantly longer to achieve the ACL for arsenic at the point of compliance (the edge of the waste management unit) than anticipated at the time of the 1985 ROD due to the inability of the GWETS to reduce elevated arsenic levels, and the inability of other technologies to address the problem. However, EPA believes this is reasonable given conditions at the Site, the fact that the community is connected to a public drinking water supply system, and a Town Ordinance prohibits all groundwater withdrawal and use.

A future ROD Amendment will address the need for remedial action at the Hoyt Brook seep area.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No new information has come to light that could call into question the protectiveness of the remedy.

As previously described, action is needed to address human health risk at the Hoyt Brook seep area, including a ROD Amendment and modification to the CD. The property on which the seep area is located is privately owned, wooded, and undeveloped, and the nearest home is located approximately 500 feet away. The property owner is aware of

the potential risk from sediment, and the public is notified during every public meeting of the potential risk from sediment in the Hoyt Brook seep area. Caution signs are posted at the Hoyt Brook seep area advising passers-by to avoid contact with sediment, and no-swimming signs are also posted in the area.

Potential risk from arsenic-contaminated algae/flocculent has been identified and addressed. A small potential crack along the landfill cap has been identified and will continue to be assessed.

Also as previously described, the Consent Decree requires that a deed notice be recorded documenting the presence of hazardous waste on property within the landfill. Although a Declaration of Covenant was recorded on the Town-owned property, a deed notice is still required on a separate, smaller parcel, the ownership of which is in some dispute. There is also some question regarding the potential need for a deed notice on a second small parcel. This issue is still outstanding, and the Agencies will coordinate further with the Town on this matter.

The public is protected from on-site contaminants because a fence around the landfill impedes access and the Town of Winthrop controls Site access. Additionally, the Town Ordinance prohibits all groundwater withdrawal, groundwater use, and certain excavation within the Site, as well as excavation control in areas potentially impacted by landfill gas migration. However, the lack of a notice to the deed or Declaration of Environmental Covenant on the privately-owned parcel(s), calls into question the long-term protectiveness of the remedy. Also, while notification and signage currently addresses human health risk at the Hoyt Brook seep area, remediation is required in this area.

No other new information has come to light which would call into question the effectiveness of the remedy, beyond identification of potential risk from arsenic-contaminated algae/flocculent, which has been addressed, and the small potential crack in the landfill cap which is currently being addressed. No new human or ecological receptors have been identified at this time. No evidence of damage due to natural disasters was noted during the Site inspection.

Technical Assessment Summary.

The remedy, as outlined in the ROD and modified by the ESDs, is operating as designed and meeting all remedial action objectives in the short term. Additional activities are required to ensure long-term protectiveness.

An alternate water supply was extended to area residents and a Town Ordinance restricting excavation and groundwater use is in place. With the exception of one or two smaller parcels not owned by the Town, all property within the landfill is subject to a restrictive covenant which further protects against exposure to Site-related contaminants. The Agencies will coordinate with the Town in seeking to record a Declaration of Environmental Covenant for the remaining parcel, or at a minimum a deed notice as required by the Consent Decree.

Land use at the Site has not changed and is not expected to change. The GWETS and VES systems were decommissioned, and ownership of the buildings were transferred to the Town of Winthrop.

The landfill cap and fencing are performing as intended and routine maintenance and repair activities continue on a regular basis, including off-site landfill gas monitoring. UTC's contractor, AMEC, is currently evaluating a small potential crack on the eastern slope of the landfill. AMEC also continues to conduct monitoring of groundwater, surface water, and sediment and conducted a number of additional supplemental sampling events at the Annabessacook Lake and Hoyt Brook seep areas.

ACLs were established for each contaminant in groundwater at MCLs, MEGs, or a more stringent ecologically derived guideline. Following the detection of ACL exceedances, the GWETS was installed and operated as designed, reducing concentrations of contaminants in groundwater to the point that ACLs are or will soon be achieved for all contaminants, with the exception of arsenic.

The February 2007 ESD allows for the decommissioning of the GWETS and attainment of the arsenic ACL through natural processes over an extended period of time. The ESD also requires the monitoring and evaluation of contaminants at points of exposure, and, if warranted, remediation of contaminants posing an unacceptable risk.

EPA has already determined, based on potential human health risks, that action is required for the PCL exceedance of arsenic in sediments at Hoyt Brook, and caution signs were posted at the seep area in 2007 and 2010. The greatest potential risk in the Hoyt Brook seep area exists for young children, who may wade into and/or accidentally ingest the contaminated sediment. EPA's exposure scenario for this area is conservative, and assumes that adults and young children access the area regularly during the recreational season and are dermally exposed and incidentally ingest sediment during each visit. While there is nothing to prevent access to the area, the property is privately owned, wooded, and undeveloped. The nearest home is located approximately 500 feet away. The area is most frequently accessed by recreational boaters via kayak or canoe. The property owner is aware of the potential risk from sediment, and the public is notified during every public meeting of the potential risk from sediment in the Hoyt Brook seep area. Caution signs are posted at the Hoyt Brook seep area advising passers-by to avoid contact with sediment, and no-swimming signs are also posted in the area. As previously noted, a ROD Amendment and modification of the CD are required prior to the start of any remedial work.

Beyond arsenic, 1,1-dichloroethane and vinyl chloride are the only other contaminants still exceeding ACLs. It is expected that levels of both contaminants will continue to decrease and that they will eventually meet the ACL through natural processes. Current levels of 1,1-dichloroethane in groundwater do not present a human health risk. To specifically address the presence of vinyl chloride in the southern flowpath, a Vinyl Chloride Contingency Plan was implemented in 2003 which outlines definitive response

actions at several groundwater and soil gas monitoring locations. The contingency plan also established action levels for evaluating potential vapor migration into indoor air, and requires remediation in the southern flowpath if data indicate that migration is likely. Since implementation of the Contingency Plan in 2003, remediation has not been required. Additionally, the Agencies have determined that conditions currently at the Site do not present an unacceptable risk via potential vapor intrusion of vinyl chloride or other VOCs. The February 2007 ESD requires continued monitoring, evaluation and remediation of the risk posed by potential vapor intrusion, as necessary.

8.0 ISSUES

Based on the activities conducted during this Five-Year Review, the issues identified in Table 2 have been noted.

Issues	Affects Current Protectiveness	Affects Future Protectiveness
Privately-owned properties at landfill require deed notice.	N	Y
Exceedance of PCL for arsenic in sediment at Hoyt Brook requires remediation.	N	Y

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

In response to the issues noted above, it is recommended that the actions listed in Table 3 be taken:

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
Deed notices on private properties never filed; further protections may be required	Agencies to discuss need to comply with CD requirements with Town Private owners will be requested to implement deed notice, or preferably, Declaration of Environmental Covenant to provide additional protections for the cap portion of the remedy	Town of Winthrop (PRP)	EPA & ME DEP	9/30/2014	N	Y

Exceedance of PCL for arsenic in sediment at Hoyt Brook requires remediation.	ROD Amendment and modification of CD are required. Agencies to work with PRPs on Focused Feasibility Study prior to ROD Amendment. As soon as CD modification is entered in court, implement remediation at Hoyt Brook.	EPA & ME DEP for the ROD Amendment and CD modification; followed by PRPs for implementation of the remedy	EPA & ME DEP	ROD Amendment by 9/30/2013. Finalize CD modification efforts by 9/30/2014, expect entry of CD in court by 6/30/2015. Begin remediation at Hoyt Brook in 2015	N	Y
---	---	---	--------------	--	---	---

10.0 PROTECTIVENESS STATEMENTS

The remedy at the Winthrop Landfill Superfund Site currently protects human health and the environment in the short-term because an alternate water supply has been extended to area residents and a Town Ordinance prohibiting groundwater use is in place. The landfill is capped, a fence has been erected around the landfill, and access to the landfill is controlled by the PRPs. With the exception of one or two small parcels not owned by the Town, all parcels within the landfill are subject to institutional controls which prevent disturbance of the cap. The cap and fencing are performing as intended and routine maintenance and repair activities continue on a regular basis. Monitoring of groundwater, surface water, and sediment is ongoing, including monitoring of vinyl chloride in the southern flowpath, and monitoring of algae/flocculent in the Annabessacook Lake seep area.

At the Hoyt Brook seep area, the property owner is aware of the potential risk from sediment, and the public is notified during every public meeting of the potential risk from sediment in the seep area. Caution signs are posted at the Hoyt Brook seep area advising passers-by to avoid contact with sediment, and no-swimming signs are also posted in the area.

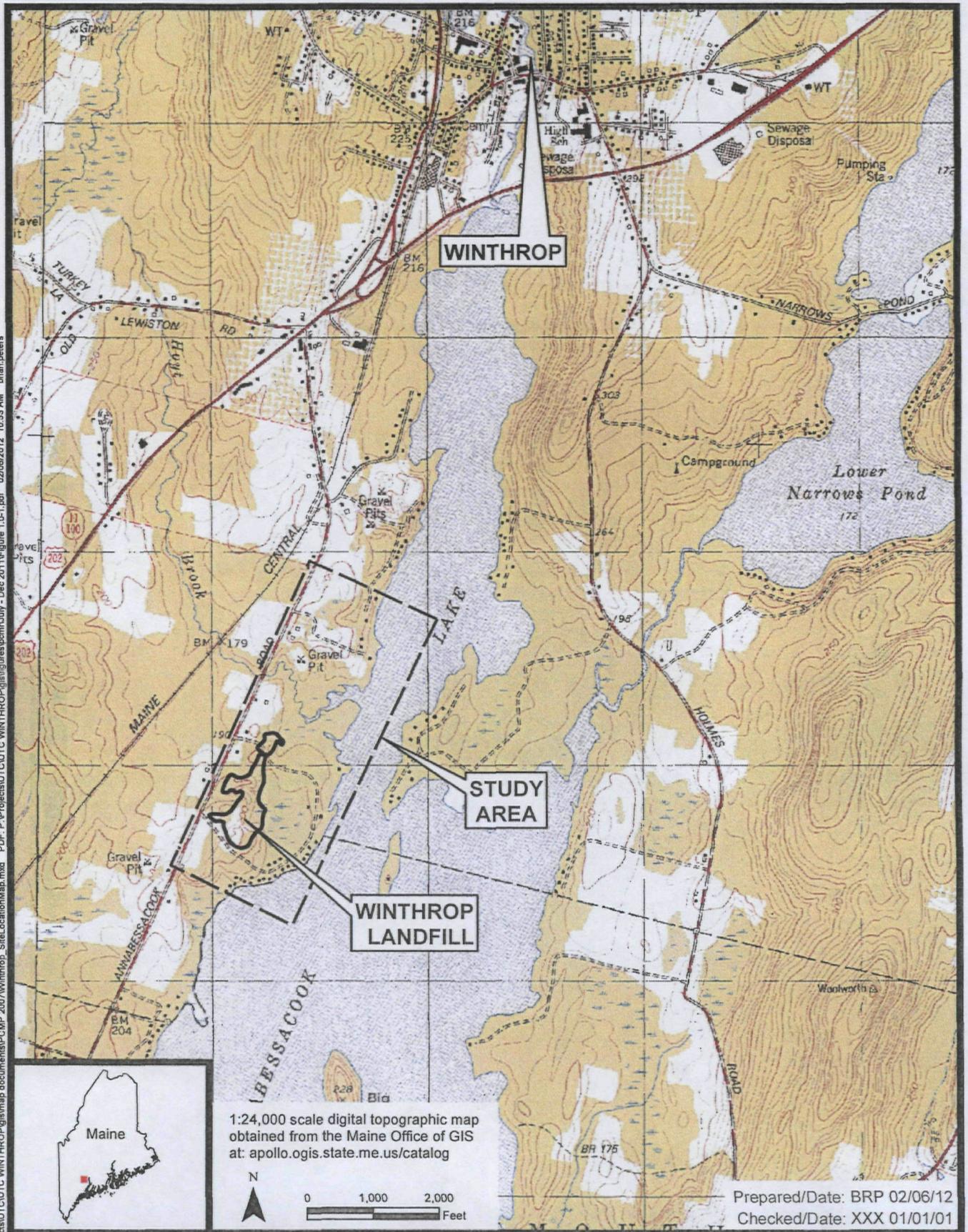
In order for the remedy to be protective in the long-term, follow-up actions are required. The Agencies will continue to coordinate with the Town to ensure that deed notices or, if possible, Declaration of Environmental Covenants, are recorded for the privately owned parcel(s) within the landfill, as required. The Agencies will continue to work with the PRPs to develop the necessary documentation required for a ROD Amendment and modification of the CD. Following ROD Amendment and CD modification, remediation of arsenic-contaminated sediment at Hoyt Brook will be initiated.

11.0 NEXT REVIEW

The due date for this fifth five-year review of the Winthrop Landfill Superfund Site is September 21, 2012. This report is final as of September 19, 2012, therefore, the next five-year review should be completed by September 19, 2017.

**ATTACHMENT 1
SITE MAP**

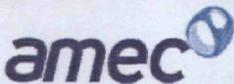
Document: P:\Projects\UTC\UTC WINTHROP\gis\map documents\PCMP 2007\Winthrop_SiteLocationMap.mxd PDF: P:\Projects\UTC\UTC WINTHROP\gis\figures\pcmr\July - Dec 2011\Figure 1.0-1.pdf 02/06/2012 10:53 AM brian.peters



1:24,000 scale digital topographic map
obtained from the Maine Office of GIS
at: apollo.gis.state.me.us/catalog

Prepared/Date: BRP 02/06/12
Checked/Date: XXX 01/01/01

United Technologies Corporation
Winthrop Landfill
Winthrop, Maine



Site Location
July - December 2011 PCMR
Project 3617117273 Figure 1.0-1

**ATTACHMENT 2
SAMPLING LOCATIONS**

**ATTACHMENT 3
REMEDIAL ACTION PLAN (RAP) TABLE 1**

Table 2-2: RAP Table 1 Constituents

2,4-Dinitrophenol	Trichloroethylene
Diethylphthalate	Vinyl chloride
Chrysene ¹	Acetone
Benzene	2-Butanone
1,1-Dichloroethane	4 Methyl-2-pentanone
1,2-Dichloroethane	2-Hexanone
1,1,1-Trichloroethane	Styrene
Chloroethane	Total Xylenes
1,1-Dichloroethylene	Tetrahydrofuran
trans-1,2-Dichloroethylene	Di-2-ethylhexyl adipate
1,2-Dichloropropane	Dimethylformamide
Ethylbenzene	2-Methoxyethanol ³
Methylene chloride	Zinc ²
Fluorotrichloromethane	Nickel ²
Tetrachloroethylene	Arsenic ²
Toluene	Phenol ²

Notes:

- 1 = deleted March 1993
 2 = added February 1988
 3 = deleted May 2005

Prepared/Date JPC 03/30/07

Checked/Date NWH 04/30/07

Adapted from Remedial Action Work Plan (RAP), Element II-5, Table 1

ATTACHMENT 4
REMEDIAL ACTION PLAN (RAP) TABLE 2

Table 2-3: RAP Table 2 Constituents

Volatile Organic Compounds (27)

Acrolein	1,3-Dichloropropene
Acrylonitrile	Ethylbenzene
Benzene	Methylene chloride
Carbon Tetrachloride	Methyl chloride
1,1-Dichloroethane	Bromoform
1,2-Dichloroethane	Dichlorobromomethane
1,1,2-Trichloroethane	Dichlorodifluoromethane
1,1,1,2-Tetrachloroethane	Chlorodibromomethane
Chloroethane	Tetrachloroethylene
2-Chloroethyl vinyl ether	Toluene
Chloroform	Trichloroethylene
1,1-Dichloroethylene	Vinyl chloride
trans-1,2-Dichloroethylene	bis (Chloromethyl) ether
1,2-Dichloropropane	

Base-Neutral Extractable Organic Compounds (46)

Acenaphthene	Nitrobenzene
Benzidine	N-Nitrosodimethylamine
1,2,4-Trichlorobenzene	N-Nitrosodiphenylamine
Hexachlorobenzene	N-Nitrosodi-n-propylamine
Hexachloroethane	Butyl benzyl phthalate
bis (2-Chloroethyl) ether	Di-n-butyl phthalate
2-Chloronaphthalene	Di-n-octyl phthalate
1,2-Dichlorobenzene	Diethylphthalate
1,3-Dichlorobenzene	Dimethylphthalate
1,4-Dichlorobenzene	Benzo (a) anthracene
3,3-Dichlorobenzidine	Benzo (a) pyrene
2,4-Dinitrotoluene	Benzo (b) fluoranthene
2,6-Dinitrotoluene	Benzo (k) fluoranthene
1,2-Diphenylhydrazine	Chrysene
Fluoranthene	Acenaphthylene
4-Chlorophenyl phenyl ether	Anthracene
4-Bromophenyl phenyl ether	Benzo (g,h,i) perylene
bis (2-Chloroisopropyl) ether	Fluorene
bis (2-Chloroethoxy) methane	Phenanthrene
Hexachlorobutadiene	Dibenzo (a,h) anthracene

Table 2-3: RAP Table 2 Constituents

Hexachlorocyclopentadiene	Ideno (1,2,3-cd) pyrene
Isophorone	Pyrene
Naphthalene	bis (2-Ethylhexyl) phthalate
<u>Acid Extractable Organic Compounds (11)</u>	
2,4,6-Trichlorophenol	4, Nitrophenol
d-Chloro-m-cresol (4-chloro-3-methylphenol)	2,4-Dinitrophenol
2-Chlorophenol	4,6-Dinitro-o-cresol
2-Nitrophenol	(4,6-Dinitro-2-methylphenol)
Pentachlorophenol	2,4-Dichlorophenol
2,4-Dimethylphenol	Phenol
<u>Pesticides and PCBs (22)</u>	
Aldrin	Alpha-BHC
Dieldrin	Beta-BHC
4,4'-DDE	PCB-1242
4,4'-DDD	PCB-1254
alpha-Endosulfan	PCB-1221
beta-Endosulfan	PCB-1232
Endosulfan sulfate	PCB-1248
Endrin	PCB-1260
Endrin aldehyde	PCB-1016
Heptachlor	Toxaphene
Heptachlor epoxide	2,3,7,8-Tetrachlorodibenzo p-dioxin (TCDD)
<u>Metals (13)</u>	
Antimony (Sb)	<u>Inorganic Constituents</u>
Arsenic (As)	Calcium
Beryllium (Be)	Iron
Cadmium (Cd)	Magnesium
Chromium (Cr)	Potassium
Copper (Cu)	Sodium
Lead (Pb)	Chloride
Mercury (Hg)	Sulfate
Nickel (Ni)	<u>Other Volatile Organic Compounds</u>
Selenium (Se)	1,2-ds-Dichloroethylene
Silver (Ag)	2-Butanone
Thallium (Tl)	4-Methyl-2-Pentanone
Zinc (Zn)	Tetrahydrofuran

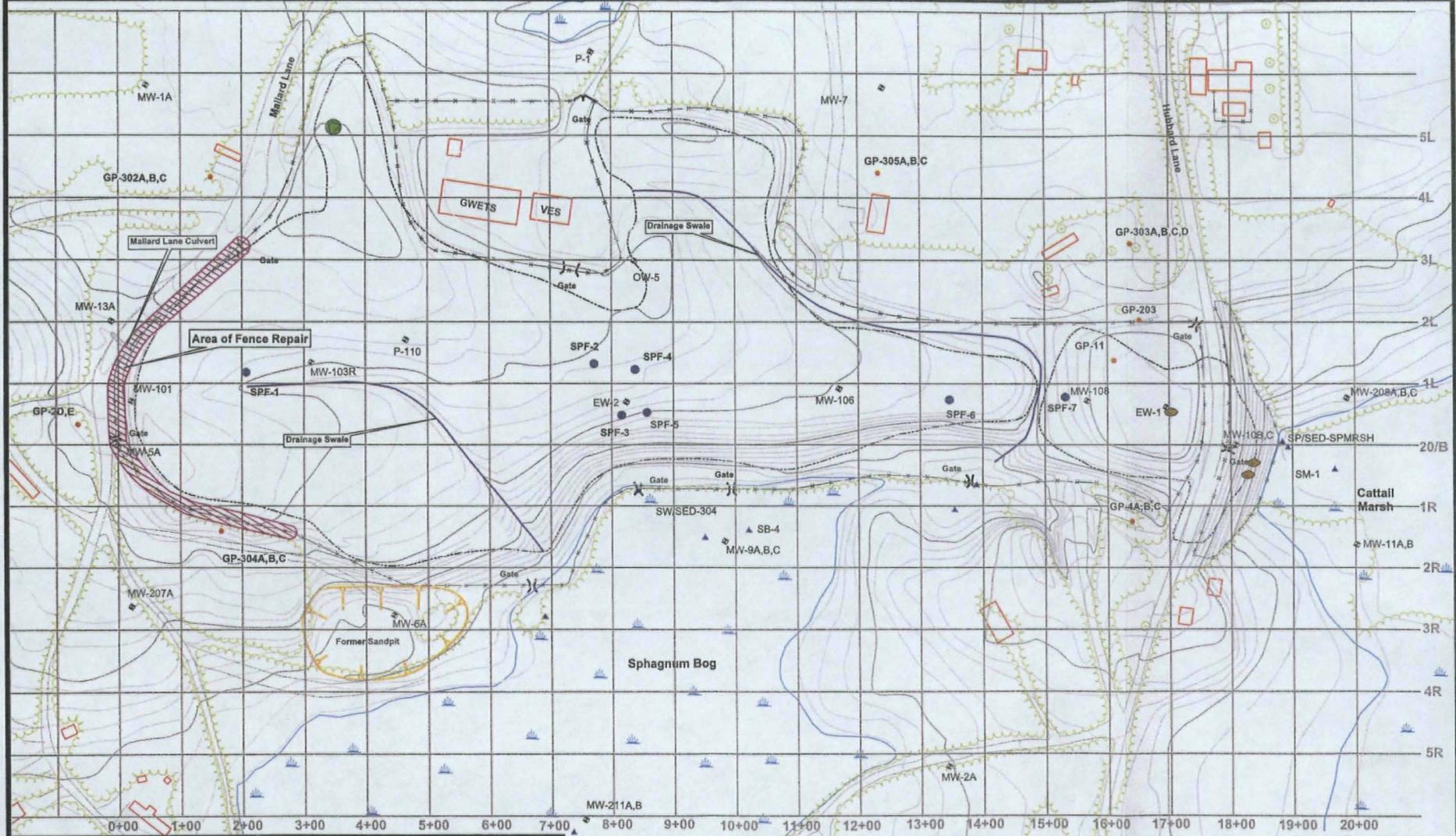
Table 2-3: RAP Table 2 Constituents

<u>Miscellaneous</u>
Total Cyanides
<u>Other Non-Volatile Organic Compounds</u>
2-methoxyethanol
Di-2-ethyladipate
Di-2-ethylhexyladipate
Dimethylformamide

Adapted from Remedial Action Work Plan (RAP), Element II-5, Table 2

Prepared/Date: ASZ 8/10/07
Checked/Date: NWH 08/22/07

ATTACHMENT 5
LANDFILL MONITORING SYSTEMS



Legend

	Sediment Sample Location		Survey Grid
	Surface Water/Seep Sample Location		Tree Line
	Settlement Platforms		Drainage Swales
	Monitoring Well / Piezometer Location		Culverts
	Landfill Gasprobe Monitoring Location		Road/Driveways
	Rodent Holes		Index Contours (10ft)
			Intermediate Contours (2ft)
			Former Sandpit
			Water Boundary
			Landfill Limit Boundary
			Building Outlines
			Bog/Marsh
			Fence
			Gate

United Technologies Corporation
Winthrop Landfill
Winthrop, Maine



Prepared/Date: BRP 02/06/12
Checked/Date: XXX 01/01/10

Landfill Monitoring System
July - December 2011 PCMR
Project 3617117237

Figure 3.1-1

ATTACHMENT 6
EPA AND DEP APPROVED ALTERNATE CONCENTRATION
LIMITS AND PROTECTIVE CONCENTRATION LIMITS

TABLE 6
EPA AND DEP APPROVED ALTERNATE CONCENTRATION LIMITS AND
PROTECTIVE CONCENTRATION LIMITS
FOR THE WINTHROP LANDFILL SUPERFUND SITE
(The numbers in this Table are in parts per billion (ppb))

COMPOUND	A SEDIMENT PCLs	SURFACE WATER PCL		ACLs	
		Number	Basis	Number	Basis
BENZENE	3,100	5		5	(MCL)
TOLUENE	5,800	650	(MEDEP F&S)	1,000	(MCL)
STYRENE	18,500	27	(MEDEP DW)	100	(MCL)
ETHYLBENZENE	5,500	320	(MEDEP F&S)	440	(ECO)
XYLENES	9,500	590		590	(ECO)
METHYLENE CHLORIDE	3,900	5		5	(MCL)
TRICHLOROFLUROMETHANE	7,500	2,300		2,300	(MEG)
CHLOROETHANE	1,800	1,300#		1,300	(ECO)
1,1-DICHLOROETHANE	3,800	5		5	(MEG)
1,2-DICHLOROETHANE	5,700	0.73	(EPA F&S)	5	(MCL)
1,1,1-TRICHLOROETHANE	11,800	200		200	(MCL)
1,2-DICHLOROPROPANE	7,500	5		5	(MCL)
VINYL CHLORIDE	1,300	0.32	(EPA F&S)	2	(MCL)
1,1-DICHLOROETHYLENE	1,800	0.34	(EPA F&S)	7	(MCL)
1,2-DICHLOROETHYLENE	460	70		70	(MCL)
TRICHLOROETHYLENE	7,200	5		5	(MCL)
TETRACHLOROETHYLENE	3,000	1.9	(EPA F&S)	5	(MCL)
ACETONE	4,100	390		390	(ME DW)
2-BUTANONE (MEK)	2,600	170		170	(MEG)
2-HEXANONE (MBK)	920	1,400		1,400	(ME DW)
4-METHYL-2-PENTANONE (MIBK)	30,300	190		190	(ME DW)
PHENOL	600	160		160	(ECO)
2,4-DINITROPHENOL	18	31		31	(MEG)
TETRAHYDROFURAN	8,000	3,300		3,300	(ME DW)
DIMETHYLFORMAMIDE	1,200	390		390	(EPA & ME DW)
2-METHOXYETHANOL	810	46		46	(ME DW)
DIETHYLPHALATE	8,300	1,700	(MEDEP F&S)	2,900	(ECO)
DI-2-ETHYLHEXYL ADIPATE	2,100,000	2	(EPA F&S)	40	(ECO)
NICKEL	50,000	88		88	(ECO)
ZINC	270,000	59		59	(ECO)
ARSENIC	31,000	0.77-30	(BACKGROUND)	30	+

: Chloroethane shall be 3,500 at the Seeps and Marshes based on eco.
+ : Formerly a Maine Maximum Exposure Guideline.

ATTACHMENT 7
SIGNS POSTED AT HOYT BROOK SEEP AREA

CAUTION

AVOID CONTACT WITH WATER AND
SEDIMENT NEAR SIGNS

WINTHROP LANDFILL SUPERFUND SITE
GROUNDWATER DISCHARGE AREA.

FOR MORE INFORMATION CONTACT
TOWN MANAGER
CORNELL KNIGHT 207-377-7200 ext. 423



NO
SWIMMING

ATTACHMENT 8 LIST OF DOCUMENTS REVIEWED

Enforcement Decision Document
Winthrop Landfill, ME
November 22, 1985

Consent Decree, Civil Action No. 86-0029-B and 86-0031-B
Winthrop Landfill Superfund Site
March 23, 1986

Remedial Action Work Plan
Winthrop Landfill
E.C. Jordan Company for United Technologies Corporation
November 19, 1986

Remedial Action Work Plan
Task II-8 Alternate Concentration Limit Demonstration
Winthrop Landfill
ABB Environmental Services, Inc. for United Technologies Corp.
April 15, 1992.

Remedial Action Work Plan
Task II-8 Alternate Concentration Limit Demonstration
Winthrop Landfill
ABB Environmental Services, Inc. for United Technologies Corp.
September 25, 1992

Decision Document
Winthrop Landfill Superfund Site, Alternate Concentration Limit
March 10, 1993

Explanation of Significant Differences
Vapor Extraction System
Winthrop Landfill Superfund Site
October 20, 1993

Second Five-Year Review
Winthrop Landfill Superfund Site
September 30, 1997

Preliminary Close-Out Report
Winthrop Landfill Superfund Site
September 30, 1997

Preliminary Close-Out Report Amendment
Winthrop Landfill Superfund Site
December 23, 1997

Interim Remedial Action Report
Winthrop Landfill Superfund Site
September 29, 1998

Third Five-Year Review
Winthrop Landfill Superfund Site
September 30, 2002

Explanation of Significant Differences
GWETS Decommissioning, Points of Exposure, and Potential Vapor Intrusion Pathway
Winthrop Landfill Superfund Site
February 14, 2007

Fourth Five-Year Review
Winthrop Landfill Superfund Site
September 21, 2007

[FOR TECHNICAL DOCUMENTS PRIOR TO SEPTEMBER 2007, SEE FOURTH
FIVE-YEAR REVIEW, DATED SEPTEMBER 21, 2007.]

Sediment Sampling Plan, Annabessacook Lake Point of Exposure
Winthrop Landfill
MACTEC Engineering and Consulting, Inc.
September 12, 2008

September 2008 Arsenic Profiling at Hoyt Seep Report
Winthrop Landfill Project
MACTEC Engineering and Consulting, Inc.
November 4, 2008

November 2008 Arsenic Profiling at Annabessacook Lake Point of Exposure Report
Winthrop Landfill Project
MACTEC Engineering and Consulting, Inc.
January 23, 2009

January 2009 Arsenic in Sediment Delineation, Hoyt Brook Seep Area
Winthrop Landfill Project
MACTEC Engineering and Consulting, Inc.
March 12, 2009

Arsenic in Sediment Delineation Sampling Report
Annabessacook Lake Point of Exposure
Winthrop Landfill, Winthrop, Maine
MACTEC Engineering and Consulting, Inc.
March 13, 2009

Remedial Alternative Analysis Report for Hoyt Brook Seep
Winthrop Landfill Project
MACTEC Engineering and Consulting, Inc.
March 23, 2009

Contingency Sampling Results, Post-Closure Monitoring Program
Winthrop Landfill
MACTEC Engineering and Consulting, Inc.
April 10, 2009

Division of Remediation Field Trip Report
ME DEP
April 27, 2009

Contingency Sampling Results, Post-Closure Monitoring Program
Winthrop Landfill
MACTEC Engineering and Consulting, Inc.
July 23, 2009

Memo re: Algae mats, Annabessacook Lake
EPA
July 27, 2009

Algae Survey and Sampling Plan, Annabessacook Lake Point of Exposure
Winthrop Landfill
MACTEC Engineering and Consulting, Inc.
August 27, 2009

Memo re: Winthrop Landfill Seep Alternatives
EPA
October 13, 2009

2009 Annabessacook Lake Algae Survey and Sampling Results
Winthrop Landfill
MACTEC Engineering and Consulting, Inc.
October 30, 2009

Environmental Evaluation of Groundwater Seeps
Winthrop Landfill Superfund Site
Techlaw
December 22, 2009

Vapor Intrusion Contingency Monitoring at MW-5A
Winthrop Landfill Project
MACTEC Engineering and Consulting, Inc.
January 13, 2010

Review of the Vapor Intrusion Contingency Monitoring at MW-5A, Winthrop Landfill
Project letter dated January 13, 2010
ME DEP
January 26, 2010

Memo re: Human Exposure to Algal Mats at Annabessacook Lake POE, Winthrop
Landfill, Winthrop, ME
ME CDC
February 5, 2010

Memo re: Winthrop Landfill Seeps and Algae, Ecological Risk Issues
EPA
February 11, 2010

Memo re: Winthrop Landfill, Algae Sampling
EPA
March 2, 2010

Memo re: Winthrop Landfill Superfund Site: Risks Associated with Exposure to Arsenic
in Lake Annabessacook while Swimming
EPA
March 23, 2010

Site Investigation Plan, Annabessacook Lake and Hoyt Brook Points of Exposure
Winthrop Landfill
MACTEC Engineering and Consulting, Inc.
March 26, 2010

Memo re: April 2, 2010 Annabessacook Lake and Hoyt Brook POE Observations
MACTEC Engineering and Consulting, Inc.
April 5, 2010

Revised - Site Investigation Plan, Annabessacook Lake and Hoyt Brook Points of Exposure
Winthrop Landfill
MACTEC Engineering and Consulting, Inc.
May 2010

Memo re: May 27, 2010 Annabessacook Lake POE Surface Water Sampling Activities and Observations.
MACTEC Engineering and Consulting, Inc.
June 2, 2010

Post-Closure Monitoring Plan, Revision No. 5, Addendum 2
Winthrop Landfill
MACTEC Engineering and Consulting, Inc.
June 14, 2010

Annabessacook Lake POE, Risk Evaluation for Swimming
MACTEC Engineering and Consulting, Inc.
June 25, 2010

Responses to Comments, Annabessacook Lake POE, Risk Evaluation for Swimming
MACTEC Engineering and Consulting, Inc.
July 22, 2010

Annabessacook Lake POE – Sediment Analytical and Toxicity Testing Results
MACTEC Engineering and Consulting, Inc.
August 20, 2010

Hoyt Brook Point of Exposure, Brook and Seep Flow Measurements and Dilution Calculations
MACTEC Engineering and Consulting, Inc.
October 19, 2010

Annabessacook Lake Point of Exposure, Updated Risk Evaluation for Swimming
MACTEC Engineering and Consulting, Inc.
October 19, 2010

Annabessacook Lake Point of Exposure, Updated Risk Evaluation for Swimming
EPA
December 13, 2010

Review of the October 19, 2010 Hoyt Brook Point of Exposure, Brook and Seep Flow Measurements and Dilution Calculations
ME DEP
December 16, 2010

Annabessacook Lake POE, Sediment Analytical & Toxicity Testing Results
EPA
December 16, 2010

Annabessacook Lake Point of Exposure, Supplemental Risk Calculations
MACTEC Engineering and Consulting, Inc.
December 21, 2010

Review of the December 21, 2010 Annabessacook Lake Point of Exposure, Supplemental Risk Calculations
ME DEP
March 7, 2011

Annabessacook Lake Point of Exposure, Updated Risk Evaluation for Swimming
EPA
March 8, 2011

Annabessacook Lake Point of Exposure, Proposed Sampling Program in Support of Risk Evaluation for Swimming
MACTEC Engineering and Consulting, Inc.
May 2, 2011

Remedial Alternative Analysis Report, Hoyt Brook Seep Area
MACTEC Engineering and Consulting, Inc.
May 2011

Annabessacook Lake Point of Exposure, Proposed Sampling Program in Support of Risk Evaluation for Swimming
MACTEC Engineering and Consulting, Inc.
May 11, 2011

Remedial Alternative Analysis Report, Hoyt Brook Seep Area, dated May 2011
EPA
July 22, 2011

Draft Remedial Alternative Analysis Report, Hoyt Brook Seep Area, Revised August 2011
AMEC Environment & Infrastructure, Inc.
August 2011

Annabessacook Lake Point of Exposure, Supplemental Risk Calculations
AMEC Environment & Infrastructure, Inc.
November 10, 2011

Annabessacook Lake Point of Exposure, Supplemental Risk Calculations
EPA
December 20, 2011

Post-Closure Monitoring Report, January to June 2012 (and previous reports)
Winthrop Landfill
AMEC
August 29, 2012

Revised Ecological Risk Memorandum
EPA
September 6, 2012

ATTACHMENT 9
PUBLIC MEETING AGENDA, JUNE 26, 2012

PUBLIC MEETING AGENDA
Winthrop Landfill Superfund Site, Winthrop, Maine
June 26, 2012, 6:30 pm
Winthrop Town Hall, 17 Highland Ave.

Presented by U.S. Environmental Protection Agency, Maine Department of Environmental Protection, and United Technologies Corporation

- I. Administrative items needed to proceed at Hoyt Brook Seep Area
 - a. need for Record of Decision amendment (and formal public comment period) and CD modification before implementing a remedial alternative.

- II. Update on Hoyt Brook Seep Area activities
 - a. arsenic in sediment horizontal and vertical delineation
 - b. seep & stream flow measurement and dilution calculations to assess potential ecological risk (from arsenic in surface water)

- III. Update on activities at Annabessacook Lake Seep Area & other areas
 - a. arsenic in sediment delineation
 - b. risk assessment for wading and swimming (from arsenic in sediment)
 - c. site-specific toxicity testing to assess ecological risk for arsenic in sediment
 - d. 2011 risk assessment for wading and swimming (from arsenic in algae).
 - e. May 2012 surface water & sediment testing
 - f. Fish testing request
 - g. ongoing site-wide monitoring and landfill cap & fence maintenance
 - h. upcoming Five-Year Review (site-wide)

- IV. Question & answer

For More Information

Anni Loughlin, U.S. Environmental Protection Agency Project Manager
5 Post Office Square, Suite 100, Mailcode OSRR07-1, Boston, MA 02109-3912
617-918-1273, loughlin.anni@epa.gov

Rebecca L. Hewett, Maine Department of Environmental Protection Project Manager
Bureau of Remediation & Waste Management, 17 SHS, Augusta, ME 04333-0017
207-287-8554, rebecca.l.hewett@maine.gov

Nathan Hagelin, AMEC Environment & Infrastructure Inc. (formerly MACTEC)
(Contractor for United Technologies Corporation)
511 Congress Street, P.O. Box 7050, Portland, ME 04112-7050
207-828-3508, NWHagelin@amec.com

Bryan Kielbania, United Technologies Corporation
One Financial Plaza (M/S 503), Hartford, CT 06101
860-728-6503, Bryan.Kielbania@utc.com

Jeff Woolston, Town Manager
Town of Winthrop, 17 Highland Ave., Winthrop, Maine 04364
207-377-7200, x 423, jwoolston@winthropmaine.org

Bob Engdahl, Winthrop Landfill Citizens Action Group
105 Hubbard Lane, Winthrop, ME 04364
207-377-8826, bob.engdahl.380@gmail.com

Sandra Small-Hughes, Annabessacook Lake Improvement Association, Winthrop Landfill
Citizens Action Group
111 Mallard Lane, Winthrop, Maine 04364
207-227-8026, sshgirl@roadrunner.com

A public information repository containing major decision and enforcement documents, five-year review reports, and major technical documents related to the Winthrop Landfill Superfund Site is located at the Town Offices at 17 Highland Avenue. Please contact Jeff Woolston, Town Manager, to access the repository.

Site information and decision documents are also available on USEPA's webpage at:
www.epa.gov/ne/superfund/sites/winthrop

**ATTACHMENT 10
GROUNDWATER, SURFACE WATER, AND SEDIMENT
DETECTIONS IN 2011 AND 2012**

Table 2.3-1: Groundwater Detections
 January to June 2011

Media AOC Name Location Sample Date Sample ID QC Code	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW		
	POC	POC	POC	POC	POC	Northern Flow path																
	MW-10B	MW-10C	MW-5A	MW-5A	MW-5A	MW-15A	MW-15B	MW-20A	MW-20B	MW-20C	MW-210A	MW-210B	MW-210C	MW-208A	MW-208B	MW-208C	MW-210A	MW-210A	MW-210B	MW-210B		
	5/19/2011	5/19/2011	5/18/2011	5/18/2011	5/18/2011	5/19/2011	5/19/2011	5/18/2011	5/19/2011	5/19/2011	5/18/2011	5/18/2011	5/18/2011	5/18/2011	5/19/2011	5/19/2011	5/18/2011	5/18/2011	5/18/2011	5/18/2011		
	MW-10B	MW-10C	MW-5A	MW-5A Dup	MW-5A	MW-15A	MW-15B	MW-20A	MW-20B	MW-20C	MW-210A	MW-210B	MW-210B	MW-208A	MW-208B	MW-208C	MW-210A	MW-210A	MW-210B	MW-210B		
	FS	FS	FS	FD	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS		
Parameter and Method	ACL	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	
VOCs - 8260B																						
1,1-Dichloroethane	5	2.8 J		1.3		1 U		1 U		1 U		1 U		1.4		1 U		1 U		3.1		1.2
Benzene	5	1 U		4		1 U		1 U		1 U		1 U		1.3		1 U		1 U		1 U		1 U
Chloroethane	1300	23.2		2 U		2 U		2 U		4.2		2 U		13.3		16.1		2.6		3.3		7.4
Cis-1,2-Dichloroethene	70	1 UJ		1		2		2.3		1 U		1 U		1 U		1 U		1 U		1 U		1 U
Ethyl benzene	440	1 U		15.3		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U
Tetrahydrofuran	3300	4.3		27.8		2 U		2 U		2 U		2 U		2 U		2 U		2 U		2 U		2 U
Vinyl chloride	2	1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U
Xylenes	590	1 U		5.6		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U
Xylenes (m&p)	590	2 U		11.7		2 U		2 U		2 U		2 U		2 U		2 U		2 U		2 U		2 U
Vinyl Chloride - 524.2																						
Vinyl chloride	2	--		--		0.59 J		0.5 UJ		--		--		--		--		--		--		--
SVOCs-8270																						
Target Compounds	NA	ND		ND		ND		ND		--		--		--		--		--		--		--
Pesticides - 8081																						
Endosulfan I	40 ^a	0.021 U		0.048		0.025 U		0.023 U		--		--		--		--		--		--		--
Metals - 6010B																						
Arsenic	30	3.35 J		3.15		4 U		4 U		74.8		37.6 J		21.2		28.8		19.1		40.4		4 U
Calcium		150000		135000		76300		70100		--		--		--		--		--		--		--
Iron	5000 ^b	6880		32000		2270		1940		--		--		--		--		--		--		--
Magnesium		26800		43800		15300		14300		--		--		--		--		--		--		--
Nickel	88	5 U		11.4		6		5		--		--		--		--		--		--		--
Potassium		6930		5420		6080		5700		--		--		--		--		--		--		--
Sodium	20000 ^b	270600		57200		25000		25100		--		--		--		--		--		--		--
Zinc	59	5 U		13.6		8.3 J		5 UJ		--		--		--		--		--		--		--
Inorganics - 300.0																						
Chloride	250,000 ^b	37300		30100		8300		8290		--		--		--		--		--		--		--
Sulfate	250,000 ^b	24200		10000 U		28200		29800		--		--		--		--		--		--		--

Notes
 GW = Groundwater
 AOC = Area of Concern
 POC = Point of Compliance
 QC Code FS = Field Sample
 FD = Field Duplicate
 ACL = Alternate Concentration Limit
 VOCs = Volatile Organic Compounds
 Results reported in micrograms per liter (µg/L)
 Qualifiers U = Not detected
 J = Estimated value
Highlighted results exceed ACL
^a = State of Maine Maximum Exposure Guideline
 -- = Not Analyzed
 NA = Not Applicable
 SVOCs = Semivolatile Organic Compounds
 ND = Not Detected
 b = Secondary Maximum Contaminant Level

Table 2.3-1: Groundwater Detections
 January to June 2011

Parameter and Method	Media AOC Name Location Sample Date Sample ID QC Code	GW Northern Flowpath		GW Southern Flowpath		GW Landfill Wells		GW Landfill Wells		GW Seep East/Sphag Bog											
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier												
VOCs - 8260B																					
1,1-Dichloroethane	5	1 U		4.5		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U	
Benzene	5	1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U	
Chloroethane	1 300	2 U		2 U		3		2 U		3.4		2 U		2 U		7.1 J		4.4		2 U	
Cis-1,2-Dichloroethene	70	1 U		6		1 U		1 U		1.8		2.9		1 U		1.6		1 U		1 U	
Ethyl benzene	440	1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U	
Tetrahydrofuran	3 300	2 U		3.5		2 U		2 U		2 U		2 U		2 U		3		2		12.8	
Vinyl chloride	2	1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U	
Xylene o	590	1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U		1 U	
Xylenes (m&p)	590	2 U		2 U		2 U		2 U		2 U		2 U		2 U		2 U		2 U		2 U	
Vinyl Chloride - 524.2																					
Vinyl chloride	2	--		--		0.8		--		--		0.5 U		0.5 U		--		--		--	
SVOCs-8270																					
Target Compounds	NA	--		--		--		--		--		--		--		--		--		--	
Pesticides - 8081																					
Endosulfan I	40 ^a	--		--		--		--		--		--		--		--		--		--	
Metals - 6010B																					
Arsenic	30	21.8		39.3 ^a		31.4 ^a		4 U		189 ^a		976 ^a		272 ^a		193 ^a		22.2		--	
Calcium		--		--		--		--		--		--		--		--		--		--	
Iron	5000 ^b	--		--		--		--		--		--		--		--		--		--	
Magnesium		--		--		--		--		--		--		--		--		--		--	
Nickel	88	--		--		--		--		--		--		--		--		--		--	
Potassium		--		--		--		--		--		--		--		--		--		--	
Sodium	20000 ^a	--		--		--		--		--		--		--		--		--		--	
Zinc	59	--		--		--		--		--		--		--		--		--		--	
Inorganics - 300.0																					
Chloride	250,000 ^b	--		--		--		--		--		--		--		--		--		--	
Sulfate	250,000 ^b	--		--		--		--		--		--		--		--		--		--	

Notes
 GW = Groundwater
 AOC = Area of Concern
 POC = Point of Compliance
 QC Code FS = Field Sample
 FD = Field Duplicate
 ACL = Alternate Concentration Limit
 VOCs = Volatile Organic Compounds
 Results reported in micrograms per Liter (µg/L)
 Qualifiers U = Not detected
 J = Estimated value
Highlighted results exceed ACL
^a = State of Maine Maximum Exposure Guide
 -- = Not Analyzed
 NA = Not Applicable
 SVOCs = Semivolatile Organic Compounds
 ND = Not Detected
^b = Secondary Maximum Contaminant Level

**Table 2.3-2: Surface Water Detections
 January to June 2011**

Media Flow Path Location Sample Date Sample ID Qc Code	SEEP	SEEP	SEEP	SW	SW	SW	SW	SW	SW									
	Annabessacook Lake SP-108 5/25/2011 SP-108 FS	Annabessacook Lake SP-8 5/25/2011 SP-8 FS	Annabessacook Lake SP-8 5/25/2011 SP-8 DUP FD	Cattail Marsh SP-MRSII 5/25/2011 SPMRSII FS	Cattail Marsh SP-MRSIIA 5/25/2011 SPMRSIIA FS	Cattail Marsh SW-18 5/25/2011 SW-18 FS	Hoyt Brook SP-114N 5/25/2011 SP-114N FS	Hoyt Brook SW-119 5/25/2011 SW-119 FS	Hoyt Brook SW-120 5/25/2011 SW-120 FS									
Parameter and Method	PCL	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	
VOCs - 8260B																		
Toluene	650	--		1 U		1 U		1 U		27		--		1 U		--		1 U
Total Metals - 6010B																		
Arsenic	5	200		4 U		4 U		4 U		58		4 U		39		4 U		4 U
Zinc	59	--		5 U		5 U		164		30		--		5 U		--		6
Dissolved Metals - 6010B																		
Arsenic	5	8 U		8 U		8 U		8 U		9.5		8 U		15.2		8 U		8 U
Zinc	59	--		10 U		10 U		136		18		--		10 U		--		10 U

NOTES:

SW = Surface Water

QC Code

FS = Field Sample

FD = Field Duplicate

PCL = Protective Concentration Limit

VOCs = Volatile Organic Compounds

-- = Not sampled

Results reported in micrograms

per Liter (µg/L)

Qualifiers

U = Not detected

J = Estimated value

Highlighted results exceed PCL

**Table 2.3-2: Surface Water Detections
 January to June 2011**

Parameter and Method	Media Flow Path Location Sample Date Sample ID Qc Code	SW Hoyt Brook		SW Seep East/Sphag. Bog											
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260B															
Toluene	650	1	U	1	U	2		--		--		--		--	
Total Metals - 6010B															
Arsenic	5	4	U	15.5		62.6		7.2	J	6.9	J	25.2		74.5	
Zinc	59	5	U	9.5		23.2		21.5		16.8		--		12	
Dissolved Metals - 6010B															
Arsenic	5	8	U	7.8		29.5		10.7	J	8.2	J	31.4		72.6	
Zinc	59	10	U	10	U	10	U	12.2		10	U	--		10	U

NOTES:
 SW = Surface Water
 QC Code
 FS = Field Sample
 FD = Field Duplicate
 PCL = Protective Concentration Limit
 VOCs = Volatile Organic Compounds
 -- = Not sampled
 Results reported in micrograms
 per Liter (µg/L)
 Qualifiers
 U = Not detected
 J = Estimated value
 Highlighted results exceed PCL

**Table 2.3-3: Sediment Detections
 January to June 2011**

Parameter and Method	Media	SED		SED		SED		SED		SED		SED	
	Flow Path	Annabessacook Lake	Annabessacook Lake	Cattail Marsh	Hoyt Brook	Hoyt Brook	Hoyt Brook	Hoyt Brook	Hoyt Brook	Hoyt Brook	Hoyt Brook	Hoyt Brook	Hoyt Brook
	Location	SED-108	SED-8	SED-SPMRSH	SED-114N	SED-114N	SED-114N	SED-114N	SED-114N Dup	SED-119	SED-119	SED-120	SED-120
	Sample Date	5/25/2011	5/25/2011	5/25/2011	5/25/2011	5/25/2011	5/25/2011	5/25/2011	5/25/2011	5/25/2011	5/25/2011	5/25/2011	5/25/2011
	Sample ID	SED-108	SED-8	SED-SPMRSH	SED-114N	SED-114N	SED-114N Dup	SED-119	SED-119	SED-120	SED-120	SED-120	SED-120
	QC Code	FS	FS	FS	FS	FS	FD	FS	FS	FS	FS	FS	FS
	PCL	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260B													
Acetone	4.1	--	0.0647 U	0.0534	0.0942	0.097	--	0.0956 U					
Metals - 6010B													
Arsenic	31	23.5	43.2	13.8	24.9	34.2	95.9	5.3					
Nickel	50	--	--	--	25.9	30.3	--	--					
Zinc	270	--	32.7	72.6	33.1	32	--	54.7					
Solids Modified SM212540G													
Percent Solids	NA	73.4	70.1	60.4	53.3	47.3	69.7	42.8					

NOTES:

SED = Sediment

QC Code:

FS = Field Sample

FD = Field Duplicate

PCL = Protective Concentration Limit

VOCs = Volatile Organic Compounds

-- = Not Sampled

Results reported in milligrams per kilogram (mg/kg)

Qualifiers:

U = Not detected

Highlighted results exceed PCL

NA = Not Applicable

Percent Solids reported in Percent (%)

**Table 2.3-3: Sediment Detections
 January to June 2011**

Parameter and Method	Media	SED Hoyt Brook		SED Seep East/Sphag. Bog		SED Seep East/Sphag. Bog	
	Flow Path	Result	Qualifier	Result	Qualifier	Result	Qualifier
	Location	SED-121		SED-304		SED-304	
	Sample Date	5/25/2011		5/25/2011		6/21/2011	
	Sample ID	SED-121		SED-304		SED-304	
	QC Code	FS		FS		FS	
	PCL						
VOCs - 8260B							
Acetone	4.1	0.0887	U	0.0767	U	--	
Metals - 6010B							
Arsenic	31	4.57		24.5		--	
Nickel	50	--		48.7		--	
Zinc	270	36.7		355		125	
Solids Modified SM212540G							
Percent Solids	NA	56.7		54.6		58.4	

NOTES:

SED = Sediment

QC Code:

FS = Field Sample

FD = Field Duplicate

PCL = Protective Concentration Limit

VOCs = Volatile Organic Compounds

-- = Not Sampled

Results reported in milligrams per kilogram (mg/kg)

Qualifiers:

U = Not detected

Highlighted results exceed PCL

NA = Not Applicable

Percent Solids reported in Percent (%)

**Table 2.3-2: Groundwater Detections
 July to December 2011**

Parameter and Method	Media	GW		GW		GW		GW		GW	
	AOC Name	POC	POC	POC	POC						
	Location	MW-10B	MW-10C	MW-10C	MW-5A	MW-5A	MW-5A	MW-5A	MW-5A	MW-5A	MW-5A
	Sample Date	11/30/2011	11/30/2011	11/30/2011	11/30/2011	11/30/2011	11/30/2011	11/30/2011	1/16/2012	1/16/2012	1/16/2012
	Sample ID	MW-10B	MW-10C	MW-10C	MW-5A	MW-5A Dup	MW-5A Dup	MW-5A Dup	MW-5A**	MW-5A**	MW-5A Dup**
	QC Code	FS	FS	FS	FS	FD	FD	FD	FS	FS	FD
	ACL	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260B											
1,1-Dichloroethane	5	3		1.7		1 U		1 U		--	
Benzene	5	1.1		3.3		1 U		1 U		--	
Chloroethane	1,300	21.4		2.6		3.2		3.2		--	
Cis-1,2-Dichloroethene	70	1 U		1 U		4		4.2		--	
Ethyl benzene	440	1 U		4.9		1 U		1 U		--	
Tetrahydrofuran	3,300	4.3		14		2 U		2 U		--	
Vinyl chloride	2	1 U		1 U		1.9		2.4		--	
Xylene, o	590	1 U		1.9		1 U		1 U		--	
Xylenes (m&p)	590	2 U		96		2 U		2 U		--	
Vinyl Chloride - 524.2											
Vinyl chloride	2	--		--		2.2		2.3		--	
SVOCs-8270											
Target Compounds	NA	ND		ND		ND		ND		--	
Dimethylformamide - SW8033M											
Dimethylformamide	390	0.02 UJ		0.02 UJ		0.02 UJ		0.02 UJ		--	
Metals - 6010B											
Arsenic	30	38.3 J		28.7 J		35.6 J		36.6 J		37.6	
Nickel	88	5 U		10.4		7.1		7.2		--	

Notes

GW = Groundwater
 AOC = Area of Concern
 POC = Point of Compliance
 QC Code: FS = Field Sample
 FD = Field Duplicate
 * = Maximum Exposure Guideline
 ** - Contingency Samples
 ACL = Alternate Concentration Limit
 VOCs = Volatile Organic Compounds
 Results reported in micrograms per Liter (µg/L)
 Qualifiers U = Not detected
 J = Estimated value

Highlighted results exceed ACL

-- = Not Analyzed ND = Not Detected
 SVOCs = Semivolatile Organic Compounds

**Table 2.3-2: Groundwater Detections
 July to December 2011**

Parameter and Method	Media	GW		GW		GW	
	AOC Name	Southern Flowpath					
	Location	MW-212B	MW-8B	MW-8B	MW-8B	MW-8C	MW-8C
	Sample Date	11/30/2011	11/30/2011	11/30/2011	11/30/2011	11/30/2011	11/30/2011
	Sample ID	MW-212B	MW-8B	MW-8B	MW-8B	MW-8C	MW-8C
	QC Code	FS	FS	FS	FS	FS	FS
Parameter and Method	ACL	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260B							
1,1-Dichloroethane	5	--		--		--	
Benzene	5	--		--		--	
Chloroethane	1,300	--		--		--	
Cis-1,2-Dichloroethene	70	--		--		--	
Ethyl benzene	440	--		--		--	
Tetrahydrofuran	3,300	--		--		--	
Vinyl chloride	2	--		--		--	
Xylene, o	590	--		--		--	
Xylenes (m&p)	590	--		--		--	
Vinyl Chloride - 524.2							
Vinyl chloride	2	0.83		1.05		0.5 U	
SVOCs-8270							
Target Compounds	NA	--		--		--	
Dimethylformamide - SW8033M							
Dimethylformamide	390	--		--		--	
Metals - 6010B							
Arsenic	30	--		--		--	
Nickel	88	--		--		--	

Notes

GW = Groundwater

AOC = Area of Concern

POC = Point of Compliance

QC Code FS = Field Sample

FD = Field Duplicate

* = Maximum Exposure Guideline

** - Contingency Samples

ACL = Alternate Concentration Limit

VOCs = Volatile Organic Compounds

Results reported in micrograms per Liter (µg/L)

Qualifiers U = Not detected

J = Estimated value

Highlighted results exceed ACL

-- = Not Analyzed ND = Not Detected

SVOCs = Semivolatile Organic Compounds

**Table 2.3-3: Surface Water Detections
 July to December 2011**

Parameter and Method	Media	SW		SW		SW		SW		SW		
	Flow Path	Annabessacook Lake	Cattail Marsh									
Location		SP-108	SP-108	SP-108	SP-108	SP-8	SP-8	SP-8	SP-8	SP-MRSII		
Sample Date		9/8/2011	9/16/2011	12/1/2011	12/1/2011	12/1/2011	12/1/2011	12/1/2011	12/1/2011	12/1/2011		
Sample ID		SP-108	SP-108	SP-108	SP-108	SP-8	SP-8	SP-8 Dup	SP-8 Dup	SPMRSH		
Qc Code		FS	FS	FS	FS	FS	FS	FD	FD	FS		
PCL		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	
VOCs - 8260B												
1,1-Dichloroethane	5	--	--	--	--	1 U		1 U		1 U		
Chloroethane	1,300	--	--	--	--	2 U		2 U		2 U		
Total Metals - 6010B												
Arsenic	5	10.1		93.5 J		4.2 J		28.2 J		9.9 J		18.2 J
Zinc	59	--	--	--	--	--		5 U		5 U		26.8
Dissolved Metals - 6010B												
Arsenic	5	2.1		4 U		4 U		4 U		4 U		14.0
Zinc	59	--	--	--	--	--		5 U		5 U		29.0

NOTES:
 SW = Surface Water
 QC Code:
 FS = Field Sample
 FD = Field Duplicate
 PCL = Protective Concentration Limit
 VOCs = Volatile Organic Compounds
 -- = Not sampled
 Results reported in micrograms per Liter (µg/L)
 Qualifiers:
 U = Not detected
 J = Estimated value

Highlighted results exceed PCL

**Table 2.3-3: Surface Water Detections
 July to December 2011**

Parameter and Method	Media Flow Path Location Sample Date Sample ID Qc Code	SW Cattail Marsh		SW Cattail Marsh		SW Hoyt Brook		SW Hoyt Brook		SW Hoyt Brook		SW Hoyt Brook	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260B													
1,1-Dichloroethane	5	1 U		--		1.5		--		1 U		1 U	
Chloroethane	1,300	2 U		--		6.9		--		2 U		2 U	
Total Metals - 6010B													
Arsenic	5	4 UJ		4 UJ		177 J		4 UJ		4 UJ		4 UJ	
Zinc	59	5.2		--		5 U		--		5 U		5 U	
Dissolved Metals - 6010B													
Arsenic	5	4 U		4 U		164 J		4 U		4 U		4 U	
Zinc	59	5 U		--		5 U		--		5 U		5 U	

NOTES:

SW = Surface Water

QC Code.

FS = Field Sample

FD = Field Duplicate

PCL = Protective Concentration Limit

VOCs = Volatile Organic Compounds

-- = Not sampled

Results reported in micrograms per Liter (µg/L)

Qualifiers:

U = Not detected

J = Estimated value

Highlighted results exceed PCL

**Table 2.3-3: Surface Water Detections
 July to December 2011**

Parameter and Method	Media	SW									
	Flow Path Location	Seep East/Sphag. Bog									
	Sample Date	SP-304		SP-304A		SW-3		SW-305		SW-4	
	Sample ID	SP-304		SP-304A		SW-3		SW-305		SW-4	
	Qc Code	FS									
PCL		Result	Qualifier								
VOCs - 8260B											
I,1-Dichloroethane	5	1	U	1	U	--		--		--	
Chloroethane	1,300	2	U	2	U	--		--		--	
Total Metals - 6010B											
Arsenic	5	25.2	J	7.9	J	4.9	J	9.2	J	21.6	J
Zinc	59	7.5		17.6		17.4		8.2		5	U
Dissolved Metals - 6010B											
Arsenic	5	27.4		4		4	U	4	U	12.0	
Zinc	59	9.4		8		11		9.7		5	U

NOTES:
 SW = Surface Water
 QC Code:
 FS = Field Sample
 FD = Field Duplicate
 PCL = Protective Concentration Limit
 VOCs = Volatile Organic Compounds
 -- = Not sampled
 Results reported in micrograms per Liter (µg/L)
 Qualifiers:
 U = Not detected
 J = Estimated value

Highlighted results exceed PCL

**Table 2.3-4: Sediment Detections
 July to December 2011**

Parameter and Method	Media	SED Annabessacook Lake		SED Annabessacook Lake		SED Cattail Marsh		SED Hoyt Brook		SED Hoyt Brook											
	Flow Path	Location	Sample Date	Sample ID	QC Code	Result	Qualifier	Result	Qualifier	Result	Qualifier										
	PCL	SED-108	12/1/2011	Sed-108	FS	SED-8	12/1/2011	Sed-8	FS	SED-SPMRSII	12/1/2011	Sed-SPMRSII	FS	SED-114N	12/1/2011	Sed-114N	FS	SED-114N Dup	12/1/2011	Sed-114N Dup	FD
VOCs - 8260B																					
Target Compounds	NA	--		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metals - 6010B																					
Arsenic	31	43.4 J		21.6 J		14 J		52.5 J		34.9 J											
Nickel	50	--						19.8		24.3											
Zinc	270	--		22.1		80.3		36.7		34											
Solids Modified SM212540G																					
Percent Moisture	NA	35.7		17.3		38.1		55.6		57.4											
Percent Solids	NA	64.3		82.7		61.9		44.4		42.6											

NOTES:

SED = Sediment

QC Code:

FS = Field Sample

FD = Field Duplicate

PCL = Protective Concentration Limit

VOCs = Volatile Organic Compounds

-- = Not Sampled

Results reported in milligrams per kilogram (mg/kg)

Percent Solids reported in Percent (%)

Qualifiers:

U = Not detected

J = Estimated value

Highlighted results exceed PCL

NA = Not Applicable

**Table 2.3-4: Sediment Detections
 July to December 2011**

Parameter and Method	Media	SED Hoyt Brook		SED Hoyt Brook		SED Hoyt Brook		SED Seep East/Sphag. Bog	
	Flow Path	Location	Sample Date	Sample ID	QC Code	Result	Qualifier	Result	Qualifier
VOCs - 8260B									
Target Compounds	NA	--				ND		ND	
Metals - 6010B									
Arsenic	31	84.1 J				5.83 J		9.05 J	
Nickel	50								17.7
Zinc	270					51		52.8	
Solids Modified SM212540G									
Percent Moisture	NA	23.2						54.9	
Percent Solids	NA	76.8				58.4		45.1	

NOTES:
 SED = Sediment
 QC Code:
 FS = Field Sample
 FD = Field Duplicate
 PCL = Protective Concentration Limit
 VOCs = Volatile Organic Compounds
 -- = Not Sampled
 Results reported in milligrams per kilogram (mg/kg)
 Percent Solids reported in Percent (%)
 Qualifiers:
 U = Not detected
 J = Estimated value
~~Highlighted results exceed PCL~~
 NA = Not Applicable

**Table 2.3-1: Groundwater Detections
 January to June 2012**

Parameter and Method	AOC Name Location Sample Date Sample ID QC Code ACL	POC MW-10B 5/10/2012 MW-10B FS		POC MW-10B 7/5/2012 ** MW-10B FS		POC MW-10C 5/10/2012 MW-10C FS		POC MW-10C 7/5/2012 ** MW-10C FS		POC MW-5A 5/10/2012 MW-5A FS		POC MW-5A 5/10/2012 MW-5A Dup FD	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260C													
1,1-Dichloroethane	5	3.1	--	--	1.8	--	--	1 U	--	1 U	--	1 U	--
Benzene	5	1.2	--	--	3.7	--	--	1 U	--	1 U	--	1 U	--
Chloroethane	1300	16.2 J	--	--	2 UJ	--	--	2.4	--	2.6	--	2.6	--
Cis-1,2-Dichloroethene	70	1 U	--	--	1 U	--	--	4.4	--	4.1	--	4.1	--
Ethyl benzene	440	1 U	--	--	2.6	--	--	1 U	--	1 U	--	1 U	--
Tetrahydrofuran	3300	3.5	--	--	21.3	--	--	2 U	--	2 U	--	2 U	--
Trichloroethene	5	1 U	--	--	1 U	--	--	1 U	--	1 U	--	1 U	--
Vinyl chloride	2	1 UJ	--	--	1 UJ	--	--	1 U	--	1 U	--	1 U	--
Xylene, o	590	1 U	--	--	1.3	--	--	1 U	--	1 U	--	1 U	--
Xylenes (m&p)	590	2 U	--	--	71.9	--	--	2 U	--	2 U	--	2 U	--
Vinyl Chloride - 524.2													
Vinyl chloride	2	--	--	--	--	--	--	--	--	0.74	--	0.77	--
SVOCs-8270D													
Target Compounds	NA	ND	--	--	ND	--	--	ND	--	ND	--	ND	--
Metals - 6010C													
Arsenic	30	384	--	--	307	--	--	71.6	--	74.3	--	74.3	--
Nickel	88	5 U	--	--	14.2	--	--	8.8	--	8.7	--	8.7	--
Zinc	59	5 U	--	--	5.6	--	--	5.2 J	--	5 UJ	--	5 UJ	--
DMF - 8033M													
Dimethylformamide	390	R	20 U	20 U	R	20 U	20 U	R	20 U	R	20 U	R	20 U

Notes

** = DMF resampling effort

POC = Point of Compliance

QC Code. FS = Field Sample

FD = Field Duplicate

ACL = Alternate Concentration Limit

VOCs = Volatile Organic Compounds

SVOCs = Semivolatile Organic Compounds

DMF = Dimethylformamide

Results reported in micrograms per Liter (µg/L)

Qualifiers U = Not detected

J = Estimated value

R = Result rejected

Highlighted results exceed ACL

-- = Not Analyzed

NA / ND = Not Applicable / Not Detected

Table 2.3-1: Groundwater Detections
 January to June 2012

Parameter and Method	AOC Name	POC MW-5A		POC MW-5A		Northern Flowpath MW-15A		Northern Flowpath MW-15B		Northern Flowpath MW-208A		Northern Flowpath MW-208A	
	Location	MW-5A	MW-5A	MW-5A	MW-5A	MW-15A	MW-15A	MW-15B	MW-15B	MW-208A	MW-208A	MW-208A	MW-208A
	Sample Date	7/5/2012 **	7/5/2012 **	7/5/2012 **	7/5/2012 **	5/9/2012	5/9/2012	5/9/2012	5/9/2012	5/10/2012	5/10/2012	7/5/2012 **	7/5/2012 **
	Sample ID	MW-5A	MW-5A	MW-5A	MW-5A	MW-15A	MW-15A	MW-15B	MW-15B	MW-208A	MW-208A	MW-208A	MW-208A
	QC Code	FS	FD	FS	FD	FS	FS	FS	FS	FS	FS	FS	FS
	ACL	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260C													
1,1-Dichloroethane	5	--		--		1 U		1 U		1.5		--	
Benzene	5	--		--		1 U		1 U		1.6		--	
Chloroethane	1300	--		--		4 J		2 UJ		9.4 J		--	
Cis-1,2-Dichloroethene	70	--		--		1 U		1 U		1 U		--	
Ethyl benzene	440	--		--		1 U		1 U		1 U		--	
Tetrahydrofuran	3300	--		--		2 U		2 U		2 U		--	
Trichloroethene	5	--		--		1 U		1 U		1 U		--	
Vinyl chloride	2	--		--		1 UJ		1 UJ		1 UJ		--	
Xylene, o	590	--		--		1 U		1 U		1 U		--	
Xylenes (m&p)	590	--		--		2 U		2 U		2 U		--	
Vinyl Chloride - 524.2													
Vinyl chloride	2	--		--		--		--		--		--	
SVOCs-8270D													
Target Compounds	NA	--		--		--		--		--		--	
Metals - 6010C													
Arsenic	30	--		--		63.2		43.8		222		--	
Nickel	88	--		--		--		--		--		--	
Zinc	59	--		--		--		--		--		--	
DMF - 8033M													
Dimethylformamide	390	20 U		20 U		--		--		R		20 U	

Notes

** = DMF resampling effort

POC = Point of Compliance

QC Code: FS = Field Sample

FD = Field Duplicate

ACL = Alternate Concentration Limit

VOCs = Volatile Organic Compounds

SVOCs = Semivolatile Organic Compounds

DMF = Dimethylformamide

Results reported in micrograms per Liter (µg/L)

Qualifiers U = Not detected

J = Estimated value

R = Result rejected

Highlighted results exceed ACL

-- = Not Analyzed

NA / ND = Not Applicable / Not Detected

**Table 2.3-1: Groundwater Detections
 January to June 2012**

Parameter and Method	AOC Name	Northern Flowpath												
	Location	MW-208B	MW-208C	MW-208C	MW-210A	MW-210B	MW-210B	MW-210B	MW-210C	MW-210C	MW-210C	MW-210C	MW-210C	
Sample Date	Sample ID	Sample ID	Sample ID											
QC Code	QC Code	QC Code	QC Code	QC Code	QC Code	QC Code	QC Code	QC Code	QC Code	QC Code	QC Code	QC Code	QC Code	
ACL	Result	Qualifier	Result	Qualifier										
VOCs - 8260C														
1,1-Dichloroethane	5	1 U	1 U	3.3	1 U	--	1 U	1 U						
Benzene	5	1 U	1 U	1 U	1 U	--	1 U	1 U						
Chloroethane	1300	15.5	4.2 J	2.7	9.6	--	1 U	2 UJ						
Cis-1,2-Dichloroethene	70	1 U	1 U	1 U	1 U	--	1 U	1 U						
Ethyl benzene	440	1 U	1 U	1 U	1 U	--	1 U	1 U						
Tetrahydrofuran	3300	2 U	2 U	2 U	2 U	--	2 U	2 U						
Trichloroethene	5	1 U	1 U	1 U	1 U	--	1 U	1 U						
Vinyl chloride	2	1 U	1 UJ	1 U	1 U	--	1 U	1 UJ						
Xylene, o	590	1 U	1 U	1 U	1 U	--	1 U	1 U						
Xylenes (m&p)	590	2 U	2 U	2 U	2 U	--	2 U	2 U						
Vinyl Chloride - 524.2														
Vinyl chloride	2	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs-8270D														
Target Compounds	NA	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals - 6010C														
Arsenic	30	295	112	28.5	4 U	--	21	21						
Nickel	88	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	59	--	--	--	--	--	--	--	--	--	--	--	--	--
DMF - 8033M														
Dimethylformamide	390	--	--	--	R	--	R	--	R	--	20 U	--	R	R

Notes

** = DMF resampling effort
 POC = Point of Compliance
 QC Code: FS = Field Sample
 FD = Field Duplicate
 ACL = Alternate Concentration Limit
 VOCs = Volatile Organic Compounds
 SVOCs = Semivolatile Organic Compounds
 DMF = Dimethylformamide
 Results reported in micrograms per Liter (µg/L)
 Qualifiers: U = Not detected
 J = Estimated value
 R = Result rejected

Highlighted results exceed ACL

-- = Not Analyzed
 NA / ND = Not Applicable / Not Detected

**Table 2.3-1: Groundwater Detections
 January to June 2012**

Parameter and Method	AOC Name	Northern Flowpath		Southern Flowpath		Southern Flowpath		Southern Flowpath		Southern Flowpath		Southern Flowpath	
	Location	MW-210C	MW-210C	MW-212A	MW-212A	MW-212A	MW-212B	MW-212C	MW-212C	MW-212C	MW-8A	MW-8A	MW-8A
Sample Date	Sample ID	7/5/2012 **	7/5/2012 **	5/9/2012	5/9/2012	7/5/2012 **	5/9/2012	5/9/2012	5/9/2012	5/9/2012	5/10/2012	5/10/2012	5/10/2012
QC Code	QC Code	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
ACL	ACL	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260C													
1,1-Dichloroethane	5	--		6.6		--		1.2		1 U		5.5	
Benzene	5	--		1 U		--		1 U		1 U		1 U	
Chloroethane	1300	--		2 UJ		--		4.4		2 UJ		2 UJ	
Cis-1,2-Dichloroethene	70	--		7		--		1.1		1 U		2.1	
Ethyl benzene	440	--		1 U		--		1 U		1 U		1 U	
Tetrahydrofuran	3300	--		2 U		--		2 U		2 U		2 U	
Trichloroethene	5	--		1 U		--		1 U		1 U		1 U	
Vinyl chloride	2	--		1 UJ		--		1 U		1 UJ		1 UJ	
Xylene, o	590	--		1 U		--		1 U		1 U		1 U	
Xylenes (m&p)	590	--		2 U		--		2 U		2 U		2 U	
Vinyl Chloride - 524.2													
Vinyl chloride	2	--		--		--		0.73		--		--	
SVOCs-8270D													
Target Compounds	NA	--		--		--		--		--		--	
Metals - 6010C													
Arsenic	30	--		47.6		--		345		4 U		173	
Nickel	88	--		--		--		--		--		--	
Zinc	59	--		--		--		--		--		--	
DMF - 8033M													
Dimethylformamide	390	20 U		R		20 U		--		--		--	

Notes

** = DMF resampling effort

POC = Point of Compliance

QC Code: FS = Field Sample

FD = Field Duplicate

ACL = Alternate Concentration Limit

VOCs = Volatile Organic Compounds

SVOCs = Semivolatile Organic Compounds

DMF = Dimethylformamide

Results reported in micrograms per Liter (µg/L)

Qualifiers U = Not detected

J = Estimated value

R = Result rejected

Highlighted results exceed ACL

-- = Not Analyzed

NA / ND = Not Applicable / Not Detected

Table 2.3-1: Groundwater Detections
 January to June 2012

Parameter and Method	AOC Name	Southern Flowpath		Southern Flowpath		Landfill Wells		Landfill Wells		Seep East/Sphag.Bog		Seep East/Sphag.Bog	
	Location	MW-8B	MW-8C	MW-8C	MW-103R	MW-108	MW-108	MW-9B	MW-9B	MW-9B	MW-9B	MW-9B	MW-9B
	Sample Date	5/10/2012	5/10/2012	5/10/2012	5/9/2012	5/8/2012	5/8/2012	5/9/2012	5/9/2012	5/9/2012	5/9/2012	7/5/2012 **	7/5/2012 **
	Sample ID	MW-8B	MW-8C	MW-8C	MW-103R	MW-108	MW-108	MW-9B	MW-9B	MW-9B	MW-9B	MW-9B	MW-9B
	QC Code	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
	ACL	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260C													
1,1-Dichloroethane	5	1 U		--		19		1 U		18		--	
Benzene	5	1 U		--		1.5		1 U		1 U		--	
Chloroethane	1300	2 U		--		10.2 J		2 UJ		2 UJ		--	
Cis-1,2-Dichloroethene	70	3.8		--		1.4		1 U		1 U		--	
Ethyl benzene	440	1 U		--		1 U		1 U		1 U		--	
Tetrahydrofuran	3300	2 U		--		2 U		3.7 J		11.8		--	
Trichloroethene	5	1 U		--		1 U		2.8 J		1 U		--	
Vinyl chloride	2	1 U		--		1 U		1 U		1 UJ		--	
Xylene, o	590	1 U		--		1 U		1 U		1 U		--	
Xylenes (m&p)	590	2 U		--		2 U		2 U		2 U		--	
Vinyl Chloride - 524.2													
Vinyl chloride	2	0.52		0.5 U		--		--		--		--	
SVOCs-8270D													
Target Compounds	NA	--		--		--		--		--		--	
Metals - 6010C													
Arsenic	30	1250		--		265		196		25.6		--	
Nickel	88	--		--		--		--		--		--	
Zinc	59	--		--		--		--		--		--	
DMF - 8033M													
Dimethylformamide	390	--		--		--		--		R		110	

Notes

** = DMF resampling effort

POC = Point of Compliance

QC Code: FS = Field Sample

FD = Field Duplicate

ACL = Alternate Concentration Limit

VOCs = Volatile Organic Compounds

SVOCs = Semivolatile Organic Compounds

DMF = Dimethylformamide

Results reported in micrograms per Liter (µg/L)

Qualifiers: U = Not detected

J = Estimated value

R = Result rejected

Highlighted results exceed ACL

-- = Not Analyzed

NA / ND = Not Applicable / Not Detected

**Table 2.3-2: Surface Water Detections
 January to June 2012**

Parameter and Method	Flow Path Location Sample Date Sample ID Qc Code PCL	Annabessacook Lake SP-108 5/8/2012 SP-108 FS		Annabessacook Lake SP-8 5/8/2012 SP-8 FS		Annabessacook Lake SP-8 5/8/2012 SP-8 Dup FD		Cattail Marsh SP-MRSH 5/8/2012 SPMRSH FS		Cattail Marsh SP-MRSHA 5/8/2012 SPMRSHA FS		Cattail Marsh SW-18 5/7/2012 SW-18 FS	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260C													
1,1-Dichloroethane	5	--		1 U		1 U		1 U		1 U		--	
Toluene	650	--		1 U		1 U		1 U		1 U		--	
Total Metals - 6010C													
Arsenic	5	40.8		4 U		4 U		7		4.4		7.9	
Zinc	59	--		5 U		5 U		20.5		28		--	
Dissolved Metals - 6010C													
Arsenic	5	4 U		4 U		4 U		4 U		4 U		4 U	
Zinc	59	--		5 U		5 U		20		22		--	

NOTES:

QC Code:

FS = Field Sample

FD = Field Duplicate

PCL = Protective Concentration Limit

VOCs = Volatile Organic Compounds

-- = Not sampled

Results reported in micrograms per Liter (µg/L)

Qualifiers:

U = Not detected

J = Estimated value

Highlighted results exceed PCL

**Table 2.3-2: Surface Water Detections
 January to June 2012**

Parameter and Method	Flow Path	Hoyt Brook		Hoyt Brook		Hoyt Brook		Hoyt Brook		Seep East/Sphag.Bog		Seep East/Sphag.Bog	
	Location	SP-114N	SW-119	SW-120	SW-121	SW-121	SW-121	SW-121	SW-121	SP-304	SP-304	SP-304A	SP-304A
	Sample Date	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/8/2012	5/8/2012	5/8/2012	5/8/2012
	Sample ID	SP-114N	SW-119	SW-120	SW-121	SW-121	SW-121	SW-121	SW-121	SP-304	SP-304	SP-304A	SP-304A
	Qc Code	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
	PCL	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260C													
1,1-Dichloroethane	5	1.1	J	--		1	U	1	U	1	U	1	UJ
Toluene	650	1	U	--		1	U	1	U	1.2		1	UJ
Total Metals - 6010C													
Arsenic	5	243		4	U	4	U	4		69.9		16.8	
Zinc	59	5	U	--		5	U	5	U	20.9		9.2	
Dissolved Metals - 6010C													
Arsenic	5	210		4	U	4	U	4	U	49.2		8.1	
Zinc	59	5	U	--		5.4		5	U	21.8		6.4	

NOTES:

QC Code:

- FS = Field Sample
- FD = Field Duplicate

PCL = Protective Concentration Limit

VOCs = Volatile Organic Compounds

-- = Not sampled

Results reported in micrograms per
 Liter (µg/L)

Qualifiers:

- U = Not detected
- J = Estimated value

Highlighted results exceed PCL

**Table 2.3-2: Surface Water Detections
 January to June 2012**

Parameter and Method	Flow Path Location Sample Date Sample ID Qc Code PCL	Seep East/Sphag.Bog SW-3 5/8/2012 SW-3 FS		Seep East/Sphag.Bog SW-305 5/8/2012 SW-305 FS		Seep East/Sphag.Bog SW-4 5/8/2012 SW-4 FS	
		Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260C							
1,1-Dichloroethane	5	--		--		--	
Toluene	650	--		--		--	
Total Metals - 6010C							
Arsenic	5	15		10.4		26.4	
Zinc	59	17.2		7.5		5 U	
Dissolved Metals - 6010C							
Arsenic	5	11.4		6.6		10.5	
Zinc	59	17.9		8.2		5.2	

NOTES:

QC Code:

FS = Field Sample

FD = Field Duplicate

PCL = Protective Concentration Limit

VOCs = Volatile Organic Compounds

-- = Not sampled

Results reported in micrograms per
 Liter (µg/L)

Qualifiers:

U = Not detected

J = Estimated value

Highlighted results exceed PCL

**Table 2.3-3: Sediment Detections
 January to June 2012**

Parameter and Method	Flow Path Location Sample Date Sample ID QC Code PCL	Annabessacook Lake SED-108 5/8/2012 SED-108 FS		Annabessacook Lake SED-8 5/8/2012 SED-8 FS		Cattail Marsh SED-SPMRSH 5/8/2012 SED-SPMRSH FS		Hoyt Brook SED-114N 5/7/2012 SED-114N FS		Hoyt Brook SED-114N 5/7/2012 SED-114N Dup FD	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs - 8260C											
Target Compounds	NA	--		ND		ND		ND		ND	
Metals - 6010C											
Arsenic	31	50.1 J		25.6 J		44.4 J		130 J		155 J	
Nickel	50	--		--		--		29.5		30.7	
Zinc	270	--		24.3		191		30.9		30.4	
Solids/Moisture E245.1/SM2540G											
Percent Solids	NA	62.5		77.3		36.7		51		45.9	
Percent Moisture	NA	37.5		22.7		63.3		49		54.1	

NOTES:

QC Code:

FS = Field Sample

FD = Field Duplicate

PCL = Protective Concentration Limit

VOCs = Volatile Organic Compounds

Results reported in milligrams per
 kilogram (mg/kg)

Percent Solids reported in Percent (%)

Qualifiers:

J = Estimated value

-- = Not Sampled

Highlighted results exceed PCL

NA / ND = Not Applicable / Not Detected

**Table 2.3-3: Sediment Detections
 January to June 2012**

Parameter and Method	Flow Path	Hoyt Brook		Hoyt Brook		Hoyt Brook		Seep East/Sphag.Bog	
	Location	SED-119	SED-120	SED-120	SED-121	SED-121	SED-304	SED-304	SED-304
	Sample Date	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/8/2012	5/8/2012	5/8/2012
	Sample ID	SED-119	SED-120	SED-120	SED-121	SED-121	SED-304	SED-304	SED-304
	QC Code	FS	FS	FS	FS	FS	FS	FS	FS
	PCL								
	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result
VOCs - 8260C									
Target Compounds	NA	--	ND	ND	ND	ND	ND	ND	ND
Metals - 6010C									
Arsenic	31	97.9 J	6.95 J		3.7 J		22.4 J		
Nickel	50	--	--		--		34.6		
Zinc	270	--	54.3		29.1		176		
Solids/Moisture E245.1/SM2540G									
Percent Solids	NA	87.1	44.8		63.7		57.5		
Percent Moisture	NA	12.9	55.2		36.3		42.5		

NOTES:

QC Code:

FS = Field Sample

FD = Field Duplicate

PCL = Protective Concentration Limit

VOCs = Volatile Organic Compounds

Results reported in milligrams per kilogram (mg/kg)

Percent Solids reported in Percent (%)

Qualifiers:

J = Estimated value

-- = Not Sampled

Highlighted results exceed PCL

NA / ND = Not Applicable / Not Detected

ATTACHMENT 11
COMPARISON OF CURRENT ACLs TO CURRENT MCLs
AND MEGs

Attachment 11 - Comparison of Current ACLs to Current MCLs and MEGs (all units in ppb)

Compound	ACLs		Current MCL (bold = lower than ACL)	Current MEG (bold = lower than ACL)
	Number	Basis		
Benzene	5	MCL	(same)	4
Toluene	1,000	MCL	(same)	600
Styrene	100	MCL	(same)	100
Ethylbenzene	440	ECO	700	30
Xylenes	590	ECO	10,000	1,000
Methylene Chloride	5	MCL	(same)	50
Trichlorofluoromethane	2,300	MEG	- None -	2,000
Chloroethane	1,300	ECO	- None -	7
1,1-Dichloroethane	5	MEG	- None -	60
1,2-Dichloroethane	5	MCL	(same)	4
1,1,1-Trichloroethane	200	MCL	(same)	10,000
1,2-Dichloropropane	5	MCL	(same)	10
Vinyl Chloride	2	MCL	(same)	0.2
1,1-Dichloroethylene	7	MCL	(same)	40
1,2-Dichloroethylene	70	MCL	(same)	20
Trichloroethylene	5	MCL	(same)	4
Tetrachloroethylene	5	MCL	(same)	0.6
Acetone	390	ME DW	- None -	6,000
2-Butanone	170	MEG	- None -	4,000
2-Hexanone	1,400	ME DW	- None -	- None -
4-Methyl-2-Pentanone	190	ME DW	- None -	500
Phenol	160	ECO	- None -	2,000
2,4-Dinitrophenol	31	MEG	- None -	10
Tetrahydrofuran	3,300	ME DW	- None -	70
Dimethylformamide	390	EPA & ME DW	- None -	700
2-Methoxyethanol	46	ME DW	- None -	- None -
Diethylphthalate	2,900	ECO	- None -	6,000
Di-2-Ethylhexyl Adipate	40	ECO	400	300
Nickel	88	ECO	- None -	20
Zinc	59	ECO	- None - *	2,000
Arsenic	30	**	10	10

* Zinc has a secondary MCL of 5 ppb; secondary MCLs are not risk-based.

** Formerly a Maine MEG.

ATTACHMENT 12
ME DEP COMMENT LETTER, DATED SEPTEMBER 18, 2012



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PAUL R. LEPAGE
GOVERNOR

PATRICIA W. AHO
COMMISSIONER

September 18, 2012

Ms. Anni Loughlin
U.S. EPA, Reg. 1
5 Post Office Square, Suite 100
Mailcode: OSRR07-1
Boston, MA 02109-3912

Re: **Review of Draft "Five-Year Review Report" for the Winthrop Landfill Superfund Site, Winthrop, Maine" received September 17, 2012**

Anni

Dear Ms. Loughlin:

The Maine Department of Environmental Protection (MEDEP) has reviewed the revised draft Five-Year Review Report for the Winthrop Landfill Superfund Site, Winthrop, Maine which was prepared by the U.S. Environmental Protection Agency (EPA) and submitted to us on September 17, 2012.

The MEDEP agrees with the two (2) issues identified in Table 2 of Section 8.0 of the report (i.e., "privately-owner properties at landfill require deed notice" and "exceedence of PCL for arsenic in sediment at Hoyt Brook requires remediation") and concurs with the recommendations and follow-up actions listed in Table 3 of Section 9.0 to address the two (2) issues.

As with prior Five-Year Review reports, the MEDEP appreciates the opportunity to be part of the Five-Year Review Report review team and we look forward to continuing our collaborative working relationship at this site.

If you have any questions or concerns regarding this letter, please contact me by e-mail at Rebecca.l.hewett@maine.gov or by telephone at (207) 287-8554.

Sincerely,

Rebecca L. Hewett

Rebecca L. Hewett, Project Coordinator
Division of Remediation
Bureau Remediation & Waste Management

cc: James Chow, EPA
David Wright, MEDEP

9-17-2012 draft 5-Yr Review ltr

AUGUSTA
17 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0017
(207) 287-7688 FAX: (207) 287-7826
RAY BLDG., HOSPITAL ST.

BANGOR
106 HOGAN ROAD, SUITE 6
BANGOR, MAINE 04401
(207) 941-4570 FAX: (207) 941-4584

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

PRESQUE ISLE
1235 CENTRAL DRIVE, SKYWAY PARK
PRESQUE ISLE, MAINE 04679-2094
(207) 764-0477 FAX: (207) 760-3143