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ALTERNATIVES ARRAY DOCUMENT
TREMONT CITY BARREL FILL SITE
CLARK COUNTY
GERMAN TOWNSHIP, OHIO

by

Haley & Aldrich, Inc.
Cleveland, Ohio

for

Responsible Environmental Solutions Alliance (RESA)*

File No. 28703-030
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*RESA is comprised of eight companies: Delphi Corporation; Franklin International, Inc.; General Motors Corporation; International Paper Company; The Procter & Gamble Company; PPG Industries, Inc.; Strebor/Roberts, and Worthington Cylinder Corporation

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LIST OF ACRONYMS AND ABBREVIATIONS

AAD	Alternatives Array Document
AMSL	Above Mean Sea Level
AOC	Administrative Order by Consent
ARARs	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
BDL	Below Detection Limits
BFOU	Barrel Fill Operable Unit (Tremont City Barrel Fill Site)
bgs	Below Ground Surface
BNA	Base/Neutral and Acid Extractable SVOCs
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CLP	Contract Laboratory Program
cm/sec	Centimeters per Second
COC	Constituents of Concern
COPC	Constituents of Potential Concern
COEC	Constituents of Ecological Concern
CPT	Cone Penetration Test
CSM	Conceptual Site Model
CSEM	Conceptual Site Exposure Model
CSF	Cancer Slope Factor
CVS	Calibration Verification Sample
CWM	Chemical Waste Management
CFR	Code of Federal Regulations
DAF	Dilution Attenuation Factor
Danis	Danis Industries, Inc.
DFR	Daily Field Report
DO	Dissolved Oxygen
DOH	Department of Health
DOT	Department of Transportation
DPT	Direct Push Technology
DSP/WPA	Data Summary Package/Work Plan Addendum
Eagon	Eagon & Associates
ECO-SSLs	Ecological Soil Screening Levels
ERA	Ecological Risk Assessment
FID	Flame Ionization Detector
FS	Feasibility Study
FSP	Field Sampling Plan
ft/day	Feet per Day

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

GRA	General Response Action
gpm	Gallons per Minute
Haley & Aldrich	Haley & Aldrich, Inc.
HASP	Health and Safety Plan
HEAST	Health Effects Assessment Summary Tables
HHE	Human Health Evaluation
HHRA	Human Health Risk Assessment
I.D.	Inner Diameter
ID	Identification
IRIS	Integrated Risk Information System
IWD	Industrial Waste Disposal, Inc.
IC	Institutional Control
K_p	Dermal permeability
K	Hydraulic Conductivity
KVA	Kilovolt
LNAPL	Light non-Aqueous Phase Liquid
LDR	Land Disposal Restriction
LTTD	Low Temperature Thermal Desorption
mg/L	Milligrams per Liter
ug/L	Micrograms per Liter
mg/kg	Milligrams per Kilogram
ug/kg	Micrograms per Kilogram
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MS	Matrix spike
MSD	Matrix spike duplicate
MRBVA	Mad River Buried Valley Aquifer
MW	Monitoring Well
MNA	Monitored Natural Attenuation
NA	Not Analyzed
NAPL	Non-Aqueous Phase Liquid
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
ND	Not Detected
NTU	Nephelometric Turbidity Unit
NPDES	National Pollution Discharge Elimination System
O.D.	Outer Diameter
ODNR	Ohio Department of Natural Resources
ODH	Ohio Department of Health
Ohio EPA	Ohio Environmental Protection Agency
ORP	Oxidation Reduction Potential

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

OVA	Organic Vapor Analyzer
OSHA	Occupational Safety and Health Administration
OAC	Ohio Administrative Code
ORC	Ohio Revised Code
O&M	Operations and Maintenance
PAHs	Polyaromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PID	Photoionization Detector
ppb	Parts per Billion
ppbv	Parts per Billion - volume
ppm	Parts per Million
PRG s	Preliminary Remediation Goals
PTI	Permit to Install
POTW	Publicly Owned Treatment Works
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QMP	Quality Management Plan
RAO	Remedial Action Objective
RBC	U.S. EPA Region III, Risk Based Concentration
RCRA	Resource Conservation and Recovery Act
RESA	Responsible Environmental Solutions Alliance
RfD	Reference Dose
RI	Remedial Investigation
RG	Remediation Goal
RD/RA	Remedial Design/Remedial Action
SAP	Sampling & Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SIS	Site Investigation Summary
Site	Tremont City Barrel Fill Site
SLERA	Screening-Level Ecological Risk Assessment
SOP	Standard Operating Procedures
SOW	Scope of Work
SSL	Soil Screening Level
SSP	Support Sampling Plan
SVOC	Semi-Volatile Organic Compound
TBC	To Be Considered
TSCA	Toxic Substance Control Act
TAL	Target Analyte List
TCL	Tremont City Landfill (Tremont City Landfill Site)
TCLP	Toxicity Characteristic Leaching Procedure
TN&A	T N & Associates, Inc.

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

TSDF	Treatment Storage and Disposal Facility
UCL	Upper Confidence Limit (of the mean)
USACE	U.S. Army Corps of Engineers
USCS	Unified Soil Classification System
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
UTL	Upper Tolerance Limit (population)
VAP	Voluntary Action Program
VOCs	Volatile Organic Compounds
WTF	Waste Transfer Facility (Tremont City Waste Transfer Facility Site)

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TREMONT CITY BARREL FILL SITE
ALTERNATIVES ARRAY DOCUMENT
AUGUST 2007

1. INTRODUCTION

This document comprises the Alternatives Array Document (AAD) for the Tremont City Barrel Fill Site (Barrel Fill Site) (formerly the Barrel Fill Operable Unit (BFOU) of the Tremont City Landfill (TCL)).

Performing Respondents entered into an Administrative Order on Consent (AOC) for Remedial Investigation/Feasibility Study (RI/FS) for the BFOU of the Tremont City Landfill. The RI/FS technical approach is consistent with USEPA Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final, 1988. The AOC became effective on 3 October 2002. The AOC included a Statement of Work (SOW) (Attachment D of the AOC) issued by the United States Environmental Protection Agency (USEPA). The SOW set forth requirements for conducting the RI/FS. This AAD fulfills the requirements of the SOW Task 5: Alternatives Array Document. This AAD was prepared in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, and associated regulations (40 CFR 300.430(e)(2) through (e)(8)).

1.1 Purpose and Organization

The purpose of this AAD is to develop and screen an appropriate range of remedial action alternatives that will be analyzed more fully in the subsequent detailed analysis phase of the FS (40 CFR 300.430(e)(9) – Detailed Analysis of Alternatives). The SOW Task 6 (FS) will be performed after USEPA approval of the AAD.

This AAD is organized in sections, as follows:

Section 1 – Introduction
Section 2 – Alternatives Array Document Requirements
Section 3 - Remedial Action Objectives
Section 4 – General Response Actions
Section 5 – Identification/Screening Applicable Technologies
Section 6 – Representative Technology Process Options
Section 7 – Assemble Remedial Alternatives
References

Detailed information is presented in tables, as referenced throughout this document. Appendices contain supplemental information, as referenced.

The AAD process is described in Section 2. This AAD is based on data that were summarized and characterized in the October 2006 Remedial Investigation Report for the Tremont City Landfill, Barrel Fill Operable Unit (RI Report). The RI Report was approved by USEPA on 1 November 2006. The remainder of Section 1 summarizes pertinent data from the RI Report.

1.2 Barrel Fill Site Background

The Barrel Fill Site is located at 3108 Snyder-Domer Road, Tremont City, German Township, Clark County, Ohio. The Barrel Fill Site is referenced as CERCLIS ID# OHD 980 612 188 and Spill Site ID# B5B1. It is situated approximately 1.5 miles west of Tremont

City and 3.5 miles northwest of Springfield. The Barrel Fill Site is located north of the Tremont City Landfill Site (TCL), and north and west of the Tremont City Waste Transfer Facility Site (WTF).

In 1976, Ohio EPA granted a permit for the specific purpose of disposal of liquid waste (containerized and uncontainerized or bulk) in the 8.5-acre barrel fill landfill (the "barrel fill"). The barrel fill began accepting waste material in late-1976 and operated until 1979 when barrel fill disposal operations ceased.

Wastes disposed in the barrel fill were placed into 50 waste cells that had been excavated into natural glacial till material. These cells were approximately 15 to 20 feet in depth. Drums were placed in layers in each of the cells. Pallets were also placed into some cells. After the drums were placed, uncontainerized liquid wastes were added to some of the cells. Cells were subsequently backfilled. Approximately 51,500 drums and 304,000 gallons of uncontainerized liquids/sludges were disposed in the barrel fill. Waste generally included glues, resins, paint sludge, paint scrap/waste, soap/shampoo/detergent waste, asbestos slurry, caustic waste, oils, polyol and other compounds.

In 1980, after all barrel fill disposal operations ceased, soil cover was placed over the barrel fill. Subsequent subsidence was repaired by filling with soil and placement of geotextile fabric. Additional clean fill from a local source was placed on the barrel fill. The resulting soil cover, currently in place, has a thickness that ranges from 10 feet to greater than 17 feet. In 1988, buried chromium waste that had been discovered during post-closure geophysical studies was excavated and disposed off Site; the excavation was backfilled.

As required by the AOC and SOW, a RI was completed at the Barrel Fill Site. The RI included two field efforts that were completed between September 2003 and June 2005. Findings were reported in the RI Report.

The RI Report included the following information:

- Introduction and Barrel Fill Site Description
- Evaluation of Historical Information and Data Gap Identification
- Contaminant Transport
- Remedial Investigation Field Efforts, Results, Interpretations and Conclusions
- Human Health Risk Assessment
- Screening Level Ecological Risk Assessment
- Uncertainty
- Conclusions
- References

The following is a summary of the Remedial Investigation activities (adapted from RI Report Executive Summary):

Reviewed Existing Information for Preparation of the Support Sampling Plan (SSP)

Planning for the RI included review of existing information and development of the SSP based on the review. The RI work scope included filling data gaps identified through this information review with the intent of characterizing current and future risk to human health and environment and providing the information necessary to complete a Feasibility Study.

Site Reconnaissance and Baseline Monitoring Well Survey

Site Reconnaissance and Baseline Monitoring Well Survey activities were conducted to evaluate site conditions at the inception of the RI. Activities conducted included a visual site inspection, baseline monitoring well assessment and ambient air survey.

- **Visual Site Inspection**

  The entire Barrel Fill Site was inspected visually. This inspection indicated the following:
  - The entire Barrel Fill Site was heavily vegetated and fenced.
  - No erosion was observed on the cover, although standing water was observed in the southwestern corner of the Barrel Fill Site.
  - The unnamed tributary appeared to be cutting into the eastern portion of the fenced Barrel Fill Site area.

- **Baseline Monitoring Well Assessment**

  Existing monitoring wells were inspected and evaluated to determine their condition and usefulness during the RI. This assessment indicated the following:
  - Based on this monitoring well assessment, it was determined that 15 of the existing monitoring wells were unusable and needed to be abandoned or replaced.
  - Unusable wells were abandoned and replaced with newly installed monitoring wells.

- **Ambient Air Survey**

  An ambient air survey was conducted using a Flame Ionization Detector (FID) to determine if the Barrel Fill Site was adversely impacting ambient air. The FID is a field instrument used to detect volatile organic compounds as a whole and is often times used as a screening tool to determine if these compounds are present in air. Depending on the data quality needs of a project, results from FID testing are verified by subsequent laboratory testing. This assessment indicated the following:
  - Concentrations of volatile organic compounds (including methane) in ambient air were lower in samples collected above the Barrel Fill Site than in samples collected from upwind of the site (which was downwind of the Tremont City

Landfill), indicating that releases from the Tremont City Landfill were impacting the Barrel Fill Site.

- Concentrations of soil vapor were modeled to predict potential impacts from barrel fill hazardous constituents on ambient air. Those modeling results indicated that hazardous substances in vapor form were below screening criteria; therefore the nature and extent of contamination in soil vapor and ambient air were adequately determined (see below).

Local Groundwater Use Survey

A local groundwater use survey was conducted to evaluate the use of groundwater for potable purposes in the Barrel Fill Site area. This assessment indicated the following:

- Eighty-six potable water wells are located within a one-mile radius of the Barrel Fill Site.
- Groundwater flow direction in the Deep Sand and Gravel beneath the Barrel Fill Site is generally to the northeast or north and accordingly it does not appear that any of the 86 identified wells are located directly downgradient of the Barrel Fill Site.
- The bedrock aquifer beneath the area is the primary source of groundwater, with more than 75% of the private potable water wells installed in this unit.

Waste Cell Characterization Activities

Waste cell characterization activities were completed to determine the depth and boundaries of waste placement at the Barrel Fill Site and to verify operational records.

- **Soil Gas Survey**

  A soil gas survey was conducted to aid in the location of waste cells and to determine if the barrel fill wastes had impacted soil gas at the Barrel Fill Site. This survey indicated the following:

  - Soil gas samples were collected from 50 locations above the barrel fill waste cells and from 10 background locations. All samples were field analyzed with a flame ionization detector and analyses of background samples were used to define background concentrations of VOCs in soil gas.
  - Samples from 18 locations above the waste cells were submitted to a laboratory for analysis.
  - The maximum concentration of each VOC detected (in the laboratory analyses) was modeled to ambient air and then compared to site-specific screening criteria. No compounds detected exceeded these criteria.

- **Test Pit Excavations**

  Excavations were completed in five waste cells (C-3, B-7, D-7, A-8 and A-11) to confirm waste cell locations (boundaries and depths) and to verify operational records. Results indicated the following:

  - The extent and boundaries of waste cells were found to be consistent with operational records; and

- Two successful deep excavations were completed (C-3 and D-7) confirming cell construction techniques. At both deep excavations the number of drum layers present was consistent with operational records.

Waste Characterization Activities

Waste samples were collected from 10 drums in each of five waste cells (50 total samples) to evaluate wastes disposed at the facility and to verify operational records of waste disposal activities. Results indicated the following:

- Using the waste characterization process described in the RI report, waste sources and types were identified for 92% of the drums sampled (46 of 50). That is, 92% of the wastes were confirmed as meeting the anticipated range of characteristics for wastes disposed in the target cells as identified in the cell reports compiled by the operator at the time the wastes were disposed in the cells. This evaluation indicated the operational records were accurate.
- Of the 50 drums sampled, 24 contained materials that are currently classified as hazardous waste under Resource Conservation and Recovery Act regulations.

Soil Investigation

Soil investigation activities were completed at the site to evaluate soil quality, define the extent and characteristics of the existing soil cover and to evaluate the clay wall previously installed to the east of the site. Activities conducted are summarized below.

- **Soil Quality Investigation**

  Ten surface and 10 subsurface soil samples were collected from background and Barrel Fill Site sampling locations (40 total samples) to determine if barrel fill activities had adversely impacted soil quality. Results indicated the following:
  - Analyses from both surface and subsurface soils indicated that no Barrel Fill Site soil samples collected exceeded the screening criteria (Region IX PRGs). One background soil sample (31.1 mg/kg in BK-5, 0-2'depth interval), however, did exceed the screening criterion for arsenic.

- **Soil Cover Investigation**

  A soil cover investigation was completed to evaluate the extent, thickness and characteristics of the existing barrel fill cover. Results indicated the following:
  - Cover thickness was determined to range from 10 to 17 feet.
  - Cover material permeabilities ranged from 1.89×10^{-5} cm/sec to 2.37×10^{-8} cm/sec.
  - Visual inspection indicated that the soil cover extended over the entire barrel fill.

- **Clay Wall Investigation**

  Site maintenance records indicate that the Barrel Fill Site owner/operator installed a clay groundwater flow cutoff wall east of the barrel fill in approximately 1985 to prevent shallow groundwater flow from the barrel fill to the surface water east of the

Barrel Fill Site. Test pits were excavated in the expected vicinity of the clay wall to determine the location of the clay wall and to evaluate the effects of the clay wall on local groundwater flow (in the Water Table unit). Results indicated the following:

- Because this clay wall was made of native clays from the area and was installed in native clays, visual location was not possible.
- Based on review of the Water Table groundwater surface (the unit into which the clay barrier wall was installed) in this area, the clay wall has no apparent impact on groundwater flow east of the barrel fill.

Groundwater Investigation

A groundwater investigation was completed to better evaluate the geologic and hydrogeologic characteristics of the site and to evaluate site groundwater quality. Results of this investigation are summarized below.

- **Site Geology**

Soil borings and monitoring wells were installed and logged to obtain information on site geology, as summarized below:

- Site geology consists of 100 to 160 feet of dense glacial till deposits interbedded with sand zones and underlain by 0 to 80 feet of glacial outwash, overlying a carbonate bedrock.
- The sand zones interbedded within the till are generally continuous and vary in thickness from 0.5 to greater than 10 feet.
- Identified hydrogeologic units include:
  - Water Table unit located in the shallow glacial till;
  - 1075 Intertill unit (approximate elevation);
  - 1050 Intertill unit (approximate elevation);
  - 1015 Intertill unit (approximate elevation); and
  - Deep Sand and Gravel unit (just above bedrock).

- **Site Hydrogeology**

Field and laboratory analyses were completed to evaluate the hydrogeologic characteristics of the Barrel Fill Site. Results are summarized below.

- Water Table:
  - Groundwater flow is eastward, toward the unnamed tributary, into which the Water Table unit discharges.
  - The hydraulic gradient in the Water Table is approximately 0.05 feet per foot.
  - Hydraulic conductivities range from 3.2×10^{-6} to 1.4×10^{-4} cm/sec with an average of 5.27×10^{-5} cm/sec.
  - Triaxial permeability tests (vertical hydraulic conductivity) of the till from depths of approximately 10 ft. bgs ranged from 3.71×10^{-8} to 1.04×10^{-8} cm/sec with an average of 2.04×10^{-8} cm/sec.
- 1075 Intertill:
  - Groundwater flow is eastward toward the unnamed tributary.
  - The hydraulic gradient is approximately 0.035 feet per foot.

- Hydraulic conductivities range from 1.2×10^{-2} to 1.8×10^{-6} cm/sec with an average of 2.52×10^{-4} cm/sec.

- 1050 Intertill:
  - Groundwater flow is eastward.
  - The hydraulic gradient is approximately 0.04 feet per foot.
  - Based on slug test results, hydraulic conductivities range from 1.3×10^{-3} to 7.9×10^{-6} cm/sec with an average of 1.3×10^{-4} cm/sec.

- 1015 Intertill:
  - Groundwater flow is to the northeast.
  - The hydraulic gradient is approximately 0.025 feet per foot.
  - Hydraulic conductivities range from 2.5×10^{-2} to 7.9×10^{-4} cm/sec with an average of 4.18×10^{-3} cm/sec.

- Deep Sand and Gravel:
  - Groundwater flow is divided and flow to the north on the eastern portion of the site and is flat and indiscernible on the western portion of the site.
  - A "low flow" boundary is present in the central portion of the site.

- Results of Aquifer Testing:
  - Three aquifer tests were completed with pumping wells installed in the 1050 Intertill.
  - Pumping stresses were observed in monitoring wells located up to 360 ft. from the pumped wells and were calculated to be approximately 500 ft. from the pumped wells, indicating that the 1050 Intertill is laterally continuous under the Barrel Fill Site.
  - Pumping stresses were created under nearly all the waste cells at the Barrel Fill Site indicating that hydraulic conductivities calculated from aquifer testing activities are representative of hydraulic conditions under the Barrel Fill Site.
  - Hydraulic conductivity of the 1050 Intertill calculated from the aquifer testing results indicated values that range from 2.65×10^{3} to 2.59×10^{-5} cm/sec and averaged 3.05×10^{-4}.cm/sec.

- **Groundwater Quality**

A groundwater quality investigation, consisting of three rounds of groundwater sampling and analysis, was completed to evaluate groundwater quality beneath the Barrel Fill Site. Results indicated the following:

- Though several constituents of potential concern (COPCs) were detected in groundwater, only one well, HMW-301 (a Water Table well), contained COPCs potentially attributable to the barrel fill at concentration in excess of screening criteria (MCLs or PRGs).
- The very low concentrations of volatile organic compounds, all below risk-based screening criteria, identified in all groundwater units result in uncertainty as to the source or sources of those compounds.

- **Groundwater Flow and Contaminant Transport**

  Information collected on groundwater quality, geology and hydrogeology was used to evaluate groundwater flow and contaminant transport at the Barrel Fill Site. This evaluation indicated the following:

  - The primary groundwater flow and contaminant transport route is laterally in the Water Table hydrogeologic unit, which discharges to the unnamed tributary.
  - Vertical groundwater flow between the Water Table and 1075 Intertill is controlled by the low permeability of the unweathered glacial till.
  - The groundwater velocity through the unweathered till beneath the barrel fill and above the 1075 Intertill has been estimated at 0.05 feet per year. This velocity represents a lower bound for contaminant transport of even highly concentrated waste material within this unweathered till unit, assuming there would be no attenuation. It is possible that velocities of highly concentrated materials would be higher through this unit if the wastes affect the molecular structure of the unweathered till, thereby increasing till permeability. To date, there has been no evidence of such an occurrence despite the fact that test pit water collected during the RI contained high concentrations of hazardous substances. In addition, laboratory permeability testing of the till beneath the barrel fill, which was in direct contact with the highly concentrated test pit water, did not indicate a decrease in permeability. This may be the result of the till containing relatively high proportions of silt and sand (described as elastic silts or lean clays).

Surface Water and Sediment Investigation

Surface water and sediment samples were collected from the seep located downstream of the barrel fill to evaluate potential impacts to the unnamed tributary from the barrel fill. Results indicated the following:

- No barrel fill surface water or sediment sample concentrations exceeded applicable screening criteria.

The RI Report concluded that no additional investigative activities were required to meet the RI objectives. The information gathered from the above RI activities was used to complete a Human Health Risk Assessment and Screening Level Ecological Risk Assessment, which were included in the RI Report. A summary of the findings of these risk assessments is provided in Section 1.4 of this document.

1.3 Areas and Volumes

For the AAD, an initial determination was made of the areas and volumes for media to which general response actions may be applied. To take interactions between media into account, response actions for areas or volumes of media will be refined after the range of alternatives has been assembled; those refinements will be made at the FS stage. The following information regarding areas and volumes of affected media are based on results of the RI activities that were detailed in the RI Report:

- The barrel fill covers 8.5 acres with a perimeter of approximately 2,600 linear feet.

- Fifty disposal cells large enough to contain wastes were built by completing excavations large enough to contain wastes into the natural low permeability glacial till. Drums were placed in the cells and bulk sludges were also placed in some cells. The cells were covered with native soil. Within the 50 waste cells, operational records indicate 51,500 drums were stacked, vertically or horizontally, with a calculated waste volume of 2.8 million gallons. Operational records indicated a total of some 304,000 gallons of bulk wastes were also placed into waste cells A2, A3, A5, B1, B2, B3, B4, B5, C2, C3, C9, D1, D2, D3, D4 and E2. In addition, accounts from a former employee that worked at the barrel fill indicated sludges from an oil reclamation process located at the WTF were placed in cells. The volume of bulk waste is about 10% to 12% of the volume of drum waste. The total disposal volume was calculated to be 3.1 million gallons.

- Additional soil fill was placed over the barrel fill later that resulted in a total thickness of cover/fill over the waste cells ranging from 10 to 17 feet. The reason for placement of this thickness of fill over the waste cells is not known. Using an average depth over 8 acres of the Barrel Fill Site, the additional fill volume was calculated to be 180,000 cubic yards.

- Depth to the Water Table is 4 to 10 feet below ground surface (bgs) at the Barrel Fill Site. Water Table groundwater flow is eastward, toward the unnamed tributary, into which the Water Table groundwater discharges. Groundwater discharge from Water Table flow from the barrel fill to the unnamed tributary is an estimated 0.4 gpm. The total flow of Water Table groundwater to the unnamed tributary from both sides of the tributary is estimated at approximately 0.8 gpm. The hydraulic gradient is approximately 0.05 feet per foot.

  Horizontal hydraulic conductivities range from 1.4×10^{-4} to 3.2×10^{-6} cm/sec with an average of 5.27×10^{-5} cm/sec. Vertical hydraulic conductivity of the till (measured at depths of approximately 10 feet bgs) range from 1.04×10^{-8} to 3.71×10^{-8} cm/sec with an average of 2.04×10^{-8} cm/sec.

- Depth to the 1075 Intertill unit ranges from 25 feet to 45 feet beneath the barrel fill. Lateral groundwater flux in the 1075 Intertill is 0.26 gpm. Groundwater flow is eastward toward the unnamed tributary. The hydraulic gradient is approximately 0.035 feet per foot. Horizontal hydraulic conductivities range from 1.2×10^{-2} to 1.8×10^{-6} cm/sec with an average of 2.52×10^{-4} cm/sec.

- The length of the unnamed surface water drainage along the north and east sides of the barrel fill to the observed seep measures approximately 1,100 linear feet.

1.4 Summary of Risk Assessments

A Human Health Risk Assessment (HHRA) and Screening Level Ecological Risk Assessment (SLERA) were conducted as documented in the RI Report. Each of the risk assessments is summarized in the following sections.

1.4.1 Summary/Conclusions of Human Health Risk Assessment

Two general future reasonably anticipated receptor populations were considered in the HHRA to be present at the Barrel Fill Site as currently used; 1) Maintenance Worker and 2) Trespasser. This is based on the exposure scenario of water within the waste cells migrating in/as Water Table groundwater to the unnamed tributary and Maintenance Workers and Trespassers being exposed to hazardous substances in the surface water by direct contact. Based on the risk estimates of the Maintenance Worker and Trespasser, the risk of harm associated with potential impacts to ambient air, surface soil and current surface water conditions is not an unacceptable risk.

Three general receptor populations and their respective exposures were considered in the HHRA, even though they do not currently occur and are not reasonably anticipated to occur in the future. These receptors included; 1) Barrel Fill Site Resident, 2) Routine Commercial or Industrial Worker and 3) Utility/Construction Worker. Based on the evaluation of these receptor populations and their respective exposure routes, an unacceptable future risk from exposure exists for the following:

- Potable use of groundwater from the Water Table Unit and 1075 Intertill;
- Inhalation of air in residential buildings constructed over the Barrel Fill Site;
- Dermal contact with groundwater (without personal protective equipment) during construction activities; and
- Dermal contact with surface water from future groundwater discharge.

The presence of a commercial building on the Barrel Fill Site under current soil gas conditions does not represent unacceptable risk from exposure to COPCs in indoor air. However, due to the level of risk estimated under current soil gas concentrations and the uncertainty with future soil gas concentrations, one can conclude that if this not reasonably anticipated exposure were to occur, that it would cause unacceptable risk.

Based on the risk estimates of the Utility/Construction Worker, the risk of harm associated with potential impacts to ambient air is not an unacceptable risk. The risk estimates do not indicate unacceptable risk for soil exposure during excavation work or to soil left on the surface after excavation. The risk estimates do not indicate unacceptable risk associated with potential exposure to current concentrations of COPCs in surface water.

Although not quantified, it is assumed that potential direct contact by construction workers with the potentially complex and concentrated mixture of materials in the waste cells during excavations will represent an unacceptable risk without appropriate engineered controls and personal protective equipment.

The summary of potential receptors and complete exposure routes for human health risk is provided as Table 1 (excerpt from RI Report). In summary the HHRA concluded:

1. There is no current unacceptable risk to human health at the Barrel Fill Site.

2. The only reasonably anticipated future risk is associated with the migration of hazardous substances in waste cells and waste cell water with Water Table groundwater to the unnamed tributary surface water for a maintenance worker or trespasser.
3. All other future exposure scenarios are not reasonably anticipated. Of these not reasonably anticipated exposure scenarios the following were identified as having unacceptable risk: potable use of Water Table and 1075 Intertill groundwater, migration of soil vapor to indoor air in a residential building located on the Barrel Fill Site, direct contact with waste cell water by a construction worker, direct contact with waste cell water that migrates to Water Table groundwater by a construction worker, and migration of hazardous substances in waste cells and waste cell water with Water Table groundwater to the unnamed tributary surface water for a utility/construction worker and an on-Barrel Fill Site resident.

1.4.2 Summary/Conclusions of Screening Level Ecological Risk Assessment

The Screening Level Ecological Risk Assessment concluded that there is no unacceptable risk of harm to environmental receptors under current conditions. However, COECs identified as having the potential to migrate with groundwater from the waste cells to surface water at the unnamed tributary in the future includes 45 volatile organic compounds, 27 SVOCs, 5 pesticides and 15 metals. The future modeled concentrations of many of the COECs are significantly higher than the screening criteria. As such, these constituents and their associated concentrations are expected to pose an unacceptable future ecological risk to receptors that may utilize the unnamed tributary.

Based on the magnitude of these exceedances, additional evaluation and ecological risk characterization was not required to establish a probable ecological risk under the modeled conditions. The magnitude of exceedances are enough to conclude that future discharge of groundwater to surface water will result in unacceptable risk to ecological receptors exposed to the surface water.

The Conceptual Site Model for ecological risk is provided as Table 2 (excerpt from RI Report).

1.5 Interim Remedial Measures

The following interim remedial measures, as described in the RI Report, have been implemented at the Barrel Fill Site:

- In 1980, a soil cover was placed over the Barrel Fill Site after all disposal operations had ceased.

- Subsidence of the soil cover had been repaired by placement of additional fill soil. Subsequently, geotextile fabric was placed to further stabilize areas where depressions and subsidence had occurred. Additional clean fill from a local source was placed on the barrel fill. The resulting soil cover ranges from 10-feet to greater than 17-feet thick.

- In 1988, buried chromium waste was removed and disposed of off-site; the resulting excavation was backfilled.

- Records indicate that a clay wall was constructed in 1985 along the eastern side of the barrel fill (at a location described specifically in the RI Report) between the barrel fill and the unnamed tributary to mitigate seepage of groundwater to surface water. The wall was constructed of compacted clay to a depth of approximately 10 feet below ground surface and was 10 to 15 feet wide. The wall was designed to intersect groundwater in a shallow sand layer that was thought to be the source of the seep. It does not appear that the clay wall was tied into any geologic unit that would preclude contaminants from moving beneath or around the wall, and hydrogeologic data indicate that the wall has little to no effect on groundwater flow.

- The barrel fill is surrounded by a security fence (chain link with three-strand barbed wire) with a locked gate entrance. The installation date of the fence is not known. The condition of the fence is currently inspected on a monthly basis and to date has not required maintenance.

1.6 Data Adequacy Evaluation

The RI data (summarized above) are evaluated in this section to determine if they are sufficient to develop remedial alternatives.

Waste Characterization: The waste characterization activities conducted during the RI confirmed waste records including cell locations, construction, waste types and cell locations for individual wastes. These data were sufficient to identify hazardous substances present and the risk they pose to human health and the environment. In addition, these data are sufficient to estimate waste volumes, waste types, treatment options and required construction necessary to develop remedial alternatives for Feasibility Study purposes.

Soil: Soil data collected during the RI were sufficient to quantify the risk associated with this environmental media. In addition, soil investigations provided information on cover thickness and permeability to sufficiently evaluate remedial alternatives associated with site soils.

Groundwater: Groundwater data collected during the RI were sufficient to quantify the risk associated with this environmental media. Hydrogeologic information collected during the RI provides estimates of groundwater flow rates necessary for the evaluation of remedial alternatives associated with groundwater. In addition, the approximate configuration of hydrogeologic units and their relationship with surface waters allows for remedial alternative development and evaluation. The characterization of subsurface conditions allows for predictions of future contamination patterns and development of remedial alternatives associated with this environmental media. Groundwater chemistry data are sufficient to characterize groundwater contaminant distribution and to allow for appropriate remediation alternative development. The groundwater chemistry also allows for an evaluation of treatment options associated with this environmental media.

Risk Assessments: The risk assessments conducted as part of the RI provided information on environmental media that require evaluation of remedial alternatives. Specifically, the risk assessment indicated that with the exception of the future discharge of shallow contaminated groundwater to the unnamed tributary, environmental media does not pose a current or future unacceptable risk to human health or the environment for reasonably anticipated land uses. The risk assessment identified contaminants of concern (COCs) in shallow groundwater that will pose an unacceptable future risk and provides the basis for chemical-specific contaminant levels for these COCs discussed later in this document.

In summary, the data collected as part of the RI are sufficient to develop remedial response objectives with respect to the contaminants of concern, the areas and volumes of contaminated media, and existing and potential exposure routes and receptors of concern can be identified for the FS.

2. ALTERNATIVES ARRAY DOCUMENT REQUIREMENTS

2.1 Purpose and Terminology

The purpose of this AAD is to develop and screen an appropriate range of remedial alternatives for the Barrel Fill Site.

In this AAD, the following terms are used:

Remedial Technology or Technology Type – refers to general categories of technologies, such as capping, dewatering, chemical treatment, thermal destruction, etc.

Process Option or Technology Process Option - refers to specific processes within each technology type. For example, the chemical treatment technology type may include precipitation, ion exchange, oxidation/reduction, etc.

Remedial Alternative – refers to an assembly or combination of technology types for each medium of concern to form a remedial alternative for the Barrel Fill Site as a whole. Representative process options are selected from technology types to build this assembly.

Additional terms are defined in subsequent sections of this document.

2.2 AAD Goals, Objectives and Approach

The purpose of remedial alternative development and screening is to develop an appropriate range of remedial action alternatives that will be analyzed more fully in the detailed analysis phase of the Feasibility Study. This AAD develops and screens a range of remedial options required by the NCP (40 CFR 300.430(a)(1)). Appropriate options that eliminate, reduce, or control risks to human health and the environment may involve, depending on site-specific conditions, prevention of exposure by means of engineering or institutional controls, reduction of constituent concentrations to acceptable health-based concentrations, elimination or destruction of hazardous constituents, or some combination of these. Development of the remedial alternatives has been integrated with the characterization activities of the RI. The AAD is a development and screening phase, and serves as the link between the RI and the more-detailed analysis of alternatives in the FS.

The subsequent FS will analyze in detail the remedial alternatives selected for further consideration by the AAD against the statutory mandates of CERCLA, that is the overall protection, compliance, short-term and long-term effectiveness, reduction of toxicity/mobility/volume, implementability, and cost, with consideration of State and community acceptance as required in 40 CFR 300.430(e)(9) – Detailed Analysis of Alternatives.

USEPA Guidance (USEPA, 1988) describes the AAD approach for development and screening of alternatives with the following six steps:

1. Develop remedial action objectives (RAOs) that specify the constituents and media of concern, exposure pathways, and preliminary remediation goals that permit a range of remedial alternatives to be developed (40 CFR 300.430(e)(2)(i)).

2. Develop general response actions (GRAs) for each medium of concern that define the actions that may be taken to satisfy the RAOs. Potential actions could include administrative controls, engineering controls, containment, treatment, excavation/removal, pumping, combinations of these actions, or other actions.

3. Identify volumes or areas of media of concern to which GRAs might be applied. This step also takes into account the requirements for protectiveness (from the RAOs), and the chemical and physical characteristics of the Barrel Fill Site (from the RI).

4. Identify and screen the technologies applicable to each GRA to eliminate those that cannot be implemented technically at the site. At this step, the GRAs are defined to specify remedial technology types (e.g., treatment GRAs may be further defined to include physical, chemical or biological technology types).

5. Identify and evaluate technology process options to select a representative process for each technology type that is retained. Although specific processes are selected at this step for alternative development and evaluation, these processes represent a broader range of process options within a general technology type.

6. Assemble the selected representative technologies into remedial alternatives (40 CFR 300.430(e)(2)(iii)) that represent a range of remedial action combinations to achieve protection of human health and the environment (40 CFR 300.430(a)(1)(iii)(C)).

The SOW specifically requires an AAD approach that includes the following:

- Develop remedial and, where appropriate, removal action objectives that take into consideration the following: prevention or abatement of exposure; prevention or abatement of drinking water contamination; stabilization or elimination of hazardous substances that may pose a threat of a release; treatment or elimination of hazardous substances in soil or sediments that may migrate; elimination of threat of fire or explosion; acceptable chemical-specific contaminant levels for all exposure routes; and mitigation or abatement of other factors that may pose threats to public health, welfare or the environment.

- Define the broad scope and objectives (short-term and long-term) of the remedial action, and address the protectiveness of the remedial action.

- Determine the general schedule for remedial action.

- Identify all applicable, relevant and appropriate requirements (ARARs), and other Federal or State advisories, criteria, or guidance to be considered (TBC) that applies to the remedial action. In addition, this section of the document will describe how the ARARs will be met (40 CFR 300.430(e)(9)(iii)(B) - Detailed Analysis of Alternatives - Compliance with ARARs).

- Identify, preliminarily screen and evaluate remedial action alternatives.

- Use presumptive remedy guidance, if appropriate and applicable, to provide an immediate focus to the identification and analysis of alternatives.

- Select a limited number of alternatives for detailed analysis. Describe each alternative with sufficient detail so that the entire process may be understood. List technologies that may apply to the media or source of contamination.

3. REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) provide a general description of what the remedial action will accomplish. The RAOs are media-specific goals for protecting human health and the environment. While RAOs should be specific, they should not be so specific that they unduly limit the range of alternatives that can be developed. This section describes development of remedial action objectives for appropriate media.

The process for developing RAOs includes identification of the following:

- Constituents of concern (COCs) and constituents of ecological concern (COECs);
- Media of concern, including critical natural resources such as drinking water;
- Potential exposure pathways and receptors of concern; and
- Remediation goals that establish acceptable exposure levels that are protective of human health and the environment.

RAOs for protecting human health and environmental receptors generally address constituents of concern and their exposure route(s) because protectiveness may be achieved by reducing or eliminating exposure, as well as by reducing constituent concentrations.

The RAO development process is carried out in the following sections. Site-specific data regarding constituents of concern, media of concern, and exposure pathways and receptors of concern are based on findings of the RI Report, including the risk assessments.

3.1 Media of Concern

Media of concern were identified and evaluated by the Human Health Risk Assessment and Screening level Ecological Risk Assessment. As discussed below, Water Table and 1075 Intertill groundwater, soil vapor, and the materials in the waste cells (hereafter referred to as "waste") are the media of concern. As discussed in the RI Report, the Water Table groundwater includes water that is currently located within waste cells (called test pit water in the RI report).

3.1.1 Media of Concern from Human Health Risk Assessment

Based on the Human Health Risk Assessment, only the following is a medium of concern for reasonably anticipated future exposure scenarios:

- Water Table groundwater

The following are media of concern for not reasonably expected human health exposures scenarios:

- 1075 Intertill groundwater
- Soil vapor
- Waste

These media are considered in this AAD because they are primary media of concern; that is, they are currently contaminated to a degree that poses an unacceptable future risk and/or may act as a future source of contamination to other (secondary) media. Secondary media of concern are those media that are not currently contaminated, or contaminated to a degree that poses an unacceptable risk, but have the potential for future contamination from primary media of concern. The primary media of concern are addressed throughout the remainder of the AAD/FS process. By addressing the primary media of concern through appropriate remedial responses developed for Barrel Fill Site-specific conditions, including hydrogeology, the secondary media of concern are consequently addressed.

Monitoring and contingency planning for potential impacts to secondary media of concern are required to ensure that remedial efforts on primary media of concern are successful at preventing unacceptable risk from secondary media of concern. Secondary media of concern include:

- Surface Water and Sediment
- Deeper groundwater units
- Indoor Air (if applicable)

If monitoring suggests potential impacts to secondary media of concern, the contingency plan will provide a mechanism to address the issue before significant impacts occur.

3.1.2 Media of Concern from Screening Level Ecological Risk Assessment

The Screening Level Ecological Risk Assessment concluded that no media of concern pose an unacceptable current ecological risk. Water Table groundwater discharging to surface water may pose an unacceptable future risk to receptors that may utilize the unnamed tributary.

3.2 Exposure Pathways and Receptors

Potential exposure pathways and receptors were identified and evaluated by the Human Health Risk Assessment and Screening Level Ecological Risk Assessment.

3.2.1 Exposure Pathways and Receptors from Human Health Risk Assessment

The Human Health Risk Assessment identified as potential future receptors maintenance workers at the Barrel Fill Site and trespassers to the unnamed tributary located along the northern portion and eastern portion of the Barrel Fill Site. This is a future exposure based on migration of hazardous substances in Water Table groundwater (primary medium of concern) to surface water (a secondary medium of concern). The HHRA found that maintenance workers may be exposed in the future, to hazardous substances that will have migrated from Water Table groundwater to surface water and sediments, during routine grass mowing or during removal of debris from the drainage ditch. For trespassers, they may be exposed while playing in the stream, etc. Exposure routes included incidental ingestion and dermal contact with sediment, and incidental ingestion and dermal contact with surface water.

As discussed in the RI Report, three additional not reasonably anticipated receptors were identified for unrestricted future use and included a Barrel Fill Site resident, routine commercial or industrial worker and utility/construction worker. The reason why these receptors are not reasonably anticipated is that current land use is not expected to significantly change. This is based on discussions with local officials indicating the reasonably expected land use is maintenance of former landfilling operations and adjacent agricultural use. The HHRA found that these receptors may be exposed to hazardous substances in waste cells (primary medium of concern), shallow Water Table and 1075 Intertill groundwater (primary media of concern) and from exposure to contaminants that will have migrated from soil vapor (primary medium of concern) to indoor air (secondary medium of concern).

3.2.2 Exposure Pathways and Receptors from Screening Level Ecological Risk Assessment

The Screening Level Ecological Risk Assessment identified unacceptable risk associated with aquatic organisms exposed to future groundwater discharge along the unnamed tributary located north and east of the Barrel Fill Site.

3.3 Constituents of Concern

Constituents of concern were identified by the Human Health Risk Assessment and the Screening Level Ecological Risk Assessment.

3.3.1 COCs from Human Health Risk Assessment

The human health risk assessment identified the following COCs as contributing to future unacceptable risk to human health from Water Table groundwater discharge to surface water:

- 1,4-Dichlorobenzene
- Benzene
- Ethylbenzene
- Methylene chloride
- Tetrachloroethene
- Toluene
- Trichloroethene
- Vinyl chloride
- bis(2-ethylhexyl)phthalate
- Naphthalene
- Cadmium

These COCs are the primary contributors to a Hazard Index greater than 1.0 and/or a cumulative Excess Lifetime Cancer Risk greater than 10^{-5} for this future exposure scenario.

The following COCs were identified as causing an unacceptable risk to human health for a not reasonably anticipated exposure caused by potable groundwater use

(including the Water Table and 1075 Intertill groundwater), direct contact to test pit water, and volatilization to indoor air:

VOCs	SVOCs	Inorganics
1,1,1-Trichloroethane	2-Methylnaphthalene	Aluminum
1,1-Dichloroethane	2-Methylphenol	Antimony
1,1-Dichloroethene	4-Methylphenol	Arsenic
1,2,4-Trichlorobenzene	Benzaldehyde	Barium
1,2-Dichlorobenzene	Biphenyl	Cadmium
1,3-Dichlorobenzene	bis(2-ethylhexyl)phthalate	Chromium
1,4-Dichlorobenzene	Butyl benzylphthalate	Cobalt
1,2-Dichloroethane	Caprolactam	Iron
4-Methyl-2-pentanone	Naphthalene	Manganese
Benzene	N-Nitrosodiphenylamine	Nickel
Carbon disulfide	Pentachlorophenol	Thallium
Chloroethane	Phenol	Vanadium
Chloroform		Zinc
Trichloromethane		
Chloromethane		
cis-1,2-Dichloroethene		
Ethylbenzene		
2-Butanone		
Acetone		
CFC-12		
Isopropylbenzene		
Methyl cyclohexane		
Methylene chloride		
n-Hexane		
Tetrachloroethene		
Toluene		
trans-1,2-Dichloroethene		
Trichloroethene		
CFC-11		
Vinyl chloride		
Xylene (total)		

Direct contact to hazardous substances in the waste was not quantified as part of the Human Health Risk Assessment; however, the exposure would be similar to that of test pit water because some waste cells received uncontainerized wastes that would be reflected in test pit water analytical results.

3.3.2 COECs from Ecological Risk Assessment

The Screening Level Ecological Risk Assessment identified the following COECs as contributing to future unacceptable risk from groundwater discharge to surface water:

VOCs	SVOCs	Inorganics
1,1-Dichloroethane	2-Methylnaphthalene	Cobalt
1,1-Dichloroethene	2-Methylphenol	Copper
1,2,4-Trichlorobenzene	4-Chloro-3-methylphenol	Lead
1,2-Dichlorobenzene	4-Methylphenol	Mercury
1,3-Dichlorobenzene	Biphenyl	Nickel
1,4-Dichlorobenzene	bis(2-ethylhexyl)phthalate	Selenium
2-Butanone	Butyl benzylphthalate	Silver
2-Hexanone	Diethyl phthalate	Zinc
4-Methyl-2-pentanone	Di-n-butylphthalate	
Acetone	Naphthalene	
Benzene	Pentachlorophenol	
Carbon disulfide	Phenol	
Chloroform	Dieldrin	
(Trichloromethane)	Heptachlor	
Ethylbenzene	Methoxychlor	
Isopropylbenzene		
Methylene chloride		
Tetrachloroethene		
Toluene		
Trichloroethene		
Xylene (total)		

These COECs had modeled surface water concentrations greater than surface water quality criteria for this future exposure scenario.

3.4 Applicable or Relevant and Appropriate Requirements

Applicable or Relevant and Appropriate Requirements (ARARs), and to-be-considered (TBC) criteria are defined as follows:

Applicable Requirements – Cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State environmental or facility siting law that specifically address a hazardous substance, pollutant, constituent, remedial action, location or other circumstances at a CERCLA site (EPA/540/G-89/006).

Relevant and Appropriate Requirements – Cleanup standards that address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site (EPA/540/G-89/006).

To-Be-Considered Criteria – Non-promulgated advisories or guidance documents issued by Federal or State government that are not legally binding. Such criteria may be useful where no specific ARARs exist, for example in determining the appropriate level of cleanup for protection of human health and the environment.

Because of the iterative nature of the CERCLA RI/FS process, ARAR identification continues throughout the RI/FS as a better understanding is gained of site conditions, constituents of concern, media of concern, and remedial action alternatives.

CERCLA Section 121(d)(2)(A) specifies that on-site remedial actions must meet (unless waived under certain circumstances) Federal environmental ARARs or more-stringent State environmental ARARs upon completion of the remedial action. To Be Considered (TBC) guidance is not legally binding, but may be useful in developing CERCLA remedies.

The summary of potential ARARs and TBC guidance is included on Table 5. These ARARs and TBC guidance are divided into three categories: chemical-specific, location-specific and action-specific, as described below.

3.4.1 Potential Chemical-Specific ARARs

Chemical-specific requirements set health-based or risk-based concentration limits or ranges for specific constituents in various media. These potential ARARs provide cleanup levels as a basis for calculating such levels for COCs. Chemical-specific ARARs may also be used to determine an acceptable level for discharge, to determine treatment and disposal requirements, and to assess the effectiveness of a remedial alternative.

A chemical-specific ARAR for the Barrel Fill Site is the Resource Recovery and Conservation Act (RCRA) related to hazardous waste disposal including the potential for Land Disposal Restrictions (LDRs) if wastes contained within the Barrel Fill Site are removed and disposed at an off-site hazardous waste disposal facility.

3.4.2 Potential Location-Specific ARARs

Location-specific ARARs restrict the types of remedial activities that could be performed based on certain site characteristics or the site location. Remedial alternatives may be restricted or precluded based on hazardous-waste siting laws, or proximity to wetlands, floodplains, or local historical buildings.

3.4.3 Potential Action-Specific ARARs

Action-specific ARARs control or restrict the design, implementation or performance of remedial actions. These ARARs may specify performance levels, actions, or technologies and specific discharge concentrations. Action-specific ARARs provide a basis for assessing the feasibility and effectiveness of remedial alternatives. An action-specific ARAR for the Barrel Fill Site is the Comprehensive Environmental Response and Compensation Liability Act (CERCLA) under which the Barrel Fill Site is currently regulated. CERCLA regulations provide rules under which actions including investigation, remedial design and remedial action will be undertaken at the Barrel Fill Site. In addition, RCRA would also apply if hazardous wastes are removed and disposed at an off-site disposal facility.

3.5 Barrel Fill Site-Specific Remedial Action Objectives

The Barrel Fill Site-specific remedial action objectives are based on the COCs, media of concern, exposure pathways and receptors, and allowable risk levels. The RI and risk assessments identified one medium that requires evaluation for remedial action under a reasonably anticipated land use:

- Groundwater in the Water Table hydrogeologic unit

Other media require evaluation under a not reasonably anticipated land use and include:

- 1075 Intertill groundwater
- Soil Vapor directly above the Barrel Fill Site
- Waste located within the waste cells

Chemical-specific contaminant levels have been developed for the COC related to reasonably anticipated human health exposures from the future discharge of contaminated Water Table groundwater to the surface water in the unnamed tributary east of the barrel fill and are provided in Table 3. The chemical-specific contaminant levels were developed based on a single-chemical target risk for total excess lifetime cancer risk of 1×10^{-6} or a target organ hazard index greater than 0.1. The chemical-specific contaminant levels were developed for a trespassers and maintenance workers potentially exposed via incidental ingestion and dermal contact of contaminated groundwater that discharges to surface water.

Because the ecological risk assessment was undertaken at the screening level, chemical specific contaminant levels for COECs are not able to be determined. Instead, chemical specific contaminant levels are derived from the Ohio Water Quality Standards for surface waters as provided in Table 4.

The RAOs for Water Table and 1075 Intertill groundwater at the Barrel Fill Site are as follows:

- Prevent human exposure to groundwater COCs that exceed Maximum Contaminant Levels (MCLs) or, for COCs that do not have MCLs, that contribute more than a total excess lifetime cancer risk greater than 1×10^{-6} or a target organ hazard index greater than 0.1 for reasonably anticipated exposures (groundwater discharge to surface water). PRGs that meet this RAO are provided in Table 3.
- Prevent discharge of contaminated groundwater to surface water in excess of ecological criteria.

The RAOs for soil vapor and wastes at the Barrel Fill Site are as follows:

- Prevent human exposures to hazardous substances in indoor air to a resident living on the Barrel Fill Site.
- Prevent direct contact human exposures to hazardous substances in the wastes.

Note, because the exposures to soil vapor and wastes are not reasonably anticipated, chemical specific contaminant levels were not developed.

- Stabilize or eliminate hazardous substances in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release.

Consistent with the SOW, the above remedial action objectives were developed with both short- and long-term considerations including risk to human health and the environment, prevention of exposure, potential contamination of drinking water supplies and ecosystems, and stabilization or elimination of Barrel Fill Site-related hazardous substances.

4. GENERAL RESPONSE ACTIONS

General response actions (GRAs) are media-specific response actions, such as institutional controls, engineering controls, treatment or containment, which satisfy the remedial action objectives. This section generically introduces the GRAs that are potentially applicable to Water Table groundwater, 1075 Intertill groundwater, indoor air and wastes that are the media of concern at the Barrel Fill Site. Site-specific screening of these GRAs will proceed in Section 5.

4.1 No Action

A no-action alternative has no components of remedial action. Consideration of the No Action alternative as the baseline remediation scenario is required for all CERCLA remedial actions.

4.2 Access Restrictions

This action would include installing a site security fence with locked gate and warning signs.

4.3 Institutional Controls

Institutional controls (ICs) are non-engineered instruments such as administrative and/or legal controls that would minimize the potential for human exposure by limiting land or resource use. ICs would generally be used in conjunction with engineering measures such as treatment or containment. USEPA recommends that ICs be "layered" (i.e. use multiple ICs simultaneously) or implemented in a series to provide overlapping assurances of protection. Some examples of ICs would include easements, covenants, well drilling prohibitions, zoning restrictions, and special requirements for building permits.

There are four categories of ICs:

- Governmental Controls
- Proprietary Controls
- Enforcement and Permit Tools
- Informational Devices

4.3.1 Governmental Controls

Governmental controls, implemented by State or local government, include zoning restrictions, ordinances, statutes, building permits, or other provisions that restrict land use or resource use at the site. Groundwater use restrictions and bans on fishing or swimming are common examples of governmental controls.

It is noted that a governmental control is already in place for the Barrel Fill Site and surrounding property. Ohio Administrative Code (OAC 3745-27-13) prohibits any excavation, building, drilling, mining, etc. on the barrel fill or within 300 feet of the barrel fill without authorization from the Ohio EPA Director while waste remains in place.

4.3.2 Proprietary Controls

Proprietary controls are based on real-property law and generally create legal property interests. These controls may include easements and covenants controlling land use and access, and involve legal instruments placed in the chain-of-title. These controls are generally more reliable in the long-term than other types of ICs because they transfer with ownership of the land.

Use of the Barrel Fill Site and surrounding land and resources can be restricted by environmental covenants. Restrictive environmental covenants may be developed and instituted under the Ohio Environmental Covenants Act (ORC 5301.80 to 5301.92) and with U.S. EPA and/or Ohio EPA approval.

4.3.3 Enforcement and Permit Tools

Under CERCLA, Unilateral Administrative Orders and Administrative Orders by Consent can be issued or negotiated to compel the landowner to limit certain activities at the site. Consent Decrees can also be negotiated. However, most enforcement agreements are only binding on the signatories and the property restrictions are not necessarily transferred with ownership. In addition, permits may be required particularly for treatment that may be required as part of a remedial action (for example, NPDES permits).

4.3.4 Informational Devices

Informational tools provide information or notification that residual or capped contamination may remain on a site. Common examples include state registries of contaminated properties, deed notices and advisories. Informational devices are most likely used as a secondary "layer" to bolster the reliability of other ICs.

4.4 Monitoring

Remedial action is defined as inclusive of any monitoring reasonably required to ensure that such actions protect the public health, welfare and the environment. It is noted that monitoring alone may not constitute a GRA, but is often a component of an overall remedy. In addition, the NCP may require post-response reviews at 5-year intervals including review of monitoring data if hazardous substances remain in place after completion of any remedial actions. The monitoring GRA may include monitoring only, or monitored natural attenuation.

4.4.1 Monitoring

The framework for scientific management decision points in a monitoring program includes the following steps:

- Identify monitoring objectives based on site activity
- Develop monitoring plan hypotheses based on conceptual models
- Formulate monitoring decision rules

- Design the monitoring plan with data needs, and collection/analytical methods
- Conduct monitoring analyses with data evaluation
- Establish the management decision such as conclude, continue or revise monitoring. This step also often includes contingency planning for monitoring results that require action beyond monitoring. An example is monitoring results that trigger evaluation of remedy effectiveness and modification if appropriate.

4.4.2 Monitored Natural Attenuation

Monitored natural attenuation (MNA) considers natural subsurface processes of biodegradation, sorption, dilution, dispersion, volatilization, and abiotic chemical reactions to demonstrate the naturally occurring reduction of COC concentrations that migrate from a source area. At a site where MNA is an appropriate alternative, COC concentrations released from the source area attenuate to acceptable concentrations prior to reaching receptors. Biodegradation and chemical transformation destroy and reduce contaminant mass. MNA is a passive response action that relies on monitoring naturally occurring processes, sometimes with limited enhancement to the processes to reduce COC concentrations to acceptable concentrations. MNA combines site characterization, predictive modeling, risk assessment, and long-term monitoring to determine whether natural processes are capable of achieving the desired results.

4.5 Groundwater Collection/Treatment/Discharge

There are a number of technologies for each of the groundwater collection, treatment and discharge components of this GRA. Collection technologies may include extraction wells and permeable interceptor trenches. For treatment, in-situ technologies may include reactive barrier walls; and ex-situ on-site physical/chemical technologies and biological technologies; and off-site treatment by local POTW and commercial TSD facilities. In-situ treatment has the advantage of lower operation and maintenance cost. Ex-situ treatment has several advantages over in-situ treatment; ex-situ treatment conditions can be monitored and controlled; ex-situ treatment times are generally shorter; ex-situ treatment is more uniform because of mixing; and multiple treatment processes can be assembled into a treatment train to address a variety of contaminants. Discharge of water that has been treated on-site could be either through a NPDES Permit or to a local POTW. Groundwater collection is often undertaken for hydraulic containment of hazardous substances in groundwater, which is discussed below under the containment GRA.

4.6 Containment

Containment technologies may include contact barriers, engineered low permeability caps and vertical barriers. Groundwater containment technologies also include hydraulic controls as described below. An integral part of hydraulic containment is groundwater collection/treatment/discharge. Accordingly, any part of the AAD text that references groundwater containment includes groundwater collection/treatment/discharge as part of the remedy discussion.

4.6.1 Contact Barrier

Contact barriers may include asphalt, concrete or vegetated soil. Their purpose is to prevent contact by receptors with a medium of concern. Maintenance is generally required for long-term effectiveness of a contact barrier because it is exposed to the elements. It is noted that 10 to 17 feet of uncontaminated, low permeability soil is present on the barrel fill and should be considered a contact barrier.

4.6.2 Capping

Capping technologies may include various combinations of layers that improve runoff, limit infiltration and provide a contact barrier. Capping is the most common form of landfill remediation because of its effective management of risks and its cost effectiveness. Combinations of vegetative soil, clay, sand, geosynthetics, geocomposites and geomembranes may be used. Particular attention is generally paid to the critical components of the barrier layer and drainage layer. It is noted that 10 to 17 feet of uncontaminated, low permeability soil is present on the barrel fill and should be appropriate as a cap.

4.6.3 Vertical Barriers

Vertical barriers are used to limit subsurface migration or provide structural support. They are typically keyed into a suitable low permeability sub-stratum. Examples include a slurry wall placed in an excavated trench, driven sheet pile wall, pressure-injected jet grout curtain, mechanical deep soil mixing with additives, and grouting behind a vibrating beam. Vertical barriers may be used upgradient for groundwater diversion or downgradient for containment or confinement. Linear barrier walls often include extensions or "wings" at the ends.

For groundwater, a form of vertical barrier is hydraulic containment which utilizes groundwater pumping to induce groundwater gradients that prevent migration of hazardous substances beyond the hydraulic barrier. This can be in the form of vertical wells or pumping via a groundwater collection trench.

4.7 Source Removal, Source Destruction/Treatment and Source Disposal

4.7.1 Source Removal

Source removal may require excavation, dewatering, dredging, demolition, etc. to remove wastes. The complexity and associated risks and hazards generally increase with depth of excavation, soil instability, and presence of groundwater, vibrations, and other conditions. Excavation is a well-known process with proven procedures; however, it is labor intensive with little potential for automation. Fugitive dust and emissions are common concerns.

4.7.2 Source Destruction/Treatment

Source destruction or treatment could include methods that physically reduce the mass of source waste. Some of these technologies have in-situ applications; others have ex-situ applications after the source has been removed.

4.7.2.1 In-Situ

The technical implementability of in-situ source destruction and treatment technologies depends on the delivery of the destruction or treatment means to the hazardous substances and/or contaminated media. Application can be limited or precluded by site conditions such as low permeability clays, presence of groundwater, and wide variation of hazardous substances, heterogeneity, or other complications. In-situ treatment generally requires longer time periods compared to ex-situ; there is less certainty about the uniformity of treatment because of the subsurface variability; and the effectiveness of in-situ treatment is more difficult to verify. Representative technologies may include biological, chemical and thermal means, including physical solidification or chemical stabilization methods.

4.7.2.2 Ex-Situ

Ex-situ source destruction and treatment would first require source removal. Destruction and treatment technologies may include biological, chemical, physical solidification, chemical stabilization, and thermal methods. The main advantages of ex-situ treatment are that it generally requires shorter time periods than in-situ treatment, and there is more certainty about ex-situ treatment uniformity because wastes can be homogenized and mixed. The intent of this technology would be to treat hazardous substances to render them non-hazardous waste (if feasible and desired) for either on-site or off-site disposal.

4.7.3 Off-Site Disposal

Off-site disposal would first require source removal of the contents of the waste cells including drummed waste, uncontainerized materials, contaminated water and contaminated soils. Off-site disposal is the off-site transportation and treatment/disposal of hazardous wastes at commercial TSD facilities (TSDFs). These TSDFs may include solid-waste or hazardous-waste landfills, waste treatment facilities, incinerators, etc. The availability of transport containers and distance to the appropriate TSDF affect costs. Transportation through populated areas may affect community acceptability. Off-site disposal has the advantage of more options and flexibility for reliable, efficient, well-established, permitted facilities with capacity for treatment/disposal of a myriad of waste streams. Off-site disposal also offers potential for energy recovery or beneficial reuse, for example from TSDFs permitted for fuel blending.

4.7.4 On-Site Disposal

On-site disposal would also require source removal, and is generally most suitable for large volumes of lesser-contaminated residuals such as contaminated soil. Suitable on-site treatment would be required to render residuals non-hazardous. On-site disposal would require construction of a suitable disposal facility such as a solid waste landfill. Additional requirements for on-site disposal would include post-closure care for a suitable period.

5. IDENTIFICATION AND SCREENING OF APPLICABLE TECHNOLOGIES

In this step of the AAD process, the number of generic, potentially applicable technology types and process options was reduced by evaluating the options with respect to technical implementability at the Barrel Fill Site. This was accomplished by using readily available information from the RI regarding constituents of concern and Barrel Fill Site characteristics to screen out technologies and process options that cannot be effectively implemented at the Barrel Fill Site. Technical implementability includes the ability to meet substantive requirements, and construct, reliably operate, and meet performance specifications or requirements. It also includes operation, maintenance, replacement and monitoring of technical components. These evaluations, based on technical implementability, are provided on Table 6. A more detailed discussion of screening decisions is included in Appendix A.

A number of factors influence technology screening at this step. Two common factors are the mix of COCs (which limit the applicability of many types of treatment processes), and subsurface conditions (which limits many types of containment, in-situ treatment and groundwater collection/containment technologies).

Identification and screening of applicable technologies are shown on Table 6 for Water Table and 1075 Intertill groundwater, soil vapor, and waste in waste cells at the Barrel Fill Site.

5.1 Barrel Fill Site-Specific Factors Used in Assessing Technical Implementability in Table 6

The following Barrel Fill Site-specific factors were used in assessing the technical implementability of potential remedial actions at this stage in the technology screening process provided in Table 6.

- At least a portion of a site-wide groundwater monitoring well network is present at the Barrel Fill Site. This network would require evaluation as to its adequacy and a monitoring plan would be required to determine sampling frequency, etc. if monitoring is part of a remedy for the Barrel Fill Site.
- Depths to waste allow for implementable remedial actions such as excavation.
- Depths to groundwater allow for implementable remedial actions such as hydraulic containment.
- Water discharge to a POTW was assumed to be implementable.
- There are off-site waste disposal and treatment facilities with sufficient capabilities and capacity to receive Barrel Fill Site–derived wastes;
- RI results indicated that the low permeability till was extremely dense and caused sampling devices (Shelby tubes) to be crushed during their installation. This outcome suggests that construction of a vibrated beam slurry wall or use of jet grouting containment remedies could not be implemented.
- There are hazardous substances including constituents such as SVOCs and certain organic compounds (such as BTEX) within predicted Barrel Fill Site waste streams that are not amenable to anaerobic degradation.

6. REPRESENTATIVE TECHNOLOGY PROCESS OPTIONS

Technology processes that passed the implementability screen (see Section 5) were evaluated in greater detail before selecting one process to represent each technology type. Where possible, one representative process was selected for each technology type to simplify the subsequent development and evaluation of alternatives without limiting flexibility during remedial design. This representative process may provide the basis for developing performance specifications during preliminary design; however, the specific process that is eventually implemented at remedial action will not be selected until the remedial design phase.

Process options that passed the initial technical implementability screen (see Table 6) were further evaluated as shown on Table 7 for effectiveness, institutional implementability and relative cost. During this screening step available information is used to identify/distinguish differences among the various alternative technology types and process options. Each alternative is evaluated relative to others in its group with respect to its effectiveness, institutional implementability and cost. Only the alternatives judged as the best or most promising were retained for further consideration. A more detailed discussion of screening decisions is included in Appendix A. The evaluation of these three screening criteria is described below.

6.1 Effectiveness Evaluation

Specific technology processes were evaluated based on their effectiveness relative to other processes within the same technology type. This effectiveness evaluation focused on the following:

- Potential effectiveness of process options in handling the estimated areas or volumes of media, and meeting the remediation goals that were identified in the RAOs. The ability of some collection/containment/removal systems (e.g., groundwater pumping for hydraulic containment) to recover hazardous substances in contaminated media (to achieve the RAOs) for subsequent treatment was also assessed at this stage.
- Potential impacts to human health and the environment during the construction/implementation phase.
- Proven reliability of the process with respect to the COCs and site conditions.
- The degree to which an alternative reduces toxicity, mobility or volume through treatment, minimizes residual risk and affords long-term protection, complies with ARARs, minimizes short-term impacts and quickly achieves protection.

Preliminary analyses or conceptual design of the process may be required to evaluate effectiveness for some processes (e.g., rates of removal or containment/treatment for groundwater, surface water or subsurface gas). These subsequent analyses, if necessary, will be conducted during the FS when alternatives have been refined and evaluated for the Barrel Fill Site as a whole.

6.2 Implementability Evaluation

Implementability encompasses both the technical and administrative feasibility of implementing a technology process. Technical implementability was the initial screen of

technology types and process options (see Section 5). Therefore, this subsequent evaluation of process options placed greater emphasis on the institutional aspects of implementability. Such institutional aspects include the ability to obtain permits necessary for off-site activities; the availability of treatment, storage and disposal services (including capacity); and the availability of necessary equipment and skilled labor to implement the technology.

6.3 Cost Evaluation

Cost plays a role in the screening of process options. Relative costs for capital expenditures, and for operation and maintenance (O&M) costs were used rather than detailed estimates. Based on engineering judgment, each process was evaluated relative to other process options in the same technology type as either high-, medium- or low-cost. These are order-of-magnitude costs, for example, $100,000, $1 million and $10 million. This order-of-magnitude approach to relative cost is appropriate because different technology types (e.g., containment, treatment, removal) have greater cost consequences than different process options within a given technology type.

7. ASSEMBLE REMEDIAL ALTERNATIVES

General response actions and the process options chosen to represent the various technology types for the Water Table and 1075 Intertill groundwater, soil vapor, and waste were combined to form remedial alternatives for the Barrel Fill Site as a whole. More than one GRA can be applied to each medium.

In accordance with AAD guidance and the requirements of 40 CFR 300.430(e)(3)(i) and (ii), a range of remedial alternatives was developed that reduces the toxicity, mobility, or volume of the hazardous substances, pollutants, or contaminants. The range of remedial alternatives shown on Table 8 includes alternatives that remove or destroy hazardous substances, pollutants, or contaminants to the maximum extent feasible, eliminating or minimizing, to the degree possible, the need for long-term management; and one or more alternatives that involve little or no treatment, but provide protection of human health and the environment primarily by preventing or controlling exposure to hazardous substances, pollutants, or contaminants, through engineering and/or institutional controls.

The AAD is the initial screening step of the FS. Neither the AAD nor FS constitutes remedial design. Throughout the AAD process, specific process options were selected to represent an entire technology type. Selection of a representative process option at this AAD step will not limit the flexibility of the remedial design. At the remedial design step, the designer is free to choose any other applicable process option from that technology type.

The six remedial alternatives retained in this AAD cover an appropriate range and no further screening is required. The following six alternatives developed by the AAD are retained for detailed evaluation in the Feasibility Study:

There are common elements to all of the alternatives except No Action. These include:

1. Institutional Controls: As described previously in this document, environmental covenants can be placed on the Barrel Fill Site and surrounding property. All of the remedial alternatives (except the No Action alternative) include an environmental covenant component to supplement engineering controls to prevent or limit exposure to hazardous substances (40 CFR 300.430(a)(1)(iii)(D)) .
2. Long-Term Groundwater Monitoring: All of the remedial alternatives (except the No Action alternative) will require long-term groundwater monitoring. Contingency planning is shown for those alternatives without waste removal. The monitoring is required to verify the long-term effectiveness and reliability of the remedy. The Contingency Plan is included as Appendix B.

In addition to the above, soil vapor is not considered in the alternative evaluation because the risk associated with soil vapor is in the future and only if residential buildings are placed on the Barrel Fill Site. In addition, institutional controls that may include prohibitions on construction and/or building requirements/restrictions to eliminate or control this exposure route can be implemented. Remedial alternatives associated with this media should be considered only when the risk may occur, and should be built into FS/RD/RA contingency plans for the Barrel Fill Site, if appropriate.

Documentation of ARARs for each alternative is included on Table 9. Documentation includes for each alternative the ARARs and how they will be met, the ARAR waivers that will be required, and the justification for ARAR waivers. Identification and documentation of compliance with ARARs will continue through the FS process (40 CFR 300.430(e)(9)(iii)(B) - Compliance with ARARs), and culminate with the USEPA's ROD.

The six retained remedial alternatives are briefly described as follows:

Alternative 1 - No action.

Alternative 2 - Regrade the exiting cap/cover and revegetate.. Relocate and modify the unnamed tributary. Implement institutional controls (covenants) to prohibit certain activities and uses. Install fence to prevent access. Implement upgradient and downgradient groundwater monitoring (in Water Table, 1075 Intertill, 1050 Intertill, 1015 Intertill, and Deep Sand and Gravel) and contingency planning. Install downgradient groundwater containment in Water Table and 1075 Intertill; with permeable cut-off trench with ex-situ treatment train and NPDES or POTW discharge.

Alternative 3 - Regrade the exiting cap/cover and revegetate. Relocate and modify the unnamed tributary. Implement institutional controls (covenants) to prohibit certain activities and uses. Install fence to prevent access. Implement upgradient and downgradient groundwater monitoring (in Water Table, 1075 Intertill, 1050 Intertill, 1015 Intertill, and Deep Sand and Gravel) and contingency planning. Install downgradient groundwater containment in Water Table and 1075 Intertill with permeable cut-off trench with ex-situ treatment train and NPDES or POTW discharge. Install upgradient groundwater diversion structure keyed into top of unweathered till; either trench-excavated bentonite slurry wall; or sheet pile wall with sealed joints.

Alternative 4 - Remove and stockpile uncontaminated cover soil. Excavate and remove waste (drums and uncontainerized), cell water and contaminated soil. Inspect, characterize and group compatible wastes. Transport wastes off site to commercial TSDFs. Manage cell water, LNAPL and solids from cell water; transport off site to commercial TSDFs. Manage contaminated soil; transport soil off-site to commercial TSDFs. Regrade site with uncontaminated soil and revegetate. Implement institutional controls (covenants) to prohibit certain activities and uses. Install fence to prevent access. Implement upgradient and downgradient groundwater monitoring (in Water Table, 1075 Intertill, 1050 Intertill, 1015 Intertill, and Deep Sand and Gravel).

Alternative 5 - Remove and stockpile uncontaminated cover soil. Excavate and remove waste (drums and uncontainerized), cell water and contaminated soil. Inspect, characterize and group compatible wastes. Transport wastes off-site to commercial TSDFs. Manage cell water, LNAPL and solids from cell water; transport off site to commercial TSDFs. Manage contaminated soil; treat soil on site to non-hazardous characteristics with low temperature thermal desorption, secondary gas collection/treatment, and subsequent chemical stabilization. Construct on-site solid waste landfill. Place treated non-hazardous soil into on-site landfill with subsequent landfill closure and post-closure care. Implement institutional controls (covenants) to prohibit certain activities and uses. Install fence to prevent access. Implement upgradient and downgradient groundwater monitoring (in Water Table, 1075 Intertill, 1050 Intertill, 1015 Intertill, and Deep Sand and Gravel).

Alternative 6 – Same as Alternative 5 with the exception that treated soil would be transported off-site and disposed at a solid waste landfill.

Each remedial alternative is described in the following sections.

7.1 Alternative 1: No Action

Alternative 1, the "no action" alternative, is required by the NCP for consideration as a baseline, no-cost alternative.

7.2 Alternative 2: Down-gradient Groundwater Collection Trench, Cap/Cover Regrading, Institutional Controls, Contingency Planning and Groundwater Monitoring

Alternative 2 would include cap re-grading, the installation of a down-gradient groundwater collection trench in the Water Table and 1075 Intertill. The broad scope of this alternative includes containment/treatment/discharge of Water Table groundwater down-gradient of the barrel fill, in addition to cap/cover regrading, access restrictions, institutional controls, contingency planning and groundwater monitoring. One process option for groundwater containment is retained and includes an ex-situ water treatment train that would be assembled to address COCs. The representative process option for discharge of treated water is nearby surface water while meeting the substantive requirements of an NPDES permit, or transport and disposal of collected groundwater to a licensed treatment works.

Groundwater containment would be accomplished by the installation of a permeable collection trench constructed perpendicular to the direction of groundwater flow at a location down-gradient of the barrel fill. The collection trench would be approximately 1,100 feet long along the east side of the Barrel Fill Site with sufficient length on the north and south sides to prevent flow of Barrel Fill Site groundwater around the trench. In order to contain Water Table and 1075 Intertill groundwater, the trench would be excavated just into unweathered glacial till underlying the 1075 Intertill. The trench would extend to the unweathered glacial till, as this competent till is not a water producing zone. In cross-section, the trench would slope toward manholes and pumping lift stations placed at appropriate intervals to promote flow and maximize system performance. The slope and placement of pumping manholes would provide the means to remove geologic sediments that may collect in the trench. The saturated zone of the trench would be filled with highly permeable granular material such as gravel. A geotextile filter fabric would likely be used around the permeable granular material in the trench to capture fines and limit system fouling. A permeable, slotted HDPE pipe would be laid across the bottom of the trench to promote water flow to the manholes. The unsaturated zone of the trench would be capped with low permeability material to minimize surface water infiltration. Groundwater pump stations would be placed at each manhole to extract groundwater and deliver extracted water, through a common underground force main, to an above-ground treatment system or off-site transport system.

Groundwater treatment would be accomplished above ground in a treatment building or through off-site transport and disposal at a POTW. An on-site treatment system would include appropriate utilities, containment, monitoring, etc. The design flow rate and initial water quality would be ascertained during remedial design; however, based on RI data, the

initial flow rate is estimated to be less than five gallons per minute (gpm). For purposes of this AAD, the initial groundwater quality is assumed to resemble that in monitoring well HMW-301, which is contaminated primarily by VOCs. Additional Barrel Fill Site hazardous substances could be present in extracted groundwater in the future, including metals, SVOCs, and pesticides, which may modify the required treatment processes in the future. For purposes of the AAD, water treatment is currently envisioned to include removal of organic compounds via air stripping and carbon adsorption and metals treatment would likely include precipitation (if necessary). Final treatment processes would be determined during remedial design. This treatment alternative is proven for the types of COCs found in Water Table and 1075 Intertill groundwater and treatment requirements including discharge to the unnamed tributary would be met using this technology.

Water treatment residuals would include bag filters/solids and spent carbon. Chemical additives (a sequestering agent or biocide) may be required to prevent treatment system fouling. Water treatment would require regular operation and maintenance of the treatment components, discharge monitoring, and necessary controls.

The location of the groundwater containment trench would be at or near the current location of the unnamed tributary east of the Barrel Fill Site. Accordingly, as part of the groundwater containment trench construction, the unnamed tributary would be relocated east of its current location. The relocation would include appropriate civil engineering and construction including erosion control measures, culverting, etc. that would be determined during the FS and remedial design.

Alternative 2 would include re-grading the existing cap and cover system to provide drainage and promote runoff. This alternative would minimize infiltration by shedding precipitation eastward towards the unnamed tributary. The slope of the cap and cover system would be approximately 3% to 5% and would slope eastward. Once graded, the proper native vegetation would be applied to the re-graded area to minimize erosion from the area. An area of approximately 8 acres would be re-graded and re-vegetated as part of this alternative. In addition, it is currently anticipated that the unnamed tributary would be modified and relocated east of its current location to reduce the likelihood of encroachment of the tributary on the Barrel Fill Site and to increase its effectiveness at managing surface water runoff.

Permeability testing of the current cap/cover indicates that the cap/cover meets or exceeds engineering permeability and thickness requirements of a hazardous waste or solid waste landfill cap/cover system. The ARARs that apply for this alternative and how they are achieved are contained in Table 9.

In addition to the above, the 1050 Intertill, the 1015 Intertill and the Deep Sand and Gravel would be monitored. Monitoring well installation/locations would be both up- and down-gradient of the Barrel Fill Site.

The exact monitoring well network would be developed during remedial design and would consist of co-located wells (clusters) with some wells in each of the hydrogeologic units. Selected wells in the Water Table, 1075 Intertill, 1050 Intertill, 1015 Intertill and Deep Sand and Gravel located directly adjacent to and down-gradient from the Barrel Fill Site would be monitored. Water Table wells would be monitored for the presence of LNAPL. The

frequency of monitoring and monitoring constituents would be determined during remedial design

The monitoring system would provide data necessary to modify Barrel Fill Site remediation if necessary. Contingencies for system modification would be undertaken according to the Contingency Plan contained in Appendix B.

An integral component of Alternative 2 would be the placement of institutional controls on the Barrel Fill Site. The institutional controls would consist of environmental covenants developed and instituted under common law and the Ohio Environmental Covenants Act (ORC 5301.80 to 5301.92). Two environmental covenants would apply to the Barrel Fill Site; one for the portion of the Barrel Fill Site where wastes have been disposed and one for the surrounding property. Sample language for the environmental covenants is summarized below.

For the Barrel Fill Site waste area, the limitations that would be placed by covenant on the area include prohibition on the installation and use of water wells for potable or other use except for purposes of remediation, monitoring or investigation; and limiting the use of the property to only those activities related to remediation, monitoring or investigation.

For the land surrounding the Barrel Fill Site disposal area, limitations that would be placed by covenant on the area include the following: a) prohibition on the installation and use of water wells for potable or other use except for purposes of remediation, monitoring or investigation; b) prohibition on residential use; and c) requirement that all future use must be demonstrated to be protective of human health and the environment.

The ARARs that apply for this alternative and how they are achieved are contained in Table 9.

This alternative would achieve RAOs for groundwater by the following:

- Institutional controls prohibiting the use of groundwater would prevent human potable use exposure to groundwater COCs.
- The groundwater cutoff/collection trench would prevent discharge of Water Table and 1075 Intertill groundwater to surface water at concentrations in excess of the chemical-specific contaminant levels or ecological criteria.

This alternative would achieve RAOs for soil vapor and wastes at the Barrel Fill Site by the following:

- Institutional controls prohibiting residential use on the Barrel Fill Site would prevent human exposures to hazardous substances in indoor air to a resident living on the Barrel Fill Site.
- The cap and cover would prevent direct contact human exposures to hazardous substances in the wastes.

- The groundwater cut-off/collection trench would stabilize or eliminate hazardous substances in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release by preventing the spread of contamination and protecting human health and the environment.

The estimated time for remedial design, procurement, and development of project plans and construction submittals would be 6 to 12 months; and for remedial construction would be 8 to 12 months. Monitoring and contingency planning would start after remedy construction and continue for 30 years.

The cost range for this alternative would be on the order of $6 million to $8 million.

7.3 Alternative 3: Down-gradient Groundwater Collection Trench, Upgradient Groundwater Diversion, Cap/Cover Regrading, Institutional Controls, Contingency Planning and Groundwater Monitoring

Alternative 3 includes all elements of Alternative 2 plus the installation of an upgradient groundwater diversion structure consisting of either an excavated trench bentonite slurry wall or driven sheet pile wall upgradient of the barrel fill. The upgradient groundwater diversion structure would be placed along the western edge of the Barrel Fill Site upgradient of the existing waste. The structure would consist of a bentonite slurry wall or a steel sheet pile wall installed through the weathered till and keyed into the top of the unweathered till beneath the 1075 Intertill. The wall would extend the entire length of the western Barrel Fill Site boundary and would include two "wings" extending southeast at the southern end of the structure and northeast along the northern end of the structure. The permeability of the structure would be 10^{-6} or less and its purpose would be to divert Water Table groundwater flow around the barrel fill thereby reducing the water levels in waste cells and reducing the quantity and velocity of groundwater entering the down-gradient groundwater containment/cutoff system.

The ARARs that apply for this alternative and how they are achieved are contained in Table 9.

This alternative would achieve RAOs for groundwater by the following:

- Institutional controls prohibiting the use of groundwater would prevent human potable use exposure to groundwater COCs.

- The groundwater cutoff/collection trench would prevent discharge of Water Table groundwater and 1075 Intertill to surface water at concentrations in excess of the chemical-specific contaminant levels or ecological criteria.

This alternative would achieve RAOs for soil vapor and wastes at the Barrel Fill Site by the following:

- Institutional controls prohibiting residential use on the Barrel Fill Site would prevent human exposures to hazardous substances in indoor air to a resident living on the Barrel Fill Site.

- The cap and cover would prevent direct contact human exposures to hazardous substances in the wastes.

- The groundwater cut-off/collection trench would stabilize or eliminate hazardous substances in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release by preventing the spread of contamination and protecting human health and the environment.

The estimated time for remedial design, procurement, and development of project plans and construction submittals would be 8 to 12 months; and for remedial construction would be 10 to 12 months. Monitoring and contingency planning would start after remedy construction and continue for 30 years.

The cost range for this remedial alternative would be on the order of $7 million to $9 million.

7.4 Alternative 4: Waste Removal with Off-Site Disposal of Waste and Contaminated Residuals

Alternative 4 is waste removal with off-site disposal of waste and contaminated residuals. It includes excavation and removal of contaminated soil above and/or below the Barrel Fill Site waste cells, removal of the source wastes inside the cells, and transportation from the Barrel Fill Site to an off-site facility for commercial waste treatment and disposal. Alternative 4 also includes the long-term groundwater monitoring to verify long-term effectiveness.

Wastes would be transported off-site and treated at commercial treatment, storage, and disposal facilities (TSDFs) or solid waste facilities, as appropriate. The resulting excavation would be backfilled and graded. Key components of the removal alternative would include removal of the existing cover soil, removal and handling of the waste cell contents (drums, water, uncontainerized waste, contaminated soil), personnel and perimeter monitoring, waste transportation and disposal, water management, and site grading/restoration.

Removal of drums, uncontainerized waste, cell water and soil between cells would require extensive excavation and waste handling for a variety of solid and liquid wastes and contaminated media. Based on the RI findings with test pits, it is envisioned that waste removal would require removal of not only the contents of waste cells (drums, water and bulk wastes) but also a portion of the soil walls that separate the cells. The resulting excavation would proceed from one side of the Barrel Fill Site to the other. Extensive benching, sheeting and/or shoring would also be required to provide safe excavation.

The removal of wastes cell contents would include the following:

- The removal of approximately 51,500 drums from 50 waste cells;
- The removal of approximately 304,000 gallons of sludge-like uncontainerized waste, likely mixed with cell water/groundwater;
- The removal of precipitation liquids during excavation;
- The removal of contaminated soil excavated from the cell walls & floors; and
- The removal of uncontaminated soil from the cell walls.

Construction for waste removal would proceed by excavation of the top five to eight feet of soil within manageable sections of the Barrel Fill Site (currently envisioned to be approximately eight to ten sections). These uncontaminated soils would be stockpiled in an area for reuse as backfill during site restoration. Within each section, excavation would proceed within individual cells. Once the cell is encountered, the cell would be dewatered by pumping from sumps constructed to the base of the cell. The cell water would be pumped to storage containers/tanks and LNAPL, if present, would be separated and placed in a separate container. Solids would also be separated and placed in separate containers. Drums would be removed and processed as described below.

Excavation would proceed to the adjacent cell and the process described above would be repeated. Soil between cells, if recoverable, would be excavated and stockpiled. These soils would be segregated into "clean" and "dirty" stockpiles based on visual observation and field screening. The process would continue from cell to cell within a section of the Barrel Fill Site. Once a section is completed, it would be backfilled for site restoration (see below) and another section would be excavated as described above until all of the wastes are removed from the Barrel Fill Site.

Drums would be removed from the waste cells and transferred to a drum inspection building or temporary drum storage pad. The exterior of each drum would be cleaned, and an initial inspection of the drum would identify any label or markings and ascertain the condition of the drum. Leaking and unstable drums would subsequently be placed into overpack drums. Following inspection, all drums would be moved to a drum handling area and grouped according to the labels and/or markings, historic documentation and according to its phase (liquid or solid). Each drum group would then be sampled in a processing area.

Compatibility testing procedures would be developed for liquids and solids. After sampling, analysis and characterization of drum contents, drums would be emptied into bulk containers combining compatible wastes. Bulk containers would include tanks, hoppers, roll-off boxes, storage pads, etc. appropriate for solid and liquid wastes and soil. Bulk wastes would be stored pending waste disposal characterization. Wastes approved for TSDF or solid waste disposal would be loaded onto appropriate DOT transports such as bulk tankers, bulk trailers and roll-off box transports.

During the design phase, a Drum Handling and Sampling Plan would be developed to address details of the removal operations. Topics would include site development, buildings, roads and utilities; drum removal, handling and transfer; drum inspection, sampling and storage; bulking of various similar wastes; and waste loading. The NIOSH *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH, October 1985) includes a chapter on handling drums and other containers that addresses the important topics of inspection, planning, handling, opening, sampling, characterization, staging, bulking and shipment, and would be utilized during remedial design and remedial work, as appropriate.

Cell water, LNAPL and solids from the cell water (each within individual containers as described above) would be tested for hazardous waste characterization and disposed as described below. Soils from between cells that have been segregated into "clean" and "dirty" stockpiles would be tested for hazardous waste characterization and disposed as described below. Non-hazardous soils with testing results less than risk-based criteria would be reused as backfill during site restoration.

Wastes would be characterized and prepared for transportation to appropriate commercial TSDFs and solid waste facilities as appropriate. Waste disposal would take into consideration Land Disposal Restrictions (LDRs). Because of the volumes of various wastes, a number of treatment/disposal facilities would likely be utilized. During the Feasibility Study, waste disposal facilities would be identified to accurately develop remedial alternative cost estimates. It is anticipated that hazardous waste treatment/disposal facilities would be utilized for incineration, fuel blending, stabilization/solidification, micro-encapsulation and/or macro-encapsulation. Non-hazardous waste disposal facilities would be utilized for conventional landfilling. Water treatment facilities would be utilized for treatment/disposal of cell water. Based on information collected during the RI, the following wastes would be expected from the Barrel Fill Site:

- Drummed waste: Drummed wastes, containing both solids and liquids, and considered both hazardous and non-hazardous, would be appropriately disposed after characterization;
- Bulk uncontainerized waste and cell water: The extracted mixture of uncontainerized bulk waste and cell water would require disposal as a hazardous waste liquid;
- LNAPL: LNAPL separated from the cell water is assumed to be hazardous waste and would be disposed as a hazardous waste; and
- Soil: Contaminated soil excavated from the cell walls and floors would likely be both hazardous and non-hazardous. It is assumed that all contaminated soils would be pre-treated off-site (if necessary) and disposed of at an appropriate landfill.

During the Remedial Design, a Transportation and Disposal Plan would be prepared to address details of this remedial activity. Topics would include: waste stream descriptions for drummed waste, bulk waste, liquids and soils; identification of waste disposal outlets; transportation modes; transportation routes; identification of transporters; interaction with local officials; preparations for off-site transport such as vehicle inspections, liners, waste packaging, weighing, labeling and placarding; waste manifests; recordkeeping and reporting; DOT training; and emergency notification procedures.

Stormwater run-on would be controlled through site preparation including construction of diversions, berms, culverts, etc. Stormwater run-off would be collected, contained and treated if it comes in contact with waste materials or contaminated environmental media. Water contained in waste cells would be collected, stored in bulk containers such as tanks, and transported off site for appropriate treatment/disposal. Decontamination water would be collected, stored, and transported off-site for appropriate treatment/disposal.

The ARARs that apply for this alternative and how they are achieved are contained in Table 9.

This alternative would achieve RAOs for groundwater by the following:

- Waste removal and institutional controls would eliminate the source of groundwater contamination and would therefore prevent human exposure to groundwater.

- Waste removal would eliminate the source of groundwater contamination and therefore prevent the future discharge of Water Table and 1075 Intertill groundwater

to surface water at concentrations in excess of the chemical-specific contaminant levels or ecological criteria

This alternative would achieve RAOs for soil vapor and wastes at the Barrel Fill Site by the following:

- Waste removal and institutional controls would eliminate the source and therefore eliminate human exposures to hazardous substances in indoor air to a resident living on the Barrel Fill Site.
- Waste removal would eliminate the source and therefore eliminate the human direct contact exposure pathway.
- Waste removal would stabilize or eliminate hazardous substances in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release.

The estimated time for remedial design, procurement, and development of project plans and construction submittals would be 12 to 15 months; and for remedial construction would be 24 months. Monitoring would start after remedy construction and continue for 10 years.

The estimated cost for this remedial alternative would be on the order of $60 million to $70 million.

7.5 Alternative 5: Waste Removal with Off-Site Disposal of Waste, On-Site Treatment of Contaminated Residuals and Placement of Residuals into the Barrel Fill

Alternative 5 is a variation of Alternative 4 with the difference being the on-site treatment of hazardous soils and other residuals. After these residuals are treated to levels that render them non-hazardous, they would be placed into a structure at the current location of the barrel fill that is built consistent with requirements for a solid waste landfill. Alternative 5 also includes the long-term groundwater monitoring to verify long-term effectiveness.

Alternative 5 includes waste removal with off-site disposal of waste and on-site treatment/replacement of contaminated residuals. Key components of the removal alternative would include removal of the existing cover soil, removal and handling of the waste cell contents (drums, water, uncontainerized waste, contaminated soil), off-site waste transportation and disposal, on-site treatment of residuals, personnel and perimeter monitoring, water management, replacement of treated residuals into the barrel fill area, site grading/restoration, and closure/post-closure consistent with requirements for a solid waste landfill.

Removal of drums, uncontainerized waste, cell water and soil between cells would require the same extensive excavation and waste handling as Alternative 4. Similar to Alternative 4, drum waste, uncontainerized waste, cell water and LNAPL would be handled, characterized and subsequently transported off-site for treatment and disposal.

For on-site treatment, hazardous and non-hazardous soil would be stockpiled on an impervious, bermed surface and covered to control surface water run on, run off and to control dust.

The process option selected for on-site treatment would be low temperature thermal desorption (LTTD) for organics and stabilization for metals. LTTD is a physical treatment method that separates organics from soil by raising the temperature to volatilize organics and transfer them to a gas stream. Stabilization is a chemical treatment method that reduces mobility of inorganics with a stabilizing agent such as pozzolan, Portland cement or soluble phosphates.

LTTD would include a primary thermal separation treatment followed by a secondary treatment for the collected gas. Treatment temperature would depend on the volatility of COCs; soil properties such as moisture content, heat capacity and particle size; and desorber characteristics of heat transfer and mixing. Temperatures in the range of 200F to 600F would remove VOCs and SVOCs. A thermal desorber would be fired either directly or indirectly; could be stationary or mobile; and would be configured as a rotary dryer, thermal screw, conveyor furnace, or asphalt aggregate dryer type.

Soil preparation would include screening out particles larger than two inches, crushing of coarse-grained materials, shredding of cohesive soils with addition of gypsum to prevent clumping, drying to remove moisture and removal of debris.

Secondary treatment for the LTTD gas collection/separation would include features such as an afterburner, catalytic oxidation chamber, condenser and/or carbon adsorption.

Key technical requirements for LTTD would include the following:

- Pretreatment soil sampling for moisture content, concentrations of COCs, particle size, and plasticity.
- Treatment verification sampling frequency.
- Soil handling and stockpile management including prevention of surface water run on and run off, and dust control.
- System operation requirements including temperature, feed rate, residence time and secondary treatment requirements.
- Automatic shutdown in case of burner failure, outlet temperature, secondary treatment failure, blower failure, baghouse pressure drop, carbon monoxide in exhaust and waste feed rate.
- Proof of performance is typically required at three consistent runs for each set of operating conditions.
- Emissions monitoring for COCs, particulates, metals and carbon monoxide; and continuous emission monitoring for oxygen, carbon monoxide, total hydrocarbons and carbon dioxide.
- Water discharge monitoring for COCs.
- Health and safety procedures.

Stabilization would be performed after LTTD to chemically bind the metals that fail TCLP testing. Additives such as pozzolan, Portland cement, soluble phosphates, soluble silicates, fly ash and proprietary additives would be mixed into the soil.

Key technical requirements for soil stabilization would include the following:

- Concentration of COCs
- Moisture content
- Size of the mobile treatment system and
- Post-cure testing for moisture content, physical strength (unconfined compressive strength) and leachability (TCLP).

Following successful separation of organics by LTTD and immobilization of metals by stabilization, the soil would be placed into the former barrel fill in a structure designed and engineered to meet the performance standards of a solid waste landfill. Key technical requirements for the solid waste landfill would include the following:

- Prepared in-situ foundation
- Liner system that serves as a barrier to prevent leachate discharge to ground or surface waters
- Leachate collection and management system that limits the leachate level
- Surface water control structures that accommodate the 25-year 24-hour storm event, including sedimentation ponds that accommodate runoff from the 10-year 24-hour storm event
- Cap system that protects cap components and minimizes surface water infiltration with appropriate grade
- Access roads
- Permanent survey marks and record drawings
- Groundwater monitoring system
- Construction QA/QC program
- Final closure
- Post-closure care

The ARARs that apply for this alternative and how they are achieved are contained in Table 9.

This alternative would achieve RAOs for groundwater by the following:

- Waste removal and institutional controls would eliminate the source of groundwater contamination and would therefore prevent human exposure to contaminated groundwater.

- Waste removal would eliminate the source of groundwater contamination and therefore prevent the future discharge of Water Table and 1075 Intertill groundwater to surface water at concentrations in excess of the chemical-specific contaminant levels or ecological criteria.

This alternative would achieve RAOs for soil vapor and wastes at the Barrel Fill Site by the following:

- Waste removal and institutional controls would eliminate the source and therefore eliminate human exposures to hazardous substances in indoor air to a resident living on the Barrel Fill Site.
- Waste removal would eliminate the source and therefore eliminate the human direct contact exposure pathway.
- Waste removal would stabilize or eliminate hazardous substances in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release.

The estimated time for remedial design, procurement, and development of project plans and construction submittals would be 12 to 18 months; and for remedial construction would be 36 months.

The estimated cost for this remedial alternative would be on the order of $60 million to $70 million.

Post-closure care would be implemented following closure and continue for a minimum period of 30 years. Post-closure care would include quarterly inspections and the following activities:

- Operation, maintenance, monitoring and repair of the leachate management system
- Cleaning and repair of the surface water management features
- Groundwater monitoring, and repair of the monitoring system
- Maintenance and repair of the cap system to correct settling or subsidence, ponding, erosion, pest holes; and regular mowing to discourage deep-rooted vegetation.

Upon completion of the post-closure care period, written certification would be required that post-closure activities were performed in accordance with requirements of applicable rules and the post-closure plan.

7.6 Alternative 6: Waste Removal with Off-Site Disposal of Waste, On-Site Treatment of Contaminated Residuals and Off-Site Disposal of Treated Residuals as a Solid Waste

Alternative 6 includes the elements of Alternative 5 with the exception that the LTTD-treated will be disposed off-site at a solid waste landfill.

Alternative 6 includes waste removal with off-site disposal of waste and off-site treatment/replacement of contaminated residuals. Key components of the removal alternative would include removal of the existing cover soil, removal and handling of the waste cell contents (drums, water, uncontainerized waste, contaminated soil), off-site waste transportation and disposal, on-site treatment of residuals, off-site disposal of treated residuals, personnel and perimeter monitoring, water management, replacement of treated residuals into the barrel fill area, site grading/restoration, and closure/post-closure consistent with requirements for a solid waste landfill.

This alternative would achieve RAOs for groundwater by the following:

- Waste and residuals removal and institutional controls would eliminate the source of groundwater contamination and would therefore prevent human exposure to contaminated groundwater.

- Waste and residuals removal would eliminate the source of groundwater contamination and therefore prevent the future discharge of Water Table and 1075 Intertill groundwater to surface water at concentrations in excess of the chemical-specific contaminant levels or ecological criteria.

This alternative would achieve RAOs for soil vapor and wastes at the Barrel Fill Site by the following:

- Waste and residuals removal and institutional controls would eliminate the source and therefore eliminate human exposures to hazardous substances in indoor air to a resident living on the Barrel Fill Site.

- Waste and residuals removal would eliminate the source and therefore eliminate the human direct contact exposure pathway.

- Waste removal would stabilize or eliminate hazardous substances in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release.

The estimated time for remedial design, procurement, and development of project plans and construction submittals would be 12 to 18 months; and for remedial construction would be 36 months.

The estimated cost for this remedial alternative would be on the order of $60 million to $70 million.

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TABLES

Table 1
Summary of Potential Receptors and Complete Exposure Routes
Alternatives Array Document

Tremont City Barrel Fill Site Tremont City, Ohio

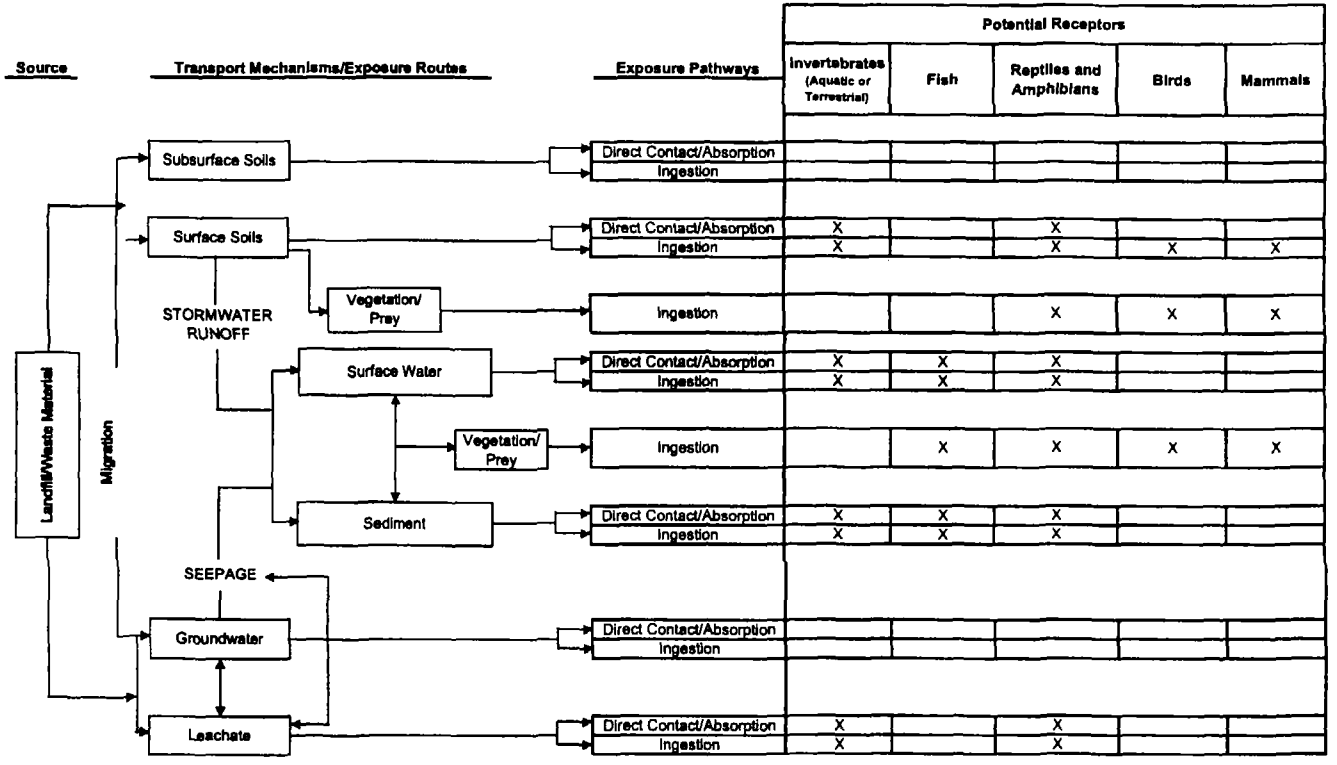
Land Use	Receptor Population(s)	Exposure Pathways	Exposure Routes	Complete For Purposes of Baseline Risk Assessment?
Reasonable and Anticipated Land Uses				
Current Land Use	Maintenance Worker (outdoor)	Groundwater to Soil Gas to Ambient Air	Inhalation of Outdoor Air	Yes
		Historical Releases to Surface Soil	Direct Contact (incidental ingestion, dermal, inhalation of dust)	No. No COPC were identified in surface soil.
		Groundwater Discharge to Surface Water	Direct Contact (incidental ingestion, dermal)	Yes.
		Accumulation in Sediment	Direct Contact (incidental ingestion, dermal)	No. No COPC were identified in sediment.
Unauthorized Access Use	Trespasser	Groundwater to Soil Gas to Ambient Air	Inhalation of Outdoor Air	Yes
		Historical Releases to Surface Soil	Direct Contact (incidental ingestion, dermal, inhalation of dust)	No. No COPC were identified in surface soil.
		Groundwater Discharge to Surface Water	Direct Contact (incidental ingestion, dermal)	Yes.
		Accumulation in Sediment	Direct Contact (incidental ingestion, dermal)	No. No COPC were identified in sediment
Not Reasonably Anticipated Land Uses				
Agricultural and Residential (This land use is restricted at the Barrel Fill Site but is considered for purposes of baseline risk assessment.)	Resident on Barrel Fill Site	Groundwater to Soil Gas to Indoor Air	Inhalation of Indoor Air	Yes.
		Potable Use of Groundwater	Ingestion, Dermal Contact, Inhalation of Volatiles	Yes.
		Historical or Future Releases to Surface Soil[1]	Direct Contact (incidental ingestion, dermal, inhalation of dust)	Yes. Subsurface soil is exposed during construction.
		Groundwater Discharge to Surface Water	Direct Contact (incidental ingestion, dermal)	Yes.
		Accumulation in Sediment	Direct Contact (incidental ingestion, dermal)	No. No COPC were identified in sediment.
Commercial and Industrial (This land use is restricted at the Barrel Fill Site but is considered for purposes of baseline risk assessment.)	Routine Workers	Groundwater to Soil Gas to Indoor Air	Inhalation of Indoor Air	Yes.
		Potable Use of Groundwater	Ingestion, Dermal Contact, Inhalation of Volatiles	Yes.
	Construction or Utility Worker	Groundwater to Soil Gas to Ambient Air	Inhalation of Outdoor Air	Yes.
		Historical Releases to Surface and Subsurface Soil	Direct Contact (incidental ingestion, dermal, inhalation of dust)	Yes.
		Groundwater Discharge to Surface Water	Direct Contact (incidental ingestion, dermal)	Yes.
		Accumulation in Sediment	Direct Contact (incidental ingestion, dermal)	No. No COPC were identified in sediment.
		Direct Contact with Groundwater	Direct Contact (incidental ingestion, dermal)	Yes.

Notes and Abbreviations:

1. Future release to surface soil assumes subsurface soil is excavated and left exposed on surface.

Table 2
Conceptual Site Model: Ecological Risk Assessment
Alternatives Array Document

Tremont City Barrel Fill Site Tremont City, Ohio



Exposure Pathways	Potential Receptors: Invertebrates (Aquatic or Terrestrial)	Fish	Reptiles and Amphibians	Birds	Mammals
Subsurface Soils – Direct Contact/Absorption					
Subsurface Soils – Ingestion					
Surface Soils – Direct Contact/Absorption	X		X		
Surface Soils – Ingestion	X		X	X	X
Vegetation/ Prey – Ingestion			X	X	X
Surface Water – Direct Contact/Absorption	X	X	X		
Surface Water – Ingestion	X	X	X		
Vegetation/ Prey – Ingestion		X	X	X	X
Sediment – Direct Contact/Absorption	X	X	X		
Sediment – Ingestion	X	X	X		
Groundwater – Direct Contact/Absorption					
Groundwater – Ingestion					
Leachate – Direct Contact/Absorption	X		X		
Leachate – Ingestion	X		X		

Notes:
1) X denotes a potentially complete exposure pathway.

TABLE 3
CHEMICAL SPECIFIC CONTAMINANT LEVELS
GROUNDWATER AND SURFACE WATER
HUMAN HEALTH
TREMONT CITY LANDFILL
BARREL FILL OPERABLE UNIT
TREMONT CITY, OHIO

CONSTITUENTS OF CONCERN		SURFACE WATER (SECONDARY MEDIA)						GROUNDWATER (PRIMARY MEDIA)			
Analyte	CASRN	Trespasser Preliminary Remediation Goal (mg/L)[3]	Basis of PRG	Maintenance Worker Preliminary Remediation Goal (mg/L)[3]	Basis of PRG	Solubility (mg/L)	Human Health Preliminary Remedial Goal Surface Water (mg/L)[4]	Federal Drinking Water Standard - MCL (mg/L)[5]	Human Health Preliminary Remedial Goal Groundwater to Surface Water (mg/L)[6]	Remedial Goal Groundwater to Surface Water (mg/L)[7]	Basis of Remedial Goal
1,4-Dichlorobenzene	106-46-7	0.22	ELCR	0.074	ELCR	73.8	0.074	0.075	0.148	0.075	MCL
Benzene	71-43-2	0.5	ELCR	0.17	ELCR	1750	0.17	0.005	0.340	0.005	MCL
Ethylbenzene	100-41-4	5.8	HI	8	HI	169	5.8	0.7	11.6	0.7	MCL
Methylene chloride	75-09-2	12	ELCR	3.9	ELCR	13200	3.9	0.005	7.8	0.005	MCL
Tetrachloroethene	127-18-4	0.11	ELCR	0.036	ELCR	200	0.036	0.005	0.072	0.005	MCL
Toluene	108-88-3	21	HI	29	HI	526	21	1	42	1	MCL
Trichloroethene	79-01-6	1.2	HI	0.69	ELCR	1100	0.69	0.005	1.38	0.005	MCL
Vinyl chloride	75-01-4	0.046	ELCR	0.016	ELCR	2760	0.016	0.002	0.032	0.002	MCL
bis(2-Ethylhexyl)phthalate	117-81-7	0.035	ELCR	0.012	ELCR	NA	0.012	0.006	0.024	0.006	MCL
Naphthalene	91-20-3	1	HI	1.4	HI	31	1	-	2.0	2.0	PRG
Cadmium	7440-43-9	0.18	HI	0.25	HI	NA	0.18	0.005	0.36	0.005	MCL

Notes and Abbreviations:

1. -: Indicates value not available.
2. NA: Not applicable. -: Not available.
3. The Trespasser and Maintenance Worker PRGs are based on the lower of a single chemical risk of 0.1 hazard index (HI) and 1.0E-06 excess lifetime cancer risk (ELCR). The risk-based preliminary remedial goals (PRG) were developed based on the risk estimates for the indicated receptor's future risk of exposure to COC surface water.
4. Human Health Preliminary Remedial Goal for Surface Water is the minimum of the Trespasser and Maintenance Worker PRGs and solubility.
5. MCL were compiled from the *2004 Edition of the Drinking Water Standards and Health Advisories, U.S. EPA, Office of Water EPA-822-R-04-005.*
6. Human Health Remedial Goal for Groundwater to Surface Water are based on assumption that potentially contamianted groundwater discharge to surface water and contributes a maximum of half the surface water flow. Thus, the goal is two-times the Human Health Preliminary Goal for Surface Water.
7. The Groundwater Remedial Goal is the MCL or where an MCL is not available the groundwater risk-based preliminary remediation goal.

TABLE 4
CHEMICAL SPECIFIC CONTAMINANT LEVELS
GROUNDWATER AND SURFACE WATER
ECOLOGICAL
TREMONT CITY LANDFILL
BARREL FILL OPERABLE UNIT
TREMONT CITY, OHIO

COEPC	Chemical Specific Contaminant Levels[3] (mg/L)	Remedial Goal Groundwater to Surface Water (mg/L)
1,1-Dichloroethane	--	--
1,1-Dichloroethene	0.21	0.42
1,2,4-Trichlorobenzene	--	--
1,2-Dichlorobenzene	0.023	0.046
1,3-Dichlorobenzene	0.022	0.044
1,4-Dichlorobenzene	0.0094	0.0188
2-Butanone	22	44
2-Hexanone	--	--
4-Methyl-2-pentanone	--	--
Acetone	--	--
Benzene	0.16	0.32
Carbon disulfide	0.015	0.03
Chloroform (Trichloromethane)	0.14	0.28
Ethylbenzene	0.061	0.122
Isopropylbenzene	0.0048	0.0096
Methylene chloride	1.9	3.8
Tetrachloroethene	0.053	0.106
Toluene	0.062	0.124
Trichloroethene	0.22	0.44
Xylene (total)	0.027	0.054
2-Methylnaphthalene	--	--
2-Methylphenol	0.067	0.134
4-Chloro-3-methylphenol	--	--
4-Methylphenol	0.053	0.106
Biphenyl	0.0065	0.013
bis(2-Ethylhexyl)phthalate	0.0084	0.0168
Butyl benzylphthalate	0.023	0.046
Diethyl phthalate	0.22	0.44
Di-n-butylphthalate	--	--
Naphthalene	0.021	0.042
Pentachlorophenol	0.00924	0.0
Phenol	0.16	0.32
Dieldrin	0.000056	0.000112
Heptachlor	--	--
Methoxychlor	--	--
Cobalt	0.024	0.048
Copper	0.0315	0.063
Lead	0.0394	0.0788
Mercury	0.00091	0.00182
Nickel	0.174	0.348
Selenium	0.005	0.01
Silver	0.00006	0.00012
Zinc	0.401	0.802

Notes and Abbreviations:

1. --: Indicates value not available.
2. Compounds included in this table are those identified as Compounds of Potential Ecological Concern (COEPC) in the RI Report.
3. The Water Quality Standards, Ohio EPA, Division of Surface Water, Ohio River Basin - Outside Mixing Zone Average (OMZA) for (Aquatic Life August 5, 2004.) are used for chemical specific contaminant levels.
4. Groundwater Remedial Goals are based on assumption that potentially contamianted groundwater discharge to surface water and contributes a maximum of half the surface water flow.

Table 5
Summary of Potential ARAR and TBC Guidance

Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio
CERCLIS ID# OHD 980 612 188

Potential Requirement	"Applicable", "TBC", or "Relevant and Appropriate"	Chemical, Action, or Location Specific	Requirement Synopsis
Federal			
33 CFR Parts 320-330, and 40 CFR § 6.302 Fish and Wildlife Coordination Act	Relevant and appropriate if the unnamed tributary were diverted, channeled or otherwise impacted by the remedial actions.	Location	These Corps of Engineers provisions would require permits (including nationwide general permits) to protect fish or wildlife from dams, dikes, diversion, channeling, discharge of dredged fill, or other actions that would modify navigable waters
Guidance on Remedial Action for Superfund Sites with PCB Contamination OSWER Directive 9355.4-01, EPA 540/G-90/007 August 1990	TBC	Chemical, Action, Location	This guidance is for remedial actions at Superfund landfill sites with PCB contamination. Applies for engineering and institutional controls for material that is managed in place
40 CFR Part 6.302 and Executive Order No. 11990 - Protection of Wetlands	Relevant and appropriate to any wetlands that would be impacted by remedial actions.	Location	Any action involving construction of facilities or management of property in wetlands would avoid adverse effects on the wetlands, minimize potential harm, and preserve and enhance the wetlands to the extent possible.
40 CFR 60 - Standards of Performance for New Stationary Sources	Applicable (default to federal rules if state regulations are only as stringent) to equipment used in remedial actions with potential air emissions	Action	These regulations establish air emissions performance criteria for select equipment installations (tanks for volatile organic liquid storage), which could be utilized for remedial technologies
40 CFR 61 & 63 - National Emissions Standards for Hazardous Air Pollutants and for Source Categories	Applicable (default to federal rules if state regulations are only as stringent) for actions with potential hazardous air emissions	Action	These regulations establish air emissions performance criteria for specific compounds (benzene and vinyl chloride) and select source categories (manufacturing/operating practices) that emit Hazardous Air Pollutants, including remediation activities, pumping/piping leaks and other specific equipment oriented standards.
40 CFR Part 81 - Non-Attainment Provisions for Ozone - Clark County, Ohio	Relevant and appropriate	Location, Action	These provisions provide additional regulation of stationary sources in non-attainment areas Metropolitan Dayton Intrastate Air Quality Control Region includes Clark County. (40CFR81.34)
40 CFR Part 141 - National Primary Drinking Water Regulations	Applicable (default to federal rules if state regulations are only as stringent) for groundwater that is potentially a source of public water supply	Chemical	These regulations establish maximum contaminant levels (MCLs) for public water systems MCLs are conservative health-based standards.
40 CFR Part 143 - National Secondary Drinking Water Regulations	TBC	Chemical	These regulations establish secondary maximum contaminant levels (SMCLs) for public water systems. SMCLs are conservative health based standards and are non-enforceable guidelines for public water supplies.
40 CFR Parts 122 and 125 - National Pollutant Discharge Elimination System Permits (NPDES), criteria and standards	Applicable (default to federal rules if state regulations are only as stringent) for off-site discharges of treated water to surface water, substantive requirements are applicable for on-site discharges.	Chemical	These regulations set chemical specific standards to discharge any pollutant from a point source to the waters of the United States.
40 CFR Part 136 - Guidelines for Establishing Test Procedures for analyses of pollutants	Relevant and appropriate.	Chemical	These regulations establish procedures for the analysis of pollutants in water.
40 CFR 144-147 - Underground Injection Control Program, criteria and standards	Applicable (default to federal rules if state regulations are only as stringent) only to underground injection of waste.	Chemical, Action, Location	These regulations protect groundwater sources of drinking water by setting standards for and imposing restrictions upon underground injection of waste.
40 CFR 165 - Pesticide Management and Disposal (FIFRA)	TBC - Disposal of pesticides.	Action	These regulations recommend pesticide incineration and treatment processes, and performance.
40 CFR Part 261 - Identification and Listing of Hazardous Wastes (RCRA)	Applicable (default to federal rules if state regulations are only as stringent) to identify hazardous wastes that may be generated during remedial actions at the Site.	Chemical	These regulations define hazardous wastes by list and by criteria
40 CFR Part 262 - Standards Applicable to Generators of Hazardous Wastes (RCRA)	Applicable (default to federal rules if state regulations are only as stringent) if listed or characteristic wastes are generated at the Site.	Action	These regulations establish standards of operation and management for hazardous wastes that may be generated at the Site.
40 CFR Part 267 - Standards for Hazardous Waste Facilities	Applicable (default to federal rules if state regulations are only as stringent) for any containment remedial action where wastes that meet criteria as hazardous are generated and landfilled on site.	Action	These regulations establish minimum national standards for design, construction, and operation of hazardous waste landfills and would be considered as part of any remedial actions that include generating what would be defined as hazardous waste and landfilling hazardous waste on site
40 CFR Part 268 - Land Disposal Restrictions	Applicable if hazardous wastes are disposed off-site.	Action, Chemical	These regulations establish standards for treatment and disposal of certain hazardous wastes
40 CFR Part 403 - General Pretreatment Regulations	Applicable (default to federal rules if state regulations are only as stringent) for any discharge of process water to a POTW.	Chemical	These regulations establish standards for discharge to POTWs to control pollutants which pass through or interfere with treatment processes in publicly owned treatment works (POTWs)

Notes:
1. ARAR - Applicable, or relevant and appropriate requirement
2. TBC - To be considered

Table 5
Summary of Potential ARAR and TBC Guidance

Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio
CERCLIS ID# OHD 980 612 188

Potential Requirement	"Applicable", "TBC", or "Relevant and Appropriate"	Chemical, Action, or Location Specific	Requirement Synopsis
40 CFR Part 761 - Regulation of PCB Containing Materials	Relevant and appropriate if any PCB containing materials are removed or handled.	Chemical	These regulations establish requirements for storage, handling and disposal of materials containing PCBs greater than 50 ppm that may be generated during remedial actions.
42 USC §§ 6901 *et seq.* - Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act	Applicable (default to federal rules if state regulations are only as stringent) for waste disposal facility construction, operation and maintenance.	Action	This act details various design, operation, and maintenance requirements for solid waste disposal facilities.
49 CFR Part 171 - US DOT Placarding and Handling Hazardous Material Regulations	Applicable for off-site transportation of waste.	Action	These regulations establish Federal transportation and handling requirements for hazardous materials that are shipped by common carrier.
Implementing Presumptive Remedies (EPA 540-R-97-029) October 1997	TBC	Action	Guidance
Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (OSWER Directive 9200.4-17P) April 1999	TBC	Chemical	Guidance
Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with VOCs in Soils (EPA 540-F-93-048) September 1993	TBC	Chemical, Action	Guidance for VOCs in soil.
User's Guide to the VOCs in Soils Presumptive Remedy	TBC	Chemical, Action	Guidance for VOCs in soil.
Presumptive Remedy: Multi-Phase Extraction Technology for VOCs in Soil and Groundwater (EPA 540-F-97-004) April 1997	TBC	Chemical, Action	Guidance for VOCs in Soil and Groundwater.
Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Groundwater at CERCLA Sites	TBC	Chemical, Action	Guidance for ex-situ treatment of groundwater.
Presumptive Remedy for CERCLA Municipal Landfill Sites (EPA 540-F-93-035) September 1993	TBC	Action	Presumptive remedy for MSW landfills is containment.
A Guide to Principal Threat and Low Level Threat Wastes (OSWER Directive 9380.3-06FS)	TBC	Chemical	Considerations for categorizing waste for treatment or containment.
Ohio Requirements			
ORC 3704.05(A) - Prohibits Violation of Air Pollution Control Rules	Requirements are applicable for on-site waste treatment operations.	Chemical, Action	This statute prohibits violations of ambient air quality standards by stationary sources. Emissions from the site during construction of remedial alternatives would be controlled by appropriate measures which would be specified as part of the remedial design.
ORC 3734 - Solid and Hazardous Wastes	Requirements are applicable for hazardous wastes treated, stored or disposed on-site.	Action	This statute governs hazardous waste disposal facilities.
ORC 3734.02 (H) - "Digging" Where Hazardous or Solid Waste Facility was Operated	Requirements are applicable for remedial alternatives that include excavations on-site.	Location, Action	Prohibits filling, grading, excavating, building, drilling, or mining without authorization from director on land where a hazardous waste or solid waste facility was operated.
ORC 3734.02 (I) - Air Emissions from Hazardous Waste Facilities	Requirements are applicable to any remedial action that includes a stationary source of regulated air emissions	Action	This statute requires stationary sources at hazardous waste facilities to comply with this statute. Hazardous waste facility shall not cause, permit or allow nuisance emission of particulates, dust fumes, gas, mist, smoke, vapor or odorous substance.

Notes:
1. ARAR - Applicable, or relevant and appropriate requirement
2. TBC - To be considered

Table 5
Summary of Potential ARAR and TBC Guidance

Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio
CERCLIS ID# OHD 980 612 188

Potential Requirement	"Applicable", "TBC", or "Relevant and Appropriate"	Chemical, Action, or Location Specific	Requirement Synopsis
ORC 3734.03 - Prohibits Open Dumping or Open Burning of Solid Waste	Requirements are relevant and appropriate for site.	Action, Location	No additional solid waste would be placed at the site during remediation; however, surface materials at the site would be re-graded within the area of contamination to allow for the construction of the remedy. No open burning of solid waste would take place at the site for any remedial alternatives.
ORC 3734.041 - Explosive Gas Monitoring for Sanitary Landfill	Requirements are relevant and appropriate for site.	Location, Action	A sanitary landfill gas monitoring plan and program which incorporates provisions to monitor for the risk of explosion would be instituted during the remediation and may be required long term if wastes are left on-site.
ORC 3767.13 - Prohibition of Nuisances	Requirements are relevant and appropriate for remedial actions on-site.	Action, Chemical	Odor emissions would be controlled during construction for all remedial alternatives. None of the alternatives would cause an unlawful obstruction, impedance, collection or corruption of a waterway.
ORC 5301.80 to 5301.92 - Uniform Environmental Covenants Act	Applicable for placement of Environmental Covenants on the site.	Location	Regulations for the restriction of activity and use at contaminated properties by maintaining institutional controls.
ORC 6111.04 - Acts of Pollution of State Waters Prohibited	Applicable	Action	This statute prohibits polluting the waters of the state. No point source discharges of untreated leachate to surface water would exist for any of the remedial alternatives
ORC 6111.04.2 - Rules Requiring Compliance with National Effluent Standards consistent with Federal CWA Sect. 301, 306, 307 and 405	Applicable	Action, Chemical	This statute requires point source discharges to comply with national effluent standards for any remedial action that includes a point source discharge. Remedial alternatives that have point source discharges of storm water from the surface of the site would be monitored to ensure that they meet substantive storm water regulations
ORC 6111.30 - Section 401 Water Quality Standards	Applicable	Action, Chemical	This statute requires evaluation of the impacts to wetlands/waterways, sets standards to prevent degradation of water quality
ORC 6111.07 A.C - Water Pollution Control Requirements - Duty to Comply	Applicable	Action	This statute prohibits violations of Chapter 6111
Ohio Water Requirements			
OAC 3745-1 - Water Quality Standards	Applicable for off-site discharges of treated water to surface water, substantive requirements are applicable for on-site discharges.	Location, Action	This regulation governs surface water quality criteria with qualitative rules for specific Ohio water bodies/rivers and water body types. These rules establish minimum water quality requirements for all surface waters of the state.
OAC 3745-2 - Surface Water Quality Standards, Attainment and Protection	Applicable for off-site discharges of treated water to surface water, substantive requirements are applicable for on-site discharges.	Action	This regulation governs attainment and protection of standards (WQS) for surface water quality. This chapter sets forth the rules for developing water quality based effluent limitations for point sources and total maximum daily loads (TMDLs) for discharges of any pollutant requiring control, including toxic, carcinogenic, and/or organoleptic pollutants. Obtaining permits is an administrative requirement.
OAC 3745-3 Pretreatment Rules	Applicable if any wastewater is discharged to a POTW as part of remedial actions.	Action	These regulations govern pretreatment of wastewater that is discharged to a POTW, to be utilized as an alternative to surface water NPDES-permitted discharge
OAC 3745-9 - Water Well Standards	Applicable	Action	This regulation applies to drilling, operation, maintenance and abandonment of a well or monitoring well and is applicable only if a well is installed
OAC 3745-32 - Federal CWA Section 401 Water Quality Certifications	Applicable	Action	This statute requires point source discharges to comply with national effluent standards for any remedial action that includes a point source discharge. Remedial alternatives that have point source discharges of storm water from the surface of the site would be monitored to ensure that they meet substantive storm water regulations.
OAC 3745-34 - Underground Injection Control Program	Applicable if any underground injection of wastes is part of remedial actions	Action	These regulations govern underground disposal of wastes through Class I through Class V, including on-site septic systems, groundwater recharge wells and others
OAC 3745-36 - Non-domestic Wastewater Discharges into a Publicly Owned Treatment Works; Permit Program	Applicable if any wastewater is discharged to a POTW as part of remedial actions.	Action	These regulations govern the discharge of non-domestic wastewaters to a POTW, to be utilized as an alternative to surface water NPDES-permitted discharge
OAC 3745-39 - Storm water Management Program	Applicable requirements for alternatives that increase surface water runoff.	Action	These regulations define requirements for storm water discharges to surface waters of the state.
OAC 3745-81 & 82 - Primary and Secondary Drinking Water Rules for Public Water Systems	Applicable - Chapter 81 MCLs TBC - Chapter 82 MCLGs.	Action, Chemical	These regulations provide to public water systems the chemical specific regulatory (primary) and guidance (secondary) concentrations (MCLs, MCLGs) for drinking water standards and BATs for treatment.

Notes:
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Table 5
Summary of Potential ARAR and TBC Guidance

Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio
CERCLIS ID# OHD 980 612 188

Potential Requirement	"Applicable", "TBC", or "Relevant and Appropriate"	Chemical, Action, or Location Specific	Requirement Synopsis
Ohio Air Requirements			
OAC 3745-15 - General Provisions For Air Pollution Control	Substantive requirements are applicable for on-site waste treatment operations that may generate regulated air emissions	Action	This regulation provides baseline evaluations of air emissions sources, and allows for exemptions on qualified air sources of a certain size to opt out of the permitting program Also prohibits nuisance air emissions. Obtaining permits and reporting are administrative requirements.
OAC 3745-17 - General Provisions For Particulate Matter Emissions from Air Pollution Sources	Substantive requirements are applicable for on-site waste treatment operations that may generate regulated particulate emissions	Chemical, Action	This regulation governs and places limits upon the particulate matter emissions from air pollution sources.
OAC 3745-21 - Carbon Monoxide, Ozone, Hydrocarbon Air Quality Standards and Related Emissions Requirements.	Substantive requirements are applicable for on-site waste treatment operations that may generate regulated hydrocarbon air emissions.	Chemical, Action	This regulation establishes ambient air quality standards and best available technology for the emissions of CO, ozone, and hydrocarbons.
Ohio Waste Requirements			
OAC 3745-27 - Solid Waste Regulations	Applicable in determining appropriate remedial actions for solid waste that is generated and landfilled on site.	Action	This regulations specifies the requirements for construction, permitting, operation and closure of solid waste disposal facilities
OAC 3745-31-03 PTI New Sources - Exemptions	Relevant and appropriate	Action	Exemptions for small emitting sources, remediation activity and general permit by rules for remediation associated activities.
OAC 3745-50 RCRA Hazardous Waste Management System - General	Applicable requirements if RCRA-Hazardous wastes are removed from the site (substantive and administrative) or generated and managed on site (substantive only).	Action, Chemical	These regulations set forth general requirements of the RCRA hazardous waste management system.
OAC 3745-51 Identification & Listing of RCRA Hazardous Waste	Applicable requirements if RCRA Hazardous wastes are removed from the site (substantive & administrative) or generated and managed on site (substantive only).	Action, Chemical	These regulations set forth Identification and Listing of RCRA Hazardous Waste.
OAC 3745-52 RCRA Generator Standards	Applicable requirements if RCRA Hazardous wastes are removed from the site (substantive & administrative) or generated and managed on site (substantive only).	Action	These regulations set forth RCRA generator requirements of manifests, pre-transport labeling/marking/placarding, record keeping and reporting
OAC 3745-53 RCRA Transporter Standards	Applicable to Transporters	Action	These regulations set forth RCRA transporter standards for compliance with manifest and record keeping, and clean up of discharge.
OAC3745-54, RCRA New Facility Standards (and OAC 3745-65 Interim Standards)	Applicable requirements if new RCRA facility is constructed on site (substantive only)	Action	These regulations set forth RCRA requirements for new Facility Standards, CQA, Preparedness and Prevention, Contingency Plan & Emergency Procedures, Manifest/Recordkeeping/Reporting, and Groundwater Protection.
OAC 3745-55 RCRA Closure & Post-closure Containers & Tank Systems (and 3745-66 Interim Standards)	Applicable requirements if new RCRA facility is constructed on site (substantive only)	Action	These regulations set forth RCRA requirements for closure, post-closure, and financial assurance, and for container units and tank systems.
OAC3745-56 SI. Waste Pile, Land Treatment (and OAC 3745-67 Interim Standards)	Applicable requirements if new RCRA SI. Waste Pile, Land Treatment is constructed on site (substantive only)	Action	These regulations set forth RCRA requirements for Surface Impoundments, Waste Piles and Land Treatment Units.
OAC 3745-57 Landfills, Incinerators, CAMU, Drip Pads and Misc. Units	Applicable requirements if new RCRA unit is constructed on site (substantive only)	Action	These regulations set forth RCRA requirements for Landfills, incinerators, CAMUs, Drip Pads and misc. units.
OAC 3745-68 Interim Standards Landfills, Incinerators, Thermal Treatment & Misc. Units	Applicable requirements if new RCRA unit is constructed on site (substantive only)	Action	These regulations set forth RCRA interim facility requirements for landfills, incinerators, thermal treatment and misc. units.
OAC 3745-69 Interim Standards UG Injections, Drip Pads, Misc. Units	Applicable requirements if new RCRA unit is constructed on site (substantive only)	Action	These regulations set forth RCRA interim facility requirements for underground injection, drip pads and misc. units.
OAC 3745-114 Toxic Air Contaminants	Applicable	Chemical	Requires for TAC fenceline concentration modeling to meet state criteria.

Notes:
1. ARAR - Applicable, or relevant and appropriate requirement
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Table 5

Summary of Potential ARAR and TBC Guidance

Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio
CERCLIS ID# OHD 980 612 188

Potential Requirement	"Applicable", "TBC", or "Relevant and Appropriate"	Chemical, Action, or Location Specific	Requirement Synopsis
OAC 3745-270 Hazardous Wastes Restricted from Land Disposal	Applicable requirements if RCRA Hazardous wastes are removed from the site (substantive & administrative) or generated and managed on site (substantive only).	Action, Chemical	These regulations set forth RCRA prohibitions on Land Disposal, treatment standards, and prohibitions on storage of Restricted Wastes
1976 OEPA Landfill Closure Standards OAC 3745-27-09 (F) (effective 7/29/76)	Applicable to permitted closure of barrel fill in 1979-80.	Action	This Ohio guidance specifies criteria for Landfill Caps applicable in 1979-80 when the Barrel Fill was closed.
Ohio EPA DSIWM Guidance No. 0123 Standards for Current Construction of a 1976 Cap System (March 27, 1995)	TBC for permitted closure of barrel fill in 1979-1980.	Action	This regulatory interpretation establishes criteria for materials, construction, and testing specifications for building a new cap that meets the requirements of the 1976 rules
Ohio EPA DSIWM Guidance No. 0111 Measurable Criteria for Questionable Pre-1990 Landfill Caps (March 24, 1995).	TBC for permitted closure of barrel fill in 1979-1980.	Action	This regulatory interpretation establishes measurable criteria (grain size) for a cap that was placed pre-1990 to meet the requirements of the 1976 rules.
1976 OEPA Solid Waste Rules OAC 3745-27-09 (F) effective 7/29/06)	Applicable to permitted closure of barrel fill in 1979-80.	Action	This Ohio guidance specifies criteria for solid waste facilities applicable in 1979-80 when the Barrel Fill was closed

Notes:
1. ARAR - Applicable, or relevant and appropriate requirement
2. TBC - To be considered

Table 6 - Screening of Technical Implementability
Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio

Environmental Media	General Response Actions (GRAs)	Remedial Technology	Process Options	Description	Technical Implementability (See Note 1)
Groundwater (Water Table and 1075 Interfill) (Note 2)	No action	None	No options	No action	Required for consideration
	Access restriction	Barriers/warnings	Physical barrier	Security fence with locked gates	Applicable, retained for further evaluation
			Warnings	Posted signs	Applicable, retained for further evaluation
	Institutional controls	Governmental controls	Restrict land use	Prohibit land development	Applicable, retained for further evaluation
			Prohibit groundwater use	Prohibit groundwater drilling, contact, use	Applicable, retained for further evaluation
		Proprietary controls	Covenant	Easements/legal instruments with Agency participation	Applicable, retained for further evaluation
		Enforcement/permit tools	Administrative order by consent	Agency required monitoring	Applicable, retained for further evaluation
			Consent decree	Agency required monitoring	Applicable, retained for further evaluation
		Informational devices	CERCLIS list	State listed waste site	Applicable, retained for further evaluation
			Deed notice	Notice that land has been used to manage hazardous waste; that remedial measures are in place	Applicable, retained for further evaluation
	Monitoring	Groundwater monitoring	Groundwater monitoring	On-going monitoring of groundwater wells	Applicable, retained for further evaluation
		Monitored natural attenuation (MNA)	MNA	Natural sorption, dilution, dispersion, volatilization, abiotic chemical reactions reduce contaminants of concern concentrations	Applicable, retained for further evaluation for residuals
	Ex-situ groundwater treatment	Biological	Aerobic	Degradation of organics using microorganisms in an aerobic environment	Applicable, retained for further evaluation
			Anaerobic	Degradation of organics using microorganisms in an anaerobic environment	Applicable, retained for further evaluation
		Physical/chemical	Precipitation	Alteration of chemical equilibria to reduce the solubility of the inorganic contaminants	Applicable, retained for further evaluation
			Stripping	Mixing large volumes of air with water in a packed column to promote transfer of VOCs to air	Applicable, retained for further evaluation
			Carbon adsorption	Adsorption of organic contaminants onto activated carbon by passing water through carbon column	Applicable, retained for further evaluation
			Reverse osmosis	Use of high pressure to force water through a membrane leaving inorganic contaminants behind	Not applicable to organic COCs
			Ion exchange resin	Metals contaminated water is passed through a resin bed where ions are exchanged between resin and water	Applicable, retained for further evaluation
			E-beam	Electron source is used to destroy organic contaminants in water	Applicable, retained for further evaluation
			Oxidation	Mix oxidizing agent with contaminated water to promote destruction of organic contaminants	Applicable, retained for further evaluation
		Off-site treatment	POTW	Extracted groundwater transported to local POTW for treatment	Applicable, retained for further evaluation
			TSCA/RCRA facility	Extracted groundwater transported to licensed RCRA/TSCA facility for treatment or disposal	Applicable, retained for further evaluation
	In-situ groundwater treatment	Biological/Chemical	Bioreclamation	System of injection wells introduce bacteria and nutrients to degrade organic contaminants	Not applicable to site conditions
			Aeration	System of wells to inject air into groundwater to remove volatiles by air stripping	Not applicable to site conditions
			Permeable reactive barrier funnel and gate	Down gradient trenches filled with media to remove contaminants from water	Not applicable to site conditions
			Chemical oxidation	System of wells to inject oxidizer into groundwater to degrade organic contaminants	Not applicable to site conditions
	Groundwater discharge	On-site	Local tributary	Extracted water discharged to unnamed tributary via NPDES permit	Applicable, retained for further evaluation
			Deep well injection	Extracted water discharged to deep well injection system	Applicable, retained for further evaluation
		Off-site discharge	POTW	Extracted water transported to local POTW for treatment	Applicable, retained for further evaluation
			Pipeline to unnamed tributary	Extracted water discharged to unnamed tributary via NPDES permit	Applicable, retained for further evaluation
	Containment (Note 3)	Contact barrier	Soil vegetated with re-grading	Soil layer of sufficient thickness to prevent direct contact	Applicable, retained for further evaluation
			Asphalt or concrete	Asphalt or concrete to prevent direct contact	Applicable, retained for further evaluation
		Engineered cap	Low permeability cap	Vegetative layer, protective soil layer, drainage layer, FML layer, and low permeability soil layer, or equivalent	Applicable, retained for further evaluation
		Vertical barrier/lateral hydraulic barrier	Slurry wall	Trench filled with cement\bentonite slurry	Applicable, retained for further evaluation
			Sheet pile	Steel interlocking corrugated sheets	Applicable, retained for further evaluation
			Jet grout curtain	Pressure injection of grout in a regular pattern of drilled holes	Not feasible for well thickness
			Deep soil mix	Mechanical, in-situ mixing of soil with grout additives in a pattern of overlapping drilled holes	Applicable, retained for further evaluation
			Vibrating beam	Mechanical vibrating force to advance beam with injection of grout as beam is withdrawn	Not feasible for high density fill
			Groundwater trench	Perforated pipe in trenches backfilled with porous media to collect contaminated water with pumping	Applicable, retained for further evaluation
			Groundwater extraction wells/sumps	Vertical wells/sumps to collect contaminated water with pumping	Not feasible for site conditions

Notes:

1. Technical implementability is based on RI data regarding COCs and Barrel Fill Site characteristics. Highlighted items are retained. See Table 7 for subsequent evaluation. No technologies and/or process options that are screened out at this step on the basis of technical implementability are carried forward to Table 7.

2. The water table groundwater is evaluated for both a potential discharge to the unnamed tributary and a not reasonably anticipated potable use exposure. The 1075 Interfill is evaluated for a not reasonably anticipated potable use.

3. Groundwater containment includes groundwater collection and barriers such as caps and walls.

During the initial screening step, process options and entire technology types are eliminated from further consideration on the basis of technical implementability. Technical implementability is ability to construct, reliably operate and meet performance requirements; includes O&M, replacement and monitoring of technical components. Two factors that commonly influence technology screening are the COCs because they limit the applicability of many treatment processes, and site subsurface conditions because they limit many types of containment, groundwater collection and in-situ treatment technologies.

See Appendix A for further discussion of screening decisions.

Table 6 - Screening of Technical Implementability
Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio

Environmental Media	General Response Actions (GRAs)	Remedial Technology	Process Options	Description	Technical Implementability (See Note 1)
Soil Vapor	No action	None	No options	No action	Required for consideration
	Access restriction	Barriers\warnings	Physical barrier	Security fence with locked gates	Applicable, retained for further evaluation
			Warnings	Posted signs	Applicable, retained for further evaluation
	Institutional controls	Governmental controls	Restrict land use	Prohibit land development	Applicable, retained for further evaluation
			Prohibit groundwater use	Prohibit groundwater drilling, contact, use	Applicable, retained for further evaluation
		Proprietary controls	Covenant	Easements/legal instruments with Agency participation	Applicable, retained for further evaluation
		Enforcement\permit tools	Administrative order by consent	Agency required monitoring	Applicable, retained for further evaluation
			Consent decree	Agency required monitoring	Applicable, retained for further evaluation
		Informational devices	CERCLIS list	State listed waste site	Applicable, retained for further evaluation
			Deed notice	Notice that land has been used to manage hazardous waste; that remedial measures are in place	Applicable, retained for further evaluation
	Monitoring	Soil vapor monitoring	Soil vapor monitoring	On-going monitoring of soil vapor	Applicable, retained for further evaluation
	Soil vapor extraction\venting (Treatment discussed below)	Extraction	Extraction wells	Series of wells to extract contaminated soil vapor	Applicable, retained for further evaluation
			Sub slab venting (Assumes future development)	Depressurize the slab of any future development and vent	Applicable, retained for further evaluation
		Venting	Subsurface venting	Perforated pipe\wells in trenches backfilled with porous media to collect contaminated soil vapor	Applicable, retained for further evaluation
	Ex-situ soil vapor treatment	Physical\chemical	Carbon adsorption	Adsorption of contaminants onto activated carbon by passing vapor through carbon column	Applicable, retained for further evaluation
			Liquid scrubber	Use of water to transfer contaminants to liquid phase	Applicable, retained for further evaluation
			E-beam	Electron source is used to destroy contaminants in air	Applicable, retained for further evaluation
			Combust\Oxidation	Mix oxidizing agent with contaminated air to promote destruction of contaminants	Applicable, retained for further evaluation
	Soil vapor discharge	On-site	Atmosphere	Extracted soil vapor discharged to atmosphere	Applicable, retained for further evaluation
	Containment	Vapor barrier	Asphalt or concrete	Asphalt or concrete to prevent soil vapor discharge	Applicable, retained for further evaluation
			Flexible membrane liner	Flexible membrane liner to prevent soil vapor discharge	Applicable, retained for further evaluation
		Engineered cap	Low permeability cap	Vegetative layer, protective soil layer, drainage layer, FML layer, and low permeability soil layer	Applicable, retained for further evaluation

Notes.

1 Technical implementability is based on RI data regarding COCs and Barrel Fill Site characteristics. Highlighted items are retained. See Table 7 for subsequent evaluation. No technologies and/or process options that are screened out at this step on the basis of technical implementability are carried forward to Table 7.

During this initial screening step, process options and entire technology types are eliminated from further consideration on the basis of technical implementability. Technical implementability is ability to construct, reliably operate and meet performance requirements; includes O&M, replacement and monitoring of technical components. Two factors that commonly influence technology screening are the COCs because they limit the applicability of many treatment processes, and site subsurface conditions because they limit many types of containment, groundwater collection and in-situ treatment technologies.

See Appendix A for further discussion of screening decisions.

Table 6 - Screening of Technical Implementability
Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio

Environmental Media	General Response Actions (GRAs)	Remedial Technology	Process Options	Description	Technical Implementability (See Note 1)
Waste	No action	None	No options	No action	Required for consideration
	Access restriction	Barriers/warnings	Physical barrier	Security fence with locked gates	
			Warnings	Posted signs	
	Institutional controls	Governmental controls	Restrict land use	Prohibit land development	
			Prohibit groundwater use	Prohibit waste cell groundwater drilling, contact, use	
		Proprietary controls	Covenant	Easements/legal instruments with Agency participation	
		Enforcement/permit tools	Administrative order by consent	Agency required monitoring	
			Consent decree	Agency required monitoring	
		Informational devices	CERCLIS list	State listed waste site	
			Deed notice	Notice that land has been used to manage hazardous waste; that remedial measures are in place	
	Containment (Note 2)	Contact barrier	Soil vegetated with re-grading	Soil layer of sufficient thickness to prevent direct contact	
			Asphalt or concrete	Asphalt or concrete to prevent direct contact	
		Engineered cap	Low permeability cap	Vegetative layer, protective soil layer, drainage layer, FML layer, and low permeability soil layer	
		Vertical barrier/lateral hydraulic barrier	Slurry wall	Trench filled with cement/bentonite slurry	
			Sheet pile	Steel interlocking corrugated sheets	
			Jet grout curtain	Pressure injection of grout in a regular pattern of drilled holes	Not feasible for wall thickness
			Deep soil mix	Mechanical, in-situ mixing of soil with grout additives in a pattern of overlapping drilled holes	
			Vibrating beam	Mechanical vibrating force to advance beam with injection of grout as beam is withdrawn	Not feasible for high density till
			Groundwater trench	Perforated pipe in trenches backfilled with porous media to collect contaminated water with pumping	
			Groundwater extraction wells/sumps	Vertical wells/sumps to collect contaminated water with pumping	Not feasible for site conditions
	In-situ source destruction/treatment	Biological	Aerobic	Degradation of organics using microorganisms in an aerobic environment	Not proven for high strength and heterogeneous waste cells, COCs
			Anaerobic	Degradation of organics using microorganisms in an anaerobic environment	Not applicable to inorganic and certain organic COCs found in groundwater at the Barrel Fill Site
		Chemical	Oxidation	Mix oxidizing agent with to promote destruction of organic contaminants	Not feasible for delivery to source in waste cells, site conditions
		Thermal	Thermal	Multiple thermal process options (RF heating, 6-phase heating, vitrification)	Not feasible for delivery to source in waste cells, site conditions
		Solidification	Solidification	Physically bound or enclosed within a solid mass	Not feasible for delivery to source in waste cells, site conditions
		Stabilization	Stabilization	Mobility reduced by chemical reaction	Not feasible for delivery to source in waste cells, site conditions
	Source/residual removal with ex-situ source/residual destruction/treatment, replacement at site or off-site disposal	Biological	Aerobic	Degradation of organics using microorganisms in an aerobic environment	Applicable, retained for further evaluation to certain source wastes
			Anaerobic	Degradation of organics using microorganisms in an anaerobic environment	Applicable, retained for further evaluation to certain source wastes
		Chemical	Solvent extraction/oxidation	Volume reduction through chemical process	Applicable, retained for further evaluation to certain source wastes
	Source/residual removal with ex-situ source/res	Physical	Solidification	Physically bound or enclosed within a solid mass, inorganics	Applicable, retained for further evaluation to certain source wastes
			Stabilization	Mobility reduced by chemical reaction, inorganics	Applicable, retained for further evaluation to certain source wastes
			Vitrification	Solidification method up to 2200F to melt and convert waste materials into glass or other crystalline products	Applicable, retained for further evaluation to certain source wastes
		Thermal	Incineration	1400-2200F process to volatilize and combust wastes in presence of oxygen	Applicable, retained for further evaluation to certain source wastes
			Desorption	Low temperature (200F) or high temperature (1000F) volume reduction through thermal process	Applicable, retained for further evaluation to certain source wastes
	Source/residual removal with ex-situ off-site disposal	Disposal	Commercial TSDF and/or solid waste facility	On-site characterization, transport off-site for appropriate, permitted disposal	Applicable, retained for further evaluation

Notes:

1. Technical implementability is based on RI data regarding COCs and Barrel Fill Site characteristics. Highlighted items are retained. See Table 7 for subsequent evaluation. No technologies and/or process options that are screened out at this step on the basis of technical implementability are carried forward to Table 7.

2. Groundwater containment includes groundwater collection and barriers such as caps and walls.

During this initial screening step, process options and entire technology types are eliminated from further consideration on the basis of technical implementability. Technical implementability is ability to construct, reliably operate and meet performance requirements; includes O&M, replacement and monitoring of technical components. Two factors that commonly influence technology screening are the COCs because they limit the applicability of many treatment processes, and site subsurface conditions because they limit many types of containment, groundwater collection and in-situ treatment technologies.

See Appendix A for further discussion of screening decisions.

Table 7 - Screening of Effectiveness, Institutional Implementability and Relative Cost
Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio

Environmental Media	General Response Actions (GRAs)	Remedial Technology	Process Options	Effectiveness (See Note 1)	Institutional Implementability (See Note 2)	Relative Cost (capital/O&M) (See Note 3)	Technology screened out based on	Comment
Groundwater (Water Table and 1075 Interval)	No action	None	No options	Does not achieve remedial action objectives	N/A	None/none		Retained because of NCP
	Access restriction	Barriers/warnings	Physical barrier	Most effective, currently in place	Easily implemented	Low/low		Retained on screening criteria
			Warnings	Least effective	Easily implemented	Low/low		Retained on screening criteria
	Institutional controls	Governmental controls	Restrict land use	Effective only to the extent of enforcement	Government authority	Low/low		Retained on screening criteria
			Prohibit groundwater use	Effective only to the extent of enforcement	Government authority	Low/low		Retained on screening criteria
		Proprietary controls	Covenant	More effective because covenants transfer with ownership	Owner authority with Agency	Low/low		Retained on screening criteria
		Enforcement/permit tools	Administrative order by consent	Only binding on signatories, not on successors	Governmental control	Low/low	Effectiveness - Only binding on signatories	
			Consent decree	Only binding on signatories, not on successors	Governmental control	Low/low	Effectiveness - Only binding on signatories	
		Informational devices	CERCLIS list	Less effective, used as a secondary institutional control to other institutional controls	Owner authority	Low/low	Effectiveness - Less effective	
			Deed notice	Less effective, used as a secondary institutional control to other institutional controls	Owner authority	Low/low	Effectiveness - Less effective	
	Monitoring	Groundwater monitoring	Groundwater monitoring	Useful for documenting conditions	Easily implemented	Low/low		Retained on screening criteria
		Monitored natural attenuation (MNA)	MNA	Most effective with source removal	Easily implemented	Low/low		Retained on screening criteria
	Ex-situ groundwater treatment	Biological	Aerobic	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
			Anaerobic	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
		Physical/chemical	Precipitation	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
			Stripping	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
			Carbon adsorption	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
			Ion exchange resin	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
			E-beam	Effective and reliable. Less waste generation at completion	Easily implemented	Medium/low	Relative Cost - More expensive vs. alternatives	
			Oxidation	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
		Off-site treatment	POTW	Effectiveness and reliability require pilot testing. Transportation required	Permit required	Low/low		Retained on screening criteria
			TSCA/RCRA facility	Transportation required	Capacity required	Low/medium	Relative Cost - More expensive vs. alternatives	
	Groundwater discharge	On-site	Local tributary	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
			Deep well injection	Effective and reliable	Extensive substantive requirements	Medium/low	Cost - More expensive vs. alternatives	
		Off-site discharge	POTW	Effective and reliable Conventional technology. Transportation required	Easily implemented Permit required	Low/medium		Retained on screening criteria
			Pipeline to unnamed tributary	Effective and reliable. Conventional technology	Easily implemented Permit required	Low/low		Retained on screening criteria
	Containment	Contact barrier	Soil vegetated with re-grading	Effective and reliable. Conventional technology. Susceptible to weathering	Easily implemented	Low/low		Retained on screening criteria
			Asphalt or concrete	Effective and reliable. Conventional technology. Susceptible to cracking/weathering	Easily implemented	Low/low	Effectiveness - long-term	
		Engineered Cap	Low permeability cap	Effective and reliable. Conventional technology. Minimizes infiltration	Easily implemented	Medium/low		Retained on screening criteria
		Vertical barrier/lateral hydraulic barrier	Slurry wall	Reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
			Sheet pile	Effective at shallow depths, greater permeability	Easily implemented (shallow)	Medium/low		Retained on screening criteria
			Deep soil mix	Effective and reliable. Conventional technology	Easily implemented	Medium/low	Relative Cost - More expensive vs. alternatives	
			Groundwater trench	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria

Notes

1 Effectiveness focused on handling the estimated areas/volumes of media, impacts to human health/environment during implementation; and proven reliability. Short-term effectiveness refers to construction and implementation period; Long-term to the period after remediation is complete

2 Institutional implementability focused on ability to obtain permits, availability of TSD capacity, and availability of necessary equipment and skilled labor.

3 Relative cost plays a limited role in screening. Costs for capital and O&M were evaluated relative to other process options

During this screening step, available information is used to identify/distinguish differences among the various alternative technology types and process options. Each alternative is evaluated relative to the others in its group with respect to its effectiveness, institutional implementability and cost. Only the alternatives judged as the best or most promising are retained for further consideration.

See Appendix A for further discussion of screening decisions.

Table 7 - Screening of Effectiveness, Institutional Implementability and Relative Cost
Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio

Environmental Media	General Response Actions (GRAs)	Remedial Technology	Process Options	Effectiveness (See Note 1)	Institutional Implementability (See Note 2)	Relative Cost (capital/O&M) (See Note 3)	Technology screened out based on	Comment
Soil Vapor	No action	None	No options	Does not achieve remedial action objectives	NA	None/none		Retained because of NCP
	Access restriction	Barriers/warings	Physical barrier	Most effective, currently in place	Easily implemented	Low/low		Retained on screening criteria
			Warnings	Least effective	Easily implemented	Low/low		Retained on screening criteria
	Institutional controls	Governmental controls	Restrict land use	Effective only to the extent of enforcement	Government authority	Low/low		Retained on screening criteria
			Prohibit groundwater use	Effective only to the extent of enforcement	Government authority	Low/low		Retained on screening criteria
		Proprietary controls	Covenant	Effective because covenants transfer with ownership	Owner authority, with Agency	Low/low		Retained on screening criteria
		Enforcement/permit tools	Administrative order by consent	Only binding on signatories, not on successors	Governmental control	Low/low	Effectiveness - Only binding on signatories	
			Consent decree	Only binding on signatories, not on successors	Governmental control	Low/low	Effectiveness - Only binding on signatories	
		Informational devices	CERCLIS list	Less effective, used as a secondary institutional control to other institutional controls	Owner authority	Low/low	Effectiveness - Less effective	
			Deed notice	Less effective, used as a secondary institutional control to other institutional controls	Owner authority	Low/low	Effectiveness - Less effective	
	Monitoring	Soil vapor monitoring	Soil vapor monitoring	Useful for documenting conditions	Easily implemented	Low/low		Retained on screening criteria
	Soil vapor extraction/venting (treatment discussed below)	Extraction	Extraction wells	Effective and reliable	Easily implemented	Low/medium	Relative Cost - More expensive vs. alternatives	
			Subslab venting (Assumes future development)	Effective and reliable	Easily implemented	Low/low		Future risk only
		Venting	Subsurface venting	Effective and reliable	Easily implemented	Low/low		Future risk only
	Ex-situ soil vapor treatment	Physical/Chemical	Carbon adsorption	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
			Liquid scrubber	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
			Ozonation	Effective and reliable. Less waste generation at completion	Easily implemented	Medium/low	Relative Cost - More expensive vs. alternatives	
			Combustion/oxidation	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
	Soil vapor discharge	On-site	Atmosphere	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
	Containment	Vapor barrier	Asphalt or concrete	Effective and reliable. Conventional technology. Susceptible to cracking/weathering	Easily implemented	Low/low	Effectiveness - long-term	Future risk only
			Flexible membrane liner	Effective and reliable. Conventional technology. Susceptible to cracking/weathering	Easily implemented	Low/low	Effectiveness - long-term	Future risk only
		Engineered cap	Low permeability cap	Effective and reliable. Conventional technology. Minimizes infiltration	Easily implemented	Medium/low		Future risk only

Notes:

1. Effectiveness focused on handling the estimated areas/volumes of media; impacts to human health/environment during implementation; and proven reliability. Short-term effectiveness refers to construction and implementation period; Long-term to the period after remediation is complete.

2. Institutional implementability focused on ability to obtain permits, availability of TSD capacity, and availability of necessary equipment and skilled labor.

3. Relative cost plays a limited role in screening. Costs for capital and O&M were evaluated relative to other process options.

During this screening step, available information is used to identify/distinguish differences among the various alternative technology types and process options. Each alternative is evaluated relative to the others in its group with respect to its effectiveness, institutional implementability and cost. Only the alternatives judged as the best or most promising are retained for further consideration.

See Appendix A for further discussion of screening decisions.

Table 7 - Screening of Effectiveness, Institutional Implementability and Relative Cost
Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio

Environmental Media	General Response Actions (GRAs)	Remedial Technology	Process Options	Effectiveness (See Note 1)	Institutional Implementability (See Note 2)	Relative Cost (capital/O&M) (See Note 3)	Technology screened out based on	Comment
Waste	No action	None	No options	Does not achieve remedial action objectives	N/A	None/none		Retained because of NCP
	Access Restriction	Barriers/warnings	Physical barrier	Most effective, currently in place	Easily implemented	Low/low		Retained on screening criteria
			Warnings	Least effective	Easily implemented	Low/low		Retained on screening criteria
	Institutional controls	Governmental controls	Restrict land use	Effective only to the extent of enforcement	Government authority	Low/low		Retained on screening criteria
			Prohibit groundwater use	Effective only to the extent of enforcement	Government authority	Low/low		Retained on screening criteria
		Proprietary controls	Covenant	Effective, however, changes in transfer with ownership	Owner authority with Agency	Low/low		Retained on screening criteria
		Enforcement/permit tools	Administrative order by consent	Only binding on signatories, not on successors	Governmental control	Low/low	Effectiveness - Only binding on signatories	
			Consent decree	Only binding on signatories, not on successors	Governmental control	Low/low	Effectiveness - Only binding on signatories	
		Informational devices	CERCLIS list	Less effective, used as a secondary institutional control to other institutional controls	Owner authority	Low/low	Effectiveness - Less effective	
			Deed notice	Less effective, used as a secondary institutional control to other institutional controls	Owner authority	Low/low	Effectiveness - Less effective	
	Containment	Contact barrier	Soil vegetative with re-grading	Effective and reliable. Conventional technology. Susceptible to weathering	Easily implemented	Low/low		Retained on screening criteria
			Asphalt or concrete	Effective and reliable. Conventional technology. Susceptible to cracking/weathering	Easily implemented	Low/low	Effectiveness - long-term	
		Engineered cap	Low permeability cap	Effective and reliable. Conventional technology. Minimizes infiltration	Easily implemented	Low/low		Retained on screening criteria
		Vertical barrier/lateral hydraulic barrier	Slurry wall	Reliable. Conventional technology	Easily implemented	Medium/low		Retained on screening criteria
			Sheet pile	Effective at shallow depths, greater permeability	Easily implemented (shallow)	Medium/low		Retained on screening criteria
			Deep soil mix	Effective and reliable. Conventional technology	Easily implemented	Medium/low	Relative Cost - More expensive vs. alternatives	
			Groundwater trench	Effective and reliable. Conventional technology	Easily implemented	Low/low		Retained on screening criteria
	Source/residual removal with ex-situ source/residual destruction/treatment, replacement at site or off-site disposal	Biological	Aerobic	Potentially effective and reliable, for certain source wastes		Low/low	Effectiveness - not effective for multiple waste streams	
			Anaerobic	Potentially effective and reliable for certain source wastes		Low/low	Effectiveness - not effective for multiple waste streams	
		Chemical	Solvent extraction/oxidation	Potentially effective and reliable for certain source wastes		Medium/low	Effectiveness - not effective for multiple waste streams	
		Physical	Solidification	Potentially effective and reliable for certain source wastes.		Medium/low	Effectiveness - not effective for multiple waste streams	
			Stabilization	Potentially effective and reliable for certain source wastes		Medium/low	Effectiveness - not effective for multiple waste streams	
			Vitrification	Potentially effective and reliable for certain source wastes		High/low	Implementability - Specialized equipment	
		Thermal	Incineration	Potentially effective and reliable for certain source wastes	Specialized equipment not available	High/low	Implementability - Specialized equipment	
			Desorption (Low temp)	Potentially effective and reliable (organics) for certain source wastes		High		Retained on screening criteria
	Source/residual removal with ex-situ off-site disposal	Disposal	Commercial TSDF (RCRA/ Solid waste facility	Effective and reliable	Transportation risk. Easily implemented. Long term risk unabated	High		Retained on screening criteria

Notes

1 Effectiveness focused on handling the estimated areas/volumes of media, impacts to human health/environment during implementation, and proven reliability. Short-term effectiveness refers to construction and implementation period; Long-term to the period after remediation is complete.

2 Institutional implementability focused on ability to obtain permits, availability of TSD capacity, and availability of necessary equipment and skilled labor

3 Relative cost plays a limited role in screening. Costs for capital and O&M were evaluated relative to other process options

During this screening step, available information is used to identify/distinguish differences among the various alternative technology types and process options. Each alternative is evaluated relative to the others in its group with respect to its effectiveness, institutional implementability and cost. Only the alternatives judged as the best or most promising are retained for further consideration.

See Appendix A for further discussion of screening decisions

Table 8 - Range of Remedial Alternatives
Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio

General Response Action		Remedial Alternatives					
		1	2	3	4	5	6
Technology Type	Area/Volume	No Action	Down-Gradient Groundwater Collection, Regrade Cap, ICs, Monitoring, Contingency	Down-Gradient Groundwater Collection, Up-Gradient Diversion, Regrade Cap, ICs, Monitoring, Contingency	Waste Removal, Off-site Disposal Waste, Off-site Disposal Residuals	Waste Removal, Off-site Disposal Waste, On-site Treatment and Placement Residuals	Waste Removal, Off-site Disposal Waste, On-site Treatment of Residuals with Off-Site Disposal
Restrict Access, Fence	Barrel Fill Site	✓	✓	✓	✓	✓	✓
Institutional Controls	Barrel Fill Site		✓	✓	✓	✓	✓
Groundwater Monitoring	Barrel Fill Site and Vicinity		✓	✓	✓	✓	✓
Contingency Planning	Barrel Fill Site and Vicinity		✓	✓			
Groundwater Containment and Treatment	Depth to Silty Clay Till; Length East Side Barrel Fill Site		✓	✓			
Upgradient Groundwater Diversion	Shallow Depth Weathered Till; Length West Side Barrel Fill Site			✓			
Regrade Existing Cap/Cover	Barrel Fill		✓	✓			
Remove Source Waste with Off-site Treatment/Disposal	Barrel Fill Waste Cells				✓	✓	✓
Remove Contaminated Residuals with Off-site Source Treatment/ Disposal	Soil Around Barrel Fill Waste Cells				✓		
Remove Contaminated Residuals with On-site Treatment and Placement into On-site Landfill at Barrel Fill	Soil Around Barrel Fill Waste Cells					✓	
Remove Contaminated Residuals with On-site Treatment and Off-site Disposal	Soil Around Barrel Fill Waste Cells						✓

TABLE 9
Documentation of ARARS

Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio
CERCLIS #OHD 980 612 188

Potential ARAR	Alternative 1 - No Action	Alternative 2 - Down-Gradient Groundwater Collection, Regrade Cap, ICs, Monitoring, Contingency	Alternative 3 - Down-Gradient Groundwater Collection, Up-Gradient Diversion, Regrade Cap, ICs, Monitoring, Contingency	Alternative 4 - Waste Removal, Off-Site Disposal Waste, Off-Site Disposal Residuals	Alternative 5 - Waste Removal, Off-Site Disposal Waste, On-Site Treatment and Placement Residuals	Alternative 6 - Waste Removal, Off-Site Disposal Waste, On-Site Treatment of Residuals with Off-Site Disposal
Federal						
33 CFR Parts 320-330, and 40 CFR § 6.302 - Fish and Wildlife Coordination Act	-	Tributary diversion would meet substantive requirements	Tributary diversion would meet substantive requirements.	-	-	-
40 CFR Part 6 302 and Executive Order No 11990 - Protection of Wetlands	-	Cap grading, tributary diversion would meet substantive requirements	Cap grading, tributary diversion would meet substantive requirements	Site excavation, grading would meet substantive requirements	Site excavation, landfilling, grading would meet substantive requirements	Site excavation grading would meet substantive requirements
40 CFR 60 - Standards of Performance for New Stationary Sources	-	On-site treatment would meet substantive requirements for tank storage of volatile organic liquids.	On-site treatment would meet substantive requirements for tank storage of volatile organic liquids.	-	On-site treatment would meet substantive requirements for tank storage of volatile organic liquids	On-site treatment would meet substantive requirements for tank storage of volatile organic liquids
40 CFR 61 & 63 - National Emissions Standards for Hazardous Air Pollutants and for Source Categories	-	On-site treatment would meet substantive requirements because specific compounds are below threshold levels and because site remediation source category is exempt by CERCLA	On-site treatment would meet substantive requirements because specific compounds are below threshold levels and because site remediation source category is exempt by CERCLA.	On-site treatment would meet substantive requirements because specific compounds are below threshold levels and because site remediation source category is exempt by CERCLA	On-site treatment would meet substantive requirements because specific compounds are below threshold levels and because site remediation source category is exempt by CERCLA	On-site treatment would meet substantive requirements because specific compounds are below threshold levels and because site remediation source category is exempt by CERCLA
40 CFR Part 141 - National Primary Drinking Water Regulations (MCLs)	Will not meet, no waiver justified.	Institutional controls would be protective	Institutional controls would be protective	Institutional controls would be protective	Institutional controls would be protective.	Institutional controls would be protective
40 CFR Parts 122 and 125 - National Pollutant Discharge Elimination System Permits (NPDES), Criteria and Standards	-	Discharge of treated water would meet NPDES standards (and administrative requirements if off-site)	Discharge of treated water would meet NPDES standards (and administrative requirements if off-site).	-	-	-
40 CFR Part 136 - Guidelines for Establishing Test Procedures for Analyses of Pollutants (NPDES)	-	NPDES Analysis would meet substantive requirements by using established test procedures	NPDES Analysis would meet substantive requirements by using established test procedures	-	-	-
40 CFR Part 261 - Identification and Listing of RCRA Hazardous Wastes	-	Wastes handled during groundwater collection/treatment would be characterized in accordance with RCRA requirements	Wastes handled during groundwater collection/treatment would be characterized in accordance with RCRA requirements	Wastes handled during removal would be characterized in accordance with RCRA requirements	Wastes handled during removal would be characterized in accordance with RCRA requirements	Wastes handled during removal would be characterized in accordance with RCRA requirements
40 CFR Part 262 - Standards Applicable to Generators of RCRA Hazardous Wastes	-	Wastes handled during groundwater collection/treatment would be managed on-site in accordance with substantive requirements, off-site in accordance with substantive and administrative requirements.	Wastes handled during groundwater collection/treatment would be managed on-site in accordance with substantive requirements, off-site in accordance with substantive and administrative requirements	Wastes handled during removal would be managed on-site in accordance with substantive RCRA requirements; off-site in accordance with substantive and administrative requirements	Wastes handled during removal would be managed on-site in accordance with substantive RCRA requirements; off-site in accordance with substantive and administrative requirements	Wastes handled during removal would be managed on-site in accordance with substantive RCRA requirements, off-site in accordance with substantive and administrative requirements
40 CFR Part 267 - Standards for Hazardous Waste Facilities	-	-	-	-	-	-
40 CFR Part 268 - Land Disposal Restrictions	-	RCRA hazardous wastes handled during groundwater collection/treatment would be disposed off-site in accordance with substantive and administrative requirements	RCRA hazardous wastes handled during groundwater collection/treatment would be disposed off-site in accordance with substantive and administrative requirements.	RCRA hazardous wastes handled during removal would be disposed off-site in accordance with substantive and administrative requirements	RCRA hazardous wastes handled during removal would be disposed off-site in accordance with substantive and administrative requirements, on-site in accordance with substantive requirements.	RCRA hazardous wastes handled during removal would be disposed off-site in accordance with substantive and administrative requirements
40 CFR Part 403 - General Pretreatment Regulations	-	Discharge of treated water would meet NPDES standards (and administrative requirements if off-site)	Discharge of treated water would meet NPDES standards (and administrative requirements if off-site).	-	-	-
42 USC 6901 *et seq* - Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act	-	-	-	-	Would meet substantive requirements by design, operation and maintenance of solid waste landfill on-site for treated residual wastes	-
49 CFR Part 171 - US DOT Placarding and Handling Hazardous Material Regulations	-	DOT Hazardous Materials handled during groundwater collection/treatment would meet substantive and administrative requirements for off-site transportation.	DOT Hazardous Materials handled during groundwater collection/treatment would meet substantive and administrative requirements for off-site transportation	DOT Hazardous Materials handled during waste removal would meet substantive and administrative requirements for off-site transportation	DOT Hazardous Materials handled during waste removal would meet substantive and administrative requirements for off-site transportation	DOT Hazardous Materials handled during waste removal would meet substantive and administrative requirements for off-site transportation.
Ohio Requirements						
ORC 3704 05(A) - Prohibits Violation of Air Pollution Control Rules	Uncontrolled emissions could develop	On-site actions would meet substantive requirements by air monitoring and controls.	On-site actions would meet substantive requirements by air monitoring and controls	On-site actions would meet substantive requirements by air monitoring and controls	On-site actions would meet substantive requirements by air monitoring and controls	On-site actions would meet substantive requirements by air monitoring and controls
ORC 3734 - Solid and Hazardous Waste	-	Wastes handled during groundwater collection/treatment would be managed on-site in accordance with substantive requirements, off-site in accordance with substantive and administrative requirements	Wastes handled during groundwater collection/treatment would be managed on-site in accordance with substantive requirements; off-site in accordance with substantive and administrative requirements	Wastes handled during removal would be managed on-site in accordance with substantive requirements; off-site in accordance with substantive and administrative requirements	Wastes handled during removal would be managed on-site in accordance with substantive requirements; off-site in accordance with substantive and administrative requirements	Wastes handled during removal would be managed on-site in accordance with substantive requirements, off-site in accordance with substantive and administrative requirements
ORC 3734 02 (H) - Prohibits "Dogging" Where Hazardous or Solid Waste Facility was Operated	-	Regrading and groundwater collection would meet substantive requirements with Director's authorization	Regrading and groundwater collection would meet substantive requirements with Director's authorization.	Waste removal, backfilling and regrading would meet substantive requirements with Director's authorization.	Waste removal, backfilling and regrading would meet substantive requirements with Director's authorization.	Waste removal, backfilling and regrading would meet substantive requirements with Director's authorization

TABLE 9
Documentation of ARARS

Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio
CERCLIS #OHD 980 612 188

Potential ARAR	Alternative 1 - No Action	Alternative 2 - Down-Gradient Groundwater Collection, Regrade Cap, ICs, Monitoring, Contingency	Alternative 3 - Down-Gradient Groundwater Collection, Up-Gradient Diversion, Regrade Cap, ICs, Monitoring, Contingency	Alternative 4 - Waste Removal, Off-Site Disposal Waste, Off-Site Disposal Residuals	Alternative 5 - Waste Removal, Off-Site Disposal Waste, On-Site Treatment and Placement Residuals	Alternative 6 - Waste Removal, Off-Site Disposal Waste, On-Site Treatment of Residuals with Off-Site Disposal
ORC 3734.02 (I) - Prohibits Nuisance Emissions from Hazardous Waste Facilities	-	On-site hazardous treatment would meet substantive requirements by air monitoring and controls	On-site hazardous treatment would meet substantive requirements by air monitoring and controls.	On-site hazardous treatment would meet substantive requirements by air monitoring and controls	On-site hazardous treatment would meet substantive requirements by air monitoring and controls	On-site hazardous treatment would meet substantive requirements by air monitoring and controls
ORC 3734.03 - Prohibits Open Dumping or Open Burning of Solid Waste	Would meet substantive requirements by not open dumping or open burning solid waste.	Would meet substantive requirements by not open dumping or open burning solid waste	Would meet substantive requirements by not open dumping or open burning solid waste	Would meet substantive requirements by not open dumping or open burning solid waste	Would meet substantive requirements by not open dumping or open burning solid waste	Would meet substantive requirements by not open dumping or open burning solid waste
ORC 3734.041 - Explosive Gas Monitoring for Sanitary Landfill	-	-	-	-	Would meet substantive requirements for monitoring of solid waste landfill for treated residual waste.	-
ORC 3767.13 - Prohibition of Nuisances	-	Would meet substantive requirements by monitoring and controls during on-site construction	Would meet substantive requirements by monitoring and controls during on-site construction	Would meet substantive requirements by monitoring and controls during on-site construction.	Would meet substantive requirements by monitoring and controls during on-site construction	Would meet substantive requirements by monitoring and controls during on-site construction.
ORC 5301.80 to 5301.92 - Uniform Environmental Covenants Act	-	Would meet substantive requirements for site institutional controls	Would meet substantive requirements for site institutional controls.	Would meet substantive requirements for site institutional controls	Would meet substantive requirements for site institutional controls	Would meet substantive requirements for site institutional controls
ORC 6111.04 - Acts of Pollution of State Waters Prohibited	-	Would meet substantive requirements by treatment of point source discharge.	Would meet substantive requirements by treatment of point source discharge.	Would meet substantive requirements by treatment of point source discharge.	Would meet substantive requirements by treatment of point source discharge.	Would meet substantive requirements by treatment of point source discharge.
ORC 6111.04.2 - Rules Requiring Compliance with National Effluent Standards consistent with Federal CWA Sect. 301, 306, 307, and 405.	-	Would meet substantive requirements for point source stormwater discharge by monitoring and controls.	Would meet substantive requirements for point source stormwater discharge by monitoring and controls.	Would meet substantive requirements for point source stormwater discharge by monitoring and controls	Would meet substantive requirements for point source stormwater discharge by monitoring and controls	Would meet substantive requirements for point source stormwater discharge by monitoring and controls
ORC 6111.030 - Sec. 401 Water Quality Standards	-	Would meet substantive requirements for on-site wetlands; substantive and administrative requirements off-site.	Would meet substantive requirements for on-site wetlands; substantive and administrative requirements off-site	Would meet substantive requirements for on-site wetlands; substantive and administrative requirements off-site.	Would meet substantive requirements for on-site wetlands; substantive and administrative requirements off-site.	Would meet substantive requirements for on-site wetlands; substantive and administrative requirements off-site
ORC 6111.07 A.C - Water Pollution Control Requirements - Duty to Comply	-	Would meet substantive requirements for on-site water pollution control; substantive and administrative requirements off-site.	Would meet substantive requirements for on-site water pollution control; substantive and administrative requirements off-site.	Would meet substantive requirements for on-site water pollution control; substantive and administrative requirements off-site.	Would meet substantive requirements for on-site water pollution control; substantive and administrative requirements off-site.	Would meet substantive requirements for on-site water pollution control; substantive and administrative requirements off-site
Ohio Water Requirements						
OAC 3745-1 - Water Quality Standards	-	Would meet substantive requirements for on-site surface water discharges; substantive and administrative requirements for off-site surface water discharges. Monitoring, controls and treatment.	Would meet substantive requirements for on-site surface water discharges; substantive and administrative requirements for off-site surface water discharges Monitoring, controls and treatment	Would meet substantive requirements for on-site surface water discharges; substantive and administrative requirements for off-site surface water discharges. Monitoring, controls and treatment.	Would meet substantive requirements for on-site surface water discharges; substantive and administrative requirements for off-site surface water discharges Monitoring, controls and treatment	Would meet substantive requirements for on-site surface water discharges; substantive and administrative requirements for off-site surface water discharges Monitoring, controls and treatment
OAC 3745-2 - Attainment and Protection of Surface Water Quality Standards	-	Would meet substantive requirements for on-site surface water discharges; substantive and administrative requirements for off-site surface water discharges. Monitoring, controls, and/or treatment.	Would meet substantive requirements for on-site surface water discharges; substantive and administrative requirements for off-site surface water discharges Monitoring, controls, and/or treatment.	Would meet substantive requirements for on-site surface water discharges; substantive and administrative requirements for off-site surface water discharges Monitoring, controls, and/or treatment.	Would meet substantive requirements for on-site surface water discharges, substantive and administrative requirements for off-site surface water discharges Monitoring, controls, and/or treatment	Would meet substantive requirements for on-site surface water discharges; substantive and administrative requirements for off-site surface water discharges Monitoring, controls, and/or treatment
OAC 3745-3 Pretreatment Rules	-	Would meet substantive and administrative requirements by pretreatment for discharge to POTW	Would meet substantive and administrative requirements by pretreatment for discharge to POTW.	Would meet substantive and administrative requirements by pretreatment for discharge to POTW	Would meet substantive and administrative requirements by pretreatment for discharge to POTW	Would meet substantive and administrative requirements by pretreatment for discharge to POTW
OAC 3745-9 - Water Well Standards	-	Would meet substantive requirements for monitoring wells	Would meet substantive requirements for monitoring wells	Would meet substantive requirements for monitoring wells	Would meet substantive requirements for monitoring wells	Would meet substantive requirements for monitoring wells
OAC 3745-32 - Section 401 Water Quality Certifications	-	Would meet substantive requirements for on-site surface water discharges; substantive and administrative requirements for off-site surface water discharges. Monitoring, controls and/or treatment.	Would meet substantive requirements for on-site surface water discharges; substantive and administrative requirements for off-site surface water discharges Monitoring, controls and/or treatment.	Would meet substantive requirements for on-site surface water discharges; substantive and administrative requirements for off-site surface water discharges Monitoring, controls and/or treatment.	Would meet substantive requirements for on-site surface water discharges, substantive and administrative requirements for off-site surface water discharges. Monitoring, controls and/or treatment.	Would meet substantive requirements for on-site surface water discharges, substantive and administrative requirements for off-site surface water discharges Monitoring, controls and/or treatment
OAC 3745-36 - Permit Program Regulating Dischargers of Non-domestic Wastewater into a Publicly Owned Treatment Works	-	Would meet substantive and administrative requirements for off-site discharge to POTW	Would meet substantive and administrative requirements for off-site discharge to POTW	Would meet substantive and administrative requirements for off-site discharge to POTW	Would meet substantive and administrative requirements for off-site discharge to POTW	Would meet substantive and administrative requirements for off-site discharge to POTW
OAC 3745-39 - Storm water Management Program	-	Would meet substantive requirements for on-site stormwater management; substantive and administrative requirements for off-site stormwater management.	Would meet substantive requirements for on-site stormwater management; substantive and administrative requirements for off-site stormwater management.	Would meet substantive requirements for on-site stormwater management; substantive and administrative requirements for off-site stormwater management	Would meet substantive requirements for on-site stormwater management; substantive and administrative requirements for off-site stormwater management.	Would meet substantive requirements for on-site stormwater management; substantive and administrative requirements for off-site stormwater management
OAC 3745-81 - Primary Drinking Water Rules (MCLs)	Would not meet. No waiver justified	Institutional controls would be protective.	Institutional controls would be protective.	Institutional controls would be protective	Institutional controls would be protective	Institutional controls would be protective.
Ohio Air Requirements						

TABLE 9
Documentation of ARARS

Alternatives Array Document
Tremont City Barrel Fill Site, Clark County, German Township, Ohio
CERCLIS #OHD 980 612 188

Potential ARAR	Alternative 1 - No Action	Alternative 2 - Down-Gradient Groundwater Collection, Regrade Cap, ICs, Monitoring, Contingency	Alternative 3 - Down-Gradient Groundwater Collection, Up-Gradient Diversion, Regrade Cap, ICs, Monitoring, Contingency	Alternative 4 - Waste Removal, Off-Site Disposal Waste, Off-Site Disposal Residuals	Alternative 5 - Waste Removal, Off-Site Disposal Waste, On-Site Treatment and Placement Residuals	Alternative 6 - Waste Removal, Off-Site Disposal Waste, On-Site Treatment of Residuals with Off-Site Disposal
OAC 3745-15 General Provisions For Air Pollution Control	-	On-site actions would meet substantive requirements by monitoring and controls.	On-site actions would meet substantive requirements by monitoring and controls	-	On-site actions would meet substantive requirements by monitoring and controls	On-site actions would meet substantive requirements by monitoring and controls
OAC 3745-17 - Particulate Matter Standards	-	-	-	On-site actions would meet substantive requirements by monitoring and controls	On-site actions would meet substantive requirements by monitoring and controls	On-site actions would meet substantive requirements by monitoring and controls
OAC 3745-21 - Carbon Monoxide, Ozone, Hydrocarbon Air Quality Standards and Related Emissions Requirements	-	On-site actions would meet substantive requirements by monitoring and controls.	On-site actions would meet substantive requirements by monitoring and controls	On-site actions would meet substantive requirements by monitoring and controls	On-site actions would meet substantive requirements by monitoring and controls.	On-site actions would meet substantive requirements by monitoring and controls
Ohio Waste Requirements						
OAC 3745-27 - Solid Waste Regulations	-	-	-	-	Would meet substantive requirements by design, operation and maintenance of Solid Waste Landfill on-site for treated residual waste.	-
OAC 3745-31-05 - PTI New Sources - Exemptions	-	On-site actions would meet substantive requirements because exemptions would apply.	On-site actions would meet substantive requirements because exemptions would apply.	On-site actions would meet substantive requirements because exemptions would apply.	On-site actions would meet substantive requirements because exemptions would apply.	On-site actions would meet substantive requirements because exemptions would apply.
OAC 3745-50 RCRA Hazardous Waste Management System - General	-	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off site	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off site.	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off site	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off site.	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off site
OAC 3745-51 Identification & Listing of RCRA Hazardous Waste	-	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off-site.	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off-site	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off-site	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off-site.	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off-site
OAC 3745-52 RCRA Generator Standards	-	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off-site.	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off-site	Would meet substantive requirements if RCRA hazardous waste is generated or managed on-site; substantive and administrative requirements if managed off-site	Would meet substantive requirements if RCRA hazardous waste is generated or managed on- site; substantive and administrative requirements if managed off-site.	Would meet substantive requirements if RCRA hazardous waste is generated or managed o- site; substantive and administrative requirements if managed off-site
OAC 3745-53 RCRA Transporter Standards	-	Would meet substantive requirements if RCRA waste is transported off-site	Would meet substantive requirements if RCRA waste is transported off-site	Would meet substantive requirements if RCRA waste is transported off-site.	Would meet substantive requirements if RCRA waste is transported off-site	Would meet substantive requirements if RCRA waste is transported off site
OAC3745-54 RCRA New Facility Standards (and OAC 3745-65 Interim Standards)	-	Would meet substantive requirement if new RCRA treatment facility is constructed on-site.	Would meet substantive requirement if new RCRA treatment facility is constructed on-site	Would meet substantive requirement if new RCRA treatment facility is constructed on-site.	Would meet substantive requirement if new RCRA treatment facility is constructed on-site	Would meet substantive requirement if new RCRA treatment facility is constructed on-site
OAC 3745-55 RCRA Closure & Post-closure (and OAC 3745-66 Interim Standards)	-	Would meet substantive requirement if new RCRA treatment facility is constructed on-site.	Would meet substantive requirement if new RCRA treatment facility is constructed on-site.	Would meet substantive requirement if new RCRA treatment facility is constructed on-site.	Would meet substantive requirement if new RCRA treatment facility is constructed on-site.	Would meet substantive requirement if new RCRA treatment facility is constructed on-site
OAC3745-56 Impoundments, Waste Pile, Land Treatment (and OAC 3745-67 Interim Standards)	-	Would meet substantive requirement if new RCRA treatment facility is constructed on-site.	Would meet substantive requirement if new RCRA treatment facility is constructed on-site	Would meet substantive requirement if new RCRA treatment facility is constructed on-site.	Would meet substantive requirement if new RCRA treatment facility is constructed on-site.	Would meet substantive requirement if new RCRA treatment facility is constructed on-site
OAC 3745-57 Landfills, Incinerators, (and OAC 3745-68 Interim Standards)	-	Would meet substantive requirement if new RCRA treatment facility is constructed on-site.	Would meet substantive requirement if new RCRA treatment facility is constructed on-site	Would meet substantive requirement if new RCRA treatment facility is constructed on-site.	Would meet substantive requirement if new RCRA treatment facility is constructed on-site	Would meet substantive requirement if new RCRA treatment facility is constructed on-site.
OAC 3745-27-09 (F) (effective 7/29/76) Landfill Closure Standards	-	Substantive requirements would be met by cap regrading and improvements	Substantive requirements would be met by cap regrading and improvements.	-	-	-
OAC 3745-114 Toxic Air Contaminants	-	-	-	Waste removal/treatment actions would meet substantive requirements by modeling (for section 114 specific wastes above threshold) fenceline concentration	Waste removal/treatment actions would meet substantive requirements by modeling (for section 114 specific wastes above threshold) fenceline concentration	Waste removal/treatment actions would meet substantive requirements by modeling (for section 114 specific wastes above threshold) fenceline concentration

APPENDIX A
Screening Decisions

APPENDIX A
SCREENING DECISIONS

SCREENING DECISIONS
TABLE 6 – SCREENING OF TECHNICAL IMPLEMENTABILITY

At this stage of the AAD, implementability means technical implementability, and is specific to the media (i.e., groundwater, soil vapor and waste) and specific to the site conditions. Technical implementability is the ability to construct, reliably operate, and meet the necessary performance specifications and requirements. Technical Implementability includes operation and maintenance (O&M), replacement, and monitoring of technical components.

Two significant factors commonly influence screening for technical implementability:

- The constituents of concern (COCs), or mixture of COCs, which limit the applicability of many types of treatment processes; and
- Site subsurface conditions, which limit many types of containment, in-situ treatment, and groundwater collection/containment technologies.

For each technology type or process option that was screened out on Table 4, the following screening decisions are offered:

Media:	Groundwater
General Response Action:	Ex-Situ Groundwater Treatment
Remedial Technology:	Physical/Chemical Treatment
Process Option:	Reverse Osmosis

This process option was screened out because it would not address COCs. Water containing non-polar organic contaminants is not suitable for reverse osmosis processing. There are better process options for ex-situ groundwater treatment.

Media:	Groundwater
General Response Action:	In-Situ Groundwater Treatment
Remedial Technology:	Biological/Chemical
Process Option:	Bioreclamation, Aeration, Permeable Reactive Barriers, and Chemical Oxidation

These process options were screened out because of mix of COCs, site subsurface conditions and reliability of treatment. Compared to ex-situ technologies, these in-situ groundwater treatments would generally require longer time periods and there would be less certainty about the uniformity of treatment. In-situ treatment would have to overcome variability in aquifer characteristics, and its treatment reliability would be difficult to verify.

Media: Groundwater
General Response Action: Containment
Remedial Technology: Vertical Barrier
Process Option: Jet Grout Curtain, and Vibrating Beam Wall

These process options were screened out because of site subsurface conditions, reliability, and inability to meet performance standards such as wall thickness and continuity.

Jet grout curtain would not be able to be installed below shallow depths; its thin wall would not meet project requirements; its continuity is not verifiable, as required.

Vibrating beam grout wall would not be able to be installed in site subsurface soils; it is suitable for shallow, loose, unconsolidated sand and gravel. Its higher permeability would not meet performance requirements; its continuity is not verifiable, as required.

The retained process options (excavated trench slurry wall and deep soil mix wall) would be more adaptable to site subsurface conditions; offer lower permeability ($< 10^{-7}$ cm/sec), as required; would have the thickness required; would have verifiable continuity, as required; and their key into lower stratum would be positively confirmed.

Sheet pile is also retained as appropriate for the specific application as an upgradient groundwater diversion. It is most appropriate for shallow installations and could be installed into an excavated trench; its joints could be sealed to reduce wall permeability; and its continuity could be verified.

Media: Groundwater
General Response Action: Containment
Remedial Technology: Lateral Hydraulic Barrier
Process Option: Groundwater Extraction Wells/Sumps

This process option was screened out because of site subsurface conditions. The number of wells necessary to create hydraulic containment would be prohibitive, and the operation and maintenance reliability would be less certain.

The retained process option (groundwater collection trench) would be continuous; it would essentially be an infinite series of wells/sumps; its continuity could be verified during installation, as required.

Media: Waste
General Response Action: Containment
Remedial Technology: Vertical Barrier
Process Option: Jet Grout Curtain, and Vibrating Beam Wall

These process options were screened out because of site subsurface conditions, reliability, and inability to meet performance standards such as wall thickness and continuity.

Jet grout curtain would not be able to be installed below shallow depths; its thin wall would not meet project requirements; its continuity would not be verifiable, as required.

Vibrating beam grout wall would not be able to be installed in site subsurface soils; it is suitable for shallow, loose, unconsolidated sand and gravel. Its higher permeability would not meet performance requirements; its continuity would not be verifiable, as required.

The retained process options (excavated trench slurry wall and deep soil mix wall) would be more adaptable to site subsurface conditions; offer lower permeability ($< 10^{-7}$ cm/sec), as required; would have the thickness required; would have verifiable continuity, as required; and their key into lower stratum would be positively confirmed.

Media:	Waste
General Response Action:	Containment
Remedial Technology:	Lateral Hydraulic Barrier
Process Option:	Groundwater Extraction Wells/Sumps

This process option was screened out because of site subsurface conditions. The number of wells necessary to create hydraulic containment would be prohibitive, and the operation and maintenance reliability would be less certain.

The retained process option (groundwater collection trench) would be continuous; it would essentially be an infinite series of wells/sumps; its continuity could be verified during installation, as required.

Media:	Waste
General Response Action:	In-Situ Source Destruction/Treatment
Remedial Technology:	Biological, Chemical, Thermal, Solidification, and Stabilization
Process Option:	Aerobic, Anaerobic, Oxidation, Thermal, Solidification and Stabilization

These process options were screened out because of mix of organic and inorganic COCs, site subsurface conditions, and reliability of treatment.

In-situ source destruction/treatment methods would not be able to be reliably installed and operated, or to meet the necessary performance requirements. The mix of organic and inorganic COCs would interfere with treatment for each type; for example, metals are toxic to biological organisms, and organics interfere with solidification/stabilization for metals. Construction/delivery of in-situ methods would not be implementable given the configuration of the cells, bulk wastes and drummed wastes. Source removal with ex-situ source destruction/treatment is retained.

SCREENING DECISIONS
TABLE 7 - SCREENING OF EFFECTIVENESS, INSTITUTIONAL IMPLEMENTABILITY AND RELATIVE COST

At this stage of the AAD, remedial technology and process options are evaluated to identify/distinguish any differences among the various alternatives. Each is evaluated with respect to its effectiveness, institutional Implementability (because technical implementability was previously screened), and relative cost. **Only the alternatives judged as the best or most promising on the basis of these factors were retained for further consideration and analysis.**

Effectiveness, relative to other process options within the same technology type, is focused on the following:

- Potential effectiveness in handling estimated areas or volumes;
- Potential impacts to human health and the environment during the construction and implementation phase; and
- How proven and reliable the process is with respect to site COCs and conditions.

Institutional implementability is the ability to obtain necessary approvals/permits for off-site actions, availability of treatment/storage/disposal services and capacity, and availability of necessary equipment and skilled workers.

Cost plays a limited role in screening of process options. Relative costs, both capital and O&M, are used rather than detailed estimates. Cost analysis as this stage is an engineering judgment as to high-medium-low relative to other process options in the same technology type.

Media:	Groundwater, Soil Vapor and Waste
General Response Action:	Institutional Controls
Remedial Technology:	Enforcement/Permit Tools
Process Option:	Administrative Order and Consent Decree

These process options were screened out based on effectiveness. Enforcement tools would not be effective in the long term because an administrative order, consent decree or permit would only be binding on the signatories; they would not be binding on successors.

More effective process options such as governmental controls and proprietary controls were retained.

Media:	Groundwater, Soil Vapor and Waste
General Response Action:	Institutional Controls
Remedial Technology:	Informational Devices
Process Option:	CERCLIS List and Deed Notice

These process options were screened out based on effectiveness. Information devices would be less effective than governmental controls and proprietary controls that were retained.

Media: Groundwater
General Response Action: Ex-Situ Groundwater Treatment
Remedial Technology: Physical/Chemical
Process Option: E-beam

This process option was screened out because its relative capital cost would be higher than retained process options. There are better process options available.

Media: Groundwater
General Response Action: Ex-Situ Groundwater Treatment
Remedial Technology: Off-Site Treatment
Process Option: TSCA/RCRA Facility

This process option was screened out because transportations costs would make it higher O&M cost than on-site treatment options. There are better process options available with on-site treatment.

Media: Groundwater
General Response Action: Groundwater Discharge
Remedial Technology: On-Site
Process Option: Deep Well Injection

This process option was screened out because of higher relative capital cost. The conventional discharges of treated water (e.g. NPDES to local tributary or POTW discharge) would be much better options than on-site underground injection.

Media: Groundwater
General Response Action: Containment
Remedial Technology: Contact Barrier
Process Option: Asphalt or Concrete

This process option was screened out because of its long-term effectiveness. Vegetated soil barrier would be the more effective process option and less susceptible to cracking. Soil barrier would be simpler to maintain and repair.

Media: Groundwater
General Response Action: Containment
Remedial Technology: Vertical Barrier
Process Option: Deep Soil Mix Wall

This process option was screened out because of higher relative capital cost. Compared to the slurry wall, the relative cost of DSM would be greater with no increase in reliability or effectiveness.

Media: Soil Vapor
General Response Action: Soil Vapor Extraction/Venting
Remedial Technology: Extraction
Process Option: Extraction Wells

This process option was screened out because of higher relative O&M cost compared to the sub-slab venting option, with no greater effectiveness.

Media: Soil Vapor
General Response Action: Ex-Situ Soil Vapor Treatment
Remedial Technology: Physical/Chemical
Process Option: E-beam

This process option was screened out because of higher relative capital cost compared to other process options with no greater effectiveness. There are better options that were retained.

Media: Soil Vapor
General Response Action: Containment
Remedial Technology: Vapor Barrier
Process Option: Asphalt/Concrete and Flexible Membrane Liner

These process options were screened out because of long-term effectiveness. An engineered low-permeability cap with multiple protection layers is a better process option. Soil barriers would be simpler to maintain and repair.

Media: Waste
General Response Action: Containment
Remedial Technology: Contact Barrier
Process Option: Asphalt or Concrete

This process option was screened out because of long-term effectiveness. Vegetated soil barrier would be the more effective long-term process option and would be less susceptible to cracking. Soil barriers would be simpler to maintain and repair.

Media: Waste
General Response Action: Containment
Remedial Technology: Vertical Barrier
Process Option: Deep Soil Mix Wall

This process option was screened out because of higher relative capital cost. Compared to the slurry wall, relative cost would be higher for the DSM with no increase in reliability or effectiveness.

Media:	Waste
General Response Action:	Source\Residual Removal with Ex-Situ Source Destruction/Treatment and Replacement at Site
Remedial Technology:	Biological, Chemical, Physical and Thermal
Process Option:	All

All process options were screened out, including aerobic, anaerobic, solvent extraction, solidification, stabilization, vitrification, and incineration.

None of these process options alone would treat all of the multiple waste streams. Incineration could treat multiple organic wastes and would subsequently require waste stabilization for inorganic wastes.

The specialized incineration equipment that would be required is not available.

Low temperature thermal desorption was retained for treatment of residuals only. Subsequent stabilization would be required for inorganic wastes.

Off-site treatment and disposal options and capacity exist for all possible wastes. Such commercial TSDFs would be more suitable for timely, safe, efficient, reliable, flexible and effective treatment of the multiple wastes.

APPENDIX B
Contingency Plan

APPENDIX B
CONTINGENCY PLAN

General

Containment Remedial Alternatives for the Barrel Fill Site would include a Contingency Plan to provide an additional level of protection and risk reduction for groundwater exposure pathways at the Barrel Fill Site. The Contingency Plan would be linked to a groundwater monitoring program to be conducted under the non-excavation alternatives and to be developed during the Feasibility Study. Data collected and evaluated as part of the groundwater monitoring program would be used as a triggering mechanism for implementing a contingent response.

Triggering Conditions

Detection of COCs in groundwater at levels that exceed chemical-specific remediation levels or potentially cause an increased risk to human health and the environment would be the primary basis for implementing a contingent response. The following data will be considered:

Water Table and 1075 Intertill

- Statistically significant, increasing concentrations of COCs;
- A confirmed presence of NAPL outside the containment area;
- A confirmed and significant increase in naturally occurring constituents above background; and
- A change in groundwater use at or near the Site or land use at the Site.

1050 Intertill, 1015 Intertill, and Deep Sand and Gravel Aquifer

- Statistically significant, increasing concentrations of COCs;
- A confirmed presence of NAPL outside the containment area;
- A confirmed and significant increase in naturally occurring constituents above background; and
- A change in groundwater use at or near the Site or land use at the Site.

Other conditions or events which are not noted above could also trigger a contingent response, such as the statutorily mandated Five-Year Review of any remedy which results in leaving waste in place.

Data Evaluation

Once a triggering condition is observed, U.S. EPA and Ohio EPA will be notified, and the relevant data will be provided. Based on an evaluation of all relevant information and after obtaining input from the Responsible Parties performing the work, U.S. EPA, in consultation with Ohio EPA, will determine if a contingent remedy is required.

Potential Contingent Remedies

Potential contingent remedies include:

- Expanded groundwater monitoring
- Groundwater extraction from appropriate hydrogeologic units
- NAPL collection/recovery
- Waste stabilization or removal
- Other options as may be deemed appropriate

Site-specific data would be evaluated, as necessary, to assess which contingent remedy or combination of remedies are most applicable to particular Site conditions. The implementation of a contingent remedy, if necessary, would be conducted with review and approval by U.S. EPA in consultation with Ohio EPA.