CONTINGENCY PLAN
VINYL CHLORIDE REACTIVATION
CRITERION EXCEEDANCE

WINTHROP LANDFILL
REBOUND EVALUATION

Prepared for:
United Technologies Corporation
Hartford, Connecticut

Prepared by:
MACTEC Engineering and Consulting, Inc
Portland, Maine
Project No. 3617027001/01

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# CONTINGENCY PLAN

## VINYL CHLORIDE REACTIVATION CRITERION EXCEEDANCE

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## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>CONTINGENCY PLAN VERSIONS</td>
<td>2</td>
</tr>
<tr>
<td>HISTORICAL PERSPECTIVE ON VINYL CHLORIDE</td>
<td>2</td>
</tr>
<tr>
<td>POTENTIAL EXPOSURE ROUTES</td>
<td>4</td>
</tr>
<tr>
<td>INDOOR AIR ACTION LEVELS</td>
<td>5</td>
</tr>
<tr>
<td>RESPONSE ACTIONS</td>
<td>5</td>
</tr>
<tr>
<td>REMEDIAL OPTIONS</td>
<td>8</td>
</tr>
<tr>
<td>CLOSING</td>
<td>8</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>9</td>
</tr>
<tr>
<td>ACRONYMS</td>
<td>10</td>
</tr>
</tbody>
</table>
INTRODUCTION

The Winthrop Landfill Groundwater Extraction and Treatment System (GWETS) was deactivated in November 2002 for the purpose of a Rebound Evaluation. This Rebound Evaluation is to occur for a two year period, ending in November 2004, as long as groundwater conditions do not warrant reactivating the GWETS.

Reactivation Criteria (RC) for groundwater constituents were established for Points of Compliance (POC) wells at the north and south ends of the landfill. Monitoring data collected to date through 8 rounds of post shut down groundwater sampling indicate limited rebound of landfill constituent concentrations throughout the landfill and contaminant flowpaths. With the one exception that is the subject of this Contingency Plan, no reactivation criteria exceedances have been measured at any of the POC wells. At the southern flowpath overburden POC well, MW-5A, vinyl chloride (VC) has been observed to be at or slightly above the RC (2 µg/L) in recent monthly monitoring, including concentrations of 2.2 µg/L (micrograms per liter, equivalent to parts per billion) in July, 2.3 µg/L in August 2003, and 2.7 and 2.8 µg/L in the September sample and duplicate, respectively.

The Rebound Evaluation Work Plan (MACTEC, February 2003a) specifies a process of confirmation sampling and possible GWETS reactivation should an RC be exceeded at a POC. The work plan also includes a provision for discussion with the regulatory Agencies and citizens of possible alternatives to reactivation if slight exceedances should be encountered, and provides:

- Historical background on the presence of vinyl chloride in groundwater and surface water at the site;
- An evaluation of the potential exposure pathways and risks to human health and the environment posed by a potential RC exceedance at MW-5A;
- Recommendations for additional data collection and evaluation to further evaluate potential risk;
- Recommendations for the establishment of “action levels” for implementation of a corrective action plan; and
- Response action alternatives, including possible GWETS reactivation or other remedial actions, if warranted.
CONTINGENCY PLAN

VINYL CHLORIDE REACTIVATION CRITERION EXCEEDANCE

WINTHROP LANDFILL REBOUND EVALUATION

CONTINGENCY PLAN VERSIONS

On behalf of United Technologies Corporation (UTC), MACTEC prepared a draft VC Reactivation Criterion Exceedance Contingency Plan in April, 2003 and submitted it to the Maine Department of Environmental Protection (MEDEP) and U.S. Environmental Protection Agency (USEPA). The MEDEP and USEPA (collectively identified as “Agencies”) provided comments in July, 2003. Comment responses were provided by UTC/MACTEC in July 2003. These three correspondences were also documented in the Second Quarter 2003 Post-Closure Monitoring Report (MACTEC, 2003b).

A second set of comments from the Agencies was received on August 27, 2003. Those comments called for the development of a final, “stand alone” Contingency Plan to be available to the public at the same time as an update to the citizens on the progress of the Rebound Evaluation.

This updated document has been developed in response to those specific comments and reflects recent discussions between UTC/MACTEC and the Agencies regarding the approach to responding to the VC RC exceedances at MW-5A. Although specifically designed to deal with VC in the southern flowpath, the technical approach described herein could be used for other constituents at this and other POC locations, should rebound in groundwater concentrations occur elsewhere. However, it should be noted that the reactivation criteria and other action end points would vary with different constituents, as the current work plan focuses on VC.

HISTORICAL PERSPECTIVE ON VINYL CHLORIDE

Monitoring data for VC at the Winthrop Landfill dates back to 1982. In general, VC has only been present at trace concentrations since the late 1980s. Since approximately 2000, VC has been detected at only a few wells with most concentrations below 2 µg/L.

During the period prior to GWETS activation, VC was most prevalent at the south end of the landfill, represented by MW-103, MW-101, and MW-5A. In 1985, concentrations were as high as 1,300 µg/L. However, these concentrations dropped quickly and steeply and have been primarily less than 10 µg/L since shortly after the installation of the landfill cover system in 1987. During GWETS operation, treated groundwater was recharged in the immediate vicinity of MW-5A causing significant dilution of the aquifer.
CONTINGENCY PLAN
VINYL CHLORIDE REACTIVATION CRITERION EXCEEDANCE
WINTHROP LANDFILL REBOUND EVALUATION

and resulting in non-detects for all monitored constituents. Since GWETS deactivation in November 2002 for the two-year rebound study, VC at MW-101, located under the cap just upgradient from MW-5A has been stable, varying between 4 and 7 µg/L. It should be noted that the RC does not apply to the area around MW-101; the RC applies to wells in the downgradient flow path area. At MW-5A, where the RC applies, VC has been gradually increasing from non-detect to slightly higher than the RC of 2 µg/L since GWETS deactivation.

Groundwater flows from beneath the landfill to the south, towards MW-5A, then past the MW-8 cluster, and finally past the MW-212 cluster. MW-212 is located just upgradient of the southern flowpath discharge point in Annabessacook Lake. The fate of VC in the southern flowpath can be evaluated along the transport pathway at downgradient monitoring wells MW-8 and MW-212. From a historical perspective, over the 20+ years of monitoring at the site, the maximum recorded concentration of VC at MW-8B (sand and gravel aquifer well) was 34 µg/L in 1988. VC has been non-detect at MW-8B since 1997. At MW-8A (bedrock well) VC reached 16 µg/L in 1990, but has been 2 µg/L or less since 1997. Further downgradient, at MW-212, VC has never been detected in bedrock, had a maximum of 13 µg/L in sand and gravel in 1988, but has been non-detect since 1996.

At the Annabessacook lake discharge zone, of the 98 samples collected since 1982, VC was detected in surface water or seep water only once in 1991 at 0.31 µg/L. Also, VC has never been detected in lake sediment in 101 samples collected since 1982.

The historical data puts into perspective that natural dilution and dispersion as well as the effect of the remediation systems have all played a role in minimizing VC and other constituent concentrations in the southern flowpath. Although VC has been detected in groundwater in the southern flowpath historically, the attenuation mechanisms have so far largely prevented its detection in surface water and sediment. Based on the record presented above, VC concentrations in the southern flowpath are not likely to rebound to historical highs.

The Contingency Plan is developed to preserve groundwater quality to the extent possible if limited rebound of VC should occur and to minimize the chance that the GWETS would be reactivated prematurely (e.g. before the two-year rebound period ends), which would reduce the full scientific and engineering benefit of the Rebound Evaluation.
CONTINGENCY PLAN
VINYL CHLORIDE REACTIVATION CRITERION EXCEEDANCE
WINTHROP LANDFILL REBOUND EVALUATION

POTENTIAL EXPOSURE ROUTES

The RC were established for VC and other constituents to provide a framework for decisions about GWETS reactivation. The exceedance of an RC does not necessarily mean that an exposure has occurred. In fact, the POCs were selected such that if an RC is exceeded, sufficient contingency planning can be made well in advance of a potential exposure or risk. Discussion of where and how exposures could occur is important in determining the best Contingency Plan.

The two main potential routes of exposure are through groundwater and soil vapor. Human exposure to groundwater would be primarily a drinking water issue, as the water table is well below the ground surface and excavation is prohibited by town ordinance. Direct contact with groundwater is unlikely as extraction, and thereby consumption, of groundwater is also prohibited by town ordinance. All residents in the vicinity of the southern flowpath are provided public water. The groundwater protection ordinance is an effective institutional control that prevents human exposure to contaminated groundwater.

Exposure through the vapor migration pathway is only complete if VC partitions from groundwater to soil gas and soil gas migrates to the ground surface where it may accumulate in a building or structure to concentrations that exceed target indoor air concentrations. The depth to water at MW-5A is greater than 25 feet below ground surface, and the nearest residence is a mobile home on foundation posts. The potential for soil gas migration into this structure is unlikely as there is ample opportunity for atmospheric air in the crawl space under the mobile home to interrupt any potential flowpath into the mobile home living space. If “banking” is used to insulate this space under the residence atmospheric air dilution will still occur, though to a lesser extent. Further downgradient along the lake shore where some residents have basement structures, migration into the building would be more plausible. However, VC has not been detected to date in groundwater upgradient of the residents at MW-8B.

In terms of ecological exposure, VC has never been detected above the Protective Concentration Limit in surface water in the southern flowpath discharge zone, and has never been detected in sediment.
CONTINGENCY PLAN
VINYL CHLORIDE REACTIVATION CRITERION EXCEEDANCE
WINTHROP LANDFILL REBOUND EVALUATION

INDOOR AIR ACTION LEVELS

The Rebound Evaluation Work Plan established RC for groundwater primarily to prevent degradation of water quality in the flowpaths due to GWETS deactivation. Action levels for vapor migration to indoor air from groundwater and soils were not established in the work plan, but are proposed in this Contingency Plan to be consistent with USEPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air from Soil and Groundwater (USEPA, 2002). The USEPA guidance establishes a target indoor air concentration of 0.0011 parts per million by volume (ppmv) for vinyl chloride, based upon a target incremental cancer risk level (national average is 1 in 2 to 1 in 3) of 1 in 100,000 ($10^{-5}$) and a Hazard Quotient of 1 (no toxic effect anticipated). Using attenuation factors for soil gas to indoor air, the guidance establishes target soil gas concentrations for shallow soil and deep soil of 0.0110 ppmv and 0.110 ppmv, respectively. The guidance also establishes a target groundwater concentration of 2.5 µg/L for preventing off-gassing through a 'standard' foundation.

Considering the configuration of the southern flowpath, the location of residences above the southern flowpath, and the existing groundwater and soil gas monitoring network, UTC, MACTEC, and the Agencies have discussed specific actions in response to possible exceedance of these action levels. These responses are designed to prevent migration of unacceptable VC concentrations beneath residences in the southern flowpath and discharge of VC to Annabessacook Lake. The details are presented below along with a map (Figure 1) depicting the configuration of the southern flowpath and the location of the monitoring network.

RESPONSE ACTIONS

The VC RC (2 µg/L) was first confirmed to be exceeded in groundwater in July, 2003; therefore this Contingency Plan is already in effect. The specific contingency monitoring and corrective action activities are presented below with comments about the current status as of September, 2003.

a. Exceedance of ½ the RC (1/2 of 2 µg/L, or 1 µg/L) at MW-5A:

With the detection of more than 1 µg/L of VC at MW-5A, initiate monthly monitoring of MW-5A for the contaminant of concern (i.e., vinyl chloride).
CONTINGENCY PLAN

VINYL CHLORIDE REACTIVATION CRITERION EXCEEDANCE
WINTHROP LANDFILL REBOUND EVALUATION

• Exceedance of ½ the RC has occurred and monthly monitoring has been implemented.

b. **Exceedance of the RC (2 µg/L) at MW-5A:**

With the detection of more than 2 µg/L of VC at MW-5A, continue monthly monitoring of MW-5A and begin bi-monthly (every second month) monitoring of MW-8B for the contaminant of concern.

• Exceedance of the RC has occurred, and bi-monthly monitoring of MW-8B was initiated in September, 2003.

c. **Exceedance of Target Groundwater Concentration for Protecting Indoor Air (2.5 µg/L) at MW-5A:**

With the detection of more than 2.5 µg/L of VC at MW-5A, initiate monthly monitoring of the existing gas probes GP-2B, C, D & E for each month that the groundwater concentration at MW-5A exceeds 2.5 µg/L. GP-2B, 2C, 2D, and 2E are located between MW-5A and the nearby mobile home downgradient from MW-5A. These probes are screened at 7, 11, 18, and 27 feet below ground surface, respectively, providing a vertical profile of the unsaturated zone near MW-5A. All air monitoring will be conducted with SUMMA® canisters and USEPA Method TO-15.

• To date, groundwater concentrations at MW-5A have exceeded 2.5 µg/L (2.7 and 2.8 µg/L were detected in sample and duplicate, respectively, in September, 2003); therefore, gas probe monitoring has been implemented with the initial sampling to be conducted in October, 2003.

d. **Exceedance of Target Soil Gas Concentrations for Indoor air at GP-2 (0.110 ppmv for GP-2C, D, and E and 0.0110 ppmv at GP-2B):**

With the detection of VC greater than the soil gas criteria, initiate monthly monitoring of the skirt/crawl space under the existing mobile home located between MW-5A and MW-8B.

• This has not yet been required.
CONTINGENCY PLAN
VINYL CHLORIDE REACTIVATION CRITERION EXCEEDANCE
WINTHROP LANDFILL REBOUND EVALUATION

e. Exceedance of the Target Indoor Air Concentration (0.0011 ppmv) in the crawl
space beneath the residence between MW-5A and MW-8:

With the detection of VC greater than 0.0011 ppmv in the crawl space, initiate
remedial action such as soil vapor extraction to cut off the potential exposure
route.

- This has not yet been required.

f. Exceedance of ½ the RC (1 ug/L) at MW-8B:

With the detection of VC greater than 1 ug/L at MW-8B, monitor groundwater
at MW-5A and MW-8B and 8C monthly.

- This is underway voluntarily, but to date VC has not been detected at
MW-8B during the Rebound Evaluation.

g. Confirmed exceedance of the RC (2 ug/L) at MW-8B:

Confirmation of an RC exceedance at MW-8B will be conducted in accordance
with the procedure detailed in the Rebound Evaluation Work Plan, consisting of
re-sampling within 5 days of receipt of laboratory data indicating an exceedance
and including a split sample to be sent to a second laboratory. With the
detection of VC greater than 2 ug/L, remedial action will be taken to prevent
migration of VC in excess of the RC beyond MW-8B and will be implemented
within 60 days of a confirmed exceedance of the RC. Remedial options are
discussed below.

- This has not yet been required.

h. Remedy operational:

Continue monthly monitoring of MW-5A & MW-8B. If the VC concentration
in MW-8B drops to below the RC, remedial activities may be discontinued,
unless the RC at MW-8B is again exceeded.

- This has not yet been required.

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7
CONTINGENCY PLAN
VINYL CHLORIDE REACTIVATION CRITERION EXCEEDANCE
WINTHROP LANDFILL REBOUND EVALUATION

REMEDIAL OPTIONS

If condition 7 above is triggered, the exact nature of the remedial action that would be installed to prevent migration of VC beyond MW-8B is under consideration at this time by UTC/MACTEC. Such considerations would also be discussed with the Agencies. Approvals would be required from the Agencies before remedial action was implemented.

A conceptual remedial design plan is in progress. Both in-situ and ex-situ remedial alternatives are possible; however, only off-the-shelf technology is being considered, as expeditious design and deployment is of utmost priority. One scenario may include the quick deployment of pump and treat at R-3-3 while more time is taken to develop alternative technologies. Such technologies may be important in the post-Rebound Evaluation phase where, for example, focused remediation may be required at a few different locations in the flowpaths if concentrations remain greater than ACLs.

CLOSING

Exceedance of the RC for VC at MW-5A is being allowed on a temporary basis only, under careful monitoring and regular communication with the Agencies. The effectiveness of this Contingency Plan will be reviewed by the Agencies no later than 6 months after the exceedance of the RC at the POC. Currently, that review would take place in December 2003 unless the VC concentration at MW-5A returns to below the RC. Ultimately, at the end of the Rebound Evaluation, a comprehensive remediation and closure strategy will be updated for the site which may include the continued operation of any remedial system that is installed and operated in the southern flowpath to address the VC RC exceedance.

Exploring an alternative to GWETS reactivation for the VC RC exceedance at MW-5A makes sense at this time in order to derive maximum benefit from the Rebound Evaluation without increasing risk to human health and the environment. The Contingency Plan provides specific response actions that will prevent migration of unacceptable contamination beneath residences and into Annabessacook Lake.
REFERENCES


ACRONYMS

GWETS  groundwater extraction and treatment system
MEDEP  Maine Department of Environmental Protection
μg/L   micrograms per liter
POC    point of compliance
ppmv   part per million by volume
RC     reactivation criteria or criterion
UTC    United Technologies Corporation
USEPA  U.S. Environmental Protection Agency
VC     vinyl chloride
CONTINGENCY PLAN
VINYL CHLORIDE REACTIVATION CRITERION EXCEEDANCE
WINTHROP LANDFILL REBOUND EVALUATION

FIGURE