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Five-Year Review Report

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

September 2002

PREPARED BY:

United States Environmental Protection Agency
Region 1
Boston, Massachusetts

Approved by: Date:


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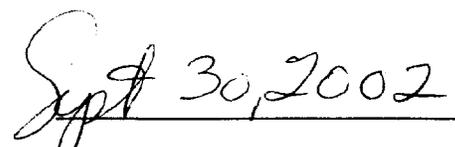

Sept 30, 2002

TABLE OF CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS	ii
1.0 INTRODUCTION	1-1
2.0 SITE CHRONOLOGY	2-1
3.0 BACKGROUND	3-1
4.0 REMEDIAL ACTIONS	4-1
5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW	5-1
6.0 FIVE-YEAR REVIEW PROCESS	6-1
7.0 TECHNICAL ASSESSMENT	7-1
8.0 ISSUES	8-1
9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS	9-1
10.0 PROTECTIVENESS STATEMENTS	10-1
11.0 NEXT REVIEW	11-1

TABLES

Table 1	Chronology of Site Events	2-1
Table 2	Issues	8-1
Table 3	Recommendations and Follow Up Actions	9-1

ATTACHMENTS

Attachment 1	Site map.
Attachment 2	Sampling locations.
Attachment 3	Remedial Action Plan (RAP) Table 1.
Attachment 4	RAP Table 2.
Attachment 5	Landfill Monitoring Systems.
Attachment 6	EPA and DEP approved Alternate Concentration Limits and Protective Concentration Limits.
Attachment 7	GWETS Capture Zone Performance Monitoring Network.
Attachment 8	List of Documents Reviewed.
Attachment 9	Municipal Water Users in Groundwater Protection Zone.
Attachment 10	Recent Groundwater, Surface Water, and Sediment Detections.
Attachment 11	Rebound Evaluation Reactivation Criteria.

LIST OF ACRONYMS AND ABBREVIATIONS

ACRONYM DEFINITION

ACL	Alternate Concentration Limit
AOC	Administrative Order by Consent
ARARs	Applicable or Relevant and Appropriate Requirements
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability
CFR	Code of Federal Regulations
DMF	Dimethylformamide
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
MCL	Method Detection Limit
ME DEP	Maine Department of Environmental Protection
MEG	1992 Maine Maximum Exposure Guidelines for Drinking Water
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation & Maintenance
PCOR	Preliminary Close Out Report
ppb	parts per billion
ppm	parts per million
PRP	Potentially Responsible Party
PQL	Practical Quantitation Limit
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
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
TAG	Technical Assistance Grant
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 remedy selected to address contamination at the Winthrop Landfill Superfund Site, located in the Town of Winthrop, Kennebec County, Maine, as outlined in the November 22, 1985 Superfund Enforcement Decision Document, includes:

- ! the 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 the 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.

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 remedy at the Winthrop Landfill Superfund Site currently protects human health and the environment in the short-term because institutional controls to prevent exposure to contaminants in groundwater and exposure pathways that could result in unacceptable risks are being controlled and monitored, however, a notification has not been filed to the deed as required by the Consent Decree. The GWETS is currently operational, monitoring of groundwater, surface water, and sediments is ongoing, the landfill cap is being monitored, and known groundwater discharge points are regularly monitored and inspected.

Follow-up actions are necessary to address long-term protectiveness. The agencies will notify the Town of the need to comply with the Consent Decree requirement for a notice to the deed; the agencies will also revisit the requirement for on site institutional controls and, if necessary, adding restrictions on disturbing the cap. Remedial action objectives may not be met due to the inability of the selected remedy to meet a more stringent arsenic MCL at the landfill and in downgradient flow paths. Additionally, points of exposure could be impacted in the future by groundwater

discharge from flow paths currently exceeding Alternate Concentration Limits. Known discharge points should be remediated in the future as necessary. A GWETS rebound evaluation is currently planned to determine the potential for optimization and/or the need for alternate remedial technologies. Remedial action objectives may need to be re-evaluated at the conclusion of the rebound study.

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: <input checked="" type="checkbox"/> Final <input type="checkbox"/> Deleted <input type="checkbox"/> Other (specify)			
Remediation Status (choose all that apply): <input type="checkbox"/> Under Construction <input checked="" type="checkbox"/> Operating <input type="checkbox"/> Complete			
Multiple OUs? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Construction completion date: 12/ 23 /1997	
Has site been put into reuse? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
REVIEW STATUS			
Lead Agency: <input checked="" type="checkbox"/> EPA <input type="checkbox"/> State <input type="checkbox"/> Tribe <input type="checkbox"/> Other Federal Agency _____			
Author name: Anni Loughlin			
Author title: Remedial Project Manager		Author affiliation: U.S. Environmental Protection Agency	
Review Period: _7_ / _29_ / _2002_ to _9_ / _25_ / _2002_			
Date(s) of inspection: _8_ / _21_ / _2002_ , _6_ / _13_ / _2000_			
Type of Review: <input type="checkbox"/> Post-SARA <input checked="" type="checkbox"/> Pre-SARA <input type="checkbox"/> NPL-Removal Only <input type="checkbox"/> Non-NPL Remedial Action Site <input type="checkbox"/> NPL State/Tribe-lead <input type="checkbox"/> Regional Discretion			
Review number: <input type="checkbox"/> 1 (first) <input type="checkbox"/> 2 (second) <input checked="" type="checkbox"/> 3 (third) <input type="checkbox"/> Other (specify) _____			
Triggering Action: Actual RA Onsite Construction at OU # _____ Actual RA Start at OU# _____ Construction Completion <input checked="" type="checkbox"/> Previous Five-Year Review Report Other (specify) Signing of ROD			
Triggering action date (from WasteLAN): _9_ / _30_ / _1997_			
Due date (five years after triggering action date): _9_ / _30_ / _2002_			

* ["OU" refers to operable unit.]

** [Review period should correspond to the actual start date and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues: There are multiple settlement areas on the landfill cap.

Notice in the deed to the property was never filed. Further protections for the cap may be required.

The Groundwater Extraction and Treatment System (GWETS) is ineffective at cleaning up arsenic, which is the only remaining contaminant in influent above an Alternate Concentration Limit within the GWETS capture zone.

The GWETS is ineffective at addressing ongoing volatile organic compound (VOC) exceedances and arsenic mobilization in downgradient flow paths outside of the GWETS capture zone.

Arsenic continues to discharge to sediment.

Recommendations and Follow-up Actions: The potentially responsible parties (PRPs) recently completed landfill cap settlement repairs to re-establish proper grading and a vegetative cover. Cap maintenance ongoing.

Notify Town of the need to comply with CD requirements regarding notice to the deed of the property. Agencies to revisit on site requirements, possibly add restrictions to provide additional protections for the cap portion of the remedy.

The PRPs, EPA, and the Maine Department of Environmental Protection (ME DEP) have agreed that a groundwater rebound evaluation study is required to determine the potential for optimization of the GWETS and/or the need for alternate remedial technologies. Upon conclusion of the rebound evaluation, the PRPs will re-start the GWETS and/or re-evaluate remedial action objectives.

The PRPs will continue site-wide monitoring, including monitoring of downgradient flow paths and discharge areas, and surface water monitoring for recreational exposure scenario and inspection of known seep areas for potential future exposure. Seep areas will be remediated as necessary.

Protectiveness Statement: The remedy at the Winthrop Landfill Superfund Site currently protects human health and the environment in the short-term because institutional controls to prevent exposure to contaminants in groundwater and exposure pathways that could result in unacceptable risks are being controlled and monitored, however, a notification has not been filed to the deed as required by the Consent Decree. A Groundwater Extraction and Treatment System is currently operational, monitoring of groundwater, surface water, and sediments is ongoing, the landfill cap is being monitored, and known groundwater discharge points are regularly monitored and inspected.

Follow-up actions are necessary to address long-term protectiveness. The agencies will notify the Town of the need to comply with the Consent Decree requirement for a notice to the deed; the agencies will also revisit the requirement for on site institutional controls and, if necessary, adding restrictions on disturbing the cap. Remedial action objectives may not be met due to the inability of the selected remedy to meet a more stringent arsenic MCL at the landfill and in downgradient flow paths. Additionally, points of exposure could be impacted in the future by groundwater discharge from flow paths currently exceeding Alternate Concentration Limits. Known discharge points should be remediated in the future as necessary. A GWETS rebound evaluation is currently planned to determine the potential for optimization and/or the need for alternate remedial technologies. Remedial action objectives may need to be re-evaluated at the conclusion of the rebound study.

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) §121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §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 has 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 July 2002 through September 2002. This report documents the results of the review.

This is the third five-year review for the Winthrop Landfill site. The triggering action for this review is the date of the second five-year review, as shown in EPA's WasteLAN database: September 30, 1997. This review is required by policy as the Superfund Enforcement Decision Document (or, Record of Decision) 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. 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 & 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
VOCs 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
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
Public water distribution system installed to all private residences	1984 to 1987
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 prohibiting groundwater withdrawal and use, and certain excavation within the site, to include additional areas	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 & 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 excavated 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 construct fourth extraction well at an identified hot spot on the landfill	October, 1997
PRPs excavated 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 & discontinued	2000
Meeting among agencies & 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

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 to the south, and secondarily to Hoyt Brook to the north.

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). The Annabessacook Lake is used for recreational purposes, such as swimming and boating. Hoyt Brook is generally not used for any purposes 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 1920's 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-1970's. Until the mid-1970's, wastes were also burned periodically. From the mid-1970's 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 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 Savage as owners and operators of the landfill. Through a succession of purchases, Inmont's obligations are currently being fulfilled by United Technologies Corporation, Inc. (UTC). The Town of Winthrop and the Savages granted access to their portions of the site. The site is currently PRP-lead.

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:

- ! the 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 the 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.

Remedy Implementation.

The March 23, 1986 Consent Decree designates Inmont Corporation as the lead PRP. Inmont 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.

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.

A monitoring program was implemented in March, 1986, which specifies a quarterly monitoring program for 37 samples at specified groundwater, surface water, and sediment locations (see Attachment 2) with analysis for 32 landfill constituents as listed in Remedial Action Plan (RAP) Table 1 (see Attachment 3). The RAP also requires 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.

Cap construction activities, including implementation of all engineering studies, was conducted by the PRP's contractor, E.C. Jordan. E.C. Jordan also performed all landfill cap post-closure work, as well as quarterly monitoring, through 1991. ABB Environmental Services, Inc. took over all post-closure monitoring work, including monitoring of groundwater, surface water, and sediment in 1991. While ABB still continues to perform this work, the company was subsequently acquired by Harding Lawson Associates, then Harding ESE/MACTEC (Harding ESE). Woodard & Curran operates and maintains the GWETS. UTC also contracted with VAPEX, then Envirogen to design, construct, and maintain the VES.

All work performed at the site was consistent with the ROD, ESD, and all final design reports. Final designs contained construction quality assurance programs to verify that the work met the ROD and design requirements. EPA and ME DEP staff, 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; CH2M Hill provided oversight from 1984-1989, and Arthur D. Little provided oversight from 1989-1997.

Implementation of engineering studies (Seismic and Topographic Surveys, Sediment Sampling and Analysis, Hydrogeologic Investigation, Treatability Studies, and Wetland and Floodplain Mitigation) were all completed, and 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 was complete October 1, 1987, and fence installation was completed October 21, 1987. In April, 1989, 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.

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.

Post-closure monitoring of the cap has continued. Settlement of the landfill cap was again reported to EPA and ME DEP in July, 1994, and the PRPs made repairs as necessary. The PRPs continued to make repairs to ongoing divots and depressions that occurred because of operation of the VES. Landfill monitoring systems are outlined on Attachment 5.

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 that 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. PCLs were also set at MCLs for most contaminants, with the same aforementioned caveats.

Arsenic was recognized in the 1993 Decision Document as being an 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. 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.

In the past, contamination from the site did accumulate to sufficient quantities in Annabessacook Lake to cause an exceedance of PCLs for arsenic in sediment. In October 1996, the PRPs excavated a large area of exposed contaminated sediment. A geotextile fabric and riprap material were placed over the discharge area to prevent any possible future exposure of residents to

sediments at groundwater seeps in the lake. ME DEP observed these activities. A similar exceedance was present in a smaller affected portion of nearby Hoyt Brook. The PRPs remediated this area in December 1997.

Some fine-grained sediment in Annabessacook Lake was covered by water and therefore inaccessible for excavation in 1996. Contamination remains around the perimeter of the remediated area, however, these areas are approximately 200 feet from the shoreline, underwater and generally not accessible or exposed during recreational periods in the summer. However, the potential for exposure increases if there is an abnormally low water level, such as during the summer of 2002. Portions of the riprap material are exposed in the winter, beginning in mid-October, when lake levels are lowered for flood control and dam maintenance. During these periods, the PRPs inspect exposed portions of the lake bottom for potential additional seep areas.

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, 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 is required to continue until cleanup standards are achieved in groundwater outside the landfill boundary. The GWETS was designed to hydraulically isolate groundwater underneath the landfill and to remediate groundwater constituents. Groundwater is extracted from the central portion of the landfill and treated to remove VOCs, N,N-dimethylformamide, iron, and arsenic. The clean water is re-injected at the landfill northern and southern boundaries to create artificial groundwater mounds that enhance the size of the capture zone of the extraction system.

The GWETS system consists of one extraction well (EW-2) located in the center of the landfill pumping at a maximum of 65 gallons per minute (gpm), one inactive extraction well located near the northern end of the landfill, 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 (see Attachment 7).

In December 1995, a recharge trench was installed to supplement the system, and another re-injection well was reconstructed in June 1996. Ongoing maintenance and upgrading of the system has occurred as necessary, and on January 27, 1997, the PRPs closed their subcontract for construction and start-up of the GWETS. In October 1997, the PRPs installed two extraction wells at an identified hot spot on the landfill in an attempt to maximize efficiency and expedite shutdown of the GWETS, however, detected concentrations were much lower than the initial investigations, and the PRPs determined that operating these wells as permanent extraction wells would not result in significant mass removal of contamination.

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, 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 of 1994.

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. 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.

System Operation and Maintenance.

The Operational and Functional determination for the site triggered the start of site-wide Operations and Maintenance (O&M). The PRPs will continue to monitor groundwater, surface water, and sediment until 2015. 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 constituents sampled based on historical detections. The monitoring program continues to be evaluated on an ongoing basis, and modified as appropriate based on identification of additional constituents or changes in site conditions.

Regarding the areas of Annabessacook Lake and Hoyt Brook where arsenic contamination in sediment was excavated, the PRPs continue to monitor both areas as part of its ongoing program. Also, in May of each year, the PRPs conduct surface water sampling in the area of the sediment seep and provide the data to EPA for a determination on potential risks to residents via recreational use. To date, EPA's human health risk staff have 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. Surface water and/or sediment are also sampled at Points of Exposure where groundwater is known to discharge to surface water bodies, which include the

Annabessacook Lake, Hoyt Brook, the sphagnum bog, and the cattail marsh. At all groundwater discharge points, detections of landfill constituents have not warranted action.

The PRPs continue to perform O&M work on the cap as necessary. Visual site 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. An off-site landfill gas monitoring program is conducted to identify any subsurface gas migration, and the PRPs regularly contact 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. Routine maintenance activities include: cover maintenance, erosion control, settlement and subsidence control, groundwater monitoring system maintenance, gas monitoring system maintenance, fence maintenance, and roadway maintenance. The most recent cap settlement repairs are currently ongoing; the PRPs plan to complete cap maintenance and re-establish proper grading and a vegetative cover by September 30, 2002.

The VES was re-configured 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 entirely after a determination that it had reached the limit of effective remediation for organic vapors. Since shutdown of the VES, concentrations of VOCs have not rebounded.

The PRPs have continued GWETS operation. Evaluation of the system's performance has the following objectives:

- demonstrate that the system is maintaining all groundwater flow towards EW-2,
- evaluate the progress of remediation beneath and downgradient of the landfill with the ultimate goal of determining when to deactivate the GWETS,
- monitor for adverse impacts by the system on critical wetland areas adjacent to the landfill, and
- monitor for landfill settlement which may potentially be caused by the extraction system.

Laboratory results indicate that the system is achieving performance standards and the effluent is meeting the established cleanup levels.

In 2001, the extraction well pumped at an average rate of approximately 50 gallons per minute. Since 1995, nearly 450 pounds of arsenic have been removed from groundwater by the GWETS, and the amount of dimethylformamide and 1,1-dichloroethane removed over the same time period is estimated to be 46 pounds and slightly more than 6 pounds respectively.

The only constituent currently detected above the ACL in extracted groundwater is arsenic. 1,1-dichloroethane was the last organic compound to be detected above the ACL in extracted groundwater in March 1999. In August 2000, EPA and ME DEP approved the shutdown of a UV/Oxidation unit in favor of an alternate chemical oxidation process.

There is a currently evolving issue with respect to GWETS capture. The GWETS was not designed to recover and treat groundwater downgradient of the site in the northern and southern flow paths. Prior to the start of GWETS operation, it was believed that remediation of groundwater beneath the landfill and reinjection of treated groundwater would eventually lead to compliance of ACLs for groundwater in the flow paths. Within these two groundwater plumes downgradient of the landfill and beyond the extraction system's capture zone, VOCs that continue to be detected above ACLs in groundwater are 1,1-dichloroethane and dimethylformamide. Additionally, benzene, arsenic, and vinyl chloride are above ACLs in the perched groundwater at the northern margin of the landfill.

Arsenic also continues to exceed ACLs in several monitoring wells in the flow paths, as well as beneath the landfill itself. The GWETS was not designed to address mobilization of arsenic, and while continued GWETS operation removes approximately 60 pounds of arsenic each year, significant remediation of arsenic concentrations in groundwater under the landfill and in downgradient flow paths has not been demonstrated.

For the last six years, the PRPs have been conducting voluntary assessments of other technologies that may be available to address the arsenic issues, including a field and bench scale test for "AsRT" Arsenic Remediation Technology, and a pilot scale study and bench scale test of Oxygen Release Compound application as a permeable reactive barrier. These assessments were unsuccessful, showing that site conditions were not conducive to the application, or that the approach would be more costly and intrusive than continued GWETS operation. The PRPs also evaluated the possibility of changing the groundwater extraction configuration to optimize the system, however, results showed that mass recovery of VOCs would not be measurably improved, and the arsenic issue would not be addressed.

On November 29, 2001, a meeting was held among the PRPs, EPA and ME DEP to discuss the remedial approach at the site, the possibility of a GWETS rebound study, and the administrative options of the future activities for the site. During the meeting, all parties agreed that from a technical view point, a rebound study (i.e., shutting off the GWETS and monitoring the groundwater for a few years) to observe site conditions under non-pumping conditions and evaluate how effective the operation of the GWETS has been on the contaminated groundwater plume is needed.

In an EPA and ME DEP joint letter to the PRPs dated January 28, 2002, the agencies agreed that the rebound study, necessary to determine the effectiveness of the GWETS, is an essential component of the work plan and therefore did not require modification of the Consent Decree. The agencies also clarified that, at the onset of the rebound study, a two (2) year time frame for

conducting the rebound study shall be specified and any additional time requirement shall be considered at a future date. In June 2002, the agencies and the PRPs agreed on proposed reactivation criteria within the scope of a conceptual groundwater rebound evaluation plan.

On August 21, 2002, the PRPs, in conjunction with EPA and ME DEP, conducted an open house meeting at the site in Winthrop, Maine to present the rebound evaluation concept and determine if the public would support this activity. Many of the local residents who own houses along the Annabessacook Lake shoreline attended to ask questions and speak with representatives from EPA, ME DEP, UTC and Harding ESE. The public expressed general support for the project, and a number of the local residents specifically expressed satisfaction with the conduct and responsiveness of UTC and their contractors.

The formal public comment period for the proposed groundwater rebound evaluation ended on September 6, 2002; no further comments were received. At the time of this report, the PRPs plan to submit a formal GWETS rebound evaluation work plan.

Regarding O&M costs, the Remedial Design/Remedial Action (RD/RA) was performed entirely by the PRPs, therefore EPA does not have detailed information on costs expended on these activities to date. Further, the March 23, 1986 Consent Decree does not require a summary of the costs expended by the PRPs each year.

The estimated cost of capital in the November 1985 ROD was \$6,000,000. The cost per year for operation and maintenance should the ACL be exceeded was estimated at \$360,000 to \$1,480,000 per year for a variety of potential remedial alternatives. The PRPs reported in 2001 that estimated costs related to the GWETS were \$1.8 million for construction and \$200,000 for design, and approximately \$350,000 for annual O&M initially, reduced to \$250,000 per year more recently for chemicals, maintenance, manpower, and engineering support.

UTC's payments for oversight to date total \$2,701,438. Oversight charges have been greatly reduced in recent years, with the most recent bill for 2002 totaling \$15,955. The cost reduction is due to construction completion of most remedial activities, as well as efforts made between EPA and United Technologies Corporation in 1995 to establish a cooperative oversight process. The PRPs' general willingness to work with the agencies and the community is also a tremendous asset to reduction of costs, and resulted in a decision by EPA and ME DEP in 1996 to not retain an oversight contractor. Instead, EPA and ME DEP are providing all necessary oversight by using in-house technical expertise.

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

In the second five-year review, dated September 30, 1997, EPA certified that the remedy selected for this site remains protective of human health and the environment.

The last five-year review stated that the PRPs were working with EPA and ME DEP on a plan to fill all depressions and divots in the landfill cap caused by the VES system. Remediation was expected to involve less than one truckload of topsoil. Repair to the landfill cap did occur, and the PRPs continue to perform O&M on the cap as needed. The PRPs completed the most recent cap maintenance and settlement repairs to re-establish proper grading and a vegetative cover on September 26, 2002.

At the time of the last review, the PRPs were also working with EPA and ME DEP to plan the installation of a fourth extraction well in October 1997 at an identified hot spot on the landfill. Installation of this extraction well was above and beyond the design requirements; the PRPs were conducting this work on a voluntary basis only in an attempt to expedite clean-up. The PRPs installed two extraction wells at this location, however, later determined that operating these as permanent extraction wells would not result in significant mass removal of contamination.

Finally, the last review stated that the PRPs were expected to remediate the arsenic sediment exceedance in Hoyt Brook by Spring 1998. The PRPs completed this work in December 1997, and continue to monitor this area, as well as the former arsenic sediment exceedance area in Annabessacook Lake.

No further recommendations were identified by the second five-year review. Since the review, the VES was re-configured in early 1998, and then decommissioned entirely in 2000. The PRPs continue to monitor groundwater, surface water, and sediment, including the areas of Annabessacook Lake and Hoyt Brook where arsenic contamination in sediment was excavated. 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 constituents sampled based on historical detections.

The site achieved construction completion when the Preliminary Close Out Report (PCOR) was signed in September 1997 and amended 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 O&M. The PRPs will continue to monitor groundwater, surface water, and sediment until 2015.

As previously outlined, EPA and ME DEP are currently working with the PRPs on a conceptual plan to evaluate groundwater rebound, in which the GWETS system will be shut off for up to two years. The public has expressed general support for this project.

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 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.

Because this is the site's third five-year review, the site is well beyond construction completion, and due to the age of the site, community involvement activities were conducted on a limited basis only. The area around the site is largely rural, and owners of homes along the shore of Annabessacook Lake generate most of the interest. During RD/RA, a citizen group, the Winthrop Landfill Citizens Action Group (WLCAG) actively participated in public meetings and review of documents, and part of the group's participation was initially funded via an EPA Technical Assistance Grant (TAG). WLCAG's involvement, and overall citizen interest, decreased markedly after the GWETS was implemented, and most site activities since 1995 have proceeded without significant issue or concern.

EPA and ME DEP have received a very limited number of calls pertaining to the site in recent years. Most calls are from citizens interested in buying property near the site or Annabessacook Lake, or from citizens who are renting property and want to discuss potential risks via recreational activities in the Lake. In 2001, the agencies received calls that the Town of Winthrop had rescinded tax abatement provisions for properties near the landfill based on area sales data that shows property values are unaffected. Some local citizens have also requested that the agencies remove the fence and/or signs around the landfill designating it as a hazardous waste disposal area; the agencies have not granted these requests, citing the Consent Decree requirement to restrict access and alert potential trespassers.

The public information repository has been relocated to the GWETS treatment building itself, where citizens can also visit with the plant operator during regular business hours, and by appointment at other times.

On August 21, 2002, the PRPs, in conjunction with EPA and ME DEP, conducted an open house meeting at the site in Winthrop, Maine to present the rebound evaluation concept and determine if the public would support this activity. Many of the local residents who own houses along the Annabessacook Lake shoreline attended to ask questions and speak with representatives from

UTC and Harding ESE. As previously outlined, the public expressed general support for the project, and a number of the local residents specifically expressed satisfaction with the conduct and responsiveness of UTC and their contractors on a wide variety of issues.

The completed third five-year review report for this site will be sent to the information repository, and a notice of its availability will be mailed to the community.

Data Reviewed.

As part of the GWETS rebound evaluation preparation, the PRPs undertook a records review in January 2002 to confirm that all area residences were connected to the Winthrop Water District distribution system. PRPs also conducted discussions with several area residents which supported the record review; all residences within the Town of Winthrop's Groundwater and Air Protection Zone are connected to the municipal water source (see Attachment 9).

The PRPs have been monitoring groundwater, surface water, and sediment since 1986 as part of a long-term post-closure monitoring plan. Landfill constituents are currently analyzed on a semi-annual basis, and a much larger group of constituents are analyzed annually to identify whether additional constituents should be added to the regular sampling program. For most landfill constituents (with the exception of arsenic), long-term trend analysis have indicated decreasing trends in concentrations.

Since the last five-year review, there has only been one detection of a new constituent. Results from May 2002 sampling indicated that 1,1,2,2-tetrachloroethane was detected in extraction well 2 (EW-2) at 3 ppb. Because this level was above the State of Maine's Maximum Exposure Guideline (MEG) of 1.8 ppb, EW-2 was resampled on August 25, 2002. Resampling at a quantitation limit of 1 ppb (below the MEG of 1.8 ppb) indicated that 1,1,2,2-tetrachloroethane was not detected, and given that this constituent was not previously been detected, the PRPs determined that this is not a new constituent in groundwater under the landfill.

The GWETS has been operating since 1995, and continues to remove contaminants, however, the only landfill constituent that is currently detected above the ACL in extracted groundwater is arsenic. Nearly 450 pounds of arsenic have been removed from groundwater by the GWETS, and the amount of dimethylformamide and 1,1-dichloroethane removed over the same time period is estimated to be 46 pounds and slightly more than 6 pounds respectively. The GWETS was not designed to recover and treat groundwater downgradient of the site in northern and southern flow paths.

As outlined in Attachment 10, the only constituent currently detected above the ACL in extracted groundwater is arsenic. Within the two groundwater plumes downgradient of the landfill and

beyond the extraction system's capture zone, VOCs that continue to be detected above ACLs in groundwater are:

- 1,1-dichloroethane, found in monitoring wells MW-8A and MW-8B in the southern groundwater flow path, and at monitoring wells MW-210A and MW-210B in the northern flow path, and
- dimethylformamide (DMF), found in MW-9B, adjacent to the site beneath the Sphagnum Bog area.

Additionally, benzene, arsenic, and vinyl chloride are above ACLs in the perched groundwater at the MW-10C well at the northern margin of the landfill.

Arsenic also continues to exceed ACLs in several monitoring wells in the flow paths, as well as beneath the landfill itself. The GWETS was not designed to address mobilization of arsenic, and while continued GWETS operation removes approximately 60 pounds of arsenic each year, significant remediation of arsenic concentrations in groundwater under the landfill and in downgradient flow paths has not been demonstrated.

As previously outlined, EPA, ME DEP and the PRPs met on November 29, 2001 to discuss the remedial approach at the site, the possibility of a GWETS rebound study, and the administrative options of the future activities for the site. During the meeting, all parties agreed that from a technical view point, a rebound study (i.e., shutting off the GWETS and monitoring the groundwater for a few years) is needed to observe site conditions under non-pumping conditions and evaluate how effective the operation of the GWETS has been on the contaminated groundwater plume. In an EPA and ME DEP joint letter to the PRPs dated January 28, 2002, the agencies agreed that the rebound study, necessary to determine the effectiveness of the GWETS, is an essential component of the work plan and therefore did not require modification of the Consent Decree. The agencies also clarified that, at the onset of the rebound study, a two (2) year time frame for conducting the rebound study shall be specified and any additional time requirement shall be considered at a future date. In June 2002, the agencies and the PRPs agreed on proposed reactivation criteria within the scope of a conceptual groundwater rebound evaluation plan (see Attachment 11).

On August 21, 2002, the PRPs, in conjunction with EPA and ME DEP, conducted an open house meeting at the site in Winthrop, Maine to present the rebound evaluation concept. The public expressed general support for the project, and no further comments were received during the formal public comment period. The PRPs plan to submit a formal GWETS rebound evaluation work plan in the near future.

The PRPs continue to monitor the areas of Annabessacook Lake and Hoyt Brook where arsenic contamination in sediment was excavated. The PRPs also continue to conduct surface water sampling in the area of the sediment seep in May of each year, and provide the data to EPA for a determination on potential risks to residents via recreational use. As previously outlined, EPA's

human health risk staff have 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. Surface water and/or sediment are also sampled at Points of Exposure where groundwater is known to discharge to surface water bodies, which include the Annabessacook Lake, Hoyt Brook, the sphagnum bog, and the cattail marsh. At all groundwater discharge points, detections of landfill constituents have not warranted action.

Site Inspection.

The most recent major site inspections occurred in 1996 and 1998. On October 24, 1996, EPA and ME DEP conducted final inspections of the site and determined that the PRP contractors had constructed the remedy in accordance with remedial design (RD) plans and specifications approved by the agencies. EPA and ME DEP confirmed in a site visit on August 3, 1998 that minor items associated with ongoing maintenance have since been completed.

During an on-site meeting on June 13, 2000, the PRPs identified rodent holes in the cap around extraction wells EW-1 and EW-2 to the agencies. These holes were subsequently repaired. The agencies also viewed the entire GWETS system, and all parties discussed the effectiveness of the UV/Oxidation unit. (In August 2000, the agencies approved its shutdown in favor of an alternate chemical oxidation process.)

On August 21, 2002, EPA and ME DEP attended a public meeting at the site regarding the proposed conceptual groundwater rebound evaluation plan. GWETS plant operations were discussed, as well as the condition of fencing and the integrity of the cap. The PRPs subsequently sent a letter to the agencies, dated September 9, 2002, which outlined a number of cap settlement observations by Harding ESE. The PRPs completed settlement repairs to re-establish proper grading and a vegetative cover on September 26, 2002.

One item of note is the PRPs' ongoing estimated O&M costs related to the GWETS system, which reportedly now total approximately \$250,000 per year for chemicals, maintenance, manpower, and engineering support.

7.0 TECHNICAL ASSESSMENT

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

The remedy, as outlined in the ROD and modified by the ESD, is operating as designed. The 1985 ROD outlined the following specific objectives for the remedial response:

- Ž protect public health by providing uncontaminated water supplies for residents,
- Ž protect public health by minimizing the potential for human contact with contaminants,
- Ž protect the environment by minimizing the potential for discharge to surface water bodies, and
- Ž 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. The landfill cap and fencing are performing as intended and continue to be maintained and repaired as necessary. The PRPs continue to conduct an off-site landfill gas monitoring program to identify any subsurface gas migration. Settlement areas are identified and repaired on an ongoing basis. No problems with the cap have been identified that fall outside of the range of normal maintenance, and no activities or actions that would violate the Town Ordinance requirements have been identified. These activities have succeeded in preventing direct contact with contaminants in soil and preventing exposure to, or ingestion of, contaminated groundwater.

The landfill cap has minimized the ongoing discharge of contaminated groundwater to surface water. The PRPs continue to conduct monitoring of groundwater, surface water, and sediment, and are taking all necessary measures to monitor groundwater discharge areas, including the areas where arsenic contamination in sediment was excavated. A geotextile fabric and riprap material in Annabessacook Lake now mitigate the possible exposure of residents to groundwater seeps while wading or swimming. Remaining contaminated sediment around the perimeter of the remediated area is approximately 200 feet from the shoreline, underwater and generally not accessible or exposed during recreational periods in the summer. However, the potential for exposure increases if there is an abnormally low water level, such as during the summer of 2002. When portions of the riprap material are exposed in the winter, during lowered lake levels, the PRPs inspect exposed portions of the lake bottom for potential additional seep areas.

Surface water continues to be sampled in the area of the seep, in order to provide a risk determination for potential recreational exposure. In addition to monitoring for landfill constituents, a larger group of constituents are analyzed on an annual basis to determine whether new constituents should be added to the regular sampling program. These monitoring efforts are adequate to determine the protectiveness of the remedy.

ACLs were established for each contaminant in groundwater at MCLs, MEGs, or a more

stringent ecologically derived guideline. The GWETS has been operating since 1995, and continues to remove contaminants, however, the only landfill constituent that is currently detected above the ACL in extracted groundwater is arsenic. (The operation of the VES, as outlined in the 1993 ESD, performed as intended until it was decommissioned in 2000.)

Within the two groundwater plumes downgradient of the landfill and beyond the extraction system's capture zone, certain VOCs continue to be detected above ACLs in groundwater. Arsenic also continues to exceed ACLs in several monitoring wells in the flow paths, as well as beneath the landfill itself. The GWETS was not designed to address mobilization of arsenic, and it is not expected that continued operation of the GWETS will provide significant remediation of arsenic concentrations in groundwater under the landfill and in downgradient flow paths. Discharge areas continue to be monitored, and levels have not yet warranted action.

Regarding opportunities for system optimization, the PRPs have formulated a conceptual groundwater rebound evaluation plan, necessary to comprehensively determine if improvements to the efficiency of the GWETS can be made. The agencies have agreed on proposed reactivation criteria for a rebound evaluation that is to last up to two years.

The PRPs will submit a formal work plan in the near future, and also continue to research the possible application of new technologies to this site. The PRPs' ongoing estimated O&M costs related to the GWETS system only reportedly total approximately \$250,000 per year.

The presence of contaminants in downgradient flow paths, and especially the presence of arsenic and the current lack of any cost-effective available technology to remedy the situation, will be problematic in the future pending further developments or technological advances in the field. It is possible that the remedial action objectives outlined in the ROD and Consent Decree will require re-evaluation and potential modification to incorporate different technologies or approaches. Nevertheless, the PRPs' monitoring program and a variety of institutional controls minimize or prevent exposure to the maximum extent practicable.

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

Changes in Standards. The 1985 ROD, page 38, identifies the following laws, regulations and guidance as applicable to the proposed remedial alternative. Changes in standards since the 1985 ROD do not appear to affect the protectiveness of the remedy, with the possible exception of a new arsenic Maximum Contaminant Level.

Ž 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.

Ž Executive Order 11990 (Wetlands) and 11988 (Floodplains) and guidance outlined under 40 CFR Part 6, Appendix A. Construction of the landfill cap impacted one area. In accordance with wetlands and floodplains 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. Slope reconstruction was completed in November, 1989, in accordance with construction plans and specifications approved by EPA and ME DEP, and the PRPs. No new wetland issues have been identified, and PRPs continue to monitor wetland areas.

Ž Clean Water Act. The Groundwater Extraction and Treatment System (GWETS) continues to meet all effluent limits as required.

Ž Clean Air Act. Past construction activities were conducted to minimize future emissions from the site. The Vapor Extraction System (VES) was decommissioned entirely in 2000. There are no activities currently being conducted that trigger requirements under the Clean Air Act.

Ž Safe Drinking Water Act; EPA Groundwater Protection Strategy. New 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). These MEGs were revised in 2000, but these revisions have not been promulgated.

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, site specific limits that are protective of human health and the environment. If ACLs are exceeded, the ROD provides for installation and operation of the GWETS.

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. Protective Concentration Limits (PCLs) at the points of exposure were also set at MCLs for most contaminants, with the same aforementioned caveats.

Arsenic was recognized in the 1993 Decision Document as being an ubiquitous, naturally-occurring compound, for which background concentrations often exceed health based guidelines. The PCL for arsenic in sediment was set at 31,000 ppb. 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 June 1994, ME DEP approved a PCL of 5 ppb for arsenic in surface water; EPA concurred with this decision in June 1995.

The 1993 Decision Document also set the ACL for arsenic in groundwater at 30 ppb. The MCL for arsenic at the time was 50 ppb. EPA has since adopted a new lower MCL standard for arsenic

in groundwater, changing the standard from 50 ppb to 10 ppb, effective February 22, 2002. (The 2002 State MEGs also propose a 10 ppb limit.)

As outlined previously, the only landfill constituent that is currently detected above the ACL in extracted groundwater is arsenic. Arsenic above background levels also continues to exceed ACLs in several monitoring wells in the flow paths, as well as beneath the landfill itself. The GWETS was not designed to address mobilization of arsenic, and it is not expected that continued operation of the GWETS will provide significant remediation of arsenic concentrations in groundwater under the landfill and in downgradient flow paths. Further, as evidenced by the PRPs' research, there is a current lack of any alternative viable cleanup technology for arsenic in groundwater. This raises issues about the ability to meet arsenic standards in the near future.

While arsenic does not meet the MCL, institutional controls are being controlled and monitored. All residents in the area have been provided with an alternate water supply, and a Town Ordinance prohibits all groundwater withdrawal and groundwater use, as well as certain excavation within the site and in surrounding areas. The landfill area is fenced, and control of the site is in the hands of UTC and their contractors. Discharge areas also continue to be monitored, and since the last five-year review, levels have not warranted action. Exposure to, or ingestion of, contaminated groundwater is prevented. Short-term protectiveness is therefore being achieved.

All other risk-based cleanup goals as presented in the ROD remain substantively unchanged.

Ž Pretreatment Standards for Discharge into Publicly Owned Treatment Work. Not applicable.

Ž 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 & federal standards are being used to monitor the effectiveness of the remedy. In addition, 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 review of the monitoring data to these standards, the landfill cap and operation of the VES and GWETS systems minimize contaminated groundwater discharge and impacts to surface water to the maximum extent practicable.

Ž Health Advisories. ARARs based on health advisories are addressed above.

Changes in Exposure Pathways. No new human health or ecological exposure pathways or receptors have been identified. There are no changes in land use or the anticipated land use on or near the site.

No new contaminants or contaminant sources have been identified, nor are there toxic remedy byproducts. Capping the landfill did enhance reducing (anoxic) conditions, resulting in arsenic and other inorganics to be solubilized from natural surrounding materials and transported in the

groundwater system. The potential increase in arsenic discharge, however, does not significantly impact the potential for exposure as the PRPs continue to monitor and address the discharge areas as necessary.

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.

The document review did not provide information regarding the previous cancer slope factors (CSFs) used in the RI/FS and the ROD to calculate risk, however, CSFs have generally decreased. Development of ACL and PCLs included human health and ecological risk assessments to address risks to site-specific receptors. Further, all of the risks identified in the ROD as outlined above have been addressed at this time, and the exposure scenarios associated with site contaminants and remedial action objectives remain the same as those identified at the time of the ROD.

Expected Progress Towards Meeting RAOs. The remedy is progressing as expected, with the exception of the issues regarding the GWETS capture zone and arsenic as previously outlined.

The site's Post-Closure Monitoring Plan states that, "...the GWETS can be shut down if the 95-percent upper confidence limit (UCL) is less than all ACLs (i.e., in compliance with the ACLs). When the UCL exceeds the ACL, the GWETS must be reactivated." This language appears to require GWETS operation regardless of the technical ability of the GWETS to address the constituents in the long term, and it also fails to consider that the GWETS was designed with a finite, known capture zone, and that existing groundwater contamination extends beyond the capture zone and cannot be addressed. Prior to the start of GWETS operation, it was believed that remediation of groundwater beneath the landfill and reinjection of treated groundwater would eventually lead to compliance of ACLs for groundwater in the flow paths. The addition of

the new arsenic MCL of 10 ppb raises issues about the ability to meet arsenic standards in the near future, and calls into question the ability to shut down the GWETS pursuant to the above criteria.

While arsenic does not meet the MCL, institutional controls are being controlled and monitored. Exposure to, or ingestion of, contaminated groundwater is prevented. Discharge areas continue to be monitored, and levels have not yet warranted action. Short-term protectiveness is therefore being achieved.

In addition, the PRPs and the agencies agree that a GWETS rebound evaluation is necessary at this time to observe site conditions under non-pumping conditions and evaluate how effective the operation of the GWETS has been on the contaminated groundwater plume. In the meantime, the PRPs continue to research other potential remedial alternatives.

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

The 1986 Consent Decree, Appendix A (Remedial Action Work Plan), section 2D requires:

- i.) Notice to local land authority consistent with RCRA 40 CFR § 264.119, and
- ii.) Notice in deed to property consistent with RCRA 40 CFR § 264.120.

The RCRA requirements call for notices to be filed at the deed registry so that potential buyers are aware that hazardous wastes are landfilled on site, and that post closure use must never be allowed to disturb the final cover.

This requirement was initially assigned to the Town of Winthrop and the Savages as owners of the property. ME DEP conducted a file review at the Town and found that a notice had not been filed to the deed. ME DEP verbally notified the Town of this failure to meet the CD requirement. Additionally, ME DEP recently reminded all municipalities with closed landfills, including the Town of Winthrop, of the state requirement for a deed affidavit. To date, ME DEP has not received a response from the Town on this matter.

At this time, the public is protected from on-site contaminants because the fence impedes access, and control of the site is in the hands of United Technologies Corporation and their contractors.

The agencies will notify the Town of the need to comply with the CD requirement. The agencies will also revisit the requirement for on site institutional controls and, if necessary, adding restrictions on disturbing the cap. While the Town can satisfy the CD requirements with a deed affidavit, a non-enforceable information device, the agencies initially prefer a restrictive covenant, which will provide additional protections for the cap portion of the remedy.

No other new information has come to light which would call into questions the effectiveness of the remedy. 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 ESD, is operating as designed and meeting all remedial action objectives in the short term. Institutional controls to prevent exposure to contaminants in groundwater and exposure pathways that could result in unacceptable risks are being controlled and monitored, however, a notification has not been filed to the deed as required by the CD. The agencies will notify the Town of the need to comply with the CD requirement; the agencies will also revisit the requirement for on site institutional controls and, if necessary, adding restrictions on disturbing the cap.

The landfill cap is being maintained and has minimized the ongoing discharge of contaminated groundwater to surface water. The PRPs continue to conduct monitoring of groundwater, surface water, and sediment, and are taking all necessary measures to monitor groundwater discharge areas, including the areas where arsenic contamination in sediment was excavated. Measures have been taken to prevent residents from exposure to groundwater seeps during recreational activities in the lake.

ACLs continue to be monitored, and the GWETS continues to operate. The PRPs have formulated a conceptual groundwater rebound evaluation plan to explore system optimization and determine if improvements to the efficiency of the GWETS can be made.

Within the two groundwater plumes downgradient of the landfill and beyond the extraction system's capture zone, certain VOCs continue to be detected above ACLs in groundwater, and arsenic continues to exceed ACLs in several monitoring wells in the flow paths, as well as beneath the landfill itself. The GWETS was not designed to address mobilization of arsenic, and it is not expected that continued operation of the GWETS will provide significant remediation of arsenic concentrations in groundwater under the landfill and in downgradient flow paths. Discharge areas continue to be monitored, and levels have not yet warranted action. Land use at the site has not changed and is not expected to change, and there are no additional routes of exposure.

The presence of contaminants in downgradient flow paths, and especially the presence of arsenic and the current lack of any cost-effective available technology to remedy the situation, will be problematic in the future pending further developments or technological advances in the field. In addition, changes in the arsenic MCL from 50 ppb to 10 ppb exacerbate this issue. It is possible that the ROD and Consent Decree will require modification in the future to incorporate different technologies or approaches. At this time, the PRPs' monitoring program and a variety of institutional controls minimize or prevent exposure to the maximum extent practicable, and the site remains protective in the short term.

8.0 ISSUES

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

Table 2: Issues		
Issues	Affects Current Protectiveness	Affects Future Protectiveness
Multiple settlement areas on landfill cap.	N	N
Notice in deed to property never filed; excavation control at landfill and cap protections required.	N	Y
GWETS is ineffective at cleaning up arsenic, the only remaining contaminant above ACL within the landfill boundary.	N	Y
GWETS is ineffective at addressing ongoing VOC exceedances and arsenic mobilization in downgradient flow paths.	N	Y
Arsenic continues to discharge to sediment.	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:

Table 3: Recommendations and Follow-up Actions						
Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
Landfill cap depressions	Conduct cap settlement repairs and re-establish proper grading and vegetative cover.	PRP	EPA & ME DEP	Completed 9/26/2002; Ongoing	N	N
Deed notice never filed; further protections may be required.	Notify Town of the need to comply with CD requirements. Agencies to revisit on site requirements, possibly add restrictions to provide additional protections for the cap portion of the remedy.	PRP (Town of Winthrop)	EPA & ME DEP	9/30/2003	N	Y
GWETS remediation of arsenic ACL exceedance is ineffective	Conduct groundwater rebound evaluation study to determine potential for optimization and/or need for alternate remedial technologies. Upon conclusion of evaluation, re-start GWETS and/or re-evaluation of remedial action objectives.	PRP	EPA & ME DEP	Start rebound evaluation by 12/31/2002. Evaluation concludes by 12/31/2004, unless agencies approve extension.	N	Y
GWETS cannot address VOC exceedances and arsenic mobilization in down-gradient flow paths	Continue site-wide monitoring, including downgradient flow paths and discharge areas; investigate alternative technologies.	PRP	EPA & ME DEP	Ongoing.	N	Y

Arsenic continues to discharge to sediment	Continue site-wide monitoring, including surface water monitoring for recreational exposure scenario and inspection of known seep areas for potential future exposure. Remediate seep areas as necessary.	PRP	EPA & ME DEP	Ongoing.	N	Y
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10.0 PROTECTIVENESS STATEMENTS

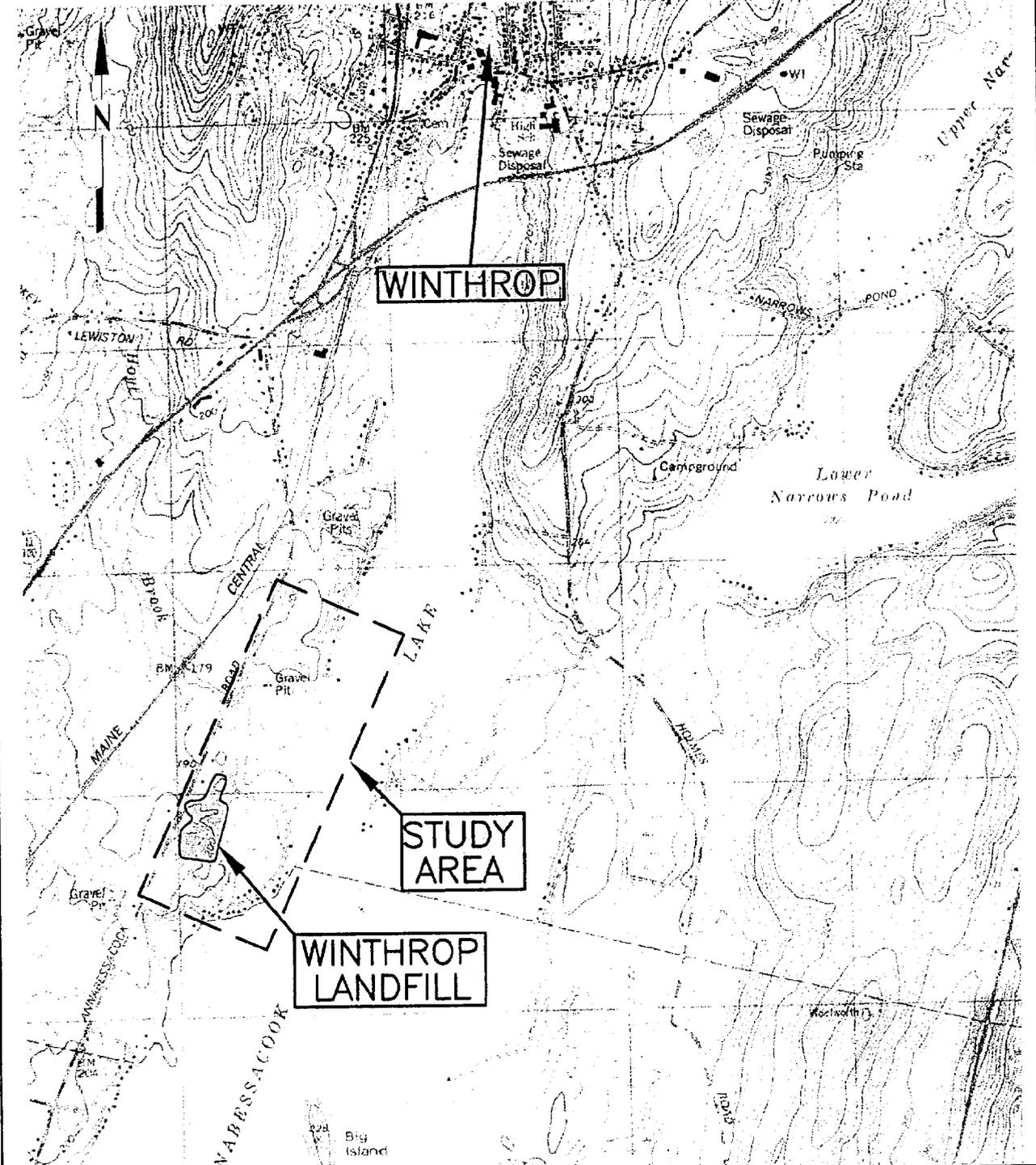
The remedy at the Winthrop Landfill Superfund Site currently protects human health and the environment in the short-term because institutional controls to prevent exposure to contaminants in groundwater and exposure pathways that could result in unacceptable risks are being controlled and monitored, however, a notification has not been filed to the deed as required by the Consent Decree. The public is protected from on-site contaminants because the fence impedes access, and control of the site is in the hands of United Technologies Corporation and their contractors. A Groundwater Extraction and Treatment System is currently operational, monitoring of groundwater, surface water, and sediments is ongoing, the landfill cap is being monitored, and known groundwater discharge points are regularly monitored and inspected.

Follow-up actions are necessary to address long-term protectiveness. The agencies will notify the Town of the need to comply with the Consent Decree requirement for a notice to the deed; the agencies will also revisit the requirement for on site institutional controls and, if necessary, adding restrictions on disturbing the cap. Remedial action objectives may not be met due to the inability of the selected remedy to meet a more stringent arsenic MCL at the landfill and in downgradient flow paths. Additionally, points of exposure could be impacted in the future by groundwater discharge from flow paths currently exceeding Alternate Concentration Limits. Known discharge points should be remediated in the future as necessary. A GWETS rebound evaluation is currently planned to determine the potential for optimization and/or the need for alternate remedial technologies. Remedial action objectives may need to be re-evaluated at the conclusion of the rebound study.

11.0 NEXT REVIEW

The due date for this third five-year review of the Winthrop Landfill Superfund Site is September 30, 2002. Therefore, the next five-year review should be completed by September 30, 2007.

ATTACHMENT 1
SITE MAP



SOURCE: USGS TOPOGRAPHIC QUADRANGLE, 7.5-MINUTE SERIES, WINTHROP, ME., DATED 1980.

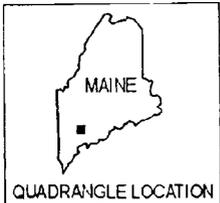
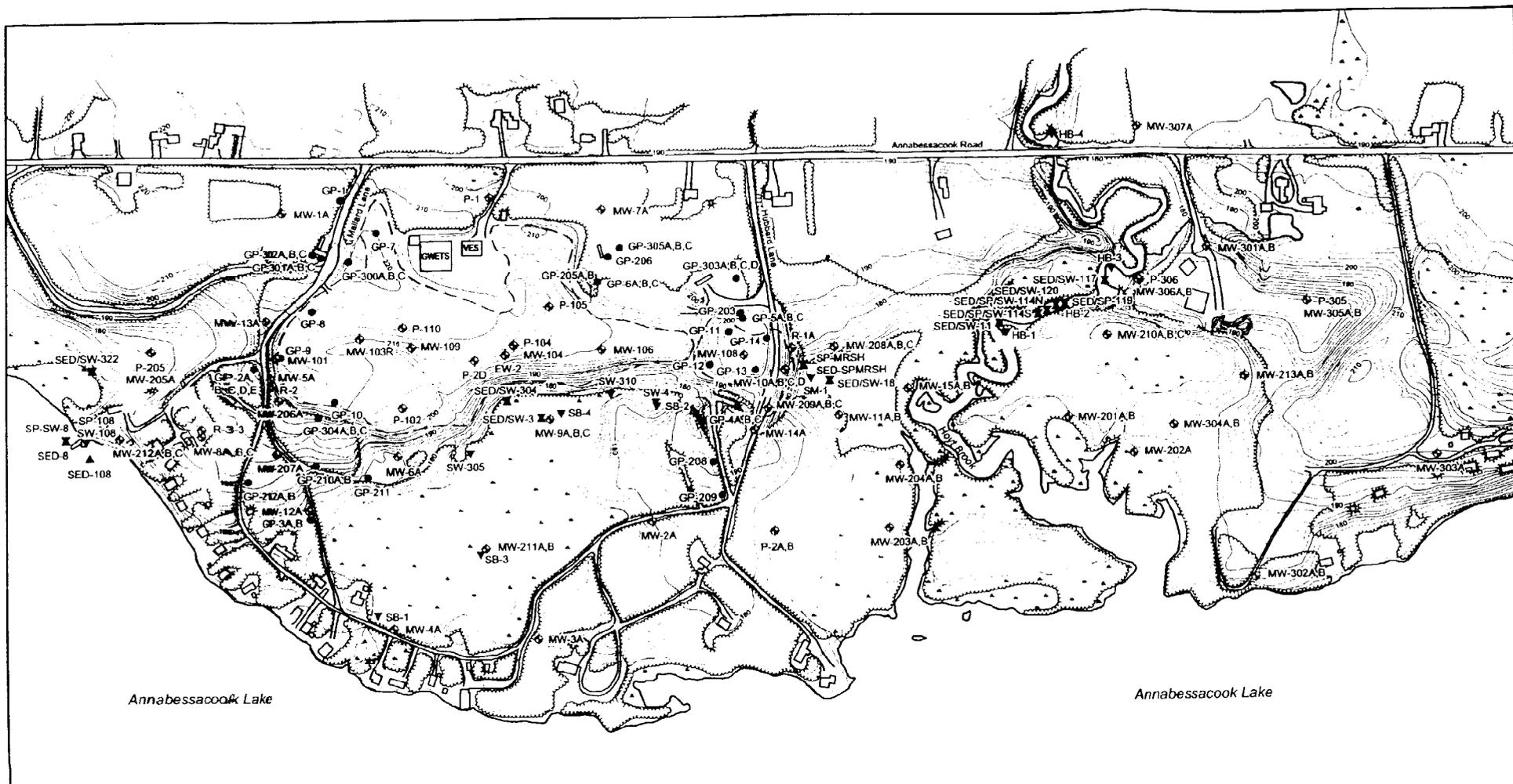


FIGURE 1.0-1
SITE LOCATION
POST-CLOSURE MONITORING REPORT
WINTHROP LANDFILL
WINTHROP, MAINE

Harding ESE

**ATTACHMENT 2
SAMPLING LOCATIONS**



Annabessacook Lake

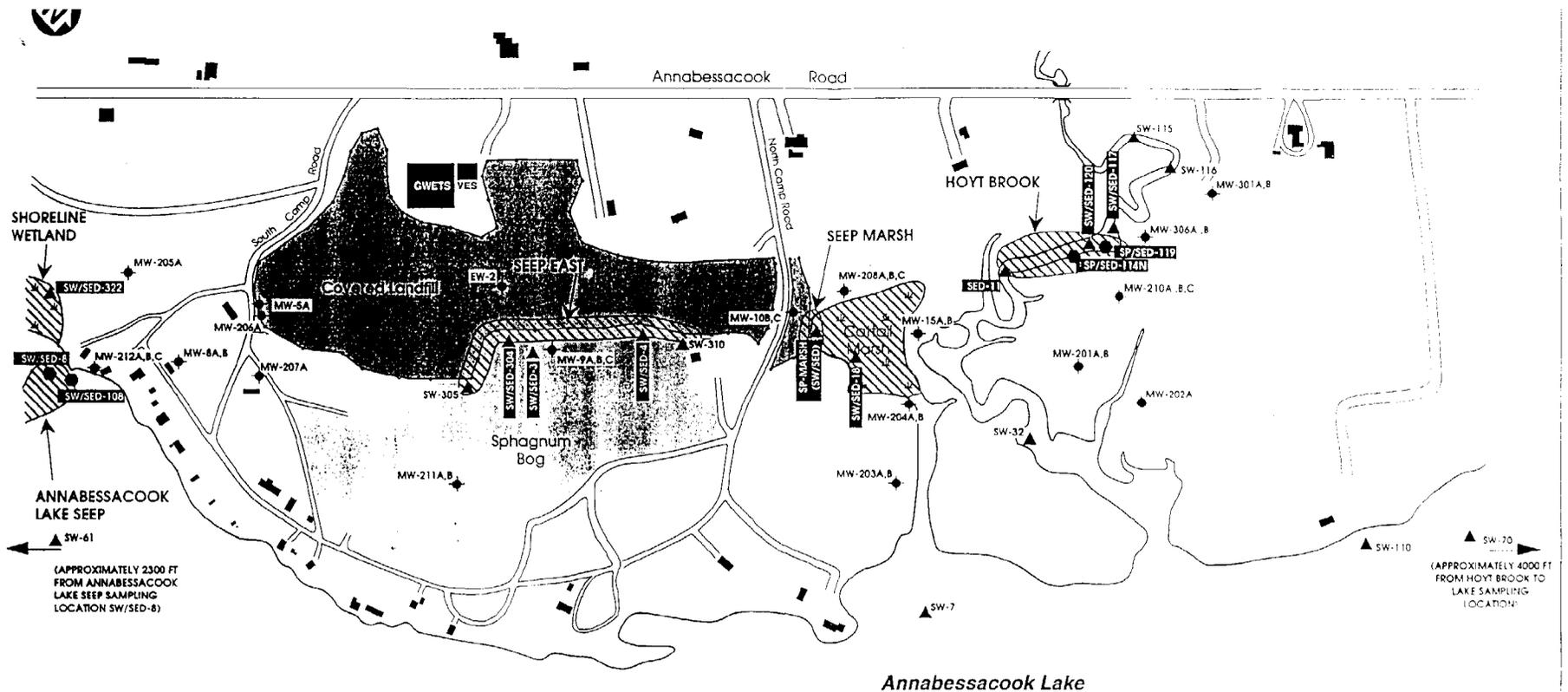
Annabessacook Lake

Legend

- ◆ Extraction Well, Monitoring Well or Piezometer Location
- ▲ Sediment Sample Location
- ▼ Surface Water Sample Location
- Gas Probe Monitoring Location
- ▬ Roads/Driveways
- ▬ Building Outlines
- ▬ Landfill Limit Line
- ▬ Tree Line
- ▬ Property Line
- ▬ Water
- ▬ Bog/Marsh
- ▬ Index Contours (10')
- ▬ Intermediate Contours (2')



FIGURE 2.1-1
 GROUNDWATER AND SURFACE WATER/SEDIMENT SAMPLING
 AND GAS PROBE MONITORING LOCATIONS
 SECOND QUARTER 2002
 POST-CLOSURE MONITORING REPORT
 WINTHROP LANDFILL
 WINTHROP, MAINE



(APPROXIMATELY 2300 FT FROM ANNABESSACOOK LAKE SEEP SAMPLING LOCATION SW/SED-8)

(APPROXIMATELY 4000 FT FROM HOYT BROOK TO LAKE SAMPLING LOCATION)

LEGEND

- SW/SED** ▲ POE MONITORING LOCATION
- SW** ▲ SURFACE WATER SAMPLING LOCATION
- SP** ● SEEP WATER SAMPLING LOCATION
- SED** ▲ SEDIMENT SAMPLING LOCATION
- MW** ◆ GROUNDWATER MONITORING WELL
- EW** ◆ EXTRACTION WELL
-  POE IDENTIFIED IN A CL DECISION DOCUMENT

NOTE: SW-7, SW-110, SW-32 ADDED AT THE REQUEST OF MEDEP OR USEPA BUT ARE NOT IN A DEFINED POE (GROUNDWATER DISCHARGE AREA).



**FIGURE 2-1
GROUNDWATER, SURFACE WATER, AND
SEDIMENT SAMPLING LOCATIONS
POST-CLOSURE MONITORING PLAN
WINTHROP LANDFILL**

ABB Environmental Services, Inc.

ATTACHMENT 3
REMEDIAL ACTION PLAN (RAP) TABLE 1

TABLE 2-2

RAP TABLE 1 - QUARTERLY ANALYTICAL PROTOCOL

POST-CLOSURE MONITORING PLAN
WINTHROP LANDFILL

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
Methylene chloride	Zinc ²
Fluorotrichloromethane	Nickel ²
Tetrachloroethylene	Arsenic ²
Toluene	Phenol ²

Notes:

1 = deleted March 1993

2 = added February 1988

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 - ANNUAL ANALYTICAL PROTOCOL

POST-CLOSURE MONITORING PLAN
WINTHROP LANDFILLVolatile 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
1,1,2,2-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

continued

TABLE 2-3
RAP TABLE 2 - ANNUAL ANALYTICAL PROTOCOL
POST-CLOSURE MONITORING PLAN
WINTHROP LANDFILL

Hexachlorobutadiene	Dibenzo (a,h) anthracene
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-cis-Dichloroethylene

continued

TABLE 2-3

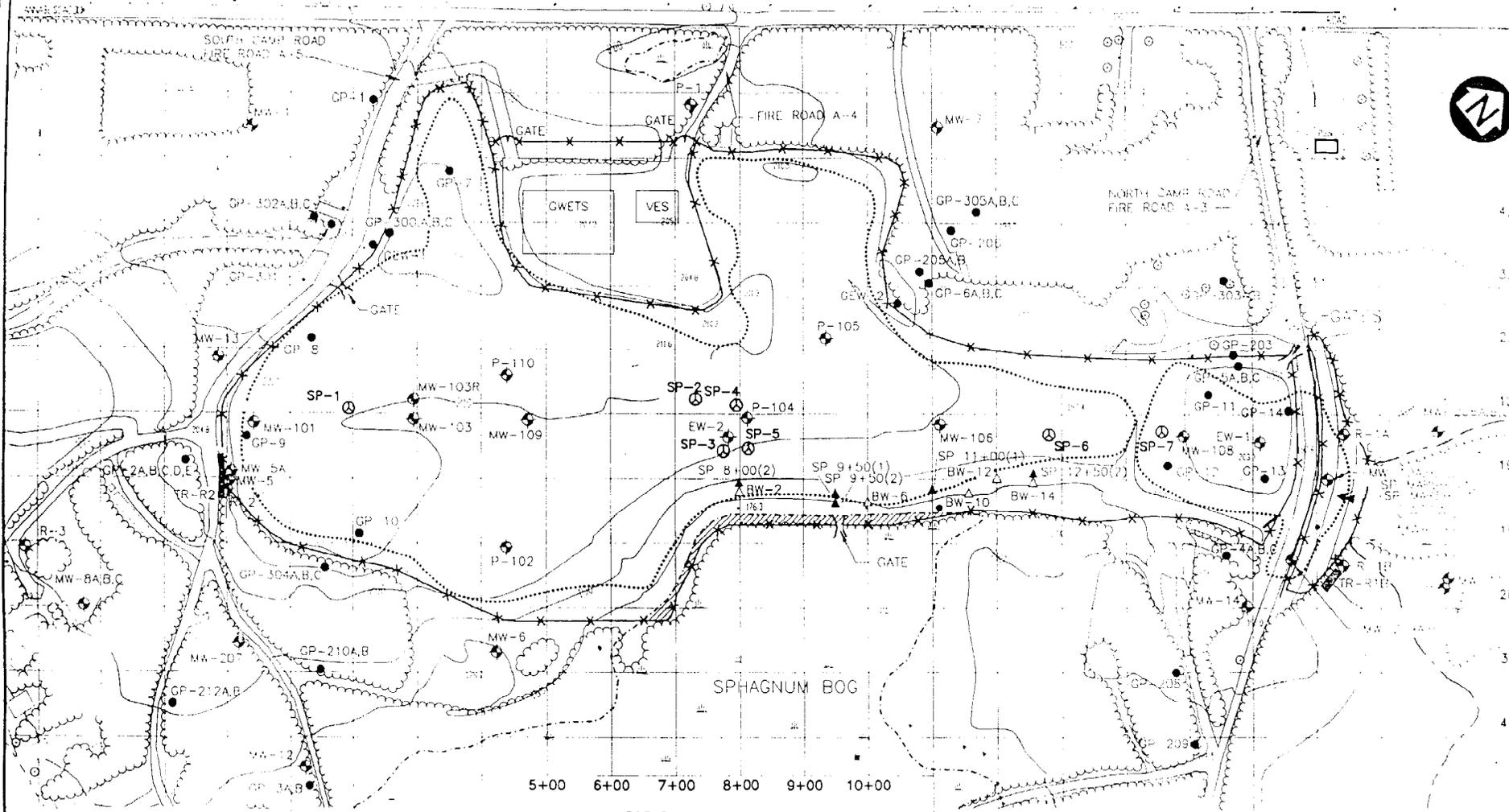
RAP TABLE 2 - ANNUAL ANALYTICAL PROTOCOL

POST-CLOSURE MONITORING PLAN
WINTHROP LANDFILL

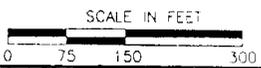
Silver (Ag)	2-Butanone
Thallium (Tl)	4-Methyl-2-Pentanone
Zinc (Zn)	Tetrahydrofuran
<u>Miscellaneous</u>	
Total Cyanides	
<u>Other Non-Volatile Organic Compounds</u>	
Di-2-ethyladipate	
Di-2-ethylhexyladipate	
Dimethylformamide	

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

ATTACHMENT 5
LANDFILL MONITORING SYSTEMS



- NOTES:
1. BASELINE AND GRID FROM H.C. SARGENT, INC., 1987.
 2. BASE MAP COMPILED BY JAMES W. SEWELL COMPANY, OLD TOWN, MAINE BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHS DATED 11-23-88, CONTROLLED BY E.C. JORDAN COMPANY



- LEGEND
- APPROXIMATE LOCATIONS OF GAS PROBE (GP) OR GAS EXTRACTION WELL (GEW)
 - ◆ GROUNDWATER MONITORING WELL (MW) OR PIEZOMETER (P)
 - BW-2 ▲ SLOPE MONITORING SURVEY POINTS
 - △ SLOPE INCLINOMETER LOCATION
 - ⊕ SETTLEMENT PLATFORM
 - APPROXIMATE LIMIT OF LANDFILLED WASTE
 - x-x- APPROXIMATE LIMIT OF SITE FENCE

FIGURE 3-1
 LANDFILL MONITORING SYSTEMS
 POST-CLOSURE MONITORING PLAN
 WINTHROP LANDFILL

1397-316-94C.DWG 10/18/97

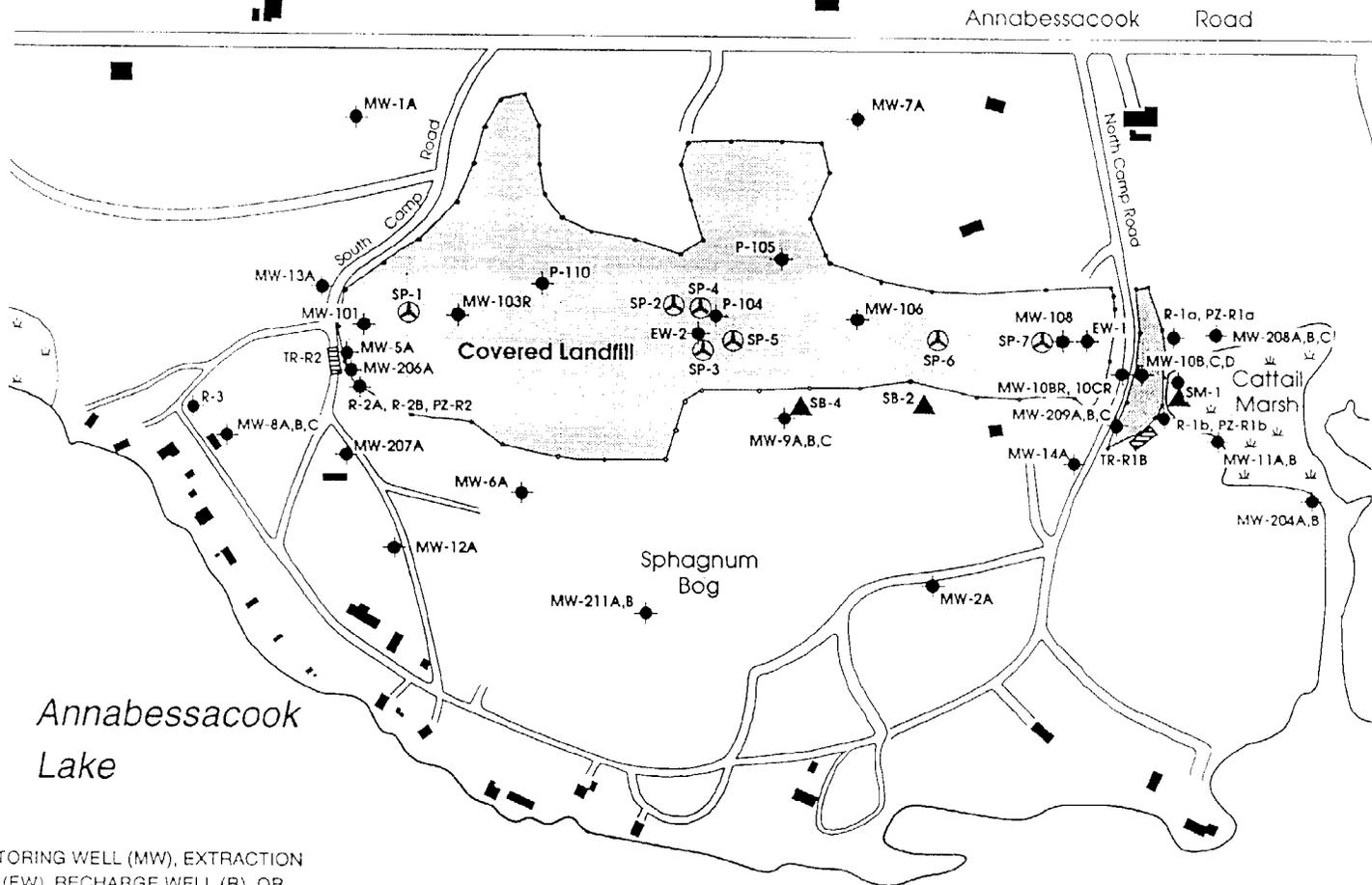
ATTACHMENT 6
EPA AND DEP APPROVED ALTERNATE CONCENTRATION LIMITS
AND PROTECTIVE CONCENTRATION LIMITS

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	B		C	D	E
	SEDIMENT PCLs	SURFACE WATER PCL		Basis	Number	Basis
		Number				
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
GWETS CAPTURE ZONE PERFORMANCE MONITORING NETWORK



LEGEND

- MW-3A ● MONITORING WELL (MW), EXTRACTION WELL (EW), RECHARGE WELL (R), OR PIEZOMETER (P or PZ) LOCATION
- SB-2 ▲ SURFACE WATER ELEVATION STATION
- SP-2 ☉ SETTLEMENT PLATFORM
- TR-R2 ▤ REINJECTION TRENCH

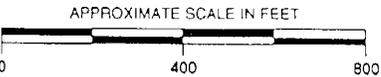


FIGURE 4-1
CAPTURE ZONE PERFORMANCE MONITORING NETWORK
POST-CLOSURE MONITORING PLAN
WINTHROP LANDFILL

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

Version 1.0 - Soil Vapor Extraction System Final Design
VAPEX for United Technologies Corp.
August 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

Revised Post-Closure Monitoring Plan
Winthrop Landfill
Harding Lawson Associates for Unites Technologies Corporation
November 13, 1998

Conceptual Rebound Evaluation Plan
Winthrop Landfill
Harding ESE for United Technologies Corp.
August 2002

ATTACHMENT 9
MUNICIPAL WATER USERS IN
GROUNDWATER PROTECTION ZONE

TABLE 1.4-1: MUNICIPAL WATER USERS IN GROUNDWATER PROTECTION ZONE

CONCEPTUAL REBOUND EVALUATION PLAN
WINTHROP LANDFILL

Tax Map	Lot Number	Owner	Previous Owners	House Status	Receive Municipal Water	Date Water Line installed
13	39	Nadeau, Jeffery	Lawrence; Beaulieu; Crocker	Year Round	YES	10/19/1984
13	35	Simpson, Mark	Palleschi	Year Round - main house Year Round - rental trailer	YES	10/22/1984 10/84
13	33	Grant, Charlie		Year Round	YES	10/22/1984
13	32	Breau, Richard		Year Round	YES	10/22/1984
13	31	Hughes, Thomas		Year Round	YES	10/22/1984
13	29	Brann, Glee		Year Round	YES	10/22/1984
13	28	Ringuette, Bert	Dick	Year Round	YES	11/8/1984
13	27	McCausland, Stephen	Pogorelc	Seasonal	YES	11/8/1984
13	4	Breau, Richard		Seasonal	YES	3/21/1999
13	7	Hughes, Thomas		Vacant Lot	NO	NA
13	8D	Brann, Glee		Vacant Lot	NO	NA
13	8B	Ringuette, Bert	Dick	Vacant Lot	NO	NA
13	8C	McCausland, Stephen	Pogorelc	Vacant Lot	NO	NA
13	25	Pratt, Peggy		Year Round - on land side Vacant lot - on lake side property	YES NO	11/7/1984
13	25A	Breau, Richard	Rosenthal	Vacant Lot	NO	NA
13	26	Kane, Larry & Wendy	Paquin & Ham	Seasonal	YES	9/24/1986
13	23A	Kane, Larry & Wendy	Ducharme	Vacant Lot	NO	NA
13	23	Ducharme, Paul		Year Round	YES	11/9/1984
13	22	Neal, Sue	Roderique	Seasonal	YES	11/9/1984
13	10	McIntire, Alicia	Boutin	Year Round	YES	11/9/1984
13	11	Christopher Stratton	Heald; Stratton R	Year Round	YES	11/9/1984
13	19	Christopher Stratton	Heald; Stratton R	Vacant Lot	NO	NA
13	21	Davis, John	Hagglund	Year Round	YES	11/9/1984

TABLE 1.4-1: MUNICIPAL WATER USERS IN GROUNDWATER PROTECTION ZONE

CONCEPTUAL REBOUND EVALUATION PLAN
WINTHROP LANDFILL

Properties Within Groundwater Protection Zone		Owner	Previous Owners	House Status	Receive Municipal Water	Date Water Line installed
13	18	True, John	Donovan	Seasonal	YES	11/84
13	17	Turner, Robert	Frost	Seasonal	YES	11/84
13	15	Chartier, Albert		Year Round	YES	11/84
13	12A	Chartier, Albert	Rosenthal	Vacant Lot	NO	NA
13	14	Savage, Brian		Year Rnd- Primary home Year Rnd -Garage	YES YES	11/84 Unknown
2	69A	Dumais, Rolland	Callahan	Year Round	YES	11/84
2	45	Mainely Lakes Property	JoAnne Mackay; Town of Winthrop	Year Round	YES	11/84
2	42	Siragusa, Dr. James		Year Round	YES	10/22/1984
2	42	Siragusa, Sean		Year Round	YES	9/2/2000
2	42A	Engdahl, Robert		Year Round	YES	11/84
2	45A	Savage, Brian		Year Round	YES	After 1990
2	45A	Savage, Brian		Year Round	YES	After 1990
2	47	Town of Winthrop		NA	NA	
2	47-1	Calcagni, Luanne		Year Round	YES	Unknown
2	48-B	Cook, Lawrence		Year Round	YES	6/30/1987
2	48-E	Savage, Cynthia		Year Round	YES	After 1989
2	48-D	Savage, Glenda		Vacant Lot	NO	NA
2	49	Savage, Brian		Vacant Lot	NO	NA
2	49A	Savage, Everett		Vacant Lot	NO	NA
2	41	Hodson, Robert		Year Round	YES	9/2/1998
2	50	Calcagni, Richard		Year Round	YES	6/94
2	35	Rheaume, Clara		Year Round	YES	11/91
2	35A	Dunn, Wally		Year Round	YES	11/91
2	35C	Nickols, Josh & Deborah		Year Round	YES	9/3/1992
2	35D	Dunn, Wally		Year Round	YES	9/92

TABLE 1.4-1: MUNICIPAL WATER USERS IN GROUNDWATER PROTECTION ZONE

CONCEPTUAL REBOUND EVALUATION PLAN
WINTHROP LANDFILL

Properties Within Groundwater Protection Zone		Owner	Previous Owners	House Status	Receive Municipal Water	Date Water Line installed
2	35B	Boucher, Timothy		2 houses under construction	YES (2 water lines)	2001
2	34L	Accomando, Susan		Vacant Lot	No Service	NA
2	34K	Cobb, Dick & Peggy		Year Round	YES	date unknown
Properties in Site Vicinity Outside of Groundwater Protection Zone						
2	34H	Sweezy, Frank		Vacant Lot	No Service	NA
2	34J	Sweezy, Frank		Seasonal	YES	date unknown
2	34I	McCaslin, Jaqueline		Year Round	YES	date unknown
2	34C	McCaslin, Jaqueline		Vacant Lot	No Service	NA
2	34B	Reinke, Edward		Year Round	YES	9/30/1998
2	34D	Nezol, Laura		Seasonal	YES	date unknown
2	34A	Chick, Richard		Year Round	YES	7/94
2	34E	Vigneault, Edward		Year Round	YES	date unknown
2	34F	Reinke, Susan		Vacant Lot	No Service	NA
2	34G	Vogt, John		Year Round	YES	3/93
2	34	Jeffe, David	Shute	Year Round	YES	9/27/1984
NOTE: Refer to Figure 1.4-1 for Lot Locations						

ATTACHMENT 10
RECENT GROUNDWATER, SURFACE WATER, AND SEDIMENT
DETECTIONS

TABLE 1.3-1: RECENT GROUNDWATER, SURFACE WATER, AND SEDIMENT DETECTIONS

CONCEPTUAL REBOUND EVALUATION PLAN
WINTHROP LANDFILL

FLOW PATH	SAMPLE LOCATION	PARAMETER	CONCENTRATION (µg/L)	ACL OR PCL (µg/L or µg/kg)
NA	EW-2	1,1-Dichloroethane	2	5
NA	EW-2	Arsenic	266	30
NA	EW-2	Bis(2-Ethylex1)phthalate	6 J	-
NA	EW-2	Calcium	99400	-
NA	EW-2	Chloride	27000	-
NA	EW-2	Chloroethane	6	1300
NA	EW-2	Iron	46800	-
NA	EW-2	Magnesium	18500	-
NA	EW-2	Manganese	7700	-
NA	EW-2	Potassium	11300	-
NA	EW-2	Sodium	178000	-
NA	EW-2	Sulfate	17000	-
Perched	MW-10C	1,1-Dichloroethane	2	5
Perched	MW-10C	1,2-Dichloroethane	0.5 J	5
Perched	MW-10C	1,2-Dichloroethene (total)	2	70
Perched	MW-10C	Acetone	3 J	390
Perched	MW-10C	Arsenic	418	30
Perched	MW-10C	Benzene	8	5
Perched	MW-10C	Calcium	124000	-
Perched	MW-10C	Chloride	45000	-
Perched	MW-10C	Chloroethane	3	1300
Perched	MW-10C	Cis-1,2-Dichloroethene	1	70
Perched	MW-10C	Dimethylformamide	25	390
Perched	MW-10C	Ethyl benzene	64	440
Perched	MW-10C	Iron	80100	-
Perched	MW-10C	Magnesium	47100	-
Perched	MW-10C	Manganese	1970	-
Perched	MW-10C	Potassium	3520	-
Perched	MW-10C	Sodium	64500	-
Perched	MW-10C	Sulfate	2000	-
Perched	MW-10C	Toluene	1	1000
Perched	MW-10C	Total Xylenes	91	590
Perched	MW-10C	Trans-1,2-Dichloroethene	0.9 J	70
Perched	MW-10C	Vinyl chloride	2	2
Northern	MW-10B	Arsenic	229	30
Northern	MW-15A	1,1-Dichloroethane	2	5
Northern	MW-15A	1,2-Dichloroethane	1	5
Northern	MW-15A	Arsenic	37	30
Northern	MW-15A	Benzene	0.9 J	5
Northern	MW-15A	Chloroethane	100	1300
Northern	MW-15A	Vinyl chloride	1	2

TABLE 1.3-1: RECENT GROUNDWATER, SURFACE WATER, AND SEDIMENT DETECTIONS

**CONCEPTUAL REBOUND EVALUATION PLAN
WINTHROP LANDFILL**

FLOW PATH	SAMPLE LOCATION	PARAMETER	CONCENTRATION (µg/L)	ACL OR PCL (µg/L or µg/kg)
Northern	MW-15B	Arsenic	220	30
Northern	MW-15B DUP	Arsenic	200	30
Northern	MW-201A	Arsenic	8	30
Northern	MW-202A	Arsenic	15	30
Northern	MW-203A	Arsenic	14	30
Northern	MW-204A	Arsenic	63	30
Northern	MW-208A	1,1-Dichloroethane	0.8 J	5
Northern	MW-208A	Arsenic	361	30
Northern	MW-208B	Arsenic	344	30
Northern	MW-208C	Arsenic	31	30
Northern	MW-210A DUP	Acetone	3 J	390
Northern	MW-210A DUP	Methylene Chloride	0.9 J	5
Northern	MW-210A	1,1-Dichloroethane	17	5
Northern	MW-210A DUP	1,1-Dichloroethane	21	5
Northern	MW-210A	1,2-Dichloroethane	1	5
Northern	MW-210A DUP	1,2-Dichloroethane	1	5
Northern	MW-210A	Arsenic	52	30
Northern	MW-210A DUP	Arsenic	51	30
Northern	MW-210A	Benzene	0.6 J	5
Northern	MW-210A DUP	Benzene	0.8 J	5
Northern	MW-210A	Chloroethane	32	1300
Northern	MW-210A DUP	Chloroethane	32	1300
Northern	MW-210A	Vinyl chloride	1 J	2
Northern	MW-210A DUP	Vinyl chloride	2 J	2
Northern	MW-210B	1,1-Dichloroethane	7	5
Northern	MW-210B	1,2-Dichloroethane	0.7 J	5
Northern	MW-210B	Chloroethane	11	1300
Northern	MW-210C	Arsenic	15	30
Northern	MW-210C	Dimethylformamide	43	390
Southern	MW-206A	Arsenic	37	30
Southern	MW-212A	1,1-Dichloroethane	2 J	5
Southern	MW-212A DUP	1,1-Dichloroethane	2 J	5
Southern	MW-212A	Arsenic	90	30
Southern	MW-212A DUP	Arsenic	92	30
Southern	MW-212A	Tetrahydrofuran	160	3300

TABLE 1.3-1: RECENT GROUNDWATER, SURFACE WATER, AND SEDIMENT DETECTIONS

CONCEPTUAL REBOUND EVALUATION PLAN
WINTHROP LANDFILL

FLOW PATH	SAMPLE LOCATION	PARAMETER	CONCENTRATION (µg/L)	ACL OR PCL (µg/L or µg/kg)
Southern	MW-212A DUP	Tetrahydrofuran	110	3300
Southern	MW-212B	Arsenic	302	30
Northern	MW-306A	1,1-Dichloroethane	3	5
Northern	MW-306A	Chloroethane	3	1300
Southern	MW-8A	1,1-Dichloroethane	42	5
Southern	MW-8A	1,2-Dichloroethane	1	5
Southern	MW-8A	1,2-Dichloropropane	3	5
Southern	MW-8A	Arsenic	360	30
Southern	MW-8A	Chloroethane	7	1300
Southern	MW-8B	1,1-Dichloroethane	16	5
Southern	MW-8B	1,2-Dichloroethane	0.6 J	5
Southern	MW-8B	1,2-Dichloropropane	1	5
Southern	MW-8B	Arsenic	429	30
Southern	MW-8B	Chloroethane	3	1300
Sphagnum Bog	MW-211A	Arsenic	125	30
Sphagnum Bog	MW-211B	Acetone	3 J	390
Sphagnum Bog	MW-9A	Arsenic	17	30
Sphagnum Bog	MW-9B	1,1-Dichloroethane	1	5
Sphagnum Bog	MW-9B	Arsenic	23	30
Sphagnum Bog	MW-9B	Dimethylformamide	550	390
Sphagnum Bog	MW-9C	Arsenic	5	30
Annabessacook Lake	SED-108	Acetone	18	4,100
Annabessacook Lake	SED-108 DUP	Acetone	21	4,100
Annabessacook Lake	SED-108	Arsenic, Total	29,100	31,000
Annabessacook Lake	SED-108 DUP	Arsenic, Total	7,300	31,000
Annabessacook Lake	SED-108	Nickel, Total	18,400	50,000
Annabessacook Lake	SED-108 DUP	Nickel, Total	14,800	50,000
Annabessacook Lake	SED-108	Zinc	27,500	270,000
Annabessacook Lake	SED-108 DUP	Zinc	32,500	270,000
Annabessacook Lake	SW-108	Arsenic, Total	6 J	5 +
Annabessacook Lake	SW-108DUP	Arsenic, Total	11	5 +
Cattail Marsh	SED-18	Acetone	14	4,100
Cattail Marsh	SED-18	Arsenic, Total	15,700	31,000
Cattail Marsh	SED-18	Nickel, Total	41,100	50,000
Cattail Marsh	SED-18	Zinc	28,600	270,000
Cattail Marsh	SW-18	Toluene	0.8 J	650

TABLE 1.3-1: RECENT GROUNDWATER, SURFACE WATER, AND SEDIMENT DETECTIONS

CONCEPTUAL REBOUND EVALUATION PLAN
WINTHROP LANDFILL

FLOW PATH	SAMPLE LOCATION	PARAMETER	CONCENTRATION (µg/L)	ACL OR PCL (µg/L or µg/kg)
Cattail Marsh	SW-18	Acetone	3 J	5
Hoyt Brook	SED-11	Arsenic, Total	7,300	31,000
Hoyt Brook	SED-11	Nickel, Total	15,200	50,000
Hoyt Brook	SED-11	Zinc	44,300	270,000
Hoyt Brook	SED-11	Acetone	57	4100
Hoyt Brook	SED-11	Methyl ethyl ketone	18	2,600
Hoyt Brook	SED-114N	Acetone	290,000	4,100 +
Hoyt Brook	SED-114N	Arsenic, Total	186,000	31,000 +
Hoyt Brook	SED-114N	Methyl ethyl ketone	30 J	2,600
Hoyt Brook	SED-114N	Methyl butyl ketone	100	2,600
Hoyt Brook	SED-114N	Nickel, Total	57,800	50,000 +
Hoyt Brook	SED-114N	Zinc	35,000	270,000
Hoyt Brook	SP-114N	Arsenic, Total	9	5 +
Hoyt Brook	SED-117	Acetone	63 J	4,100
Hoyt Brook	SED-117 DUP	Acetone	57	4,100
Hoyt Brook	SED-117	Arsenic, Total	18,000	31,000
Hoyt Brook	SED-117 DUP	Arsenic, Total	8,900	31,000
Hoyt Brook	SED-117	Nickel, Total	27,000	50,000
Hoyt Brook	SED-117 DUP	Nickel, Total	16,500	50,000
Hoyt Brook	SED-117	Zinc	66,300	270,000
Hoyt Brook	SED-117 DUP	Zinc	49,200	270,000
Hoyt Brook	SED-117	Methyl ethyl ketone	21	2,600
Hoyt Brook	SED-117 DUP	Methyl ethyl ketone	10 U	2,600
Hoyt Brook	SED-119	Acetone	55	4,100
Hoyt Brook	SED-119	Arsenic, Total	4,200	31,000
Hoyt Brook	SED-119	Nickel, Total	12,000	50,000
Hoyt Brook	SED-119	Zinc	49,200	270,000
Hoyt Brook	SED-119	Methyl ethyl ketone	12	2,600
Hoyt Brook	SED-119	Methyl butyl ketone	52	2,600
Hoyt Brook	SED-120	Acetone	10	4,100
Hoyt Brook	SED-120	Arsenic, Total	3,500	31,000
Hoyt Brook	SED-120	Nickel, Total	9,230	50,000
Hoyt Brook	SED-120	Zinc	22,100	270,000
Seep East	SED-304	Acetone	83 J	4,100
Seep East	SED-304	Arsenic, Total	57,300	31,000
Seep East	SED-304	Nickel, Total	46,100	50,000
Seep East	SED-304	Zinc, Total	174,000	270,000
Seep East	SED-304	Methyl ethyl ketone	13	2,600
Seep East	SW-304	Arsenic, Dissolved	30	5 +
Seep East	SW-304	Arsenic, Total	20	5 +
Seep East	SW-305	Acetone	6	390
Seep East	SW-305	Arsenic, Dissolved	26	5 +
Seep East	SW-305	Arsenic, Total	50	5 +
Seep East	SW-305	Toluene	0.9 J	650
Seep East	SW-310	Acetone	4 J	390

TABLE 1.3-1: RECENT GROUNDWATER, SURFACE WATER, AND SEDIMENT DETECTIONS

CONCEPTUAL REBOUND EVALUATION PLAN
WINTHROP LANDFILL

FLOW PATH	SAMPLE LOCATION	PARAMETER	CONCENTRATION (µg/L)	ACL OR PCL (µg/L or µg/kg)
Seep East	SW-310	Arsenic, Dissolved	50	5 +
Seep East	SW-310	Arsenic, Total	70 J	5 +
Seep East	SW-310	Zinc, Dissolved	178	59 +
Seep East	SW-310	Zinc, Total	155	59 +
Seep Marsh	SED-SPMRSH	Acetone	10	4,100
Seep Marsh	SED-SPMRSH	Arsenic, Total	18,400	31,000
Seep Marsh	SED-SPMRSH	Nickel, Total	20,100	50,000
Seep Marsh	SED-SPMRSH	Zinc, Total	55,400	270,000
Seep Marsh	SW-SPMRSH	Acetone	4 J	390
Seep Marsh	SW-SPMRSH	Arsenic, Dissolved	91	5 +
Seep Marsh	SW-SPMRSH	Arsenic, Total	105	5 +
Seep Marsh	SW-SPMRSH	Toluene	7	650
Seep Marsh	SW-SPMRSH	Zinc, total	43	59
Shoreline Wetland	SED-322	Acetone	9 J	4,100
Shoreline Wetland	SED-322	Arsenic, Total	2,000	31,000
Shoreline Wetland	SED-322	Methyl ethyl ketone	11	2,600
Shoreline Wetland	SED-322	Nickel, Total	7460	50,000
Shoreline Wetland	SED-322	Zinc	15,300	270,000
Sphagnum Bog	SW-3	Arsenic, Total	5 J	5
Sphagnum Bog	SW-3	Toluene	30	650
Sphagnum Bog	SW-4	Arsenic, Dissolved	12	5 +
Sphagnum Bog	SW-4	Arsenic, Total	56	5 +
Sphagnum Bog	SW-4	Zinc, total	55	59

NOTES: µg/L = micrograms per liter
µg/kg = micrograms per kilogram
BOLD = ACL Exceedance

ATTACHMENT 11
REBOUND EVALUATION REACTIVATION CRITERIA

TABLE 2.7-1: REBOUND EVALUATION REACTIVATION CRITERIA

CONCEPTUAL REBOUND EVALUATION PLAN
WINTHROP LANDFILL

METHOD	PARAMETER	MDL (µg/L)	PQL (µg/L)	Current MCL (µg/L)	Current MEG (µg/L)	ACL (µg/L)	SOUTHERN FLOW PATH MW-5A	SOUTHERN FLOW PATH MW-206A	NORTHERN FLOW PATH MW-10B	NORTHERN FLOW PATH MW-208A
							REACTIVATION CRITERIA (µg/L)	REACTIVATION CRITERIA (µg/L)	REACTIVATION CRITERIA (µg/L)	REACTIVATION CRITERIA (µg/L)
8260B	1,1,1-Trichloroethane	0.57	1	200	200	200	200	200	200	200
8260B	1,1-Dichloroethane	0.92	1		70	5	70	70	70	70
8260B	1,1-Dichloroethylene	0.55	1	7	0.6	7	7	7	7	7
8260B	1,2-Dichloroethane	0.63	1	5	4	5	5	5	5	5
8260B	1,2-Dichloroethylene	0.61	1	70	70	70	70	70	70	70
8260B	1,2-Dichloropropane	0.4	1		5	5	5	5	5	5
8260B	2-Butanone	2.6	5			170	170	170	170	170
8260B	2-Hexanone	1	4			1400	1400	1400	1400	1400
8260B	4-Methyl-2-Pentanone	0.93	3			190	190	190	190	190
8260B	Acetone	3.7	5		700	390	700	700	700	700
8260B	Benzene	0.22	1	5	12	5	12	12	12	12
8260B	Chloroethane	0.84	2			1300	1300	1300	1300	1300
8260B	cis-1,2-Dichloroethylene	0.61	1	70	70	70	70	70	70	70
8260B	Ethylbenzene	0.27	1	700	70	440	700	700	700	700
8260B	Methylene Chloride	1.2	2			5	5	5	5	5
8260B	Styrene	0.49	1	100	140	100	140	140	140	140
8260B	Tetrachloroethylene	0.33	1	5	7	5	7	7	7	7
8260B	Tetrahydrofuran	2.6	50		70	3300	3300	3300	3300	3300
8260B	Toluene	0.23	1	1400	1000	1000	1400	1400	1400	1400
8260B	trans-1,2-Dichloroethylene	0.61	1	100	140	70	140	140	140	140
8260B	Trichloroethylene	0.37	1	5	32	5	32	32	32	32
8260B	Trichlorofluoromethane	0.89	2		2100	2300	2300	2300	2300	2300
8260B	Vinyl Chloride	0.79	2	2	0.2	2	2	2	2	2
8260B	Xylenes(total)	0.95	2	10000	14000	590	14000	14000	14000	14000
8270C	2,4-Dinitrophenol	4.5	25		14	31	31	31	31	31
8270C	Di (2-ethylhexyl) adipate	0.34	10	400	292	40	400	400	400	400
8270C	Diethylphthalate	0.68	10		5000	2900	5000	5000	5000	5000
8270C	Phenol	1.4	10		4000	160	4000	4000	4000	4000
6010B	Arsenic	1.9	5	10	10	30	1050	590	375	980
6010B	Nickel	0.86	40		140	88	140	140	140	140
6010B	Zinc	3.1	25		2000	59	2000	2000	2000	2000
8000	2-Methoxyethanol2	65	110			46	88	88	88	88
8000	Dimethylformamide	3.2	3		700	390	700	700	700	700
NOTES:										
PCL=Protective Concentration Limit.										
ACL=Alternate Concentration Limit.										
PQL=Practical Quantitation Level.										
MDL=Method Detection Limit determined experimentally in accordance with the procedures described in 40 CFR 136, Appendix B, "Definition and Procedure for the Determination of the Method Detection Limit," Revised July, 1995.										
For metals, chloride, and sulfate, values listed are Instrument Detection Limits (IDLs) determined in accordance with the procedures described in the EPA CLP Statement of Work for Inorganics Analysis, Document Number ILM03.0.										
1 - The reactivation criteria for arsenic is the highest measured historical concentration at that monitoring well										
2 - The reactivation criteria for 2-methoxyethanol is the average of the MDL and PQL										
Bolded value represents the greater of the health-based criteria.										
µg/L = microgram per liter										