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Tremont City Barrel Fill Site

Clark County, Ohio

Record of Decision

United States Environmental Protection Agency

Region 5

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Abbreviations and Acronyms

AAD	Alternatives Array Document
AMSL	above mean sea level
AOC	area of contamination
AOC	Administrative Order by Consent
ARAR	applicable or relevant and appropriate requirement
BFOU	Barrel Fill Operable Unit
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CF/WATER	Citizens for Wise Approaches Toward Environmental Resources
cm/sec	centimeters per second
COC	contaminant of concern
COD	chemical oxygen demand
COPC	contaminant of potential concern
COPEC	contaminant of potential ecological concern
CSEM	conceptual site exposure model
DCA	dichloroethane
DCE	dichloroethene
DNAPL	dense non-aqueous phase liquid
ELCR	excess lifetime cancer risk
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
FID	Flame Ionization Detector
FS	Feasibility Study
FSA	Feasibility Study Addendum
HHRA	Human Health Risk Assessment
HI	Hazard Index
HTTD	high-temperature thermal desorption
IC	institutional control
IOC	inorganic compound
LFG	landfill gas
LNAPL	light non-aqueous phase liquid
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
MW	monitoring well
NAPL	non-aqueous phase liquid
NCP	National Contingency Plan
O&M	operation and maintenance
OAC	Ohio Administrative Code
ODH	Ohio Department of Health
ODNR	Ohio Department of Natural Resources
Ohio EPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code

OU	operable unit
PBT	persistent, bio-accumulative, or toxic
PCB	polychlorinated biphenyl
PCG	preliminary cleanup goal
ppm	parts per million
PRG	Region 9 preliminary remediation goal
PRP	potentially responsible party
POTW	publicly owned treatment works
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RESA	Responsible Environmental Solutions Alliance
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
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
SVOC	semi-volatile organic compound
TAL	Target Analyte List
TBC	to be considered
TCA	trichloroethane
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TN&A	T N & Associates
TOC	total organic carbon
TSDF	treatment, storage, and disposal facility
UCL	upper confidence limit
ug/kg	micrograms per kilogram
ug/l	micrograms per liter
U.S. EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UU/UE	unlimited use and unrestricted exposure
VOC	volatile organic compound
WTF	Waste Transfer Facility

PART 1: THE DECLARATION

1.0 Site Name and Location

The Tremont City Barrel Fill Site ("Barrel Fill" or "Site") is located in Clark County, German Township, Ohio about 1.5 miles west of Tremont City and about 3.5 miles northwest of Springfield. The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Identification number is OHD980612188.

2.0 Statement of Basis and Purpose

This decision document presents the selected remedial action for the Tremont City Barrel Fill Site located in Clark County, Ohio. The remedy was developed in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Specifically, this decision document has been prepared in compliance with CERCLA Section 117 and NCP Section 300.430(f). This decision document explains the factual and legal basis for selecting the remedy for this Site. This decision is based on the administrative record file for this Site. The administrative record file is available for review at the United States Environmental Protection Agency (U.S. EPA) Region 5 Records Center, 77 West Jackson Boulevard, Chicago, Illinois, and at the following information repositories:

- Clark County Public Library
  201 South Fountain Avenue
  Springfield, Ohio

- Tremont City Municipal Building
  26 East Main Street
  Tremont City, Ohio

The State of Ohio does not concur with the Selected Remedy.

3.0 Assessment of Site

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

4.0 Description of Selected Remedy

The selected remedy is the final remedy for the Site. The remedy addresses the risks posed by:

- containerized (drummed) and non-containerized non-liquid waste by separating this waste from liquid waste and consolidating it in a newly constructed engineered waste cell; and

- containerized and non-containerized liquid wastes, which present the principal threat at the Site, by removing these wastes and treating and disposing of them off-site.

Principal threat wastes are defined as those source materials considered highly toxic or highly mobile that generally cannot be reliably contained or would present significant risk to human health or the environment should exposure occur.

The following are the major components of the remedy selected (Alternative 9a) in this ROD:

- Removing and stockpiling uncontaminated cover soil (estimated to be up to 17 feet deep) outside the work area;

- Pumping cell water and non-containerized liquid from the excavations and managing the liquids for off-site treatment and disposal;

- Excavating the contents (drums, non-containerized waste and impacted soil) of each of the 50 waste cells. Those non-containerized wastes, including sludge, that are determined to be liquid by the paint filter test will be managed as a liquid for off-site treatment and disposal;

- Characterization of the excavated wastes. Non-compatible wastes will not be staged and/or stored in proximity to one another.

- Removing, managing, and off-site treating and disposing of liquid wastes and removal and staging of non-liquid hazardous wastes from drums. Containerized wastes that are determined to be liquid by the paint filter test will be managed as a liquid for off-site treatment and disposal.

- Consolidating non-containerized and drummed solid (hazardous and non-hazardous) wastes and contaminated soil in a newly-constructed engineered lined cell with leachate collection. Before consolidation, the drums and their contents will be crushed to reduce volume and to remove any free liquids contained in the drums;

- Constructing a slurry wall keyed into the glacial till (silty clay) underlying the 1075 Intertill around the Site along with a leakage collection system in the 1075 Intertill;

- Constructing a hazardous waste landfill cap covering the consolidation cell and extending beyond the slurry wall alignment;

- Collecting leakage from the 1075 Intertill and performing leak detection monitoring in the 1050 Intertill;

- Long-term groundwater monitoring and post-closure care; and

- Implementing institutional controls to prevent or limit uses at the Site.

Alternative 9a involves full waste excavation, disposal and treatment off-site of all liquid waste, and consolidation of solid hazardous and non-hazardous waste and contaminated soils in an engineered, lined waste cell on-site with leachate and leakage collection systems.

The existing soil cover will be removed and staged before excavating drummed and non-containerized waste. All liquid waste, containerized and non-containerized, will be removed from the Site and treated and disposed of off-site at a treatment, storage, and disposal facility or at a publicly owned treatment works. Liquids removed from the Barrel Fill will be those that are free-flowing or readily pumpable. EPA will set minimum pump standards for collection of non-containerized liquids from the Barrel Fill. Liquid wastes will be removed from excavated drums by first decanting liquids, and then collecting released liquids after the drums are crushed. All drums are anticipated to be opened and crushed to facilitate removal of all liquid waste.

Any non-containerized waste, including sludge, that remains in the Barrel Fill after pumping that, based on field judgment, might not pass the RCRA paint filter test, will be (1) extracted by other methods and disposed of off-site; or (2) will undergo the RCRA paint filter test and, based on the results, managed as liquid waste and disposed of off-site (fails paint filter-test); or managed as solid waste by consolidation with the other solid waste and contaminated soils on-site in the newly, engineered lined waste cell (passes paint filter-test).

An engineered waste cell will be constructed to hold the solid hazardous and non-hazardous waste, and contaminated soils. The engineered waste cell will include a compacted bottom clay liner, backfill of approximately 10 feet of the compacted clean, excavated cover soils, and above that a flexible membrane liner. The waste and soils consolidated in the engineered waste cell will be covered by a hazardous waste cap. A leachate collection system will be installed above the bottom liner, and leachate will be pumped to on-site storage tanks for eventual off-site disposal and treatment.

A slurry wall keyed into the low permeability till beneath the engineered, lined waste cell will be installed around the cell for the purpose of physically isolating the waste and groundwater at the Site. A leakage collection system will be installed beneath the engineered, lined waste cell inside the slurry wall as a back-up system to collect any liquid not collected by the leachate collection system. Any liquid collected in the leakage collection system will be transported off-site for appropriate treatment and disposal.

5.0 Statutory Determinations

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to this remedial action, is cost-effective, and uses permanent solutions and alternative treatment technologies (or resource recovery) to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy because principal threat wastes were identified at the Site, and the remedy employs treatment technologies for those wastes. To be protective, this remedy relies in part on restrictions of land and groundwater use. Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review of the protectiveness of the

remedy will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

6.0 Data Certification Checklist

The following information is included in the Decision Summary (Part 2) of this ROD, while additional information can be found in the administrative record file for this Site:

- Contaminants of concern (COCs) and their respective concentrations (see Section 14 - Summary of Human Health and Ecological Risk Assessments; Section 12.1 – Source Characterization; Section 12.5 – Nature and Extent of Contamination; Table 2; and Figures 5-10);

- Baseline risk represented by the COCs (see Section 14 – Summary of Human Health and Ecological Risk Assessments);

- Remediation goals (i.e., cleanup goals) established for the COCs and the basis for the goals (see Section 19.4.1 - Final Cleanup Levels);

- How source materials constituting principal threats are addressed (see Section 20 - Statutory Determinations and Section 18 - Principal Threat Wastes);

- Current and reasonably anticipated future land use assumptions, and current and potential future beneficial uses of groundwater used in the Baseline Human Health Risk Assessment and this ROD (see Section 13 - Current and Potential Future Land and Water Uses);

- Potential land and groundwater use that will be available at the Site as a result of the Selected Remedy (see Section 13 - Current and Potential Future Land and Water Uses; and Section 19.4 – Expected Outcome of Selected Remedy);

- Estimated capital, lifetime operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected (see Section 17.7 – Cost; Section 19.3 - Cost Estimate for the Selected Remedy; and Tables 7-14 - Cost Estimate Details for Alternative 4a); and,

- Key factor(s) that led to selecting the remedy (see Section 14.3 - Basis for Remedial Action).

7.0 Authorizing Signature

Richard C Karl

Richard C. Karl, Director
Superfund Division

9-28-11
Date

PART 2: THE DECISION SUMMARY

8.0 Site Name, Location, and Brief Description

The Tremont City Barrel Fill Site (CERCLIS # OHD980612188) is located in Clark County, German Township, Ohio, about 1.5 miles west of Tremont City and about 3.5 miles northwest of Springfield. The Site is located just north of Snyder-Domer Road, which is immediately north of Chapman Creek. Storms Creek is located about one mile north of the Site. Chapman Creek and Storms Creek flow eastward into the Mad River, which is about two miles east of the Site (Figure 1). The Site is a closed, permitted industrial waste landfill that contains approximately 51,500 drums of waste and approximately 304,000 gallons of non-containerized liquid waste. The Tremont City Waste Transfer Facility Site (WTF) is located east of and contiguous to the Site, and the Tremont City Landfill Site is located south of the Site and contiguous to the WTF (Figure 2). The Site is located in a sparsely populated, rural area. The surrounding lands outside of the three-site area remain mostly agricultural with little residential or commercial development. The Barrel Fill Site is approximately 8.5 acres in size. The three-site area is approximately 80 acres.

The Site is located on the flank of a dissected, rolling, upland area just south of the drainage divide between Chapman Creek and Storms Creek. A ravine originating along the eastern side of the Site extends to the southeast. An ephemeral stream (the "unnamed tributary") just east of the Site flows into Chapman Creek. (In Figure 1, the faint, discontinuous, blue line to the right of the Barrel Fill, heading toward Chapman Creek, is the unnamed tributary.) A second north-south ravine is located just west of the Site, and open land is further west. Undeveloped land, including that used for agricultural purposes, is located north, east, and west of the Site. The highest elevation of the Site is approximately 1,120 feet above mean sea level, near the northwest corner of the Site.

The U.S. EPA is the lead agency for this Site.

9.0 Site History and Enforcement Activities

9.1 Source of Contamination

In 1976, Ohio EPA granted a permit for the specific purpose of disposal of industrial sludges and solids (containerized and non-containerized) in the 8.5-acre Barrel Fill, and the Barrel Fill began accepting waste material in late 1976. In 1977, N.C. Realty Co., Inc. which through subsequent name changes eventually became the Tremont Landfill Company (TLC), transferred the Barrel Fill property to IWD Chemical Disposal Co., Inc. of Ohio (IWD). The Barrel Fill operated until late 1979, when disposal operations ceased. In1980, the Barrel Fill property was transferred to TLC. Waste Management, Inc. (WM) subsequently acquired the shares of IWD; and WM's subsidiary, Chemical Waste Management, Inc. (CWM), subsequently became the corporate successor of IWD through merger. TLC is a subsidiary of Diversified Environmental Management Company and a subsidiary of the Danis Companies.

Waste disposed in the Barrel Fill was placed in 50 waste cells excavated into natural glacial till material (See Figure 3 for a location of the waste cells in the Barrel Fill). These cells were approximately 15 to 20 feet in depth. Historical records indicate that drums were placed in layers in each of the unlined cells. Pallets were also placed in some of the cells.

After the drums were placed, non-containerized liquid wastes were added to some of the cells prior to backfilling. Approximately 51,500 drums and 304,000 gallons of non-containerized liquids, sludges, and biodegradable wastes were disposed of in the Barrel Fill. Wastes included glues; resins; paint sludge; paint scrap and waste; soap, shampoo, and detergent waste; asbestos slurry; caustic waste; oils; polyol; and other compounds.

The bulk liquids disposed of in waste cells were reported in cell reports to consist of still bottoms, latex glue, soap, asbestos, asbestos water, and paint sludge. The 304,000 gallons of liquid industrial waste disposed of in waste cells represent materials available for release at the time of disposal (approximately 1977). Statements of employees who worked at the Barrel Fill confirmed the practice of placing non-containerized, bulk materials into the Barrel Fill. Specifically, these employees recall placing polyol and paint sludges in bulk in several of the early disposal cells and placing waste sludges derived from the WTF oil-water separation process into waste cells. These employees indicated that the paint sludges may have contained solvents and that recovered oils from the WTF may have also contained solvents and, possibly, polychlorinated biphenyls (PCBs).

In addition to the drum disposal operations, land application and shallow injection of liquid biodegradable wastes from food industry sources occurred in the area north of the Tremont City Landfill Site and adjacent to the Barrel Fill between 1979 and 1980. Review of available photographs and maps indicates that these disposals likely occurred in the area to the south and west of the Barrel Fill. These disposals included the shallow injection of biodegradable waste (margarine, corn syrup, baby formula, and other compounds) into surface soils at depths of less than one foot.

9.2 Previous Investigations

Several investigations have been conducted at the Barrel Fill by the Site owner and the State of Ohio. Routine monitoring at on-site monitoring well locations revealed the presence of groundwater contamination. While the majority of samples have contained contaminant concentrations below maximum contaminant levels (MCLs) proposed under U.S. EPA primary drinking water standards, certain contaminants have been detected at concentrations above MCLs. The following Barrel Fill information is taken from the March 2002 U.S. EPA Site Investigation Summary (SIS) of the three-site area.

9.2.1 Shallow Barrel Fill Investigations

In the early 1980s, 26 soil borings were installed on and adjacent to the Barrel Fill in areas not being used for drum burial cells. Borings were completed to depths ranging from 10 feet to 160.5 feet below ground surface (bgs). Typically, the borings encountered silt and clay till with interspersed sand and gravel.

An electromagnetic survey was conducted on behalf of the Site owner in 1984. The survey, undertaken to outline drum burial cell locations at the Barrel Fill, showed that the highest concentration of drums occurred across the middle of the Barrel Fill. During January 1985, the Site owner excavated an approximate 10 by 12-foot trench into the west side of the Barrel Fill to investigate an observed geophysical anomaly. A review of Ohio EPA information documenting this excavation indicates that up to 1,500 gallons of yellow leachate were present in the trench. This material was sampled, pumped out, and disposed of. The leachate was found to contain 25 mg/l of hexavalent chromium and 0.071 mg/l of lead. Since the laboratory analysis performed on the liquid sample collected during excavation was limited to RCRA-listed metals, no information regarding potential organic contaminants was obtained.

In 1985, at the request of Ohio EPA, the Site owner conducted a corrective measure to apply additional capping material to the Barrel Fill cover where depressions had formed over the waste disposal cells. Settling of the cap material had resulted in depressions approximately 6 to 10 feet wide and less than 2 feet deep.

9.2.2 Surface Water/Seep Discharge Investigations

In the mid-1980s, the Site owner reported that groundwater found at 1070-1075 feet above mean sea level (AMSL) was discharging to a ravine located east of the Barrel Fill, beyond the eastern edge of the WTF. Sampling of the seepage entering the ravine by the Site owner occurred in March 1982 for inorganics and general surface water parameters. Additional sampling of the seep for volatile organic compounds (VOCs), metals, and inorganic compounds (IOCs) began in 1985 and continued until approximately 1996. Constituents detected in the seep included barium, calcium, chloride, chromium, and iron. In addition, several organic contaminants were detected at levels below MCLs, including 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethane (1,1-DCA), dichlorodifluoromethane, chloroethane, vinyl chloride, and 1,1-dichloroethene (1,1-DCE).

Samples collected during April and July 1985 from a monitoring well located up-ravine from the seep were also found to contain VOCs. To control the off-site contaminant migration, the Site owner installed a clay barrier wall to a depth of 18 feet bgs, at a location west of the well and approximately 200 feet west of the seep. The well, which was screened in a sandy zone encountered from 14 to 18 feet bgs, was destroyed during wall construction. This well was replaced by another well, located on the eastern side of the cut-off wall. Subsequent seep monitoring performed by the Site owner showed an apparent decrease in the concentration of 1,1-DCA following completion of the cut-off wall (decreasing from 39.5 micrograms per liter (μg/l) in October 1985, to 2.5 μg/l in December 1985).

9.2.3 Groundwater Investigations

After 1979, several monitoring wells were installed at the Barrel Fill by the Site owner to monitor groundwater quality. The investigations performed included the following:

- In March 1979, six wells were installed around the perimeter of the drum burial area and were screened from approximately 20 to 30 feet bgs (1066 to 1098 feet AMSL).

- Two additional monitoring wells were installed on the west side of the Barrel Fill. These wells were screened from approximately 7 to 33 feet bgs (1074 to 1100 feet AMSL).
- In December 1983, four additional wells were installed on the Barrel Fill to further investigate contaminant migration. These wells were screened approximately 10 to 61 feet bgs (1047 to 1106 feet AMSL).
- In 1986, five additional wells were installed on the Barrel Fill. These wells were screened from approximately 40 to 152 feet bgs (953 to 1078 feet AMSL).
- Monitoring of groundwater quality was performed by the Site owner in the 1980s on a quarterly basis or less frequently. The frequency of sampling and the wells included in each sampling round was monitored by Ohio EPA. In general, groundwater samples have been analyzed for several parameters including metals, VOCs, and other IOCs.
- The Ohio Department of Health (ODH) also conducted a series of groundwater sampling rounds at selected Barrel Fill monitoring well locations. This work was performed from December 1980 to October 1981. The groundwater samples that were collected underwent laboratory testing for metals.
- Soil boring information obtained at the Barrel Fill led the Site owner to conclude that the Site is underlain by an upper sand zone located 8 to 10 feet bgs, an "intertill sand" from 30-35 feet bgs, and an additional sand and gravel zone occurring at a depth of more than 100 feet bgs. It was reported that the material above and between these zones consisted of a fine-grained glacial till.

9.2.4 Groundwater Quality Summary of Work Completed Prior to the Site Investigation

The following paragraphs in this subsection summarize the groundwater quality results from the groundwater investigations described above.

For more than 20 years, elevated concentrations of chromium and arsenic were detected in groundwater samples collected from monitoring wells located at the Barrel Fill. Sampling performed by the ODH in 1981 indicated that 7,900 μg /l chromium and 170 μg /l arsenic were present in Site groundwater shortly after the Barrel Fill closed. These concentrations greatly exceed the U.S. EPA primary drinking water standards (MCLs) established for chromium (100 μg /l) and arsenic (10 μg /l). The groundwater samples also contained elevated concentrations of cadmium (110 μg /l), copper (16,200 μg /l), and lead (5,500 μg /l) exceeding applicable MCL standards or U.S. EPA action levels.

Elevated chromium concentrations were consistently reported for the groundwater samples collected from the western side of the Barrel Fill where the chromium leachate release occurred. On 57 separate occasions, the concentration of chromium exceeded the MCL established for this compound. The maximum chromium concentration reported in groundwater by the Site owner was 2,600 μg/l. Elevated chromium levels were detected at all other Barrel Fill well locations during at least one sampling event.

Arsenic was detected in groundwater samples from several of the Barrel Fill wells. Based on monitoring data obtained from the Site owner, arsenic concentrations were detected in

groundwater at concentrations exceeding the arsenic MCL on 25 separate occasions between 1980 and 1999. Most of the exceedances occurred in the southeast portion of the Barrel Fill.

Organic contaminants including 1,1,1-TCA, 1,1-DCA, trichloroethene (TCE), methylene chloride, cis-1,2-dichoroethene (cis-1,2-DCE), p-xylene, m-xylene, and dichlorodifluoromethane were present in the groundwater samples collected from some of the monitoring wells located adjacent to the Barrel Fill. The reported concentrations of organics in groundwater were below applicable MCLs.

Monitoring wells located along the eastern side of the Barrel Fill have shown indications of contaminant releases since groundwater monitoring was initiated at this Site. For instance, elevated chloride, sodium, sulfate, chemical oxygen demand (COD), total organic carbon (TOC), lead, chromium, and arsenic have been observed in groundwater on several occasions. Additionally, phosphorus, nickel, fluoride, and copper were present in groundwater samples collected by Ohio EPA between 1979 through 1982.

Groundwater samples collected on the southern end of the Barrel Fill also contained elevated concentrations of chloride, sodium, sulfate, COD, TOC, lead, chromium, and arsenic. The samples collected by Ohio EPA between 1979 through 1982 also contained phosphorus, nickel, fluoride, and copper.

9.2.5 U.S. EPA Site Investigation Summary (SIS)

In 1999, U.S. EPA contracted TN & Associates (TN&A) to perform a site investigation of what is now the three-site area (the Tremont City Barrel Fill Site, the Tremont City Landfill Site, and the WTF). The following paragraphs in this subsection summarize this investigation for the Tremont City Barrel Fill Site.

The field investigation was divided into three phases. TN&A sampled soils, surface water, sediments, and groundwater. Phase I sampling occurred in June and August of 2000. Phase II sampling occurred between October 2000 and January 2001. Phase III sampling occurred between May and June of 2001.

9.2.5.1 Soils Investigation Summary

The site investigation confirmed the presence of several organic and inorganic contaminants in subsurface soils within and around the Barrel Fill. Organic compounds (principally VOCs) were detected at all direct-push boring locations within the Barrel Fill. Generally, the highest concentrations were detected along the western portion of the Barrel Fill. The highest concentrations in this area included xylenes (1,500,000 μg/kg), ethylbenzene (420,000 μg/kg), toluene (34,000 μg/kg), methylene chloride (170,000 μg/kg), and acetone (160,000 μg/kg).

All analyzed inorganic parameters were detected in soil samples obtained from the direct-push boreholes completed at the Barrel Fill. Elevated concentrations of antimony, arsenic, lead, thallium, and cyanide were measured in soil. In general, antimony, thallium and cyanide were found at concentrations above background along the west side of the Barrel Fill. Based on

limited data, it appeared that the antimony and cyanide in the Barrel Fill soils were due to waste disposal practices conducted in this area.

Soil samples collected from all vertical borings drilled outside the margins of the Barrel Fill contained detectable organics. The majority of the VOCs detected in these borings occurred at concentrations near the laboratory detection limit (reported as estimated). However, confirmed petroleum VOC concentrations were present in soil samples collected from as deep as 155 feet bgs. Select semi-volatile organic compounds (SVOCs) and pesticides were present at a few locations, but, in general, the observed concentrations were below laboratory quantitation limits. Antimony, thallium, and cyanide were present at concentrations above background levels at a few locations outside the Barrel Fill.

Several organic compounds (benzene, cyclohexane, methylcyclohexane, and phenanthrene) were present in soil samples collected from the two angle borings advanced beneath inferred Barrel Fill disposal cell locations. Most of the organics detected on the west side of the Barrel Fill were found in soil samples collected from a boring inside the Barrel Fill area. Arsenic was also detected at potentially elevated concentrations beneath the Barrel Fill.

The SIS concluded that elevated levels of contamination exist in the deep, subsurface soils within the Barrel Fill and, to a lesser extent, beneath and outside of the Barrel Fill. The majority of the contaminants were VOCs. Based on the affected locations, it appeared likely that the Barrel Fill was a continuing contaminant source with multiple releases occurring. Contaminants were detected at all boring locations completed outside the Barrel Fill, including soil impacts more than 25 feet away from the Barrel Fill boundary.

The results from the Barrel Fill soil investigations indicated that contaminant releases were associated with the waste disposal cells. While the SIS recommended that further source characterization was needed at the Barrel Fill, the extent and location of contamination indicates that multiple contaminant sources exist at the Barrel Fill.

9.2.5.2 Surface Water/Sediments Investigation Summary

Chloroethane and 1,1-dichloroethane were detected in surface water samples from a seep located east of the Barrel Fill. Both compounds were present at concentrations near laboratory detection limits. Various inorganic contaminants were also detected.

Low concentrations of VOCs and one semi-volatile organic compound (Di-n-butylphthalate) were detected in sediment samples from the seep located east of the Barrel Fill. No inorganic constituents were detected at concentrations above soil background levels.

Since the extent of contamination in the vicinity of the seep was not assessed during this U.S. EPA investigation, the SIS recommended that additional evaluation of this occurrence should be performed.

While the observed concentrations of organics present in the surface water and sediment samples were relatively low, the SIS reported that their presence likely indicated that seepage was still occurring from the Barrel Fill. Organics in surface water and sediment would be expected to degrade relatively quickly in the natural environment.

9.2.5.3 Groundwater Investigation Summary

Several VOCs and potentially elevated metals were detected in monitoring wells located outside of the Barrel Fill. Detected VOCs included acetone, methyl acetate, and various chlorofluorocarbons. A few SVOCs and pesticides were also present in the groundwater samples.

Locally, chromium, arsenic, lead, and thallium were present in the groundwater samples from Barrel Fill wells at concentrations exceeding primary MCLs. Arsenic, chromium, and lead have been historically detected in groundwater at the Barrel Fill. Except for one location south of the Landfill, the highest chromium concentrations have been historically observed at the Barrel Fill monitoring well locations. For instance, samples from a monitoring well on the western end of the Barrel Fill consistently contained chromium concentrations above 200 μg/l (the MCL for chromium is 100 μg/l). In addition, groundwater samples from several other Barrel Fill wells contained chromium concentrations above 50 μg/l, indicating that the Barrel Fill was a likely source of chromium contamination. Varying arsenic concentrations occurred in the groundwater samples from the Barrel Fill and from other on-site monitoring locations. While elevated arsenic concentrations are noted at some Barrel Fill well locations, it was not clear whether such occurrences were due to naturally occurring conditions or contaminant sources.

Organic compounds were present in groundwater samples collected from several Barrel Fill well locations. There were no MCLs or screening toxicity values exceeded for organics. The extent of the organic contamination was not determined. The presence of contamination in soil to depths greater than 50 feet beneath the Barrel Fill and the presence of chromium in groundwater at concentrations above the MCL at a nearby, off-site location indicated that contaminant releases occurred at the Barrel Fill. The elevated concentrations of arsenic present in the Barrel Fill soils and groundwater may also be indicative of contaminant releases in this area.

According to the SIS, while only limited data existed, it appeared that the observed groundwater contamination at the Barrel Fill was migrating towards the northeast. The SIS also stated that further investigation was needed to determine the extent of groundwater contamination from the Barrel Fill.

9.3 Previous Response Actions

In 1980, after all Barrel Fill disposal operations ceased, a soil cover was placed over the Barrel Fill. Subsequent subsidence was repaired by filling of depressed areas with soil and subsequent placement of geotextile fabric to further stabilize depressions and areas where subsidence damage had occurred. Additional clean fill from a local source was placed on the Barrel Fill. Operational records indicate an initial cover thickness of three to four feet was placed on the Barrel Fill. Additional cover was added in subsequent years, resulting in a total cover thickness of 10 feet to over 17 feet over the waste cells.

As mentioned, in 1985, the Site owner investigated a subsurface anomaly identified by a geophysical investigation. The Site owner excavated an approximate 10 to 12-foot trench into

the west side of the Barrel Fill to investigate the anomaly. The Site owner then had up to 1,500 gallons of yellow leachate sampled, pumped from the trench, and disposed of. The results of the analysis indicated that the leachate was impacted by chromium.

Between 1979 and 1982, the Site owner conducted periodic monitoring of the Barrel Fill, including sampling of groundwater monitoring wells in and near the Barrel Fill.

9.4 Enforcement Activities

In October 2002, U.S. EPA issued an Administrative Order by Consent (AOC), under which eight PRPs agreed to perform the Remedial Investigation and Feasibility Study (RI/FS) for the Site (another eight PRPs participated by providing funding for the work). The performing PRPs formed the Responsible Environmental Solutions Alliance ("RESA"). The RESA contractor performed the RI field work from 2003-2005. U.S. EPA approved the RI Report in 2006, the Alternatives Array Document with modifications in 2007, the Feasibility Study (FS) with modifications in 2008, and the FS Addendum with modifications in 2009. The RESA technical consultant, Haley & Aldrich, Inc., drafted all of these reports.

In March 2007, U.S. EPA created three separate sites from the single 80-acre Tremont City Landfill Site. The March 2007 action created the Tremont City Barrel Fill Site (the Site), the new Tremont City Landfill Site, and the WTF. The Site is currently being addressed under EPA's Superfund Alternative Approach. The Superfund Alternative Approach uses the Superfund process for sites without expending the resources typically associated with placing a site on the National Priorities List (NPL).

10.0 Community Involvement

This section of the ROD describes U.S. EPA's community involvement activities. U.S. EPA has been actively engaged with the affected community and has striven to advocate and strengthen early and meaningful community participation during U.S. EPA's remedial activities at the Site. The provisions of Sections 113(k)(2) (B)(i)-(v) and 117 of CERCLA have been satisfied.

U.S. EPA issued the initial Proposed Plan for the Site to the public for comment on June 7, 2010. U.S EPA issued a new (revised) Proposed Plan for the Site to the public for comment on May 31, 2011. U.S. EPA placed copies of the Proposed Plans and the final RI, FS, FS Addendum, and FS Addendum 2 reports (as well as other supporting documents) in the local information repositories located at the Clark County Public Library in Springfield, Ohio and the Tremont City Municipal Building in Tremont City, Ohio. Documents are also available at the Ohio EPA office in Dayton, Ohio. U.S. EPA mailed copies of the Proposed Plans to interested persons on U.S. EPA's community involvement mailing list for the Site. Copies of all documents supporting the Preferred Alternative outlined in the Proposed Plans are located in the administrative record file for the Site, located at the U.S. EPA Records Center, 77 West Jackson Boulevard, Chicago, Illinois and the Clark County Public Library, 201 South Fountain Avenue in Springfield, Ohio.

The initial public comment period on the Proposed Plan ran June 10 through July 12, 2010. At the request of RESA, U.S. EPA extended that public comment period through August 11, 2010. The notice announcing the public meeting and the availability of the initial Proposed Plan was published in the *Springfield News-Sun* newspaper on June 16, 2010. U.S. EPA held a public meeting at the Northwestern High School in Springfield, Ohio on June 22, 2010, to present the Proposed Plan. Approximately 50 people attended the meeting. Representatives of U.S. EPA and Ohio EPA were present at the public meeting to answer questions regarding the Preferred Remedial Alternative. Responses to significant comments received during the initial public comment period (including comments received at the public meeting) are included in the Responsiveness Summary Part 1, which is Appendix 2 of this ROD.

During the initial public comment period, U.S. EPA received comments from CWM, which had been recently determined to be a successor to a past owner of the Site. During the initial public comment period, new information concerning two additional remedial alternatives was made available and submitted to U.S. EPA by CWM as comments. The two additional remedial alternatives submitted by CWM had not been evaluated in the Feasibility Study or in the Feasibility Study Addendum. However, because this new information became available, CH2M Hill, at the request of U.S. EPA, prepared the Feasibility Study Addendum 2 (FSA2), which evaluated a modification of one of the two newly submitted remedial alternatives, which is now known as Alternative 9a. In accordance with the NCP, U.S. EPA has discretion to make changes to the Preferred Alternative identified in the Proposed Plan based either on new information received from the public or support agency or on information generated by U.S. EPA itself. After evaluating Alternative 9a against the other remedial alternatives using the Superfund remedy selection criteria, U.S. EPA has determined that Alternative 9a offers the best balance of the criteria. The resulting changes to the Preferred Alternative based on new information about additional remedial alternatives and the modification are significant. Because the changes to the Preferred Alternative could not have been reasonably anticipated by the public based on the information then available to the public, U.S. EPA issued a new (revised) Proposed Plan for the Preferred Remedial Alternative 9a, and opened a second public comment period.

The second public comment period on the new Proposed Plan ran May 31 through July 30, 2011. It was extended from the original 30 days due to a request from The Clark County Combined Health District at the public meeting, and was prompted by some stakeholders not receiving the mailing that announced the meeting. The notice announcing the public meeting and the availability of the Proposed Plan was published in the *Springfield News-Sun* newspaper on May 31, 2011. U.S. EPA held a public meeting at the Northwestern High School in Springfield, Ohio on June 22, 2011, to present the new Proposed Plan. Approximately 35 people attended the meeting. Representatives of U.S. EPA were present at the public meeting to answer questions regarding the proposed remedy. Ohio EPA was also present at the meeting. Responses to significant comments received during the second public comment period on the new Proposed Plan (including comments received at the public meeting) are included in the Responsiveness Summary Part 2 which is Appendix 3 of this ROD. Comments from both the initial and second comment periods were considered prior to selection of the final remedy for the Site.

In addition to the public involvement activities noted above, U.S. EPA mailed out fact sheets and participated in meetings with the Community Advisory Group and the public throughout the

RI/FS phase of the project. The Community Advisory Group is called the Citizens for Wise Approaches Toward Environmental Resources ("CF/WATER"). These fact sheets and meetings were used to inform the public about progress and plans for cleanup actions. U.S. EPA developed a Community Involvement Plan during the Site Investigation in 2000, and the plan was updated most recently in 2009. The mailing list has been updated periodically. U.S. EPA also developed a website dedicated to the Site. More recent fact sheets, technical documents, and other information have been placed on the website, and are available at http://www.epa.gov/region5/sites/tremont.

11.0 Scope and Role of Response Action

This ROD addresses the first and final remedy for the Site. The threats posed by this Site to human health are due to future risk from exposure to contamination from a groundwater-to-surface water discharge to the unnamed tributary from the waste cells and due to future risk from exposure to future contamination from potable use of the deep sand and gravel aquifer. The threats posed by this Site to ecological receptors are due to future risk from exposure to contamination from a groundwater-to-surface-water discharge to the unnamed tributary from the waste cells. The main components of the selected remedy include excavation and off-site treatment and disposal of liquid waste and containment of solid hazardous and non-hazardous waste and contaminated soils on-site in an engineered lined waste cell. The remedy will remove the risk of future contamination to surface water and groundwater posed by the mobile liquid waste and prevent the risk of future contamination to surface water and groundwater due to the solid wastes by creating redundant barriers that prohibit infiltration of water and migration of the wastes.

The remedy selected in this ROD will address the long-term health threats posed by hazardous and non-hazardous waste in the Barrel Fill. The selection of the final cleanup standard is based on the Site-specific risk assessment that was conducted during and after the RI, and an evaluation under the nine criteria as required by the National Oil and Hazardous Substance Pollution Contingency Plan (NCP).

U.S. EPA classifies the hazardous liquid waste in the Barrel Fill as principal threat waste. Principal threat wastes are considered to be those source materials that are highly toxic or highly mobile that generally cannot be reliably contained or would present significant risk to human health or the environment should exposure occur.

12.0 Site Characteristics

This section of the ROD provides a brief, comprehensive overview of the Site's source characterization; geology; hydrogeology; sampling strategy; nature and extent of contamination; and the Conceptual Site Model. Detailed information about the Site's characteristics can be found in the Remedial Investigation (RI) Report.

12.1 Source Characterization

The Barrel Fill contains bulk liquid wastes and buried drums of industrial origin. Approximately 51,500 drums (approximately 2.8 million gallons, assuming 55 gallons per drum) of containerized waste and 304,000 gallons of non-containerized waste were disposed at the Barrel Fill. Wastes disposed in the Barrel Fill were placed into 50 discrete waste cells, individually excavated into the natural glacial till material present in the area.

Nearly 200 different types of containerized waste materials were disposed in the Barrel Fill. Containerized and non-containerized wastes included glues, resins, paint sludge, paint scrap/waste, soap/shampoo/detergent waste, asbestos slurry, caustic waste, oils, polyol and other compounds. Approximately 31 percent of the containerized wastes were identified as "paint sludge," with 19 percent described as "polyol" and 15 percent described as "latex or latex sludge." Most of the non-containerized waste was classified as sludge. Based on depositions and operational records, non-containerized wastes included a significant volume of still bottoms and other industrial wastes. See Table 1 for a breakdown of the categories of containerized and non-containerized wastes that is summarized from the information in Appendix B of the RI Report.

After closure of the Barrel Fill, the cells were covered with between 10 and 17 feet of glacial till. That is, the waste material is present at depths of 10 to 17 feet below grade. The bottoms of the cells are as much as 35 feet below existing grade, which corresponds to a maximum depth of five feet above the 1075 Intertill.

Contaminants identified in RI samples are consistent with the types of industrial waste disposed of at the Barrel Fill. Analyses of waste materials collected from the sampled drums and cell water indicate the presence of a number of organic and metals contaminants. Generally, these contaminants include VOCs, SVOCs, metals and pesticides. Specifically, concentrations of all 24 Target Analyte List (TAL) metals were detected in waste samples, though not in each sample. Twenty of the 22 pesticides present in the Target Compound List (TCL) were also detected in wastes analyzed (toxaphene and chlordane were not detected). Forty-four of 68 TCL SVOC compounds were detected within waste samples, as were 40 of the 50 TCL VOCs.

The detected contaminants from test pit water and saturated soils adjacent to waste cells are consistent with the type of disposal practice described in the Source of Contamination section of this report. Analytical results of water and soil samples collected from the test pits during the RI were consistent with what would be expected from water samples collected from disposal areas. Observations made during waste cell characterization activities and results of water and soil analyses indicated significant concentrations of industrial chemicals.

Light, non-aqueous phase liquid (LNAPL) was observed and sampled from test pits during the RI. It is possible if not likely that the LNAPL observed in the test pit at cell C3 (see Figure 3) is related to the bulk sludge disposal reported for this cell. Based on Site records and employee statements, oils containing chlorinated solvents may have been accepted for processing at the WTF operations, and sludges from the operations may have been disposed at the Barrel Fill. This information suggests that a potential source of chlorinated solvents at the Barrel Fill is the

bulk sludge disposal. Based on statements from employees who worked at the Barrel Fill, chlorinated solvents were not accepted at the Barrel Fill. The presence of dense non-aqueous phase liquid (DNAPL) was not observed at the Barrel Fill.

12.2 Geology

The hydrogeology at the Site was assessed by numerous investigations since 1969 (TN&A 2002). The Barrel Fill was included as part of these investigations in several reports. Information from these previous studies and results of the RI activities were used to develop interpretations.

Geology of the area consists of limestone bedrock covered by unconsolidated sand, gravel, and clay-rich glacial till. The limestone bedrock has an undulating surface. Overlying the limestone is permeable sand and gravel that ranges in thickness from 0 to more than 65 feet. This glacial outwash, which was covered by younger glacial material over 10,000 years ago, not only underlies much of the Barrel Fill but also outcrops along the northern valley wall of Chapman Creek. The sand and gravel was mined intermittently along the outcrop, including the area now covered by the Tremont City Landfill. Both the sand and gravel, and the limestone bedrock serve as sources of potable water in the area surrounding the Barrel Fill.

Overlying the sand and gravel is a mass of low permeability clay-rich glacial till that, in places, exceeds 160 feet in thickness. Within the till are Intertill deposits of fine-grained sand. Some of the sand appears to be in thin, isolated layers of limited areal extent; however, there are three Intertill units that are more extensive. In these reports, these Intertill units are referred to by their average elevation and include the 1075 Intertill, 1050 Intertill, and the 1015 Intertill. Figure 4 provides a general depiction of the geology as shown in the RI Report.

The RI Report included isopach (thickness) maps of these Intertill zones and concluded the following on the three zones (described from shallowest to deepest):

- The 1075 Intertill is areally extensive, although it is absent in the northwest corner and in a single boring installed in the central part of the Barrel Fill. This unit is generally less than two feet thick throughout much of the Barrel Fill, but thickens to seven feet northeast of the Barrel Fill and exceeds three feet in the southwest portion of the Barrel Fill. This unit outcrops in the unnamed tributary beyond the southeast corner of the Barrel Fill.

- The 1050 Intertill is oriented in the northeast-southwest direction and winds from the south central part of the Barrel Fill through the northeast corner. This unit resembles a former stream deposit and is thickest along the trend line. This unit is generally about two feet thick, but it exceeds six feet at one isolated point in the northeast corner of the Barrel Fill. The 1050 Intertill decreases in thickness laterally to the northwest and southeast of the Barrel Fill. It is absent in the northwest corner and less than six inches thick in the southeast corner of the Barrel Fill.

- The 1015 Intertill underlies the northeastern half of the Barrel Fill, and in places it is the thickest of the three Intertill units. It thickens to a maximum of 12 feet in the northeast. As is relevant for the other two intertills, the Tremont City Landfill was "constructed" in a borrow pit (Burgess & Niple, 1992) that would have been originally used to access and remove sand and gravel deposits near the current elevation of Snyder-Domer Road, and the Intertills would have outcropped along this borrow pit wall.

The clay-rich glacial till that separates the three Intertill layers has a very low permeability and forms a confining unit through which water can migrate at only an exceedingly slow rate. The interval between the 1075 Intertill and the 1050 Intertill consists of glacial till that ranges in thickness from nearly 20 to 30 feet. The 1050 Intertill is separated from the underlying 1015 Intertill by glacial till that is 23 to 31 feet thick. Where the 1015 Intertill is absent, the clay-rich glacial till, extending from the 1050 Intertill downward to the Deep Sand and Gravel, ranges from about 27 feet to more than 100 feet thick. Where the 1015 Intertill is present, as much as 60 feet of clay separates it from the underlying limestone or sand and gravel units.

Overlying the 1075 Intertill is a surficial clay that ranges from about 20 to 30 feet in thickness. This unit is weathered to a depth of 5 to 10 feet below original grade, as evidenced by the brown oxidized clay. The weathering would result in a substantial increase in permeability in the weathered zone as compared to unweathered material. Rain and snowmelt can infiltrate this zone rather rapidly and then flow as groundwater, generally to the east.

Boring logs indicate that a total thickness of glacial till ranging from 55 to more than 125 feet separates the bottom of the Barrel Fill from the deeper sand and gravel.

Post-RI Report evaluations by U.S. EPA and Ohio EPA revealed that the tills and primary Intertill layers are not completely uniform as depicted in Figure 4, which was taken from the RI Report. The geology beneath the Barrel Fill does not consist of discrete sand seams in a "layer cake" of thick clays; rather, the geology includes inter-braided stream channels that exist with sand seams detectable throughout the geology between the waste cells and the deep sand and gravel aquifer. There appear to be fractures in the tills in the vicinity of the ravine, and not all intertills may be isolated; rather, some may be inter-connected.

12.3 Hydrogeology

Groundwater Flow Direction

Water-level maps in the RI Report indicate the general direction of groundwater movement, and the spacing of the contours provide the degree of hydraulic gradient, which is the driving force that causes groundwater to move. Groundwater in several hydrogeologic units beneath the Barrel Fill was monitored, as discussed below.

Water Table

Groundwater in the Water Table unit flows horizontally and discharges to the unnamed tributary located northeast and east of the Barrel Fill. Groundwater elevation data were collected

numerous times during the RI in order to determine groundwater flow directions and to understand the effects of seasonality on groundwater flow at the Barrel Fill. Review of data from these events indicates that groundwater flow is fairly constant in this unit, with flow being toward the east, discharging to the unnamed tributary. The hydraulic gradient in the Water Table is approximately 0.05 feet per foot, and the depth of the Water Table unit ranges from approximately 4 to 10 feet below original grade.

1075 Intertill

Groundwater elevation data from wells screened in the 1075 Intertill indicate a general eastward groundwater flow direction across the Barrel Fill. The 1075 Intertill outcrops at the seep located in the unnamed tributary east of the Barrel Fill. Groundwater from the 1075 Intertill discharges at this seep location. As is true with all three Intertills, groundwater elevation data were collected numerous times during the RI in order to determine groundwater flow directions and to understand the effects of seasonality on groundwater flow at the Barrel Fill. Review of data from these events indicates that groundwater flow is fairly constant in this unit, with flow being toward the east, discharging to the unnamed tributary at the seep location east of the Barrel Fill. The hydraulic gradient in the 1075 Intertill is approximately 0.035 feet per foot.

1050 Intertill

Review of groundwater elevation data from wells screened in the 1050 Intertill indicates that groundwater flow is fairly constant in this unit, with flow being toward the east. The hydraulic gradient in the 1050 Intertill is approximately 0.040 feet per foot.

1015 Intertill

Review of groundwater elevation data from wells screened in the 1015 Intertill indicates that groundwater flow is fairly constant in this unit, with flow being toward the northeast. The hydraulic gradient in this Intertill zone is approximately 0.025 feet per foot.

Deep Sand and Gravel

As is shown in Figure 4, the deep sand and gravel aquifer appears to be absent in the central portion of the Barrel Fill. Groundwater elevations differ significantly in wells screened on either side of this "divide" indicating the presence of a "low flow boundary" corresponding to the "0" thickness of the deep sand and gravel unit. Groundwater flow data appear to indicate at least two separate flow regimes in the deep sand and gravel, with groundwater elevations of approximately 1026 feet west of the boundary and 990 feet east of the boundary. Groundwater flow on the eastern side of the no-flow boundary is to the north. West of this boundary, it is not possible to accurately determine either direction or gradient due to an extremely flat gradient and insufficient western data points. The difference in water level elevations across the no-flow boundary is as much as 36 feet, with the head being lower on the east side.

Surface Water/Groundwater Relationship

Based on surface water elevations and Water Table groundwater elevations, the Water Table discharges to the unnamed tributary east and northeast of the Barrel Fill. Based on the Water Table and 1075 Intertill groundwater elevations, it appears that the unnamed tributary is the controlling feature for groundwater discharge from the Water Table and 1075 Intertill at the Site. Surface water flow data were collected from the culvert several days after a rain event with several intermittent showers still occurring, in an effort to obtain a base-flow for the tributary upstream of the seep location and upstream of where the 1075 Intertill discharges to the tributary. The intent was to collect surface water flow data where the primary contribution of flow upstream of the seep was from the Water Table discharging to the tributary. Flow was measured to be approximately seven gpm. Calculated discharge from the Water Table to the tributary is approximately 0.4 gpm from each side of the unnamed tributary/drainageway for a total flow of approximately 0.8 gpm. This flow versus discharge difference (0.8 gpm compared to 7 gpm) is within the expected range, as some surface water runoff was likely contributing to flow.

Throughout RI activities, flow was observed in the unnamed tributary, downstream of the seep, where the 1075 Intertill discharges east of the Barrel Fill. Upgradient of the seep location, which is where the Water Table discharges, the unnamed tributary is intermittent. This intermittent observation indicates that during dry periods, the groundwater discharge from the Water Table is less than the evapotranspiration rate.

Hydraulic Characteristics

During the RI, both laboratory tests on soil samples and aquifer testing were conducted in order to determine the hydraulic characteristics of the glacial till and intertill units at the Barrel Fill.

Soil cores were collected by means of Shelby tubes for laboratory permeability testing. This test method measured the till units as having a vertical hydraulic conductivity as low as 1×10^{-8} cm/sec.

Based on the results of the aquifer tests, the RI Report reported the following:

- The 1050 Intertill is laterally extensive and connected and has an average horizontal hydraulic conductivity of 3.05×10^{-4} cm/sec.

- The vertical hydraulic conductivity of the till between the 1050 and 1075 Intertills ranges from 10^{-8} to less than 10^{-20} cm/sec. The lowermost values calculated from the aquifer test data represent very low hydraulic conductivities that are generally not reported in prevailing hydrogeologic literature for naturally occurring materials, making them highly suspect.

In post-RI evaluations that compared RI boring logs to RI depictions of the intertills in relation to the tills, U.S. EPA and Ohio EPA determined that the RI Report estimate of vertical hydraulic conductivity beneath the Barrel Fill as measured by the aquifer testing is unreasonably low.

12.4 Nature and Extent of Contamination

12.4.1 Soil

As a part of the RI, 10 surface and 10 subsurface soil samples were collected from the Barrel Fill cover material at locations above waste cells. In addition, 10 surface and 10 subsurface soil samples were collected from background locations situated several hundred feet north of the Barrel Fill. Surface soil samples were taken in the 0-2 feet range; subsurface soil samples were taken in the 3-18 feet range. On-site subsurface samples were taken just above the Water Table. All samples were analyzed for TAL/TCL parameters. Results of these analyses indicated that low or background concentrations of several VOCs, pesticides, SVOCs, and metals were detected in the soil above the Barrel Fill disposal cells. Evaluation of these results indicated that no soil samples collected from the Barrel Fill cover material exceeded RI screening criteria. One background soil sample (31.1 mg/kg in BK-5, 0-2 ft. depth interval), however, did exceed the screening criterion for arsenic. See Figure 5.

The soil sampling results are consistent with Barrel Fill historical operations. After wastes were disposed at the Barrel Fill, a significant amount of fill material (10 to 17 feet), much from surrounding agricultural land, was placed over the waste. This fill has covered any waste and associated contamination that may have been deposited near the original ground surface during active Barrel Fill operations. The presence of low level VOCs that were found in surface and unsaturated subsurface soils could be the result of VOCs in soil vapor transported upward into unsaturated soils or from field or laboratory contamination.

12.4.2 Soil Vapor

As a part of the RI, a soil vapor survey was completed. This survey included the collection and field analysis (using a flame ionization detector (FID)) for total organic vapors from 10 background and 50 investigative samples. Background samples were collected from an area situated several hundred feet north of the Barrel Fill. Investigative samples were collected from 50 sampling locations directly over the waste cells. Evaluation of the field analyses indicated that 32 of the 50 investigative samples exceeded the background soil vapor concentration (mean plus two standard deviations of the background field screening results). Samples from 18 of these locations and two background locations were analyzed for VOCs. Results of these analyses indicate that 28 VOCs were detected in at least one of the soil vapor samples analyzed.

Numerous VOCs detected in soil vapor were also detected in drum samples, test pit water, test pit saturated soils and unsaturated soils. These results indicate a correlation between VOCs in these media that may result from transport of VOCs from the wastes to soil vapor. Evaluation of the soil vapor results indicated that no soil vapor to ambient air screening criteria were exceeded.

12.4.3 Groundwater

Groundwater sampling results greater than screening criteria for the Water Table, 1075 Intertill, 1050 Intertill, 1015 Intertill, and deep sand and gravel aquifer are shown in Figures 6 through 10, respectively.

Evaluation of the Nature and Extent of Contamination (Concentrations Exceeding Screening Levels)

The groundwater quality data obtained during the RI indicate several VOCs and manganese from the Barrel Fill have impacted shallow (Water Table) groundwater above screening levels at monitoring well HMW-301. As previously noted, this well is immediately adjacent to the Barrel Fill approximately 15 to 20 feet east and hydraulically downgradient of waste cells E7 and D9. Wells HMW-703, HMW-704 and HMW-702 are located hydraulically downgradient of HMW-301 and do not contain contaminants detected in HMW-301 above screening levels. Figure 6 also shows exceedances in Water Table wells other than HMW-301; these exceedances include metals (arsenic, iron, lead, and manganese), pesticides (dieldren, alpha-BHC, and beta-BHC), VOCs (1,1,2,2-TCA and dibromochlormethane) and SVOCs (bis (2-ethylhexyl) phthalate).

Figure 7 shows a number of screening level exceedances in the 1075 Intertill; mostly of metals. In addition, one exceedance of TCE was reported, along with two estimated exceedances of pesticides (dieldren and alpha-chlordane).

Contaminant level exceedances in the groundwater zones beneath the 1075 Intertill (the 1050 Intertill, the 1015 Intertill, and the deep sand and gravel aquifer; Figures 8, 9, and 10, respectively) could not be attributed to Barrel Fill contamination.

It is noted that U.S. EPA did not always conclude that a groundwater sampling result showing a screening level exceedance meant that this exceedance was related to Barrel Fill contamination. U.S. EPA considered topics such as reproducibility of sampling results (consistency of the sampling result with other rounds of sampling), naturally occurring conditions (e.g., high levels of arsenic are prevalent in groundwater in southwestern Ohio), concentration gradients (how the sampling result in one groundwater zone compared to sampling results in groundwater zones above or beneath it), and comparison to upgradient sampling results (in general, a downgradient sampling result should have a higher contaminant concentration if it is related to Barrel Fill contamination) to determine whether an exceedance was related to Barrel Fill contamination.

Summary of the Nature and Extent of Groundwater Contamination

Shallow groundwater (Water Table and 1075 Intertill) has been impacted with Barrel Fill-derived contaminants above screening levels. Wells downgradient, off the Barrel Fill property in the Water Table and 1075 Intertill, do not show exceedances related to the Barrel Fill. The origin of groundwater contamination in geologic units beneath the 1075 Intertill found above screening levels could not be determined.

12.4.4 Test Pit Water

Among the five test pits excavated, test pit water encountered was placed into a frac tank (i.e., a storage tank with a pump). Table 2 shows that many contaminant concentrations from the frac tank samples exceeded ecological screening levels for VOCs, SVOCs, pesticides/PCBs, and metals. Surface water ecological screening levels were used because of the exposure pathway

from the Water Table and test pit water to the unnamed tributary. In some cases, the contaminant levels exceed the ecological screening levels by orders of magnitude. Much of the test pit water was highly contaminated and had to be handled as hazardous waste.

12.4.5 Solid and Liquid Waste in Drums

Solid waste samples analyzed from the 50 drums sampled showed high levels of inorganics, pesticides, VOCs, and SVOCs. Assuming a 20-to-1 extraction fluid to solid ratio used in the Toxicity Characteristic Leaching Procedure (TCLP), the maximum concentrations for carbon tetrachloride, tetrachloroethylene (PCE), hexachloroethane, and heptachlor would likely exceed their toxicity characteristic criteria, with carbon tetrachloride and PCE exceeding their criteria by orders of magnitude (670 mg/kg compared to 10 mg/l and 92,000 mg/kg compared to 14 mg/l, respectively, after dividing the maximum concentration by 20).

Liquid waste samples analyzed from the 50 drums also showed high levels of inorganics, pesticides, VOCs, and SVOCs. For contaminants having criteria for toxicity characteristics, 1,1-DCE; 1,2-DCA; 2-butanone; benzene; TCE; and endrin exceeded the criteria by orders of magnitude (1,800 mg/l compared to 0.70 mg/l; 140 mg/l compared to 0.50 mg/l; 46,000 mg/l compared to 200 mg/l; 100 mg/l compared to 0.50 mg/l; 520 mg/l compared to 0.50 mg/l; and 25 mg/l compared to 0.02 mg/l, respectively).

12.4.6 Surface Water and Sediment

As part of the RI, six sediment samples and one surface water sample were collected from the seep east of the Barrel Fill. All samples were analyzed for TAL/TCL parameters. Results of these analyses indicated that potential Barrel Fill-related contaminants were detected in samples collected from the unnamed tributary. Eight VOCs were detected in the surface water sample and 15 VOCs were detected in sediment samples. Evaluation of surface water sample results indicate concentrations of these compounds were below applicable surface water criteria. Evaluation of sediment sample results indicate that 1,1-dichloroethane, acetone, barium, and manganese exceeded ecological screening criteria. These contaminants may have migrated from Barrel Fill waste into Water Table groundwater and into surface water.

13.0 Current and Potential Future Land and Water Uses

13.1 Land Uses

The 8.5-acre Tremont City Barrel Fill Site has been closed as a barrel fill operation since 1980. Since the Site closed, the land on the Site has not been used. The Site is primarily surrounded by undeveloped land, including land used for agricultural purposes. According to German Township records, the Site is currently zoned as M-2 (heavy duty industrial). The land use and designation is expected to remain unchanged.

13.2 Groundwater and Surface Water Uses

There is currently no groundwater use at the Site, and no water supply wells exist on-site. Furthermore, State of Ohio regulations prohibit installation or use of drinking water wells on a closed landfill, such as the Site. The only on-site surface water body is the unnamed tributary located adjacent to and east of the Barrel Fill.

Groundwater is the primary source of potable water in the vicinity of the Site. Eighty-six potable water wells have been identified within one mile of the Site. Currently, the deep sand and gravel aquifer is used as a potable water source by nearby residents. This aquifer is also used as a drinking water source by communities in the area, including the cities of Springfield and Dayton. U.S. EPA and Ohio EPA also consider the 1050 and 1015 Intertills to be potable water sources; however, neither of these sources is currently being used for potable water.

Groundwater use is expected to continue in the same manner as described above.

14.0 Summaries of Human Health and Ecological Risk Assessments

14.1 Human Health Risk Assessment

14.1.1 Introduction

The human health risk assessment (HHRA) in the RI Report for the Tremont City Barrel Fill Site identified several land uses, receptor populations, and exposure routes to evaluate the conditions at the Site. Those exposures that are potentially complete are described in the Conceptual Site Exposure Model (CSEM) below.

Exposure point concentrations were then compiled or estimated to calculate the chemical specific and cumulative noncarcinogenic and carcinogenic risk for each of the exposure routes and pathways. The maximum concentration of each COPC detected in samples or the maximum modeled concentration from the potential exposure media was used for purposes of COPC screening and to estimate the risk for the identified COPC.

Table 3 shows cumulative, noncarcinogenic risk (the Screening Hazard Index columns) and cumulative, carcinogenic risk (the Excess Lifetime Cancer Risk columns). Values in red denote significant risk (defined as greater than a Hazard Index of 1 for noncarcinogenic risk and greater than 1×10^{-5} for carcinogenic risk). For this Site, U.S. EPA has defined carcinogenic risk that requires remedial action to be greater than 1×10^{-5}, consistent with Ohio EPA policy. Table 4 shows risk contributions from individual COPCs, considered COCs in this ROD. Table 4 represents cumulative risk among all affected media. As with Table 3, values in red denote significant risk.

14.1.2 Conceptual Site Exposure Model

This section discusses land use and exposure pathways used in the HHRA. In addition, the potential receptor populations, exposure routes and exposure parameters for each of the land uses are identified.

14.1.2.1 Current and Future Land Activity Scenarios

Soil and groundwater contamination, as discussed previously, do not extend outside of the Site. Contaminated groundwater discharges mainly to the unnamed tributary. Potential contact to contaminants in groundwater discharged to surface water can occur within the Site. Although contaminants discharged to the surface water could migrate downstream, water quality at the point where the Water Table discharges to the unnamed tributary represent the worst case scenario for purposes of potential surface water quality.

Current Land Use (Closed Landfill): As a closed landfill, there are maintenance requirements that will require occasional activities at the Site. As such, the HHRA provides quantitative evaluation of uses related to a closed, restricted-access landfill.

Unauthorized Use: Unauthorized and unattended use of the Site may occur. Under current land use, access to the Site is restricted by fencing and posted no-trespassing signs. However, this may not be sufficient to prevent all access.

Reasonably Anticipated, Future Land Use:

Future land uses are expected to be similar to current land uses. Therefore, two general receptor populations are expected to use the Barrel Fill: maintenance workers (groundskeepers) and trespassers. Trespassers represent unauthorized use of and access to the Barrel Fill.

14.1.2.2 Receptor Populations and Exposure Routes

The HHRA considered two general receptor populations under reasonably anticipated land use: maintenance workers (groundskeepers) and trespassers. A trespasser group represents unauthorized use and access to the Site.

Other receptor populations are possible under this land use but are adequately considered by other receptor populations. For example, visitors observing the Site are conservatively addressed by the maintenance worker or trespasser. A utility/construction worker is not considered a reasonably anticipated receptor population.

The general characteristics and potential exposure patterns of the reasonably anticipated receptor populations are discussed below.

Maintenance Worker: Under the current land use or potential future commercial land use, the maintenance worker represents outdoor workers engaged in daily facility care and maintenance

such as groundskeeping. The maintenance worker exposure to volatile contaminants is primarily through ambient air.

The maintenance worker is not likely to engage in intrusive soil activities that would lead to direct contact exposure to groundwater or subsurface soil. However, the maintenance worker may be exposed to surface soils (less than two feet below ground surface). The maintenance worker is potentially exposed to contaminants in surface soil through incidental ingestion, dermal contact, and inhalation of suspended dust or volatilization of contaminants. It is assumed that the maintenance worker may be exposed to contaminants in surface water during activities such as mowing of grass and/or debris removal from the drainage channel of the unnamed tributary. Exposure to contaminants in surface water is primarily through dermal contact. Even though the drainage channel (unnamed tributary) is shallow and not suitable for swimming, the HHRA conservatively considered incidental ingestion of sediment and surface water.

Trespasser: Any unauthorized user would be limited to occasional and infrequent access to the Site. This receptor group may engage in simple play such as mountain biking or hiking on the Site. The trespasser exposure to volatile contaminants is primarily through ambient air. The trespasser is not likely to engage in intrusive activities that would lead to direct contact exposure to groundwater or subsurface soil. However, the trespasser may be exposed to surface soils. The trespasser may be exposed to contaminants in surface water while playing or moving around on the Site (which is currently fenced). Exposure to contaminants in surface water is primarily through dermal contact. Similar to the maintenance worker scenario, the HHRA conservatively considered incidental ingestion of surface water, even though the drainage channel is shallow and not suitable for swimming.

14.1.2.3 Exposure Pathways and Exposure Media

Exposure pathways are the paths or courses that COPCs take from the source to the exposed receptor population. In some cases, the path from the source to the impacted medium may only be supported by analytical data from the specific medium. Based on the CSEM in the RI Report, this section describes the potentially impacted media (exposure media) and other potential exposure pathways that were not directly measured.

Vapor Transport to Soil: The majority of the material within the waste cells is beneath the Water Table Unit and situated below large amounts of cover material. Volatile contaminants from the waste cells may release to and then migrate from groundwater in vapor form to the soil above the cells. As such, soil may be impacted at the Site.

Migration in Groundwater: Releases from barrels or bulk material in the waste cells have impacted the groundwater in the Water Table Unit and the 1075 Intertill. The RI Report concluded that groundwater contamination did not migrate beneath the 1075 Intertill; however, given the nature and volume of principal threat waste in the Barrel Fill, it is likely that there will be eventual groundwater contaminant migration to the lower groundwater zones, including the deep sand and gravel aquifer. The Water Table Unit is primarily weathered or fractured till with competent till underlying. The next identified groundwater zone beneath the Water Table Unit is the 1075 Intertill.

The 1075 Intertill is the first unit to be impacted as groundwater migrates vertically from the Water Table Unit. Based on the Site hydrogeology, most of the impacted groundwater from future vertical migration of the material from the Water Table Unit to the 1075 Intertill will then migrate horizontally and discharge to the unnamed tributary. For purposes of the HHRA, the groundwater in the 1075 Intertill, already impacted, was considered a potentially impacted medium in the future.

Because of the nature and volume of principal threat wastes in the Barrel Fill, U.S. EPA considers groundwater contaminant migration from the Barrel Fill to all groundwater zones beneath the Barrel Fill to be an eventual exposure pathway. U.S. EPA estimates the time for groundwater contamination to migrate from the Barrel Fill to the deep sand and gravel aquifer to be approximately 1,000 years, based on a travel distance of 100 feet and a vertical hydraulic conductivity of 1×10^{-7} cm/sec.

Migration from Groundwater to Soil Gas to Ambient Air: Releases from barrels or leaching from non-containerized waste in the waste cells can impact the groundwater, and volatile contaminants can then migrate upward in soil gas and into ambient air. The ambient air above the Site is considered a potentially impacted medium under current and future conditions.

Groundwater Discharge to Surface Water: The RI documented groundwater impacts in the Water Table Unit and identified areas of seeps leading to the unnamed tributary. In addition, future vertical migration of the material from the Water Table Unit to the 1075 Intertill will also discharge to the unnamed tributary. Surface water in the unnamed tributary is considered a potentially impacted medium.

Accumulation in Sediment: Impacted groundwater from the Water Table Unit discharges to the unnamed tributary. As contaminated groundwater or surface water moves through or over the sediment, contaminants can accumulate through absorption, adsorption, or precipitation. Sediment in the unnamed tributary is considered a potentially impacted medium.

14.1.2.4 Exposure Factors

The majority of exposure factors used in the HHRA are based on general default values (e.g., skin surface areas, ingestion rates). The exposure assumptions used to estimate the carcinogenic and/or noncarcinogenic risk are discussed below.

The maintenance worker is assumed to be an adult exposed to surface water for one day per week from spring to early fall (i.e., from May through October) for a total of 25 days per year for 25 years. Under current conditions, the maintenance worker is only present one to two days per month. For future scenarios, the HHRA assumed the maintenance worker to be exposed to surface soil and ambient air 250 days per year. This assumes that a full-time position is required to maintain the Barrel Fill.

The trespasser receptor group is more likely to involve adolescents than adults. As such, the trespasser is assumed to be a youth aged 12 to 18 who may also be exposed to ambient air,

surface soil and surface water for 24 days per year (four days per month from May through October) for six years.

U.S. EPA default values for skin surface area were used to evaluate the potential dermal contact exposure scenarios for workers and trespassers. The skin surface area for the maintenance worker is 18,000 cm^2 and assumes total body emersion from falling into the unnamed tributary. The skin surface area for the trespasser is 17,500 cm^2 and is based on total body emersion.

14.1.3 Data Summary

14.1.3.1 Soil

A total of 33 soil samples collected from depths of 0-18.5 feet were used to evaluate potential exposure to contaminants in the subsurface soil (e.g., to utility workers). Samples were collected from various depth intervals above the Water Table Unit. Samples were collected in October 2003 and April 2004 and analyzed for VOCs, SVOCs, pesticides, PCBs, and cyanide.

A total of 20 soil samples collected from depths of 0-7.5 feet were used from 10 locations outside of the Barrel Fill to evaluate natural and regional background concentrations of contaminants in surface or subsurface soil. These soil samples were collected at depths similar to those used in evaluating subsurface soil discussed above. This data was used to estimate background levels to determine if Barrel Fill subsurface soil concentrations were elevated above background concentrations. Consistent with U.S. EPA guidance, the background value for each contaminant in soil is the mean background concentration plus two standard deviations.

14.1.3.2 Groundwater

A total of 174 groundwater samples were collected from 66 locations from the perimeter of the Barrel Fill. Samples were collected in April 2004, December 2004, and March 2005 and analyzed for VOCs, SVOCs, pesticides, PCBs, metals (total and dissolved) and miscellaneous inorganics, and water quality parameters. The HHRA used samples collected from the Water Table Unit or the 1075 Intertill to evaluate potential exposures.

14.1.3.3 Surface Water and Sediment

One surface water sample was collected in April 2004 from the seep area. This seep area discharges to the drainage channel and flows to the south along the eastern perimeter of the Barrel Fill. The surface water sample was analyzed for VOCs, SVOCs, pesticides, PCBs, metals (total and dissolved) and miscellaneous inorganics, and water quality parameters.

Six sediment samples were collected from three locations in the vicinity of the seep location in April 2004 and February 2005. These samples were analyzed for VOCs, SVOCs, pesticides, PCBs, metals, cyanide, and TOC.

14.1.3.4 Test Pit Water

During the RI, water was extracted from various test pits and excavations within and adjacent to waste cells. Six samples of test pit water and one LNAPL sample were collected and analyzed for VOCs, SVOCs, pesticides, PCBs, metals (total and dissolved) and miscellaneous inorganics, and water quality parameters.

14.1.3.5 Soil Gas

Soil gas samples were collected from 50 locations within the Barrel Fill and from 10 background locations. All samples were field analyzed with an FID, and analyses of background samples were used to define background concentrations of VOCs in soil gas. Based on revised background FID, 32 samples collected from the Barrel Fill were greater than the calculated background concentration. Samples from the 18 locations with the highest FID measurements were submitted to a laboratory for VOC analysis.

14.1.4 Identification of COPCs and Exposure Media

The COPC screening process was used to identify contaminants in Site-related media that were further evaluated in the HHRA. Specifically, the COPC screening process compared maximum concentrations of chemical contaminants in soil, groundwater, surface water and sediment to screening values. In addition, this process identifies media at the Site that have been impacted and required further evaluation in the HHRA. Lead is included in the COPC tables and identified as a COPC if above Site-specific background. However, consistent with risk assessment practices, lead was evaluated separately from other COPCs. Calcium, magnesium, potassium, and sodium are considered essential nutrients and were not identified as COPCs.

14.1.4.1 Soil (Surface and Subsurface)

Surface soil data was compared to the U.S. EPA Region 9 residential soil preliminary remediation goals (PRGs) and Site-specific background concentrations for metals, if available. Consistent with U.S. EPA and Ohio EPA guidance, the Region 9 PRGs based on noncarcinogenic risk were adjusted by one-tenth. Consistent with U.S. EPA guidance, the background value for each contaminant in soil is the mean background concentration plus two standard deviations. U.S. EPA has commonly used Region 9 PRGs and site-specific background values as screening levels to analyze RI sampling results.

The maximum detected concentrations of analytes in Barrel Fill surface soil (soil cover) samples were less than Region 9 PRGs and/or Site-specific background values. As such, none of the detected contaminants in Site surface soil was considered a COC, and no further human health risk evaluation of exposure to Site contaminants in soil was required. This evaluation assumes that contaminated soils located at depth within the waste cells will not be left on the surface of the Site if excavation or maintenance work is undertaken. Based on the COPC screening above, potential exposure to surface soil (routine commercial workers, maintenance workers, or trespassers), does not represent a significant exposure pathway and did not require further evaluation in the HHRA.

The maximum detected concentration of Barrel Fill subsurface soil data collected from the cover material above the Water Table Unit was also compared to the U.S. EPA Region 9 residential soil PRGs and Site-specific background concentrations (for metals), if available. Consistent with U.S. EPA and Ohio EPA guidance, the Region 9 PRGs based on noncarcinogenic risk were adjusted by one-tenth. Consistent with U.S. EPA guidance, the background value for each contaminant in soil is the mean background concentration plus two standard deviations.

The maximum detected concentration of thallium in Barrel Fill subsurface soil samples was greater than Region 9 PRGs and/or Site-specific background, and there is no screening value available for 2-hexanone. As such, these two contaminants are considered COCs in subsurface soil and were further evaluated in the HHRA. Based on the COPC screening above, potential exposure to subsurface soil (such as to a utility worker), required further evaluation to estimate potential risk of exposure.

14.1.4.2 Groundwater (Water Table Unit and 1075 Intertill)

The HHRA considered the potential for exposure to shallow groundwater during excavations or from the use of wells installed in the Water Table Unit or 1075 Intertill. Because the Water Table Unit is relatively shallow in areas of the Barrel Fill, potential exposure to groundwater during excavation work (to utility and construction workers) was evaluated. Potable use of groundwater from the Water Table and 1075 Intertill is unlikely due mostly to the low yield of these groundwater units; however, this use was considered in the HHRA to evaluate potential risk from this type of exposure. The HHRA did not evaluate risk due to potable use of groundwater below the 1075 Intertill.

The maximum concentrations of contaminants detected in groundwater samples collected from beneath or downgradient of the Barrel Fill from the Water Table Unit and 1075 Intertill were compared to Region 9 tap water values (October 2004). With the exception of contaminants detected in well HMW-301, a contaminant was also eliminated as a COPC if it was detected in less than five percent of the samples (providing there was an adequate sample size of at least 20 samples).

Results indicate that VOCs, pesticides, metals, and an SVOC were present in groundwater above screening values (see Figures 6 and 7).

In most instances, groundwater samples collected from monitoring well HMW-301 had the highest detected concentration of VOCs. HMW-301 reflects groundwater from the Water Table Unit; it is located in the southeast corner of the Barrel Fill, 10 to 15 feet southeast of waste cells E7 and D9. See Figures 3 and 6. SVOCs and metals were reported above screening values and/or Site-specific background for other locations.

Based on the COPC screening above and the CSEM, potential exposure to contaminants in groundwater was considered further in the HHRA. Specifically, the potential exposure to COPCs in groundwater was evaluated for the utility or construction worker who may be in direct

contact with groundwater during excavation and to document the potential risks associated with drinking shallow groundwater beneath the Barrel Fill in the Water Table Unit and 1075 Intertill.

14.1.4.3 Surface Water and Sediment

Contaminants detected in the single surface water sample collected from the seep were compared to Region 9 tap water values (October 2004). The concentrations of iron and manganese were greater than the screening criteria. There is no Region 9 criterion for lead available. Based on the COPC screening above and the CSEM, potential exposure to contaminants in surface water was considered further in the HHRA. The surface water sample results from April 2004 were consistent with results from surface water samples reported by TN&A in the 2002 U.S. EPA Site Investigation Summary.

The maximum detected concentrations reported for the six sediment samples were compared to the Region 9 residential soil PRGs. Aluminum, arsenic, iron, manganese, and vanadium were reported above screening values. However, the maximum concentrations are 14 to 48 percent below the background soil levels. Although these samples are classified as sediment, use of soil background concentrations is considered reasonable for an ephemeral stream. As such, while these contaminants may contribute to background risk, there are no Site-related COPCs in sediment, and further evaluation of sediment was not necessary.

Based on the COPC screening above, potential exposure to sediment does not represent a significant exposure pathway and did not require further evaluation in the HHRA.

14.1.4.4 Test Pit Water

The contaminants detected in the water extracted from the test pits and waste cell excavations were used to consider potential exposures during excavation and potential future concentrations in groundwater discharge to surface water. The maximum concentrations of contaminants detected in the samples from the extracted test pit water were compared to Region 9 tap water values (October 2004). Multiple VOCs, SVOCs and metals were identified as potential COPCs in excavation water and for consideration in future groundwater discharge. Based on the COPC screening above and the CSEM, potential exposure to contaminants in groundwater during excavation and potential exposure to future discharge to surface water was considered further in the HHRA.

14.1.4.5 Soil Gas

The contaminants detected in the soil gas samples from above the waste cells were compared to Region 9 PRG ambient air values (October 2004). The maximum detected concentrations of several contaminants were greater than the screening criteria. In addition, propylene, n-heptane and ethanol did not have screening criteria and were identified as COPCs. Based on the COPC screening above and the CSEM, potential exposure to contaminants in soil gas was considered further in the HHRA. Specifically, it is assumed that the COPC in soil gas may migrate into ambient air or future structures built on the Barrel Fill.

14.1.4.6 Summary of COPC Screening Results

The following summarizes the COPC screening results:

- No COPCs were identified for surface soils. As such, no further evaluation of surface soil was warranted in the HHRA.

- Two COPCs were identified for subsurface soils. Therefore, potential exposure to the COPCs in subsurface soil (above the Water Table Unit) warranted further evaluation in the HHRA.

- A number of COPCs (VOCs, SVOC, and metals) were identified in groundwater samples collected from the Water Table Unit and 1075 Intertill. As such, potential exposure to the COPCs in groundwater (Water Table Unit and 1075 Intertill) warranted further evaluation in the HHRA.

- A few COPCs were identified in surface water. As such, potential exposure to the COPCs in surface water warranted further evaluation in the HHRA.

- No COPCs were identified for sediments. As such, no further evaluation of sediment was warranted in the HHRA.

- Several COPCs were identified in water collected from test pits and waste cell excavations. As such, potential exposure to water during excavation activities warranted further evaluation in the HHRA. In addition, these COPCs, combined with other COPC detected in groundwater samples, were used to evaluate potential future impacts from groundwater discharge to surface water.

- Six COPCs were identified in soil gas. As such, potential exposure to the COPCs in soil gas (migration to ambient or indoor air) warranted further evaluation in the HHRA.

14.1.5 Exposure Point Concentrations

Based on the CSEM and identification of COPCs, the following exposure point concentrations for the exposure pathways were developed for reasonably anticipated land uses:

- Surface Water (Current Conditions)
- Surface Water (Future Conditions)
- Ambient Air

This section describes the development of exposure point concentrations for the complete and significant exposure pathways. In each case below, the maximum detected concentrations in media are used as the basis of estimating exposure point concentrations. This approach is conservative compared to other accepted methods to estimate exposure point concentrations such as calculation of upper confidence limits (UCLs) of the mean and other central tendency

exposure point estimates. The approach chosen will result in a more conservative quantification of risk for the purpose of developing more protective remedial alternatives.

Surface Water (Current Conditions)

The maximum detected COPC concentrations in the seep sample were used to estimate the potential risk associated with exposure to COPCs in surface water under current conditions.

Surface Water (Future Groundwater Discharge)

The potential for contaminants originating from the waste cells to migrate with groundwater and discharge to surface water in the future is considered a complete exposure pathway. The Water Table Unit discharges mainly into the unnamed tributary east of the Barrel Fill. U.S. EPA agrees with the RI estimation of the lateral, horizontal velocity of groundwater flow in the Water Table Unit of 11 ft/yr.

These modeled surface water concentrations were then used to evaluate the potential risk of exposure to these future COPCs in surface water by the maintenance worker and trespasser (the only two reasonably anticipated human receptors).

Ambient Air

The maximum detected soil gas concentrations for the COPCs were used to estimate a worst-case outdoor (ambient) air concentration. This modeled ambient air concentration was then used to evaluate the potential risk of exposure to these COPCs in ambient air by the maintenance worker and trespasser.

14.1.6 Risk Characterization

The noncarcinogenic and carcinogenic risks were estimated for the identified COPCs in the exposure media for each of the complete exposure scenarios, routes, and pathways under current and reasonably anticipated future exposures. Four receptors were evaluated for multiple exposure routes. The cumulative noncarcinogenic risk (hazard index (HI)) and cumulative carcinogenic risk (excess lifetime cancer risk (ELCR)) are summarized in Tables 3 and 4.

A cumulative hazard index greater than the target risk level of 1.0 or a cumulative excess lifetime cancer risk greater than the target action level of 1×10^{-5} are considered action levels where mitigation of the exposure pathway may be warranted. The estimated risk levels are discussed below.

14.1.6.1 Reasonably Anticipated and Complete Exposure Pathways

Two general, reasonably anticipated receptor populations are considered in this HHRA to be present at the Barrel Fill as currently used: maintenance worker and trespasser. Based on the risk estimates of the maintenance worker and trespasser, the risk associated with potential impacts to ambient air is not unacceptable risk. However, the risk estimates indicate

unacceptable risk levels from potential exposure to future surface water discharge (maintenance worker: HI = 5.25, ELCR = 3.13×10^{-4} and trespasser: HI = 7.31, ELCR = 1.05×10^{-4} (Table 3)). The risk estimates do not indicate unacceptable risk for potential exposure to current concentrations of COPCs in surface water.

As stated previously in this ROD, the HHRA did not evaluate the risk associated with future potable use of the lower groundwater units, particularly the deep sand and gravel aquifer. Due to the nature and volume of principal threat wastes in the Barrel Fill, there is future risk associated with exposure of Site contaminants in the deep sand and gravel drinking water aquifer; although, this risk was not quantified in the RI Report. The RI Report estimated a very low permeability (10^{-12} cm/sec based on the aquifer tests), equating to millions of years for contamination from the Barrel Fill to reach the deep sand and gravel aquifer. U.S. EPA has since disputed this estimate of permeability, and U.S. EPA's post-RI Report evaluations, in consultation with Ohio EPA, have shown that the permeability is likely much higher; therefore, future risk to the deep sand and gravel aquifer was considered when evaluating remedial alternatives.

14.1.6.2 Other Criteria and Standards

Lead was evaluated separately from other compounds during HHRA. Lead is an identified COPC in groundwater and surface water. For purposes of the HHRA, lead concentrations were compared to the Safe Drinking Water Act (SDWA) action level of 0.015 mg/L. Lead was detected above 0.015 mg/L in three groundwater samples (two in the 1075 Intertill and one in the Water Table Unit). However, based on the lead concentrations relative to the sample turbidity in each of the wells, it is likely that the lead concentrations above the lead action level are related to suspended solids and not groundwater conditions. Wells sampled with more yield and lower turbidity showed lead concentrations below the action level. Therefore, lead was not identified as a COPC in groundwater.

The detected concentrations in surface water were compared to the Ohio EPA Non-Drinking Water Criteria for Human Health (Ohio EPA, 2004) to determine if these standards were exceeded. Iron and mercury concentrations in the seep sample were greater than their respective standards.

The maximum soil concentration of lead from 33 surface soil and subsurface soil samples was 21.5 J mg/kg (estimated). This concentration is less than the U.S. EPA residential soil screening criteria for lead of 400 mg/kg. Lead in soil does not represent a concern at the Site.

14.1.7 HHRA Summary and Conclusions

The HHRA considered two general receptor populations to be present at the Site as currently used: maintenance worker and trespasser. Based on the related risk estimates, potential impacts to ambient air, surface soil, and current surface water conditions do not pose unacceptable risk. However, the risk estimates indicate unacceptable risk levels from potential exposure to future groundwater-to-surface water discharge.

Although not quantified, potential direct contact with the complex and concentrated mixture of materials in the waste cells during excavations will represent an unacceptable risk to future maintenance workers without appropriate engineered controls, administrative controls, and personal protective equipment.

The HHRA did not identify any risk from potable use of the deep sand and gravel aquifer. However, due to post-RI Report evaluations of the geology beneath the Barrel Fill that showed this geology to be more permeable than estimated in the RI Report, EPA has determined that potable use of the deep sand and gravel aquifer is a valid exposure pathway and that future risk associated with potable use of this aquifer must be considered while evaluating remedial alternatives.

14.2 Ecological Risk Assessment

14.2.1 Introduction

The RI Report includes a screening-level ecological risk assessment (SLERA) for the Site. The objective of the SLERA is to support a determination of whether a more detailed baseline ERA is necessary. If the SLERA shows potential risk to ecological receptors, a detailed baseline ERA is usually conducted to better quantify that risk.

14.2.2 SLERA Summary and Conclusions

The objective of the SLERA is to support a decision as to whether the Barrel Fill requires additional assessment of ecological risk. The SLERA was conducted in accordance with U.S. EPA (1997) and Ohio EPA (2003) guidance, and the approach was biased to identify potential ecological risk. The SLERA included a characterization of habitat within the Barrel Fill and surrounding areas, and identified potential ecological receptors and potentially complete exposure pathways. The potential ecological significance of these pathways was evaluated by comparing maximum detected chemical concentrations in media to Barrel Fill-specific background concentrations (for surface soil) and conservative screening criteria recommended in Ohio EPA (2003) ecological risk assessment guidance.

Results of the SLERA indicate that wildlife habitat of various levels of quality is available within the Barrel Fill and surrounding areas. Ecological receptors such as terrestrial and semi-aquatic fauna are likely to inhabit and/or use these areas, and exposure pathways may exist for these receptors. Surface soil, sediment, and surface water represent potential exposure media. Although several COPECs have been identified for surface soil, sediment, and surface water, it is important to note that the majority of these contaminants were retained as COPECs because they lack ecological screening criteria and/or are considered to be persistent, bio-accumulative, or toxic (PBT). Furthermore, for those few contaminants that were retained as COPECs because they exceeded their associated screening criteria, it is noted that these exceedances do not necessarily indicate the occurrence of ecological risks. Contaminants identified as COPECs were detected at relatively low frequencies (limited sized area), and the magnitudes of criteria exceedances were also relatively low.

Several contaminants were identified during the screening process as COPECs for surface soils, sediment, and surface water. These contaminants are not likely to present a significant ecological risk for one or more of the following reasons:

- Their low concentrations and environmental fate properties (e.g., volatilization) minimize the potential for significant ecological exposure; or

- There was an infrequent detection, low concentration, and/or the extent of the COPECs in soil is limited in terms of potential ecological exposure.

Therefore, the detected contaminants and their associated concentrations are not expected to pose an unacceptable ecological risk to receptors that may inhabit and/or use habitats at or in the vicinity of the Barrel Fill, and no further ecological assessment of potential exposures to these media was required.

The modeled concentrations of many of the groundwater-to surface water discharge COPECs described above are significantly higher than the screening criteria. As such, these contaminants and their associated concentrations are expected to pose an unacceptable future ecological risk to receptors that may use 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 were enough to conclude that future discharge of groundwater to surface water will result in unacceptable risk to ecological receptors exposed to the surface water.

Additional investigation or measurement of ecological or environmental affects within the unnamed tributary from this future modeled discharge was not necessary. The magnitude of COPEC exceedances compared to screening levels was such that potential significant impacts on aquatic organisms are possible in this future scenario for the seep. In addition, given the sensitive and high quality habitat described for Chapman Creek, the potential for these COPECs to discharge and flow into Chapman Creek at concentrations exceeding screening criteria is considered unacceptable for purposes of the screening assessment.

Therefore, the potential for the higher concentrations of Barrel Fill contaminants found in the Water Table Unit and in the waste cells to migrate with groundwater and discharge to surface water results in a potentially unacceptable ecological risk in the unnamed tributary. Although no additional ecological assessment is required, the SLERA concluded that unacceptable risk to the environment exists from the potential for Barrel Fill contaminants to discharge in the future to surface water.

14.3 Basis for Remedial Action

The response action selected in this Record of Decision is necessary to protect human health and the environment from actual or threatened releases of hazardous substances into the environment.

The HHRA identified unacceptable carcinogenic and noncarcinogenic risk for future maintenance worker and trespasser scenarios for the groundwater-to-surface-water discharge pathway. For a maintenance worker, the cumulative, carcinogenic risk is 3.14×10^{-4}, and the Hazard Index for noncarcinogenic risk is 5.25. For a trespasser, the cumulative, carcinogenic risk is 1.05×10^{-4}, and the Hazard Index for noncarcinogenic risk is 7.31. See Table 3.

In addition, although the RI did not quantify the risk associated with future, potable use of the deep sand and gravel aquifer, given the nature and volume of principal threat wastes in the Barrel Fill, there is an unacceptable risk to future exposure to Barrel Fill contaminants from use of the deep sand and gravel drinking water aquifer should a release occur that impacted that aquifer.

For ecological risk, the SLERA concluded that the potential for the higher concentrations of Barrel Fill contaminants found in the Water Table Unit and in the waste cells to migrate with groundwater and discharge to surface water results in a potentially unacceptable ecological risk in the unnamed tributary. The SLERA concluded that unacceptable risk to the environment exists from the potential for Barrel Fill contaminants to discharge in the future to surface water.

15.0 Remedial Action Objectives

15.1 Remedial Action Objectives

Remedial Action Objectives (RAOs) are goals specific to media or operable units for protecting human health and the environment. Risk can be associated with current or potential future exposures. RAOs should be as specific as possible but not so specific that the range of alternatives to be developed is unduly limited. Objectives aimed at protecting human health and the environment should specify 1) contaminants of concern (COCs), 2) exposure routes and receptors, and 3) an acceptable contaminant level or range of levels for each exposure route (i.e., a Preliminary Remediation Goal) (EPA, 1988).

RAOs were developed for the Site in part based on the contaminant levels and exposure pathways found to present potentially unacceptable risk to human health and the environment. The RAOs, remediation goals, and remediation strategies developed address contaminants posing unacceptable risks to residents and other potential receptors.

The RAOs for the Barrel Fill Site are as follows:

- Prevent human exposure to on-site groundwater COCs greater than a cumulative total excess lifetime cancer risk of 1×10^{-5} or a target organ hazard index greater than 1.0 for reasonably anticipated exposures;

- Prevent discharge of contaminated groundwater to surface water in excess of ecological criteria;

- Prevent direct contact human exposures to hazardous substances in the wastes;

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

- Prevent future contamination of groundwater;

- Eliminate the risk of a catastrophic release of contamination from the drums; and

- Prevent migration of Site contaminants above risk-based levels (including MCLs and non-zero MCLGs) to the Site land surface, the unnamed tributary, and the deep sand and gravel groundwater unit.

15.2 Preliminary Remediation Goals

As is explained later in this ROD, U.S. EPA used most of the Preliminary Remediation Goals (PRGs) developed in the FS for the final cleanup goals for the Site. PRGs are risk-based or ARAR-based chemical-specific concentrations that help further define the RAOs. PRGs are considered preliminary, in that the final remedial goals are defined in the ROD once a remedy is selected for the Site. The PRGs are used to define the extent of contaminated media requiring remedial action. PRGs were developed considering chemical-specific ARARs and chemical-specific to-be-considered (TBC) documentation. The following is a summary of the development of PRGs for the Barrel Fill.

Single-chemical PRGs were developed for potential future exposure to groundwater discharged to the unnamed tributary. The PRGs developed for this pathway and exposure route included the following considerations:

- Target Surface Water Concentrations: PRGs were developed that would be protective of potential exposures associated with the Trespasser and Maintenance Worker receptor groups. The lower concentration of the single-chemical criteria protective of human health, ecological criteria or solubility was used as the Surface Water PCG. In addition to the development of the surface water PRGs, it was demonstrated that if these concentrations are met, the cumulative risk levels for future Trespasser and Maintenance Worker exposure to surface water would be less than the cumulative action levels of 1.0 (Hazard Index) and 10^{-5} (excess lifetime cancer risk).

- Groundwater Discharge to Surface Water PRGs: The groundwater PRGs were developed to prevent concentrations in surface water greater than the surface water PRGs.

- Soil Leaching to Groundwater: The soil PRGs were developed based on the groundwater PRGs. These PRGs were intended for consideration in the excavation alternatives: 4, 4a, and 4b; 5, 5a, and 5b; and 6.

Soil criteria protective of leaching to groundwater are required for the excavation alternatives. For these alternatives, the soil PRGs would be used to confirm that adequate soil removal was completed.

Under the excavation alternatives, soil removed from the Barrel Fill would be managed as solid waste or hazardous waste. Excavated soil exceeding TCLP limits would be hazardous waste by characteristic; soil with concentrations of hazardous substances below TCLP limits but greater than the PRGs would be solid waste; and soil with concentrations less than the soil PRGs could remain on-site without treatment or any other type of long-term management. For the excavation alternatives that manage only non-hazardous soil on-site (Alternatives 4a, 4b, 5, 5a, and 5b), the contaminated soils that will be managed in the new solid waste cell will be that material with contaminant concentrations above the soil leaching values but below the toxicity characteristic criteria.

PRGs were also developed for potable use of the 1050 Intertill, 1015 Intertill and Deep Sand and Gravel Units and were applied at the boundary of the potable use restrictions. However, only the deep sand and gravel aquifer is currently used as a potable groundwater source, and it is questionable whether the 1050 or 1015 Intertills could produce enough water to be used as potable groundwater sources.

16.0 Description of Alternatives

Eleven alternatives were developed for the Site in the FS and FS Addendum. Alternative 9a represents the final selected remedy presented in this ROD. The alternatives are summarized in Table 5.

16.1 Description of Remedial Alternative Components

16.1.1 Common Elements for Each Remedial Alternative

Each of the 11 remedial alternatives includes the following elements except for the "No-Action Alternative."

- Fencing - Placing fencing and signs around the Site, except for remedial Alternatives 4 and 6, since no wastes will remain on-site;

- Relocation of the unnamed tributary to facilitate remedial construction activities, except for remedial Alternatives 4, 6 and 9a;

- Institutional controls - Preventing or limiting exposure to hazardous substances using environmental covenants to prohibit, for example, residential use on the Site; and

- Long-term ground water monitoring - Monitoring the groundwater on a long-term basis to verify effectiveness and reliability of the remedy.

16.1.2 Distinguishing Features of Each Remedial Alternative

Besides the No-Action Alternative, each of the remaining 10 alternatives has distinguishing features. Alternatives 2, 3, and 7 are considered containment alternatives, and Alternatives 4, 4a, 4b, 5, 5a, 5b, 6, and 9a are considered excavation alternatives.

Alternative 2 leaves the waste in place, but employs a passive downgradient collection trench to collect shallow groundwater that tends to flow laterally. The groundwater would either be treated in an on-site, groundwater treatment system or disposed of off-site at a publicly owned treatment works (POTW). Alternative 3 employs all of the remedial components of Alternative 2 but adds an upgradient groundwater diversion structure to divert groundwater from entering the Barrel Fill, thereby reducing the amount of contaminated groundwater generated over time. Alternative 7 employs all of the remedial components of Alternative 3 but adds an active groundwater collection system by installing one sump adjacent to each of the 50 waste cells and the use of portable pumps to extract the liquid from the sumps. The liquid would be collected on-site; then, trucked off-site for treatment.

Excavation Alternative 4 involves total waste and contaminated soil removal and transport to a treatment, storage, and disposal facility (TSDF) or a solid waste facility, depending on whether the waste and contaminated soils are hazardous or non-hazardous. Alternative 4a is a variation of Alternative 4, but involves consolidating the non-hazardous, solid waste and non-hazardous soils back on-site into an engineered waste cell without a flexible membrane liner. Alternative 4b is identical to 4a, except that the engineered waste cell would include a flexible membrane liner.

Excavation Alternative 5 involves total waste excavation, but treatment of solid, hazardous waste in an on-site, high-temperature thermal desorption (HTTD) treatment system for organic compounds and stabilization for metals. The treated waste and soils would be placed back on-site into a lined, engineered waste cell. Drummed waste, non-containerized waste, and liquid waste would be treated and disposed of off-site. Alternative 6 is a variation of Alternative 5 in which the treated waste would be disposed of off-site, and no on-site, engineered waste cell would be required.

Excavation Alternative 5a is a variation of Alternative 5 in which non-hazardous drummed waste and contaminated soils would be consolidated in the newly constructed waste cell (along with the treated waste), instead of being disposed of off-site. However, for 5a, the bottom of the waste cell would not include a flexible membrane liner. Alternative 5b is similar to 5a, except that the newly constructed waste cell would include a flexible membrane liner.

Excavation Alternative 9a involves total excavation of wastes and contaminated soils with the liquid wastes taken off-site for treatment and disposal, and the solid wastes and contaminated soils contained on-site in a newly constructed waste cell with a flexible membrane liner, a leachate collection system, a RCRA hazardous waste landfill cap, a slurry wall, and a leakage collection system.

16.1.3 Alternative 1 - No-Action Alternative

Alternative 1 consists of taking no action. The NCP requires that a no-action alternative be retained as a baseline for comparison to the other approaches. No action would leave hazardous waste in place at the Site. There are no capital or operation and maintenance costs associated with Alternative 1.

16.1.4 Alternative 2 – Downgradient Collection Trench with an On-site Groundwater Treatment System or Off-site Disposal to a POTW

Estimated Time for Construction: 8-12 months
Estimated Time to Reach Remediation Goals: greater than 30 years
Estimated Capital Costs: $3,692,000
Estimated Lifetime O&M Costs: $3,599,000
Estimated Total Present Worth Costs: $7,291,000
Number of Years Costs are Projected: 30

Alternative 2 includes the installation of a downgradient groundwater collection trench to collect contaminated groundwater. This groundwater would then be treated on-site, and the treated groundwater would be disposed of in a nearby surface water body. Alternately, the groundwater collected would be transported to a wastewater treatment plant for treatment.

Groundwater collection would be accomplished by digging a long trench along the eastern side of the Barrel Fill. (Shallow groundwater at the Site generally flows in an eastern direction.) The trench would slope toward manholes and pumping stations to promote flow. Permeable, slotted piping would be laid across the bottom of the trench to promote flow to the manholes. Additionally, extraction wells would be installed in the 1050 Intertill to allow for future groundwater collection and treatment if needed.

Alternative 2 would include relocation of the unnamed tributary slightly east of its current location. (In Figure 1, the faint, discontinuous blue line east of the Barrel Fill that heads toward Chapman Creek is the unnamed tributary.) The tributary would be moved to minimize interference with trenching activities and to prevent contamination from construction activities.

Alternative 2 also includes re-grading the existing waste cover to provide drainage and promote surface water runoff.

The main components of Alternative 2 include the following:

- Building a downgradient collection trench to collect groundwater;
- Collecting and treating groundwater on-site, and disposal to a nearby surface water body; or off-site disposal and treatment at a POTW;
- Re-grading the existing waste cover;
- Long-term groundwater monitoring and post-closure care; and
- Applying institutional controls.

16.1.5 Alternative 3 – Alternative 2 with the Addition of an Upgradient Groundwater Diversion Structure

Estimated Time for Construction: 10-12 months
Estimated Time to Reach Remediation Goals: greater than 30 years
Estimated Capital Costs: $10,222,000

Estimated Lifetime O&M Costs: $3,599,000
Estimated Total Present Worth Costs: $13,821,000
Number of Years Costs are Projected: 30

Alternative 3 includes all of the elements of Alternative 2 along with the installation of an upgradient groundwater diversion structure consisting of an excavated trench bentonite slurry wall or driven sheet pile wall. The diversion structure would be located just west of the Barrel Fill and extend along its length. The purpose of the structure would be to keep groundwater from entering the Barrel Fill, thereby reducing the amount of contaminated liquid being generated.

The main components of Alternative 3 include the following:

- Building a downgradient collection trench to collect groundwater;
- Building an upgradient groundwater diversion structure along the western edge of the Barrel Fill to limit groundwater from entering the Barrel Fill;
- Collecting and treating groundwater on-site, and disposal to a nearby surface water body; or off-site disposal and treatment at a POTW;
- Re-grading the existing waste cover;
- Long-term groundwater monitoring and post-closure care; and
- Applying institutional controls.

16.1.6 Alternative 4 - Removal of Waste and Contaminated Soils, and Transport to a Treatment, Storage, and Disposal Facility or Solid Waste Facility as Appropriate

Estimated Time for Construction: 14-18 months
Estimated Time to Reach Remediation Goals: less than 30 years
Estimated Capital Costs: $59,961,000
Estimated Lifetime O&M Costs: $595,000
Estimated Total Present Worth Costs: $60,556,000
Number of Years Costs are Projected: 10 years

Alternative 4 involves a full waste excavation and disposal of all excavated waste off-site. Wastes would be transported off-site via bulk tankers and bulk trailers, and treated at commercial treatment, storage, and disposal facilities (TSDFs) or solid waste facilities, as appropriate. The resulting excavation would be backfilled and graded.

Removal of drums, non-non-containerized waste, cell water, and soil would require extensive excavation and waste handling for a variety of solid and liquid wastes, and contaminated media.

Excavation would proceed from cell to cell. Once a cell is encountered, the cell would be dewatered by pumping from sumps constructed in the base of the cell. The cell water would be pumped to storage containers and LNAPL, if present, would be placed in a separate container. Soils, including those from the existing soil cover, would be segregated into "clean" and "dirty" stockpiles based on visual observation and field screening. Once a section of excavation is completed, confirmation sampling would be conducted to verify that contaminant concentrations

are below cleanup goals. Once cleanup goals were met, the section would be backfilled for Site restoration, and another section would be excavated until all wastes were removed from the Site. Non-hazardous soils with testing results less than soil cleanup goals (based on soil leaching to groundwater) would be used as backfill during Site restoration.

Cell liquids and solids not from drums would be tested for hazardous waste characterization. Non-hazardous soils with testing results less than the soil cleanup goals would be reused as backfill during Site restoration.

Drums would be removed from the waste cells and transferred to drum staging pads. Leaking and unstable drums would be placed into overpack containers. After sampling, analysis, and characterization of drum contents, drums would be emptied into bulk containers containing compatible wastes.

A number of TSDFs would likely be used for off-site waste disposal. Non-hazardous waste disposal facilities would be used for conventional landfilling. Water treatment facilities would be used for the treatment and disposal of cell water.

The main components of Alternative 4 include the following:

- Waste removal with off-site disposal of waste and contaminated residuals;
- Disposal and treatment of hazardous and liquid waste off-site; and disposal of non-hazardous waste off-site to a solid waste landfill;
- Backfilling and restoration of the excavated area;
- Long-term groundwater monitoring and post-closure care; and
- Applying institutional controls.

16.1.7 Alternative 4a – Alternative 4, Except that Non-hazardous Solid Waste is Consolidated On-site in an Engineered Waste Cell and Capped

Estimated Time for Construction: 14-21 months
Estimated Time to Reach Remediation Goals: less than 30 years
Estimated Capital Costs: $55,670,000
Estimated Lifetime O&M Costs: $1,213,000
Estimated Total Present Worth Costs: $56,883,000
Number of Years Costs are Projected: 30

Alternative 4a is a variation of Alternative 4. The difference in Alternative 4a is that non-hazardous, solid, drummed wastes and non-hazardous soils would be consolidated on-site in an engineered waste cell.

After the waste is excavated from each of the 50 waste cells on-site, the non-hazardous solid waste, including non-hazardous, solid, drummed waste would be consolidated in an on-site, newly constructed, solid waste cell that complies with the appropriate portions of Ohio Administrative Code (OAC) 3745-27-08 for sanitary landfill facility construction. The waste cell is not expected to need a flexible membrane liner.

The new waste cell would be constructed with compacted low-permeability clay and the bottom of the cell would be sloped to facilitate the collection and removal of leachate. Consistent with OAC 3745-27-08, a non-hazardous waste cap would be installed over the cell, and surface water control structures would be installed.

Long-term leachate management, surface water management, waste cap maintenance, and groundwater monitoring would be additional features of the solid waste landfill, consistent with OAC 3745-27-14 (post-closure care of sanitary landfill facilities).

Alternative 4a also includes relocation of the unnamed tributary east of the Barrel Fill in order to promote effective installation and operation of the newly constructed waste cell. As with Alternatives 2 and 3, the tributary would be moved slightly east of its current location. The tributary would be moved to minimize interference with and prevent contamination from construction activities.

The main components of Alternative 4a include the following:

- Excavation of all waste and contaminated soils;
- Segregation on-site of hazardous and non-hazardous waste and soils;
- Consolidation of non-hazardous solid waste in an on-site waste cell;
- Off-site disposal and treatment of liquid waste and hazardous solid waste at a TSDF;
- Long-term groundwater monitoring and post-closure care; and
- Applying institutional controls.

16.1.8 Alternative 4b – Alternative 4a, Except that the Engineered Waste Cell has a Flexible Membrane Liner

Estimated Time for Construction: 14-23 months
Estimated Time to Reach Remediation Goals: less than 30 years
Estimated Capital Costs: $57,910,000
Estimated Lifetime O&M Costs: $1,213,000
Estimated Total Present Worth Costs: $59,123,000
Number of Years Costs are Projected: 30

Alternative 4b is similar to Alternative 4a except that Alternative 4b includes the installation of a flexible membrane liner at the bottom of the solid waste cell that would further reduce contaminant migration from the Barrel Fill to the groundwater zones beneath it.

The main components of Alternative 4b include the following:

- Excavation of all waste and contaminated soils;
- Segregation on-site of hazardous and non-hazardous waste and soils;
- Consolidation of non-hazardous solid waste in an on-site waste cell that includes a flexible membrane liner;
- Off-site disposal and treatment of liquid waste and hazardous solid waste at a TSDF;

- Long-term groundwater monitoring and post-closure care; and
- Applying institutional controls.

16.1.9 Alternative 5 – Excavation of Waste and Contaminated Soils; On-site Treatment of Hazardous Soils and Residuals; Placement of Treated Soils and Residuals in a Lined Waste Cell On-site; Off-site Disposal and Treatment of Drummed Waste, Non-containerized Waste, Cell Water, and LNAPL

Estimated Time for Construction: 14-24 months
Estimated Time to Reach Remediation Goals: less than 30 years
Estimated Capital Costs: $59,272,000
Estimated Lifetime O&M Costs: $1,250,000
Estimated Total Present Worth Costs: $60,522,000
Number of Years Costs are Projected: 30

Alternative 5 is similar to Alternative 4, except that Alternative 5 includes the on-site treatment of hazardous soils and other residuals, and the construction of an engineered waste cell. After the materials are treated to levels that render them non-hazardous, they would be placed in a newly constructed waste cell consistent with the requirements for a State of Ohio solid waste landfill. Alternative 5 also includes relocation of the tributary east of the Barrel Fill in order to promote effective installation and operation of the newly constructed waste cell.

The process option selected for on-site treatment would be high-temperature thermal desorption (HTTD) for organics and stabilization for metals. HTTD separates organics from soil by raising the temperature to volatilize organics and transfer them to a gas stream. HTTD would include a primary thermal separation treatment followed by a secondary treatment for the gas by-product. Stabilization is a chemical treatment that reduces mobility of inorganics using a stabilizing agent.

Following successful separation of organics by HTTD and immobilization of metals by stabilization, the soil would be placed in the former Barrel Fill in the newly constructed waste cell. Components of this solid waste landfill would include a liner system to prevent leachate discharge to ground or surface waters, leachate collection and management, and a cap system that minimizes surface water infiltration.

As with Alternatives 2, 3, 4a, and 4b, Alternative 5 would involve the relocation of the unnamed tributary to a location slightly east of its present location, in order to minimize interference with and prevent contamination from construction activities.

The main components of Alternative 5 include the following:

- Excavation of all waste and contaminated soils;
- Segregation on-site of hazardous and non-hazardous soils and residuals;
- On-site treatment of hazardous soils and residuals via HTTD treatment and stabilization;
- Consolidation of treated waste in an engineered waste cell on-site;
- Off-site disposal of drummed waste, liquid waste, and remaining, non-hazardous waste to a TSDF or solid waste landfill, as appropriate;

- Long-term groundwater monitoring and post-closure care; and
- Applying institutional controls.

16.1.10 Alternative 5a – Alternative 5, Except that Non-hazardous Drummed Waste Is Consolidated On-site in an Engineered Waste Cell Along with the Treated Waste

Estimated Time for Construction: 14-23 months
Estimated Time to Reach Remediation Goals: less than 30 years
Estimated Capital Costs: $56,088,000
Estimated Lifetime O&M Costs: $1,263,000
Estimated Total Present Worth Costs: $57,351,000
Number of Years Costs are Projected: 30

Alternative 5a is a variation of Alternative 5. The difference in Alternative 5a is that non-hazardous drummed wastes and non-hazardous soils would be consolidated on-site (along with the treated waste) in an unlined waste cell. The landfill bottom would be constructed and sloped to facilitate the collection and removal of leachate. The landfill bottom would not include a flexible membrane liner. Installation of a cap system would minimize surface water infiltration. Alternative 5a also includes relocation of the tributary east of the Barrel Fill in order to promote effective installation and operation of the newly constructed waste cell.

The main components of Alternative 5a include the following:

- Excavation of all waste and contaminated soils;
- Segregation on-site of hazardous and non-hazardous soils and residuals;
- On-site treatment of hazardous soils and residuals via HTTD treatment and stabilization;
- Consolidation of treated waste, non-hazardous drummed waste, and non-hazardous soils in an engineered waste cell on-site;
- Off-site disposal of liquid waste and hazardous drummed waste to a TSDF or solid waste landfill, as appropriate;
- Long-term groundwater monitoring and post-closure care; and
- Applying institutional controls.

16.1.11 Alternative 5b – Alternative 5a, Except that the Engineered Waste Cell has a Flexible Membrane Liner

Estimated Time for Construction: 14-25 months
Estimated Time to Reach Remediation Goals: less than 30 years
Estimated Capital Costs: $59,293,000
Estimated Lifetime O&M Costs: $1,263,000
Estimated Total Present Worth Costs: $60,556,000
Number of Years Costs are Projected: 30

Alternative 5b is similar to Alternative 5a except that Alternative 5b includes the installation of a flexible membrane liner at the bottom of the waste cell that would further reduce contaminant migration from the Barrel Fill to the groundwater zones beneath it.

The main components of Alternative 5b include the following:

- Excavation of all waste and contaminated soils;
- Segregation on-site of hazardous and non-hazardous soils and residuals;
- On-site treatment of hazardous soils and residuals via HTTD treatment and stabilization;
- Consolidation of treated waste, non-hazardous drummed waste, and non-hazardous soils in an engineered waste cell on-site that includes a flexible membrane liner;
- Off-site disposal of liquid waste and hazardous drummed waste to a TSDF or solid waste landfill, as appropriate;
- Long-term groundwater monitoring and post-closure care; and
- Applying institutional controls.

16.1.12 Alternative 6 – Removal of Waste and Contaminated Soils; On-site Treatment of Hazardous Soils and Residuals; Off-site Disposal of Treated Soils and Residuals; Off-site Disposal and Treatment of Drummed Waste, Non-containerized Waste, Cell Water, and LNAPL

Estimated Time for Construction: 14-21 months
Estimated Time to Reach Remediation Goals: less than 30 years
Estimated Capital Costs: $60,602,000
Estimated Lifetime O&M Costs: $595,000
Estimated Total Present Worth Costs: $61,197,000
Number of Years Costs are Projected: 10

Alternative 6 includes the elements of Alternative 5 with the exception that the treated soils and residuals would be disposed of off-site at a solid waste landfill. Therefore, construction and maintenance of an on-site waste cell would not be required, nor would the long-term operation and maintenance of a waste cell. In addition, Alternative 6 would not include relocation of the unnamed tributary.

The main components of Alternative 6 include the following:

- Removal of all waste and contaminated soils;
- Segregation on-site of hazardous and non-hazardous soils and residuals;
- Backfilling and restoration of the excavated area;
- On-site treatment of hazardous soils and residuals via HTTD treatment and stabilization; and
- Off-site disposal of treated soils and residuals, drummed waste, liquid waste, and remaining, non-hazardous waste to a TSDF or solid waste landfill, as appropriate.

16.1.13 Alternative 7 – Alternative 3 with the Addition of Liquid Waste Removal Sumps and Portable Pumps, and Liquid Waste Disposal and Treatment Off-site

Estimated Time for Construction: 10-16 months
Estimated Time to Reach Remediation Goals: greater than 30 years
Estimated Capital Costs: $15,655,000
Estimated Lifetime O&M Costs: $6,813,000
Estimated Total Present Worth Costs: $22,568,000
Number of Years Costs are Projected: 30
Alternative 7 includes all elements of Alternative 3 with the additional installation of liquid waste removal sumps at all waste cell locations. The purpose of the sumps would be to remove cell water, non-containerized liquid wastes, infiltration from precipitation, and liquids that could be released by the drums. The sumps would assist to reduce the build-up of hydraulic head (pressure caused by liquid build-up) in the waste cells, further reducing groundwater flow.

One sump would be installed just below each waste cell and at a location adjacent to each cell to optimize the collection of liquid. Portable pumps that are moved from sump to sump and removed between pumping events would be used to collect the liquids. The liquid wastes removed by the pumping would be stored in tanks; then, transported off-site for disposal and treatment.

Sumps would be equipped with level sensors connected to a central control panel. The control panel would alert off-site operation and maintenance (O&M) personnel that liquid levels had risen above a pre-determined level. Once alerted, O&M personnel would respond and pump the liquid from the sumps. Routine O&M activities occurring during the pumping visits would also include measuring liquid levels in each sump, and cleaning sumps and pumps.

As noted above for Alternatives 2 and 3, Alternative 7 includes the installation of extraction wells in the 1050 Intertill to allow for future groundwater collection and treatment if needed as part of contingency planning (i.e., if the 1050 Intertill becomes contaminated above potable use cleanup goals). These wells would also be part of the overall groundwater monitoring network that includes all of the water zones.

The main components of Alternative 7 include the following:

- Building a downgradient collection trench to collect groundwater;
- Building an upgradient groundwater diversion structure along the western edge of the Barrel Fill to limit groundwater from entering the Barrel Fill;
- Collecting and treating groundwater on-site, and disposal to a nearby surface water body; or off-site disposal and treatment at a POTW;
- Installing sumps adjacent to the waste cells to collect liquid in the Barrel Fill;
- Using portable pumps to periodically extract liquid from the sumps;
- Disposing of pumped liquid to a nearby surface water body or to a TSDF as appropriate;
- Re-grading the existing waste cover;
- Long-term groundwater monitoring and post-closure care; and
- Applying institutional controls.

16.1.14 Alternative 9a – Removal of Waste and Contaminated Soils; Off-site Disposal of Liquid Wastes ; On-site Containment of Solid Hazardous and Non-Hazardous Wastes in an Engineered Waste Cell with Flexible Membranre Liner, leachate collection system, RCRA Hazardous Waste Cap, Slurry Wall, and Leakage Collection System

Estimated Time for Construction: 14-25 months
Estimated Time to Reach Remediation Goals: less than 30 years
Estimated Capital Costs: $22,634,000
Estimated Lifetime O&M Costs: $5,112,000
Estimated Total Present Worth Costs: $27,746,000
Number of Years Costs are Projected: 30

Alternative 9a includes excavation of wastes and contaminated soils with a portion of the wastes taken off-site for treatment and disposal and the rest contained on-site in a newly constructed lined waste cell. The major difference between this alternative and Alternative 4a is that only the liquid wastes would be disposed of off-site. Solid wastes, including the hazardous, nonhazardous, drummed and non-containerized wastes, and contaminated soil, would be consolidated in a newly constructed cell that includes a flexible membrane liner (FML) and a leachate collection system that complies with the appropriate parts of Ohio Administrative Code (OAC) 3745-27-08 (See Figures 11 and 12). The cap will be designed and engineered to meet the current performance standards of a Resource Conservation and Recovery Act (RCRA) hazardous waste landfill cap in accordance with U.S.EPA's Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (EPA 530-SW-89-047). The components for Alternative 9a include:

- Removing and stockpiling uncontaminated cover soil (estimated to be up to 17 feet deep) outside the work area.
- Pumping cell water and non-containerized liquid from the excavations and managing the liquids for off-site treatment and disposal.
- Excavating the contents (drums, non-containerized waste, and impacted soil) of each of the 50 waste cells. The non-containerized wastes, including sludge, that are determined to be liquid by the paint filter test will be managed as a liquid for off-site treatment and disposal.
- Characterization of the excavated wastes. Non-compatible wastes will not be staged and/or stored in proximity to one another.
- Removing, managing, and off-site treating and disposing of liquid wastes and removal and staging of non-liquid hazardous wastes from drums. Containerized wastes that are determined to be liquid by the paint filter test will be managed as a liquid for off-site treatment and disposal.
- Consolidating non-containerized and drummed solid (hazardous and non-hazardous) wastes and contaminated soil in a newly constructed engineered cell lined with a FML over compacted clay and approximately 10 feet of compacted clean, excavated cover soil backfill with a leachate collection system. Before consolidation, the drums and their contents will be crushed to reduce volume and to remove free liquids contained in the drums.
- Constructing a slurry wall keyed into the glacial till (silty clay) underlying the 1075 Intertill around the Site along with a leakage collection system in the 1075 Intertill.

- Constructing a hazardous waste landfill cap covering the consolidation cell and extending beyond the slurry wall alignment.
- Collecting leakage from the 1075 Intertill and performing leak detection monitoring in the 1050 Intertill.
- Long-term groundwater monitoring and post-closure care.
- Applying institutional controls.

16.2 Key Applicable or Relevant and Appropriate Requirements

Alternative 1, the No-Action Alternative, does not meet the threshold criteria of protection of public health and the environment. The remaining alternatives will be designed and operated to comply with all federal and state ARARs concerning hazardous and non-hazardous waste handling, and with O&M requirements, except for Alternative 5a, which would require a waiver, as explained below. Table 6 (Summary of ARARs) summarizes the ARARs and TBCs for the alternatives and shows how the alternatives will achieve compliance.

The State of Ohio is authorized under RCRA to administer a state solid waste program and enforce its regulations: and administer and enforce hazardous waste regulations. Alternatives 4a and 5a would not use a flexible membrane liner that is required by the Ohio Administrative Code (OAC) 3745-27-08 (sanitary landfill disposal facility construction requirements). In Alternatives 4a and 9a, the sanitary landfill disposal facility construction requirements are not considered ARARs for the new waste cell because the consolidation of wastes within the area of contamination (AOC) is not placement of the wastes and, thus, does not constitute land disposal under RCRA. Consequently, the Ohio sanitary landfill disposal facility construction requirements are not ARARs. Nonetheless, Alternative 9a will use a flexible membrane liner. Furthermore, based on site-specific factors, certain RCRA land disposal requirements are considered "applicable and relevant" for 9a and, therefore, ARARs, including: the leachate collection provisions of RCRA minimum technology requirements; application of the paint filter- test to identify, and subsequently address, liquid wastes associated with the bulk wastes; and the RCRA landfill cap closure and post-closure monitoring requirements.

In Alternative 5a, land disposal of solid waste residuals would occur since those residuals result from the treatment of hazardous soils and other residuals; and all requirements of the Ohio sanitary landfill facility construction regulations would be considered ARARs. If Alternative 5a was selected as the Site remedial action, a waiver to OAC 3745-27-08 would be needed since 5a would not use a flexible membrane liner.

The State of Ohio does not agree with U.S. EPA's interpretation of this ARARs analysis regarding State of Ohio sanitary landfill disposal facility construction requirements and U.S. EPA's resultant categorization of OAC 3745-27-08 as a TBC instead of an ARAR for Alternatives 4a and 9a.

16.3 Quantities of Untreated Waste

Alternative 1, the No-Action Alternative, leaves all waste untreated. Currently, an estimated 15,500 cubic yards of waste are in the Barrel Fill, of which approximately half is considered

hazardous waste. There are an estimated 1.8 million gallons of liquid waste in the Barrel Fill, of which approximately half is assumed hazardous. The estimated volume and character of the Barrel Fill waste was determined from waste records and data from the RI test pit investigation.

Containment Alternatives 2 and 3, and containment/treatment Alternative 7 would treat an unknown quantity of the liquid waste and none of the solid waste in the Barrel Fill. Alternative 7 would treat more liquid waste than Alternative 2 or 3.

Excavation Alternative 9a would treat all of the liquid waste at the Site and none of the solid waste. Excavation Alternatives 4, 4a, 4b, 5, 5a, 5b, and 6 would treat all of the hazardous liquid and hazardous solid waste. The non-hazardous waste and non-hazardous contaminated soils would not be treated in these alternatives.

16.4 Expected Outcome of Each Alternative

Alternative 1, the No-Action Alternative, would not allow unlimited use and unrestricted exposure (UU/UE) since principal threat waste would remain in place without remediation which would result in significant future risk to human health and the environment.

The containment Alternatives 2 and 3, and the containment/treatment Alternative 7 would not allow for UU/UE, because hazardous waste would remain on-site. Certain non-residential uses of the Site could be allowed with the effective implementation of institutional controls that would restrict Site use.

Excavation Alternatives 4 and 6 include excavation and off-site disposal of all waste; therefore, UU/UE would be achieved at construction completion (taking 14-18 months for 4 and 14-21 months for 6). No institutional controls would be needed to restrict UU/UE, except that use of the Site would need to allow for the effective operation of the groundwater monitoring system.

The remaining excavation alternatives (4a, 4b, 5, 5a, 5b, and 9a) would require the maintenance of a closed landfill indefinitely. Since waste would remain on-site after completion of the remedy implementation, UU/UE would not be achieved. Long-term restriction of land use with institutional controls would be required.

17.0 Comparative Analysis of Alternatives

U.S. EPA uses nine NCP criteria to evaluate remedial alternatives for site cleanup. The criteria are summarized below. These nine criteria are categorized into three groups: threshold, balancing, and modifying. The threshold criteria must be met in order for an alternative to be eligible for selection. The balancing criteria are used to weigh major tradeoffs among alternatives. The modifying criteria are state acceptance and community acceptance, which are part of the final consideration for remedy selection. Each of the alternatives considered are individually compared against each of the nine criteria described below.

Threshold Criteria:

1. Overall protection of human health and the environment. Alternatives shall be assessed to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site by eliminating, reducing, or controlling exposures to levels established during development of remediation goals consistent with 40 C.F.R. § 300.430(e)(2)(1). Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

2. Compliance with ARARs. The alternatives shall be assessed to determine whether they attain applicable or relevant and appropriate requirements under federal environmental laws and more stringent state environmental or facility siting laws; or provide grounds for invoking one of the waivers under 40 C.F.R. § 300.430(f)(1)(ii)(C).

Balancing Criteria:

3. Long-term effectiveness and permanence. Alternatives shall be assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. Factors that shall be considered, as appropriate, include the following:

    a. Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate.

    b. Adequacy and reliability of controls such as containment systems and restrictive covenants that are necessary to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential need to replace technical components of the alternative, such as a cap, a slurry wall, or a treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.

4. Reduction of toxicity, mobility, or volume through treatment. The degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume shall be assessed, including how treatment is used to address the principal threats posed by the site. Factors that shall be considered, as appropriate, include the following:

    a. The treatment or recycling processes the alternatives employ and materials they will treat;

    b. The amount of hazardous substances, pollutants, or contaminants that will be destroyed, treated, or recycled;

c. The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling and the specification of which reduction(s) are occurring;

d. The degree to which the treatment is irreversible;

e. The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate of such hazardous substances and their contaminants; and

f. The degree to which treatment reduces the inherent hazards posed by principal threats at the site.

5. Short-term effectiveness. The short-term impacts of alternatives shall be assessed considering the following:

   a. Short-term risks that might be posed to the community during implementation of an alternative;

   b. Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures;

   c. Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and

   d. Time until protection is achieved.

6. Implementability. The ease or difficulty of implementing the alternatives shall be assessed by considering the following types of factors as appropriate:

   a. Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy;

   b. Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions); and,

   c. Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and availability of prospective technologies.

7. Cost. The types of costs that shall be assessed include the following:

    a. Capital costs, including both direct and indirect costs;

    b. Annual operation and maintenance costs; and

    c. Net present value of capital and O&M costs.

Modifying Criteria:

8. State acceptance. The state concerns that shall be assessed include the following:

    a. The state's position and key concerns related to the preferred alternative and other alternatives; and

    b. State comments on ARARs or the proposed use of waivers.

9. Community acceptance. This assessment includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose.

17.1 Overall Protection of Human Health and the Environment

The 12 alternatives offer varying levels of protection of human health and the environment. All alternatives, except the No-Action Alternative 1, meet this threshold criterion.

The No-Action Alternative offers no additional protection against exposures to Site hazardous substances. Principal threat waste is left in place, and exposure pathways resulting in significant risk would remain. The excavation alternatives (4, 4a, 4b, 5, 5a, 5b, 6, and 9a) fully protect human health and the environment since they remove and treat all principal threat waste, thereby eliminating exposure pathways involving significant risk.

Containment Alternatives 2 and 3 protect human health and the environment in the short term. Although some liquid waste from the Barrel Fill will be collected and treated, the principal threat waste remains at the Site untreated. There are concerns about the reliability of these alternatives to contain Site hazardous substances in the long term.

Alternative 7, which includes containment and some liquid waste extraction and treatment, protects human health and the environment in the short term through engineering and institutional controls. Liquid waste removal from waste cells and the collection and treatment of Water Table and 1075 Intertill groundwater protects human health and the environment by reducing future risk that would result from hazardous substance migration to the unnamed tributary and to the deep sand and gravel aquifer. The principal threat wastes largely remain at the Site untreated. There are concerns about the reliability of this alternative to work as designed

and in the long term, given the untested nature of this remedial technology (i.e., placement of sumps in waste cells and extraction of waste cell liquids). There is much uncertainty associated with this alternative's effectiveness.

Relocation of the unnamed tributary (for Alternatives 2, 3, 4a, 4b, 5, 5a, 5b, and 7) is not expected to present any protectiveness issues. Appropriate civil engineering and construction techniques including erosion control measures and culverting would be used to relocate this intermittent stream.

17.2 Compliance with ARARs

All alternatives, except Alternative 1 and Alternative 5a, comply with ARARs. Alternative 5a would not use a flexible membrane liner at the bottom of the waste cell; therefore, it would not comply with the requirements of OAC 3745-27-08 (sanitary landfill disposal facility construction), as explained in the Key Applicable or Relevant and Appropriate Requirements section above. A waiver for this ARAR would be needed if Alternative 5a were selected for implementation.

17.3 Long-Term Effectiveness and Permanence

The No-Action Alternative is not effective at reaching remedial action objectives. The excavation alternatives offer long-term effectiveness and permanence because there will be little or no risk remaining after all principal threat waste is removed and treated.
Containment Alternatives 2 and 3 are not long-term effective and permanent, even though institutional controls would be in place. There is concern that principal threat wastes would eventually reach the deep sand and gravel aquifer, which is a drinking water aquifer.

There are concerns about the long-effectiveness and permanence of Alternative 7. If the remedy operates as intended, liquid waste removal via sumps removes some of the liquid principal threat waste, thereby reducing the potential of impacting the groundwater. The institutional controls provide an additional level of long-term effectiveness and permanence by reducing the likelihood of exposure to impacted groundwater or waste by restricting future use of the Barrel Fill Site. However, the principal threat waste at the Site largely remains in place, untreated. There is uncertainty associated with the long-term effectiveness of Alternative 7 because the technology is unproven in terms of its ability to prevent vertical groundwater contaminant migration to the deep sand and gravel aquifer. There are concerns that Alternative 7 may not be able to be constructed to collect all highly mobile, principal threat waste necessary for long-term effectiveness, and concerns that additional extraction wells may not collect all of the remaining, liquid waste that migrates below the 1075 Intertill. There is concern that the sumps may not operate efficiently over time because of the potential for clogging of the sump screens. There is also concern about how efficiently the sumps will collect the liquid in the Barrel Fill, since there is no way to guarantee the optimal placement of the sumps for that purpose, and no way to accurately measure the percentage of liquid in the Barrel Fill collected by the sumps.

17.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

The No-Action Alternative does not reduce the toxicity, mobility, or volume of principal threat waste. The excavation alternatives (Alternatives 4, 4a, 4b, 5, 5a, 5b, 6 and 9a) fully reduce the toxicity, mobility, or volume of principal threat waste through treatment, because all principal threat waste is removed and treated.

Containment Alternatives 2 and 3 do not significantly reduce the toxicity, mobility, or volume of principal threat waste. A percentage of groundwater flowing from the Barrel Fill would be collected and treated, but that would not result in a significant reduction of toxicity, mobility, or volume of principal threat waste.

Alternative 7 is expected to treat some of the liquid principal threat waste in the Barrel Fill. However, principal threat waste at the Site would remain largely in place, untreated. This alternative would likely not capture all principal threat liquid waste and would not treat any of the solid waste.

17.5 Short-Term Effectiveness

There are some concerns regarding short-term effectiveness for the excavation alternatives. It would take about two years to remove and treat the principal threat waste. Short-term risk to workers could be significant during excavation and on-site treatment activities (on-site treatment for Alternatives 5, 5a, 5b, 6 and 9a); although, health and safety measures would be in place and likely would provide adequate safety. Air monitoring will be in place during excavation activities, and mitigative measures will be used to minimize risk to the workers and community if air monitoring thresholds are exceeded. Risk to the community would exist from trucking hazardous waste off-site. Airborne risk to the community for Alternatives 5, 5a, 5b, and 6 would exist from operation of an on-site HTTD system; although, safeguards would be in place. Risk would exist from potentially contaminating the 1075 Intertill during excavation activities; although, dewatering the waste cells would minimize this risk.

The containment Alternatives 2 and 3 present minimal short-term risks. Principal threat waste would be left in place, and standard construction practices would provide for remedy completion. These alternatives would involve little risk to the workers and community. Any liquids collected in the downgradient collection trench requiring off-site treatment would present a risk to the community as the liquids are transported off-site.

Alternative 7 presents significant short-term risks. The installation of the sumps at the bottom and the edge of the cells will require drilling through Barrel Fill hazardous waste; this operation may pierce drums of hazardous waste. Proper placement of the sumps will be difficult. Risk to the community will exist from transporting the collected liquids off-site for treatment.

17.6 Implementability

The excavation alternatives would be implementable, but difficult. Significant coordination among numerous parties, such as local government agencies, traffic control, contractors, and

disposal facilities would be required. There is a concern about excavating the large volume of waste in an unstable setting (waste cells are steep and narrow; cell walls collapsed during the RI fieldwork); although, proper excavation procedures would be followed. For excavation Alternatives 4a, 4b, 5, 5a, 5b, and 9a, construction of an on-site engineered waste cell would be readily implementable. Construction and operation of an HTTD system on-site for Alternatives 5, 5a, 5b, and 6 is implementable; although, few vendors may be available.

For Alternatives 2, 3, and 7, collection, treatment, and discharge of groundwater are readily implementable using proven technologies. Significant implementation concerns exist for Alternative 7, as discussed at the end of this section. Installing collection and diversion trenches is readily implementable. Some coordination with regulatory agencies would be required in the disposal of contaminated or treated groundwater.

Institutional controls are readily implementable for alternatives where waste is left on-site (all except Alternatives 4 and 6). Currently, deed restrictions are in place prohibiting the development of wells or use of groundwater from the Site for anything other than remedial investigation and work, and also prohibiting construction of residences and other facilities such as hotels, day care centers, and hospitals on the Site. U.S. EPA does not consider these deed restrictions to be enforceable as written and recorded. Additional institutional controls such as enforceable environmental covenants could be used to enhance those already in place and would be easily implemented once a final remedy decision is in place. Such restrictions will require the participation of governmental, environmental, and land use agencies, and the Site property owner.

For Alternative 7, although pre-design investigations would attempt to determine the topographic low point of each waste cell using established drilling techniques and geophysics, the implementability of this technology in this setting is unproven and uncertain. There are concerns about how sumps can be installed into areas of hazardous waste, whether the sumps can be optimally located in relation to the waste cells and the bottom of the waste to collect liquid, and to what extent the clogging of the sump screens over time will affect efficiency of liquid collection. There will be no way to monitor the effectiveness of liquid collection because there will be no way to accurately determine the percentage of liquid collected. If this alternative does not work properly, it will be difficult to implement a subsequent, effective remedial action, because the integrity of the drums will have already been compromised, and hazardous liquid wastes, previously contained, will now be released to the environment.

17.7 Cost

Estimates of the capital and O&M costs for each alternative are shown in Table 7. A discount rate of seven percent was used as well as a maximum costing period of 30 years, consistent with U.S. EPA FS guidance. Tables 8 through 14 contain the estimates of the capital cost components of the selected remedy, Alternative 9a.

The excavation alternatives are the most expensive to implement, with a cost range of $27.7 million (Alternative 9a) to $61.2 million (Alternative 6). The containment alternatives range from $7.3 million (Alternative 2) to $13.8 million (Alternative 3). Alternative 7 costs $22.6

million to implement, which includes a capital cost of $100,000 to install approximately 200 borings to help define the topographic lows of the waste cell bottoms. This $100,000 capital cost is not shown in Table 7. These costs represent net present worth of capital and O&M costs. O&M for Alternatives 2, 3, 4a, 4b, 5, 5a, 5b 7 and 9a would need to occur indefinitely; although it was costed for only 30 years, consistent with U.S. EPA FS guidance, as noted above.

17.8 State Acceptance

Ohio EPA does not concur with U.S. EPA's selected remedy of Alternative 9a.

17.9 Community Acceptance

In the Responsiveness Summary (Appendices 2 and 3), U.S. EPA documented and responded to the significant comments from the community, local officials, Ohio EPA, and the PRPs. From the comments received, the community is generally not in favor of U.S. EPA's selected remedy.

17.10 Summary of Comparative Analysis of Alternatives

Each of the cleanup options was evaluated against the nine criteria discussed above. U.S. EPA has selected Alternative 9a as the final remedy because it provides the best balance of the nine evaluation criteria. U.S. EPA concluded that Alternative 1, the No-Action Alternative, would not protect human health or the environment and was eliminated from consideration. The remaining containment alternatives (2 and 3) and the containment/treatment alternative (7) meet all state and federal ARARs, and protect human health and the environment; however, there are concerns about the long-term effectiveness of these alternatives. The excavation alternatives (4, 4a, 4b, 5, 5a, 5b, 6 and 9a) meet all state and federal ARARs, and fully protect human health and the environment.

Alternatives 2 and 3 are not thought to be long-term effective and permanent. There is concern that hazardous liquid waste from the Barrel Fill will eventually migrate to the deep sand and gravel aquifer, which is a potable water source. Alternative 7 collects and treats some liquid hazardous waste, but there are also concerns that this alternative would allow hazardous wastes to migrate to the deep sand and gravel aquifer. Excavation Alternatives 4, 4a, 4b, 5, 5a, 5b, 6 and 9a are long-term effective and permanent, because they effectively treat all of the principal threat waste.

Alternatives 2, 3, and 7 do not significantly reduce the toxicity, mobility, or volume of waste through treatment. Although they treat a small amount of liquid waste, they do not treat most of the principal threat liquid waste (with Alternatives 2 and 3 treating none of this waste). Excavation Alternatives 4, 4a, 4b, 5, 5a, 5b, 6, and 9a significantly reduce the toxicity, mobility, or volume of waste through treatment by treating all of the liquid principal threat waste.

All of the alternatives present concerns of short-term effectiveness; although Alternatives 2 and 3 present the least short-term risks to the workers and community. The excavation alternatives present short-term risks to the workers and community from excavating and transporting a large volume of waste. Alternative 9a presents less short-term risk to the community than the other excavation alternatives because less waste is transported off-site. Alternative 7 presents short-term risks from drilling though hazardous waste and transporting hazardous liquids off-site.

The excavation alternatives would be difficult to implement, due to the depths of the waste cells and excavating a large amount of waste in a relatively unstable environment. For Alternatives 5, 5a, 5b, and 6, there is a concern that vendors would be difficult to secure to provide the HTTD system. Containment Alternatives 2 and 3 are readily implementable. For containment/treatment Alternative 7, there are concerns of implementability on how liquid extraction sumps can be effectively located and operated. Also, with Alternative 7, there will be no way to accurately measure the percentage of liquids collected.

The containment alternatives and Alternative 9a are significantly less costly than the other excavation alternatives. The containment alternatives range from $7.3 million to $22.6 million, and the other excavation alternatives range from $56.9 million to $61.2 million.

The State of Ohio is not in favor of the containment alternatives, Alternative 7, or Alternative 9a; however, it is in favor of any of the other excavation alternatives.

As reflected in the Responsiveness Summary, most of the community is generally in favor of the excavation alternatives, and not in favor of the containment alternatives,containment/treatment alternative, or Alternative 9a. However, the PRPs, who are considered part of the general public, are not in favor of the excavation; they favor either of the containment alternatives (Alternative 2 or 3) or the containment/treatment alternative (Alternative 7) or the Selected Remedy, Alternative 9a.

18.0 Principal Threat Wastes

The NCP establishes an expectation that U.S. EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(l)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied. U.S. EPA considers the liquid waste in the Barrel Fill to include principal threat waste based on the definition above. Under the selected remedy described below, the principal threat waste will be excavated, treated, and disposed of off-site. The statutory preference for treatment of principal threat wastes is met with the selected remedy, Alternative 9a.

19.0 Selected Remedy

19.1 Summary of Rationale for the Selected Remedy

Based on considerations of the requirements of CERCLA, the NCP, and balancing of the nine criteria, U.S. EPA has determined that Alternative 9a is the most appropriate remedial alternative for the Tremont City Barrel Fill Site.

Alternative 9a is protective of human health and the environment, meets all Federal and State ARARs, and meets all of the remedial action objectives through attainment of cleanup levels.

This alternative was selected because it is expected to achieve substantial and long-term permanence and risk reduction through off-site disposal and treatment of the principal threat waste and containment of hazardous and non-hazardous solid waste through redundant systems in an engineered lined waste cell. This alternative satisfies the statutory preference to treat principal threat wastes to the maximum extent practicable. Alternative 9a is cost effective. Because Alternative 9a leaves hazardous substances, pollutants, or contaminants on-site above levels that allow unrestricted use and unlimited exposure, periodic five-year reviews will be required. The selected remedy includes access restrictions and relies on institutional controls to restrict Site use and prevent the use of on-site groundwater to control exposure to hazardous substances.

Alternative 9a provides the best balance of the nine evaluation criteria. Alternative 9a is cost-effective.

19.2 Detailed Description of the Selected Remedy

The following are the major components of the remedy selected in this ROD:

- Removing and stockpiling uncontaminated cover soil (estimated to be up to 17 feet deep) outside the work area;

- Pumping cell water and non-containerized liquid from the excavations and managing the liquids for off-site treatment and disposal;

- Excavating the contents (drums, non-containerized waste, and impacted soil) of each of the 50 waste cells. The non-containerized wastes, including sludge, that are determined to be liquid by the paint filter test will be managed as a liquid for off-site treatment and disposal;

- Characterization of the excavated wastes. Non-compatible wastes will not be staged and/or stored in proximity to one another.

- Removing, managing, and off-site treating and disposing of liquid wastes and removal and staging of non-liquid hazardous wastes from drums. Containerized wastes that are determined to be liquid by the paint filter test will be managed as a liquid for off-site treatment and disposal.

- Consolidating non-containerized and drummed solid (hazardous and non-hazardous) wastes and contaminated soil in a newly constructed engineered cell lined with a FML over compacted clay covered with approximately 10 feet of compacted clean, excavated cover soil with a leachate collection system. Before consolidation, the drums and their contents will be crushed to reduce volume and to remove free liquids contained in the drums;

- Constructing a slurry wall keyed into the glacial till (silty clay) underlying the 1075 Intertill around the site along with a leakage collection system in the 1075 Intertill;

- Constructing a hazardous waste landfill cap covering the consolidation cell and extending beyond the slurry wall alignment;

- Collecting leakage from the 1075 Intertill and performing leak detection monitoring in the 1050 Intertill;

- Long-term groundwater monitoring and post-closure care; and

- Implementing Institutional controls to prevent or limit uses at the Site.

Alternative 9a involves full waste excavation, treatment, and disposal of all liquid waste off-site, and consolidation of non-liquid hazardous and non-hazardous waste, and contaminated soils in an engineered waste cell on-site.

The existing soil cover will be removed and staged before excavating drummed and non-containerized waste. All liquid waste, containerized and non-containerized, will be pumped from the waste cells using a high capacity trash pump and treated and disposed of off-site at a treatment, storage, and disposal facility or at a publicly-owned treatment works. Liquids removed from the Barrel Fill will be those that are free-flowing or readily pumpable. Liquid wastes will be removed from excavated drums by first decanting liquids, and then collecting released liquids after the drums are crushed. Any containerized waste, including sludge, that, based on field judgment, might not pass the RCRA paint filter test, will be (1) extracted by other methods and disposed of off-site; or (2) will undergo the RCRA paint filter test and based on the results, will be managed as liquid waste and disposed of off-site (fails paint filter-test) or managed as non-liquid waste reconsolidated on-site in the engineered waste cell (passes paint filter-test). All drums will be opened, and the wastes inside will be characterized. If the drummed wastes are found to be hazardous, the drums will be emptied to meet the definition of "RCRA empty," and then crushed. Otherwise the non-decanted wastes will be left in the drum and the drum and its contents crushed. EPA will set minimum pump standards for collection of bulk liquids in the Barrel Fill. A process for determining chemical compatibility for storage, transportation, and reconsolidation of wastes will be determined before construction of the remedy begins and implemented for the duration of the construction activities.

Any non-containerized waste, including sludge, that remains behind after pumping that, based on field judgment, might not pass the RCRA paint filter test, will be (1) extracted from the Barrel Fill by other methods and disposed of off-site; or (2) will undergo the RCRA paint filter test and based on the results, will be managed as liquid waste and disposed of off-site (fails paint filter-test) or managed as non-liquid waste reconsolidated on-site in the engineered waste cell (passes paint filter-test).

An engineered waste cell will be constructed to hold the solid hazardous and non-hazardous waste, and contaminated soils (See Figure 11). The engineered waste cell will include a bottom clay liner along with a flexible membrane liner. The waste and soils consolidated in the engineered waste cell will be covered by a hazardous waste cap. A leachate collection system will be installed above the bottom liner, and leachate will be pumped to on-site storage tanks for eventual off-site disposal and treatment.

A slurry wall keyed into the low permeability till beneath the engineered waste cell will be installed around the engineered waste cell for the purpose of physically isolating the waste and groundwater at the Site. A leakage collection system will be installed beneath the engineered waste cell inside the slurry wall as a back-up system to collect any liquid not collected by the leachate collection system. Any liquid collected in the leakage collection system will be transported off-site for appropriate treatment and disposal (See Figure 12)

Unlike the other alternatives with wastes left on-site, relocating the unnamed tributary was not included in the remedy. The lined consolidation cell with leachate collection system, the downgradient horizontal well leakage collection system, and the slurry wall around the site should address water infiltration and therefore contaminant migration to the unnamed tributary.

The following is the anticipated overall construction sequence:

- Establish Site facilities, laydown/stockpile/staging areas, and work zones within the designated AOC boundary, and install erosion controls.

- Begin excavation at the south end of the Site, strip the existing clean cover soil, and stockpile outside of work area.

- Begin excavating waste from waste cells and stockpile the non-liquid waste and cell wall material within the designated area of concern (AOC) adjacent to the excavation.

- Dewater waste cells, excavate drums and contaminated soil and move to staging area. Liquids (cell water and non-containerized wastes) from the dewatering will be pumped into portable tanks and/or containers and managed for off-site treatment and disposal regardless of the presence or absence of hazardous constituents. Management of the drums and contents will consist of the following:

    - Liquids will be decanted, and partially empty drums containing non-hazardous wastes or RCRA empty drums that contained hazardous waste will be crushed to minimize the volume of the engineered consolidation cell.

    - Drums filled with non-hazardous waste solids and RCRA empty drums that contained hazardous waste will be crushed to reduce the drum volume and to minimize the amount of solids put into the engineered consolidation cell. The crushed drum and their contents will be consolidated with the other solid wastes.

    - Should a mixture of solid and liquid be encountered in a drum, waste handling will involve decanting the liquid from the drum prior to crushing.

    - Liquids from removed drums will be collected and will be managed the same as other liquids for off-site treatment and disposal.

- Pump remaining liquids, including non-containerized waste from the excavation using a high-capacity trash pump and hold in portable tanks and/or containers. The dewatering is intended to allow for observable excavations and to minimize the potential for over-excavation into the 1075 Intertill.

- Excavate non-containerized sludge that remains after pumping and contaminated soils from walls and floor. Perform paint filter tests on the non-containerized wastes to determine disposition of the material. Materials failing the paint filter test will be further characterized for off-site disposal.

- Create southern wall of the consolidation cell and a temporary berm along the northern edge of the engineered cell.

- Relocate non-liquid waste and cell wall soil from northern waste cells into the engineered consolidation cell, continuing to pump liquids from the excavation for holding in portable tanks and/or containers and staging with drummed liquids. As excavation moves north, expand the consolidation cell to the north and move the temporary berms along the northern edge progressively farther north.

- Once at the northern limit of the consolidation cell, continue excavation of waste material to the base of the waste cells, continuing to backfill non-liquid waste into the consolidation cell. Whereas cell wall soil within the footprint of the consolidation cell needs to be excavated to accommodate construction, uncontaminated soil outside the footprint of the consolidation cell (that is, in the northern part of the site) does not need to be excavated.

- Once waste and contaminated soil are excavated, backfill the northern end of the excavation with clean soil from the soil stockpile and complete the northern wall of the consolidation cell.

- Move non-liquid waste from the secure stockpiles into the consolidation cell and fill any remaining space with clean fill to subgrade elevations.

- Characterize liquids in portable tanks and/or containers and drummed liquids and remove liquids for treatment and disposal off-site on a frequency dictated by the rate of progress.

- Any excess clean fill from the stockpile may be used as common fill in the cap if suitable. If excess fill is unsuitable as cap material, such fill will be sent off-site as appropriate.

- Construct the landfill cap over the site and extend beyond the proposed slurry wall alignment.

- Construct the slurry wall along the perimeter of the site.

- Drill the horizontal leakage collection well into the 1075 Intertill.

19.3 Cost Estimate of the Selected Remedy

Tables 8 through 14 detail the estimated capital costs to implement and construct Alternative 9a. The estimated total cost to construct and implement the selected remedy presented in this ROD is $27,746,000. The information in this cost estimate for the selected remedy is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a technical memorandum in the administrative record file, an Explanation of Significant Differences, or a ROD Amendment. This engineering cost estimate is expected to be within +50 to -30 percent of the actual project cost, consistent with U.S. EPA FS guidance.

19.4 Expected Outcome of the Selected Remedy

At the completion of this remedial action; i.e., when construction of the engineered waste cell is complete, the Site will still be subject to use restrictions to include prohibitions against on-site installation of drinking water wells and any construction or other use that would interfere with the containment of the waste remaining on-site or with the operation and maintenance of the remedy. These use restrictions will be implemented because there will be wastes left on-site. Future human health and ecological risk will be insignificant once construction of the remedy is complete (scheduled to take 14-25 months).

19.4.1 Final Cleanup Levels

Table 15 lists the final cleanup goals for the selected remedy. These goals are the PRGs developed in the FS and described in the PCG section of this ROD. An exception is where U.S. EPA used Regional Screening Levels (RSLs) instead of Region 9 PRGs for potable use cleanup goals where MCLs do not exist. (Since the preparation of the FS, EPA has replaced Region 9 PRGs with RSLs.)

The surface water cleanup goals apply to the maintenance worker, trespasser, and ecological receptors and are based on the groundwater-discharge-to-surface water pathway. The lowest of the ecological and human health PRGs developed in Appendix C of the FS were used as final surface water cleanup goals. The groundwater cleanup goals for the 1075 Intertill are equal to the surface water cleanup goals, based on the 1075 Intertill discharging the majority of its groundwater to the unnamed tributary.

The potable use groundwater cleanup goals apply to potable use of the 1050 Intertill, the 1015 Intertill, and the deep sand and gravel aquifer. As is explained in Appendix C of the FS, MCLs were used as groundwater PRGs. U.S. EPA also used these values for final groundwater cleanup goals. For COCs not having MCLs, U.S. EPA used RSLs as indicated at the beginning of this section.

The soil cleanup goals apply to soils at the Site requiring management. Soil below these cleanup goals does not need to be managed. Soil above these cleanup goals will be managed long-term

on-site in the constructed waste cell. The soil cleanup goals also apply to soil leaching to 1075 Intertill groundwater.

19.4.2 Anticipated Community Impacts

There are no significant impacts to the community from the selected remedy, other than the implementation of the remedy reducing future risk to human health and the environment.

20.0 Statutory Determinations

The selected remedy must satisfy the requirements of Section 121 (a) through (f) of CERCLA to:

1. Protect human health and the environment;
2. Comply with ARARs or justify a waiver;
3. Be cost effective;
4. Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and
5. Satisfy a preference for treatment that reduces toxicity, mobility, or volume as a principal element of the remedy.

The implementation of the selected remedy at the Tremont City Barrel Fill Site satisfies these requirements of CERCLA Section 121 as follows:

20.1 Protection of Human Health and the Environment

Implementation of the selected remedy will reduce future risk to human health and the environment from exposure to Barrel Fill-related contaminated groundwater and contaminated groundwater-to-surface water discharge. Protection of human health and the environment will be achieved through excavation, treatment, and off-site disposal of principal threat waste, and management of an engineered waste cell for hazardous and non-hazardous, solid waste. Institutional controls will be implemented to restrict Site use. The cleanup levels will attain the $1x10^{-4}$ to $1x10^{-6}$ risk level as required by the NCP.

No unacceptable short-term risks are anticipated by implementation of the remedy. Some short-term risks will be created by excavation activities, but these risks can be minimized through proper mitigative measures during construction.

20.2 Compliance with ARARs

The selected remedy of excavation, treatment, and disposal of liquid waste; and management of hazardous and non-hazardous solid waste and contaminated soils in an on-site landfill will comply with all federal and any more stringent state ARARs that are applicable to the Site. CERCLA §121(d) states that remedial actions must attain or exceed ARARs. The location-specific, chemical-specific, and activity-specific ARARs for the Site are presented in Table 6 (Summary of ARARs) and summarize how Alternative 9a will comply with ARARs.

20.3 Cost-Effectiveness

Cost-effectiveness compares the effectiveness of an alternative in proportion to its cost of providing environmental benefits. The selected remedy, Alternative 9a, has been determined to afford overall effectiveness proportional to its cost. U.S. EPA has determined that this remedy will be fully protective of human health and the environment; and that it is practicable to treat the principal threat wastes. Alternative 9a is the lowest-cost excavation alternative that fully treats the principal threat wastes. The selected remedy affords the greatest effectiveness proportional to its cost as compared to the other alternatives that meet all threshold criteria.

20.4 Utilization of Permanent Solutions to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in the most cost effective manner for this Site. It is anticipated that excavation and off-site disposal and treatment of the principal threat waste and consolidation of hazardous and non-hazardous solid wastes in the engineered waste cell will permanently prevent exposure of the human and ecological receptors to Site-related contamination.

20.5 Preference for Treatment as a Principal Element

The selected remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The remedy satisfies the statutory preference for treatment of the liquid wastes as a principal element.

20.6 Five-Year Review Requirements

This remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure; therefore, periodic five-year reviews will be required to determine that the implemented remedy remains protective over time. This remedy relies in part on restrictions of land and groundwater use.

20.7 Summary

Of those alternatives that are protective of human health and the environment and comply with ARARs, U.S. EPA has determined that the selected remedy provides the best trade-offs in terms of long-term effectiveness and permanence; reduction in toxicity, mobility, or volume achieved through treatment; short-term effectiveness; implementability; cost; and consideration of state and community acceptance.

The selected remedy offers a high degree of long-term effectiveness and permanence. These benefits are achieved at a reasonable cost.

The total estimated costs for the selected remedy at this Site are as follows:

Alternative:	9a
Total Capital Cost:	$22,634,000
Total O&M Cost:	$5,112,000
Total Present Worth:	$27,746,000

21.0 Documentation of Significant Changes from Preferred Alternative of Proposed Plan

In accordance with the NCP, U.S. EPA has discretion to make changes to the Preferred Alternative identified in the Proposed Plan based either on new information received from the public, the support agency or on information generated by U.S. EPA during the remedial process. With respect to the Barrel Fill Site, there were significant changes made by U.S. EPA from the Preferred Alternative presented in the Proposed Plan as issued June 7, 2010, based on new information. The significant changes and the reasons for those changes are discussed below.

The Preferred Alternative initially involved excavation of all waste and contaminated soils; segregation on-site of hazardous and non-hazardous waste and soils; consolidation of non-hazardous solid waste in an on-site, engineered waste cell compliant with appropriate parts of Ohio Administrative Code (OAC) 3745-27-08 for sanitary landfill facility construction, but not including the requirement of a flexible membrane liner; off-site disposal and treatment of all liquid waste and hazardous solid waste at a TSDF; backfilling and restoration of the excavated area; long-term groundwater monitoring and post-closure care; operation of the newly constructed waste cell; and implementation of institutional controls. The estimated total present worth costs of the remedy were $56,883,000.

During the initial public comment period, new information became available to U.S. EPA concerning two additional remedial alternatives. U.S. EPA arranged for CH2M Hill's preparation of the Feasibilty Study Addendum 2 which evaluated this new information as well as a modification of it (Alternative 9a).

As stated above, the Preferred Alternative now involves: excavation and other removal of all waste and contaminated soils; drum crushing to reduce volume and remove any free liquids in the drums; consolidation of solid hazardous and non-hazardous waste and contaminated soils in an on-site, engineered, lined waste cell compliant with appropriate parts of Ohio Administrative Code (OAC) 3745-27-08 for sanitary landfill facility construction, including the requirement of a flexible membrane liner; off-site disposal and treatment of all liquid waste at a TSDF; construction of a slurry wall and leachate and leakage collection systems; construction of a hazardous waste landfill cap covering the consolidation cell; long-term groundwater monitoring and post-closure care; and implementation of institutional controls. The estimated total present worth costs of the remedy were $27,746,000.

Thus, significant changes to the Preferred Alternative consist of the following: consolidation of hazardous waste and contaminated soils in an on-site engineered lined waste cell compliant with appropriate parts of Ohio Administrative Code (OAC) 3745-27-08 for sanitary landfill facility construction, including the requirement of a flexible membrane liner; drum crushing to reduce

volume and remove any free liquids in the drums; construction of a hazardous waste landfill cap covering the consolidation cell; and construction of a slurry wall as well as leachate and leakage collection systems. In addition, the estimated total present worth costs of the remedy were reduced by $29,137,000.

U.S. EPA made these significant changes to the Preferred Alternative because Remedial Alternative 9a is protective of human health and the environment, including long-term protective, but is more cost-effective and more short-term protective than the other remedial alternatives that provide long-term protectiveness. Therefore, when the remedial alternatives, including the new Remedial Alternative 9a, were evaluated against the NCP evaluation criteria, Remedial Alternative provided the best balance of these criteria while protecting the drinking water aquifers beneath the Site.

In addition, the Preferred Alternative will also now include the compaction of clean, excavated cover soil above the compacted clay layer, resulting in approximately 10 feet of clean soil fill between the compacted clay layer and the flexible membrane liner. This will result in an added additional 10 feet of soil between the engineered waste cell and the deep sand and gravel drinking water aquifer. (The details regarding ensuring stability of this layer will be addressed in the Remedial Design for the Site.) Also, drummed wastes will be characterized prior to drum crushing, and if the contents are determined to be hazardous, the contents will be removed until the drum is considered "RCRA empty," the removed waste managed as liquid or non-liquid waste as appropriate, and the drum will then be crushed. Finally, the proposed stabilization of any liquids and sludges with fly ash was eliminated due to the fact that all liquids passing the paint filter test will simply be removed from the Site and appropriately treated and disposed of off-site.

22.0 References

A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents, United States Environmental Protection Agency Office of Solid Waste and Emergency Response Directive 9200.1-23P, July 1999

A Guide to Principal Threat and Low Level Threat Wastes, United States Environmental Protection Agency Office of Solid Waste and Emergency Response Directive 9380.3-06FS, November 1991

CERCLA Compliance with Other Laws Manual; RCRA ARARs: Focus on Closure Requirements, United States Environmental Protection Agency Office of Solid Waste and Emergency Response Directive 9234.2-04FS, October 1989

Alternatives Array Document, Tremont City Barrel Fill Site, prepared by Haley & Aldrich, Inc., August 2007; approved with modifications by U.S. EPA, September 2007

Determining When Land Disposal Restrictions (LDRs) Are Applicable to CERCLA Response Actions, Superfund LDR Guide #5, United States Environmental Protection Agency Office of Solid Waste and Emergency Response Directive 9347.3-05FS, July 1989

Feasibility Study, Tremont City Barrel Fill Site, prepared by Haley & Aldrich, Inc., July 2008; approved with modifications by U.S. EPA, November 2008

Feasibility Study Addendum, Tremont City Barrel Fill Site, prepared by Haley & Aldrich, Inc., April 2009; approved with modifications by U.S. EPA, February 2010

Feasibility Study Addendum 2, Tremont City Barrel Fill Site, prepared by CH2M Hill, May 2011; approved by U.S. EPA, June 2010

Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, United States Environmental Protection Agency Office of Solid Waste and Emergency Response Directive 9355.3-01, October 1988

Letter Re: Chemical Waste Management's Comments on the Proposed Plan for the Tremont City Barrel Fill Site, Prepared by Chemical Waste Management,, Inc., August 2010.

National Oil and Hazardous Substances Pollution Contingency Plan (The NCP), United States Environmental Protection Agency Office of Solid Waste and Emergency Response Directive 9200.2-14, January 1992

Presumptive Remedy for CERCLA Municipal Landfill Sites; United States Environmental Protection Agency Office of Solid Waste and Emergency Response Directive 9355.0-49FS, September 1993

Proposed Plan (fact sheet), Tremont City Barrel Fill Superfund Site, United States Environmental Protection Agency, June 2010

Proposed Plan (long version), Tremont City Barrel Fill Superfund Site, United States Environmental Protection Agency, June 2010

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RCRA, Superfund, & EPCRA Hotline Training Manual; Introduction to Applicable or Relevant and Appropriate Requirements; United States Environmental Protection Agency Office of Solid Waste and Emergency Response Directive 9205.5-10A, June 1998

Remedial Investigation and Feasibility Study Administrative Order by Consent, Tremont City Landfill Site Barrel Fill Operable Unit, United States Environmental Protection Agency, October 2002

Remedial Investigation Report; Tremont City Landfill Barrel Fill Operable Unit; prepared by Haley & Aldrich, Inc., October 2006; approved by U.S. EPA, November 2006

Site Investigation Summary, Tremont City Landfill Site, Ohio; prepared by T N & Associates, Inc. for U.S. EPA, March 2002

United States Environmental Protection Agency (U.S. EPA) Approval with Modifications of the Haley & Aldrich, Inc. April 2009 Feasibility Study Addendum; Tremont City Barrel Fill Site; Clark, County, Ohio; February 10, 2010

United States Environmental Protection Agency (U.S. EPA) Approval with Modifications of the Haley & Aldrich, Inc. August 2007 Alternatives Array Document; Tremont City Barrel Fill Site; Clark, County, Ohio; September 20, 2007

United States Environmental Protection Agency (U.S. EPA) Approval with Modifications of the Haley & Aldrich, Inc. July 2008 Feasibility Study; Tremont City Barrel Fill Site; Clark, County, Ohio; November 25, 2008

Use of the Area of Contamination (AOC) Concept During RCRA Cleanups, United States Environmental Protection Agency Office of Solid Waste and Emergency Response; March 13, 1996

Appendix 2

Responsiveness Summary
Part 1

For Alternative 4a
(Public Comment Period June 10-August 11, 2010)

Appendix 2: Responsiveness Summary, Part 1
(For Public Comment Period June 10-August 11, 2010)

This Responsiveness Summary has been prepared to meet the requirements of Sections 113(k)(2)(B)(iv) and 117(b) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA), which require the United States Environmental Protection Agency (EPA) to respond "...to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan for remedial action. The Responsiveness Summary addresses concerns expressed by the public, potentially responsible parties (PRPs), and governmental bodies in written and oral comments received by EPA and the State regarding the proposed remedy for the Tremont City Barrel Fill Site in Clark County, Ohio.

Public Comment Period

EPA issued the Proposed Plan for the Site to the public for comment on June 7, 2010. EPA placed copies of the Proposed Plan and the final Remedial Investigation (RI), Feasibility Study (FS), and FS Addendum reports (as well as other supporting documents) in the local information repositories located at the Clark County Public Library in Springfield, Ohio and the Tremont City Municipal Building in Tremont City, Ohio. Documents are also available at the Ohio EPA office in Dayton, Ohio. EPA mailed copies of the Proposed Plan to interested persons on EPA's community involvement mailing list for the Site. Copies of all documents supporting the preferred alternative outlined in the Proposed Plan are located in the administrative record for the Site, located at the EPA Records Center, 77 West Jackson Boulevard in Chicago, Illinois and the Clark County Public Library, 201 South Fountain Avenue, in Springfield, Ohio.

The initial public comment period ran June 10 through July 12, 2010. At the request of the Performing Respondents for the RI/FS (the "Responsible Environmental Solutions Alliance" or "RESA"), EPA extended the public comment period through August 11, 2010. EPA held a public meeting at the Northwestern High School in Springfield, Ohio on June 22, 2010, to present the Proposed Plan. Approximately 50 people attended the meeting. The notice announcing the public meeting and the availability of the Proposed Plan was published in the *Springfield News-Sun* newspaper on June 16, 2010. Representatives of EPA and Ohio EPA were present at the public meeting to answer questions regarding the proposed remedy.

The next section contains a summary of the substantive comments received and the EPA's responses to those comments. Complete copies of all of the comments can be found in the administrative record.

The comments are categorized as follows:

- Comments from the General Public;
- Comments from the City of Springfield, Ohio;
- Comments from the German Township Trustees of Clark County, Ohio;

- Comments from the Community Advisory Group ("The Citizens Toward Wise Approaches Toward Environmental Resources" or "CF/WATER");
- Comments from the Clark County Waste Management District;
- Comments from the Technical Assistance Services to Communities (TASC);
- Comments from Ohio EPA;
- Comments from the RESA; and
- Comments from Chemical Waste Management (CWM, a potentially responsible party (PRP)).

Comments from the General Public

Comment:

Many commenters were in favor of EPA's preferred alternative.

Response:

EPA appreciates the support of the community.

Comment:

Several commenters felt that, although Alternative 4a was a good choice for EPA's preferred alternative, the flexible membrane liner should be included as a required component of the bottom liner of the engineered waste cell for the non-hazardous solid waste in order to ensure a greater degree of protection; therefore, they favored Alternative 4b and, in one case, Alternative 5b, over the preferred alternative.

Response:

EPA believes that the components of the preferred alternative, including a low-permeability, compacted, clay liner at the bottom of the waste cell; a leachate collection system; a composite cap system; and a groundwater monitoring system are sufficient controls to prevent the non-hazardous, solid, landfilled waste from contaminating the lower groundwater zones and surface water bodies. Therefore, these controls would prevent significant risk to human health and the environment from the Barrel Fill.

Comment:

Two commenters asked whether the taxpayer will have to pay for the cleanup.

Response:

One of the goals of EPA's Superfund program is to have the PRPs (those entities potentially responsible for the waste at a site) pay for the cleanup. In the majority of cases, EPA has been successful in doing this. However, in some cases, EPA's use of its enforcement resources to have the PRPs pay for a cleanup are unsuccessful; furthermore, there are cases where EPA will

share or reduce some of the cost of the cleanup if some PRPs are unable financially to contribute to or fully fund the cost. In these cases, where EPA funds the cleanup, taxpayers may end up paying indirectly for some of the cleanup. EPA has not yet negotiated with the PRPs for the PRPs to perform and fund the Remedial Design and Remedial Action (RD/RA) for the cleanup of the Site; therefore, EPA is not certain at his point how much of the cleanup the PRPs will fund.

Comment:

One commenter was concerned that the non-hazardous solid waste to be placed in the engineered waste cell could change to a hazardous material and, therefore, require a different type of cleanup action.

Response:

EPA will monitor the composition of the leachate at the Site and the groundwater at and near the Site to determine the nature of the contamination coming from the Site. If hazardous constituents are migrating from the Site such that a significant risk to human health or the environment results, EPA will change the cleanup plan to address this risk.

Comment:

One commenter wondered if the landfill gas generated from the Site could be reused for electricity or heat.

Response:

Unlike the nearby Tremont City Landfill Site which has a portion of its landfill gas piped to a nearby manufacturing facility, EPA does not expect landfill gas to be generated from the non-hazardous, solid waste that will remain in the engineered waste cell in the Barrel Filldue to the nature of the waste; therefore reuse of landfill gas is not expected.

Comment:

One commenter wondered how long it would take to implement the remedy.

Response:

If EPA is successful in getting PRPs to perform the cleanup, remedial construction should be complete in 5-6 years. However, if EPA is not successful in getting PRPs to perform the cleanup, the cleanup would take about two additional years. The time to construct the remedy will be about two years.

Comment:

One commenter wanted to know what transportation routes would be used to haul hazardous waste off-site, so that transportation through residential areas would be minimized.

Response:

The RD phase of the project (after the Record of Decision (ROD) is issued) will include the topic of transportation routes of off-site waste haulers. EPA will review draft RD reports and will assess proposed transportation routes with the goal of minimizing routes through residential areas.

Comment:

A CF/WATER commenter wondered whether the cleanup associated with the preferred alternative had ever been done at a site similar to the Barrel Fill, and, if so, how long ago was it conducted, and what were the results.

Response:

There have been other sites across the country which remedies included the construction of a solid waste landfill along with its typical components, such as an engineered waste cell, a waste cap, leachate collection, and groundwater monitoring. Also, there have been many drum removal projects implemented successfully across the country.

Comment:

One commenter asked if Mr. Tom Danis was a PRP and doubted that Mr. Danis would sign any document related to the cleanup of the Barrel Fill.

Response:

Mr. Danis has contributed a large amount of money to the post-closure care activities of the Tremont City Landfill Site. Mr. Danis has not contributed to the performance or funding of the remedial activities for the Barrel Fill so far. There are a number of PRPs associated with the Barrel Fill, of which Mr. Danis is one. EPA continues to track the Barrel Fill PRPs for their contribution to Barrel Fill waste and will notice Mr. Danis and the other PRPs to perform and/or fund the Remedial Design and Remedial Action activities.

Comment:

One commenter was concerned about how effective a remedy involving a solid waste landfill would be from keeping contaminated water from flowing into Chapman Creek and beyond.

Response:

The preferred alternative includes removing and disposing of all liquid and hazardous waste from the Site. Only non-hazardous, solid waste will remain. Also, the major components of a solid waste landfill that complies with the Ohio Administrative Code, such as an engineered waste cell with a low-permeability clay liner, a waste cover, a leachate collection system, and groundwater monitoring, should be effective in containing the contamination and preventing contaminant migration.

Comment:

A commenter wanted to know whether the Barrel Fill has been contaminating the drinking water of nearby residents who use private wells for drinking water. This commenter also wanted to know more about how to have private wells tested.

Response:

The 2006 Remedial Investigation for the Barrel Fill showed that the contamination from the Barrel Fill was very localized, and that it hasn't reached any residential, private wells.

Ohio EPA, at the request of EPA, conducted private well testing recently for the purpose of reassessing the Tremont City Landfill Site. Those testing results have been mailed to the residents whose wells were tested. Any resident wanting his or her private well tested may contact the Clark County Combined Health District at 937-390-5600 for information. Also, the Ohio EPA Division of Drinking and Ground Waters (614-644-2752) has information on private well testing.

Comment:

One commenter was concerned whether the PRPs would repair any roads they damaged as a result of the remedial construction and waste hauling activities. Also, this commenter felt that weighing facilities for the trucks hauling waste would be beneficial.

Response:

EPA expects the PRPs to repair any damage they cause to the roads during the remedial activities. If the PRPs do not do this, EPA will work with the PRPs to have them fulfill their responsibility for repairing any roads they damaged.

The RD will include many specific features to describe the implementation of the remedy. EPA will review the RD to ensure it includes a description of proper waste hauling procedures, including the implementation of weighing facilities, as appropriate.

Comment:

One commenter asked that EPA seriously consider the comments from nearby residents regarding traffic, air quality, or other local concerns. This commenter also wants EPA to accelerate the cleanup process, because of the uncertainty of the geology beneath the Barrel Fill and because of the hazards of what is contained in the Barrel Fill.

Response:

EPA has seriously considered the comments of nearby residents.

EPA has given the cleanup of this Site a very high priority; however, EPA needs to follow all of the required steps in the National Contingency Plan (NCP) for cleaning up sites under the Superfund program. EPA is aware of the need to clean up the Site as quickly as possible, but it cannot skip any steps required by the NCP.

Comment:

One commenter, who is a member of the Clark County Solid Waste Management Division Technical Advisory Committee, had a number of questions and comments, as detailed below.

1. Due to the relatively small difference in cost between the preferred alternative and Alternative 4b (the preferred alternative being $2.2 million less than Alternative 4b), EPA should choose Alternative 4b as the remedy because it includes the added, protective feature of a flexible membrane liner at the bottom of the engineered waste cell.

2. The commenter expects the preferred alternative to require a waiver to not include the flexible membrane liner at the bottom of the cell, to comply with State standards.

3. What are the allowable levels in the solid waste (to remain on-site) that are considered non-hazardous? How clean is the non-hazardous waste?

4. What is the specific effectiveness of identifying and separating/removing hazardous from non-hazardous waste and fill materials? Given that it won't be 100 percent effective, it makes sense to include the flexible membrane liner at the bottom of the cell.

5. Since it is only a relatively small increase in cost to completely remove all hazardous and non-hazardous materials and dispose of them off-site ($3.7 million more for Alternative 4 compared to the preferred alternative), EPA should consider choosing Alternative 4 instead of 4a or 4b as the selected remedy.

6. For short-term concerns in particular, EPA, Ohio EPA, and other agencies have the responsibility and authority to handle the cleanup to ensure the public and the environment are protected. To this end, the Clark County Solid Waste Management Division Policy Committee and Technical Advisory Committee could be used, as well as past experience. County and local agencies and associated volunteers in the Clark

County solid Waste Management Division Policy Committee and Technical Advisory Committee should be involved in the details of the cleanup as it proceeds.

7. Where will the hazardous materials go for treatment and disposal?

8. What is the schedule for remediation; how long will the cleanup take?

9. Will there be traffic re-routing or other issues to be dealt with, and for how long?

10. Will local workers and companies be employed in the cleanup effort? Is there a positive here in jobs being created?

11. Will State and local agencies have added work load to support the cleanup? Will there be State and local overhead costs needing funding or is that covered by the federal government or Superfund program?

12. The definitions and requirements that EPA follows (RCRA and 40 CFR Part 258.40, Parts 260-279, and others), as well as industry cleanup practices which have been accepted provide the basis for cleanup and verifications of the Tremont (Barrel Fill Site) cleanup by EPA and Ohio EPA.

    The commenter requested that EPA identify approaches and standards that are mandatory, versus those that are subject to trade-off; specifically, the approaches that can vary as described in EPA document EPA530-K-02-017I, paragraph 3.1, October 2001.

    If the remediation allows deposit of soils and other waste to be considered non-hazardous, due to the relative levels of hazardous waste, this is another reason to positively contain the waste. The commenter requested that any non-hazardous waste that is kept on-site be contained as appropriate for hazardous waste, with provisions such as with a liner and cap approach, and appropriate monitoring.

Response:

1. See the previous Response on this subject.

2. EPA has determined that, since waste placement is not occurring in the area of contamination, a waiver to the bottom flexible membrane liner requirement of Ohio Administrative Code 3745-27-08 is not needed.

3. Soil exceeding Toxicity Characteristic Leaching Procedure (TCLP) limits would be hazardous waste (to be disposed of off-site). Soil with concentrations of hazardous substances below TCLP limits, but greater than soil leaching values, would be solid waste (to be placed in the engineered waste cell); and soil with concentrations less than soil leaching values would remain on-site without treatment or any other type of long-term management.

4. EPA does not have information to determine the specific effectiveness of identifying and separating/removing hazardous from non-hazardous waste and fill materials. However, these testing procedures have been used across the country with a high degree of success. Also, see the previous Response on this subject for an explanation of why a flexible membrane liner at the bottom of the engineered waste cell is not needed.

5. EPA has determined that Alternative 4a is a more cost-effective remedy than Alternatives 4 or 4b.

6. EPA will notify and/or engage local agencies as appropriate during the cleanup of the Site. EPA's support agency for this Site is Ohio EPA, and EPA will continue to work closely with Ohio EPA during the upcoming RD/RA phases of the project.

7. Hazardous materials will be treated and disposed of off-site at treatment, storage, and disposal facilities (TSDFs) or solid waste facilities, as appropriate. The names and locations of the facilities will be documented in the RD Report.

8. See the previous Response on this subject.

9. Traffic patterns of waste haulers will be detailed in the RD Report. The heaviest traffic for waste hauling would occur during the remedial construction period of about two years. After remedial construction is complete, infrequent truck traffic would exist to haul leachate off-site.

10. If the PRPs perform the cleanup, they will decide with EPA's approval what contractors will be used. EPA will emphasize to the PRPs that local workers should be considered. If EPA performs the cleanup, its contractors generally have field offices near the Site where these workers can be used. The creation of local jobs will benefit the local economy.

11. Ohio EPA will have added work load to support the cleanup in terms of oversight activities. EPA expects any added work load of local agencies to be much less than that of Ohio EPA. In a PRP-led cleanup, EPA will reimburse Ohio EPA for its oversight costs. EPA, in turn, will be reimbursed for its and Ohio EPA's oversight costs by the PRPs. In an EPA-led ("fund-led") cleanup, EPA will reimburse Ohio EPA for its oversight costs. There are no such reimbursement arrangements in place between EPA and local agencies, unless EPA would create a grant for that purpose. The local community advisory group, CF/WATER, currently receives grant money from EPA.

12. In the ROD, EPA identified applicable and relevant or appropriate requirements (ARARs) for the selected remedy. These ARARs will be used for the proper design and implementation of the selected remedy. These requirements are mandatory. The "to be considereds" (TBCs) are also identified in the ROD. The TBCs are not mandatory, but they may be used in the design and implementation of the selected remedy.

The EPA passage referenced (EPA document EPA530-K-02-017I, paragraph 3.1) is part of an EPA training module for an introduction to RCRA corrective action. This paragraph discusses several regulatory changes by EPA that emphasize flexibility in RCRA corrective action cleanups, including: use of alternative permits at remediation waste management sites; (2) alternative land disposal restrictions (LDR) for contaminated soils; and (3) special standards for remediation waste management units (for temporary units, corrective action management units (CAMUs), and staging piles). These units may be used at facilities to manage remediation waste on-site at a facility; and an area of contamination (AOC) can be equated to a RCRA land-based unit for purposes of cleanup.

These regulatory changes are not mandatory requirements for the Barrel Fill.

For the selected remedy, solid, non-hazardous waste will be placed in an engineered waste cell on-site; then, the waste will be capped with a non-hazardous, solid waste cap. Besides these features, the landfilled waste will undergo construction and post-closure care requirements consistent with Ohio Administrative Code 3745-27-08 and 3745-27-14, respectively. EPA has determined that a bottom flexible membrane liner is not a requirement because the waste will be consolidated within the area of contamination. Due to the nature of the waste being landfilled, non-hazardous waste construction and post-closure care requirements will be in place, not the hazardous waste requirements.

Comment:

One commenter asked if groundwater monitoring is included in the preferred alternative.

Response:

Groundwater monitoring is included in the preferred alternative.

Comment:

One commenter was in favor of the preferred alternative and felt that this alternative "should be adopted over any appeals from the companies that are involved."

Response:

As part of the community acceptance criterion of evaluating cleanup alternatives, before selecting the remedy for the Barrel Fill, EPA will consider comments from the public, including comments from the PRPs (those entities potentially responsible for the waste at the Barrel Fill).

Comment:

One commenter favored a remedy where all of the waste is removed and disposed of (such as Alternative 4 or 6), because the commenter felt that risk would still remain from the Site if waste was left in place.

Response:

With the preferred alternative being implemented, EPA believes that the risk to human health and the environment would not be significant. See the previous Response on this subject.

Comment:

A commenter was in favor of the preferred alternative as being protective. On-site disposal of non-toxic waste in a properly engineered waste cell is acceptable if proper State law and regulations are followed. No waivers should be granted.

The commenter was concerned that, for alternatives leaving toxic waste on-site, the toxic waste will eventually leak into potable water supplies. The commenter was also concerned that, if a containment remedy was chosen, excavation would be "exponentially more expensive" if containment was later found to be a problem.

Response:

The preferred alternative will make use of proper State laws and regulations. Although a flexible membrane liner will not be used at the bottom of the engineered waste cell, this will not require a waiver, because EPA has determined that waste is not being placed in the area of contamination.

EPA agrees that if a containment remedy doesn't work, it will be considerably more expensive to implement an excavation remedy.

Comments from the City of Springfield, Ohio

Comment:

The City of Springfield Commission supports EPA's preferred alternative, recommended by the Clark County Combined Health District Board of Directors.

Response:

EPA appreciates the City of Springfield, Ohio's support of EPA's preferred alternative.

Comments from the German Township Trustees of Clark County, Ohio

Comment:

The German Township Trustees support the position of the Clark County Board of Health in endorsing any plan that includes the removal of all hazardous waste from the Site.

Response:

Since EPA's selected remedy includes the removal of all hazardous waste from the Site, EPA appreciates the German Township Trustees' support of the selected remedy.

Comments from the Community Advisory Group ("The Citizens for Wise Approaches Toward Environmental Resources" or "CF/WATER")

The following are comments from Mr. Jeff Briner, Chairman of CF/WATER.

Comment:

CF/WATER will continue to be involved in decisions involving the remediation of the Barrel Fill and the Landfill, as will other local organizations.

Response:

EPA acknowledges this comment and plans to continue its positive relationship with CF/WATER and other local organizations, including the Clark County Combined Health District.

Comment:

CF/WATER supports EPA's preferred alternative.

Response:

EPA appreciates this support.

Comment:

From the beginning of this process, the Barrel Fill Site was treated separately from the entire Tremont City Landfill Site. This has perplexed the CF/WATER membership since its stated purpose is to protect all water resources in Clark County as well as the surrounding area (the Site has the potential to cause damage in Champaign County, particularly in light of the discovery during the Remedial Investigation that some of the water underground flows to the northeast). Again, while the membership does support the proposed remedy 4a, it is very concerned about the investigation and remediation of both the Transfer Site and the Landfill and how this remedy will affect the future of the Tremont City Site as a whole. The risk of cross migration/contamination is a concern and could cause serious consequences if any of the excavated material finds its way into the adjoining sites; the so called "unnamed tributary" and of course, Chapman's Creek. I hope, and intelligent thought would indicate, that there will be contingency plans for accidental release of any substance from any of the three sites. This plan should include the participation of the German Township Trustees, the Tremont City Council, their respective Fire/EMS staff, the Clark County Emergency Management Agency, and local Hazmat teams. This should include local warning through signs, public media, and other sources.

Response:

Unfortunately, EPA was unsuccessful in negotiating with PRPs for the performance and funding of a Remedial Investigation and Feasibility Study (RI/FS)for the Tremont City Landfill. The Landfill is currently being addressed under Ohio Post-Closure Rules, with Ohio EPA and the Clark County Combined Health District performing oversight of the post-closure activities. EPA may attempt RI/FS negotiation for the Landfill in the future.

From the information in the 2002 Site Investigation Summary, contamination from the Waste Transfer Facility (WTF) is not thought to pose a significant risk to human health and the environment. Among the three sites, EPA has assigned the WTF the lowest priority. At this time, EPA does not plan to start an RI/FS negotiation process for the WTF.

Implementation of Alternative 4a will be closely controlled and monitored, with one goal being to avoid contaminant migration to any of the other two sites or to other media such as the unnamed tributary, Chapman Creek, or the intertills beneath the Barrel Fill.

EPA will review the draft Remedial Design to ensure that it includes a plan to address accidental releases during remedial construction. The plan will include notifying the proper local authorities and the community, and posting warning signs, as appropriate.

Comment:

I know we all hope and are confident that the Remediation Plan 4a will be successful and without any major accident. Even then, there should be substantial intercommunication between all of the above agencies; as well as, the Clark County Engineer's office, the County Sheriff's office and the Ohio Department of Transportation regarding the transport and cleanup of material incidental to the remediation process, like: noise, mud, dust, road damage and other transport issues. We hope that there will be more Community Involvement meetings where the details of the remedial actions will be discussed and the general public is informed of the process.

Response:

The Remedial Design will include notifying the proper local authorities on the various aspects and consequences of the remedial construction and the off-site waste hauling. Also, EPA will periodically notify the public via fact sheets, website updates, and/or newspaper notices, as well as community meetings, of the progress made to implement the remedy.

Comment:

Along with these concerns, there is the concern of on-site worker safety. I know that all pertinent OSHA regulations will be followed and assume there will be further restrictions that are necessary in the cleanup of hazardous materials. Since the monitoring of the Site and the surrounding area during the process will require safety measures for the workforce, it would seem prudent to make the results of such monitoring available to the public at large (I assume that this will be in the public record).

Response:

Proper components of worker safety will be described in the Health and Safety Plan as part of the Remedial Design and Remedial Action. EPA does not normally distribute routine health and safety monitoring information to the public; however, EPA will provide specific health and safety monitoring information if requested. EPA places health and safety monitoring information in the Site File as a normal course of action.

Comment:

Since there will be some material left at the Site in a new waste cell that will be constructed for the waste that will be considered non-hazardous, CF/WATER needs specific details about the composition of this new cell and what measures will be taken to assure that this Site will be secure now and for the long term. We understand it will be necessary to obtain a waiver from the Ohio EPA to install this cell without a "flexible membrane liner" on the bottom of the cell; but would like to have more details about the design of the cell so our members can understand and voice any concerns they would like addressed.

Response:

The Remedial Design, which will be available to CF/WATER and the public when it is approved by EPA, will contain the requested information. However, EPA will openly communicate with CF/WATER and the Technical Assistance Services for Communities (TASC) during the Remedial Design review period, before EPA approves the Remedial Design.

For the selected remedy, EPA has determined that the flexible membrane liner at the bottom of the engineered waste cell is not required regulatorily; therefore, a waiver will not be needed.

Comment:

CF/WATER also understands that costs are a pertinent factor in the remediation process, but feels that 4a meets the nine criteria as stated in EPA directives for overall protection of human health and the environment. In light of the extension of the public comment period per RESA's request to review the data, we feel that a cost comparison of the respective Alternatives is in order, particularly after the changes to the FS Approval letter and the Proposed Cleanup Plan. Also, in light of the problems with Post Closure care of the Landfill Site, we feel that a detailed financial plan and Guarantee Bonds (or similar instrument) should be in place at the completion of the Remediation process. All infrastructure damaged during the remediation process should be repaired using this fund.

Response:

The requested cost comparisons are in the Feasibility Study (FS), Feasibility Study Addendum (FSA), and the Record of Decision. The cost estimates in the FS and FSA are based on a 30-year performance period, consistent with EPA RI/FS guidance. EPA's approval with modifications letters for the FS and FSA do not significantly affect the cost comparisons.

Any PRPs who agree to fund the Remedial Design and Remedial Action (RD/RA) will be required to submit financial assurance documents to show that they have the capability to fund the RD/RA and any long term operation and maintenance. Other financial instruments would not be required, since EPA would have the authority to enforce against PRPs who do not complete the work as defined in the RD/RA consent order or unilateral order. The work would include repair of infrastructure damaged during the RD/RA activities.

Comment:

We understand that the Remediation process will be slow and methodical, but feel that a relevant and realistic timetable be in place. Along with this schedule, public information meetings should be held at frequent intervals to keep the members and the public informed of the progress in the remediation.

Response:

The Remedial Design Report will include a relevant and realistic timetable for the implementation of the remedy.

EPA will hold public information meetings to keep the public informed of the progress of the remediation. The frequency of the meetings will depend on EPA's perceived interest from the community.

Comments from the Clark County Waste Management District (CCWMD):

Ms. Debra Karns of CCWMD had the following comments:

Comment:

Ms. Karns wanted to make sure that the community was not adversely affected by the noise, smell, hours of operation, and other aspects of the remediation.

Response:

During remedial activities, EPA will work with the PRPs, Ohio EPA, the community, and local officials to ensure that adverse effects to workers and the community are minimized.

Comment:

CCWMD supports the removal of all hazardous waste from the Barrel Fill and would like to work with EPA during the planning stages to ensure that truck traffic is managed safely, that roads are repaired, and that local nuisances are considered. Also, Ms. Karns recommended the creation of a task force of local offices that would echo the concerns of the community, so that these concerns were addressed upfront.

Response:

EPA appreciates CCWMD's support of EPA's preferred alternative. EPA encourages the involvement of the community and local officials during the planning stages of the community-related issues noted. EPA already works with Mr. Blase Leven of Kansas State University on community concerns. For the Barrel Fill, Mr. Leven is the Technical Assistance Services for Communities (TASC) contact. TASC works with the local community to offer assistance by:

- reviewing, interpreting, and explaining technical materials in an understandable way;
- preparing training materials for seminars and workshops, and teaching those sessions;
- meeting with the community to answer questions and listen to concerns;
- preparing fact sheets, brochures, technical summaries, maps, diagrams, models, or other visual aids;
- translating educational, outreach, and technical documents into other languages;
- planning and holding meetings to help the community determine how to use the land once it is cleaned up; and
- training community leaders on hazardous waste issues.

EPA will work with TASC during the Remedial Design and Remedial Action phases. For community concerns, EPA recommends that local officials contact Patricia Krause, EPA Community Involvement Coordinator, at 312-886-9506 or Mr. Leven at 785-532-0780.

Comment:

Due to the nature of the proposed plan of action which may include creating a new disposal site in Clark County, CCWMD wished to make EPA aware of CCWMD's interest in reviewing the development of new solid waste disposal facilities in the county (Siting Strategy for Facilities in the 2007 Clark County Waste Management Plan). This process was developed to assist local communities that may be adversely impacted in negotiating acceptable solutions with the developer.

Response:

Please note the above responses about EPA's plans to work with the community, either directly or through TASC. However, please note that it is EPA's responsibility, in consultation with the support agency (Ohio EPA), to review Remedial Design and Remedial Action plans for the selected remedy, as designated in the National Contingency Plan (which is essentially the implementation manual for CERCLA).

Comment:

CCWMD is authorized by the Waste Management Plan (noted above) to collect fees on solid waste deposited either inside the county (disposal fees) or outside the county (generation fees). It is possible that the Board of Directors (County Commission) could waive any or all of these fees; however, they may also see fit to use this potential funding source to assist the local community to address adverse impacts relative to the cleanup.

Response:

EPA acknowledges these functions within CCWMD.

Comment:

CCWMD offers a Technical Advisory Council of technically skilled and experienced local volunteers as well as a statutorily-created representative Solid Waste Policy Committee who all wish to work cooperatively with EPA, the developer, and the local community to address potentially adverse impacts relative to the proposed plan of action.

Response:

Please see previous responses on EPA's plans to work with the community and local officials to minimize adverse effects to workers and the community of the remedy implementation.

Comment:

Ms. Karns expressed the following concern of Mr. Norm Carl, a CF/WATER member. Off-site seepage of volatile organic chemicals (VOCs) and off-site, contaminated soils should be considered in the cleanup of the Barrel Fill.

Response:

The Remedial Investigation (RI) included the evaluation of the nature and extent of contamination from the Barrel Fill among media including groundwater, surface water, and soil. The RI along with EPA's and Ohio EPA's subsequent evaluations of the Barrel Fill geology and hydrogeology has helped EPA to select a remedy for this Site that will be protective of human health and the environment among all media contaminated from the Site. As a result of the RI and previous evaluations mentioned, EPA did not identify off-site, VOC migration or off-site soil contamination as a current risk; although, groundwater contamination from the Barrel Fill to the unnamed tributary east of the Barrel Fill has been identified as a future risk and has been accounted for in EPA's selection of the remedy.

Comment:

Ms. Karns expressed another concern of Mr. Karl. Signs should be posted by Chapman Creek, especially during Site work, to recommend that no fishing be done downstream. Also, every effort should be made to protect Chapman Creek because it is recharged by the aquifer and ends up in the Mad River.

Response:

Results of the RI for the Barrel Fill do not indicate that Chapman Creek has been impacted by Barrel Fill contamination. However, if EPA discovers in the future that Chapman Creek has

been impacted from Barrel Fill contamination, EPA will take appropriate remedial measures to minimize or eliminate this impact and will have warning signs posted near Chapman Creek as appropriate.

Comments from the Technical Assistance Services to Communities (TASC):

Comment:

It would be helpful if a restrictive covenant for the Site to limit use of groundwater and to prevent exposure to wastes at the Site was filed in State and federal databases that are accessible to the public.

Response:

The restrictive covenants in the FS have been recorded in Clark County, Ohio. EPA maintains copies of such restrictive covenants in its files, but doesn't maintain a database of these covenants. Since the FS is in the Administrative Record, the restrictive covenants are accessible to the public. Also, EPA will review these restrictive covenants for enforceability and coverage.

EPA is unaware of a State of Ohio database for restrictive covenants.

Comment:

More information on cost and description of Alternative 4a should have been included in the FS Addendum and the Proposed Plan. Also, the cost to build the bottom clay liner and sidewalls of the engineered waste cell do not appear to have been included in the FS Addendum.

Response:

The FS Addendum has been approved with modifications by EPA, and the Proposed Plan has been issued by EPA. Therefore, neither of these documents will be re-issued. EPA concluded that the cost estimate in the FS Addendum is accurate from -30 percent to +50 percent, which is the acceptable range of accuracy in the EPA RI/FS guidance. The cost estimate to build the engineered waste cell is included in the overall cost estimate of the preferred alternative.

EPA also believes that the levels of description for the remedial alternatives in the FS, FS Addendum, and Proposed Plan are appropriate. More detailed information on the design of the selected remedy will be provided in the Remedial Design Report.

Comment:

TASC wondered whether the same design for the engineered waste cell would apply for Alternatives 4a and 5a, and whether the same Ohio landfill regulations would apply.

Response:

EPA expects similar designs for the engineered waste cells for Alternatives 4a and 5a; although, the volumes of waste placed in the cells would be different. In both cases, the solid waste landfill construction requirements in Ohio Administrative Code (OAC) 3745-27-08 would be implemented, except that the bottom, flexible membrane liner would be omitted. For this omission, Alternative 4a would not require a waiver of the OAC bottom, flexible membrane liner requirement because EPA determined that waste is not being placed in the area of contamination. For Alternative 5a, which involves on-site treatment of hazardous waste and placement of waste in the area of contamination, a waiver would be required.

Comment:

Based on information presented in the FS, added lifetime risk of occupational fatalities and transportation fatalities may be within the range generally considered as acceptable for occupational risk and for incidental bystanders. Further mitigation of potential transportation accidents by reducing exposure to the general public, by use of less populated routes, multiple routes and other safeguards, in addition to proper signage, road maintenance, etc. would benefit the community. Clear communication and enforcement of standards, monitoring and corrective actions to prevent exposure of workers and residents to contaminants and excessive noise, dust, and mud would also benefit the community. These could be outlined clearly in the safety plans and Engineering Design for Remediation and funded adequately.

Response:

EPA plans to have the above-mentioned features and activities described in the Remedial Design Report, Health and Safety Plan, and/or other, relevant Remedial Design and Remedial Action documents. Adequate funding will be in place to implement these features and activities.

Comment:

It is not clear if all costs (e.g., costs for installation of a clay liner for Alternative 4a) are included, due to possible inconsistencies between the original FS, FS Addendum, EPA approval with modifications letters, and the Proposed Plan. Providing the community with an accurate up-to-date cost estimate would be beneficial.

Response:

See the previous response in this section on the cost estimates. EPA concluded that the cost estimate in the FS Addendum is accurate from -30 percent to +50 percent, which is the acceptable range of accuracy in the EPA RI/FS guidance.

Comments from Ohio EPA:

Comment:

Alternative 4a proposes to excavate all Barrel Fill waste and associated contaminated soils; segregate the solid non-hazardous Barrel Fill waste and non-hazardous contaminated soils from the liquid and hazardous Barrel Fill waste and contaminated soils; transport the liquid and hazardous waste and soils off-site for commercial treatment, recycling, and disposal; and dispose of the non-hazardous solid waste and non-hazardous soils in a new solid waste cell to be constructed on-site. Ohio EPA understands that the new solid waste cell will be constructed to meet the requirements contained in pertinent provisions of Ohio's Sanitary Landfill Construction requirements (Ohio Administrative Code (OAC) 3745-27-08) excepting omission of the flexible membrane liner (FML) component of the composite liner system. The composite cap system will include the FML.

Ohio EPA further understands that the pertinent provisions of OAC 3745-27-08 to be met during construction of the new solid waste cell include the general design criteria and design, construction, and testing specifications for the prepared in-situ foundation, compacted soil liner, leachate collection and management system, surface water control structures, and composite cap system. Given this understanding, Ohio EPA supports EPA's proposal to select Alternative 4a as the final remedy for the Tremont City Barrel Fill Site.

Response:

EPA appreciates Ohio EPA's support of Alternative 4a, EPA's preferred alternative, for the selected remedy.

Comment:

EPA states in both the Proposed Cleanup Plan and EPA's February 10, 2010, Modification and Approval of the Feasibility Study Addendum that Containment Alternatives 2, 3, and 7 meet the threshold remedy selection criterion of Overall Protection of Human Health and the Environment. Ohio EPA disagrees with EPA's conclusion that these alternatives meet this threshold criterion. The following are EPA determinations in support of Ohio EPA's position which have been excerpted from EPA's Modification and Approval of the Feasibility Study (FS) and Modification and Approval of the Feasibility Study Addendum (FSA).

With respect to Alternatives 2 and 3, EPA's November 25, 2008, Modification and Approval of the FS determined the following:

> EPA Modification 11: "Claims of containment alternatives RA-2 and RA-3 being protective in the event of a catastrophic release of contamination from the drums, and claims of RA-2 and RA-3 preventing migration of Site contaminants above risk-based levels to the deep sand and gravel groundwater unit are deleted from these bullets and elsewhere in the FS. There has been no support to date from RESA that either containment alternative will completely prevent vertical contaminant migration to the deep sand and gravel groundwater unit. Claims of achieving related groundwater RAOs are also deleted from the FS."

EPA Modification 34: "The evaluation states that the containment alternatives are reliable and effective over the long-term. Based on the RI uncertainties, the adequacy and reliability of the containment system has not been demonstrated, and there is no high degree of certainty that a containment remedy will prove successful. The evaluation further states that the containment alternatives provide long-term effectiveness and permanence. Under the containment alternatives, none of the Barrel Fill waste or associated contaminated soils are treated, destroyed, or removed from the Site. Failure of the containment system could result in unacceptable exposures to human health and the environment. Any text in the FS or FS tables that states that containment alternatives are long-term effective and permanent is qualified by stating that contamination from the Barrel Fill will eventually reach the deep sand and gravel aquifer and could result in unacceptable exposures to human health and the environment."

Relevant portions of EPA Modification 49 as it relates to the evaluation of Alternatives 2 and 3 under the criterion of overall protection of human health and the environment:

"There are reasonable concerns that the remedy is not permanent."
"There is no treatment of principal threat waste; hence, there is no reduction of the toxicity, mobility, or volume of the principal threat waste through treatment."
"The magnitude of the residual risk associated with the waste is not reduced."
"Components of the containment system will require replacement over time."
"Failure of the containment system could result in unacceptable exposures to human and environmental receptors."
"The adequacy and reliability of the containment controls has not been demonstrated."
"Long-term protection of human health and the environment cannot be assured."
"Institutional controls and access restrictions are required and relied upon to control land and groundwater use."
"Time between remedial design start and construction completion is approximately two years. Given the issues associated with the reliability of the containment controls, the RAO requiring stabilization or elimination of hazardous substances in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release is questionable to be met over the long term."

Alternative 7 is nothing more that Alternative 3 with sumps. In addition to inheriting all uncertainties associated with Alternative 3, EPA determined the following with respect to Alternative 7 in EPA's February 10, 2010, Modification and Approval of the FSA:

Modification 13: "There is uncertainty associated with the long-term effectiveness of alternative RA-7 because the technology is unproven in terms of its ability to prevent vertical groundwater contaminant migration to the deep sand and gravel aquifer. There are concerns that RA-7 can be constructed to collect all highly mobile, principal threat waste necessary for long-term effectiveness, and concerns that additional extraction wells will collect all of the remaining, liquid waste that migrates below the 1075 Intertill. Even though it is assumed that the sumps will collect some of the liquid in the Barrel Fill, there is also concern that the sumps will operate efficiently over time, because of such occurrences as the clogging of the sump screens. There is also concern about how efficiently the sumps

will collect the liquid in the Barrel Fill, since there is no way to guarantee the optimal placement of the sumps for that purpose, and no way to accurately measure the percentage of liquid in the Barrel Fill collected by the sumps."

Modification 16: "Although pre-design investigation will be required in an attempt to determine the topographic low point of each waste cell using established drilling techniques and geophysics, the implementability of this technology in this setting is unproven and uncertain. There are concerns about how sumps can be installed into areas of hazardous waste, whether the sumps can be optimally located in relation to the waste cells and the bottom of the waste to collect liquid, and to what extent the clogging of the sump screens over time will affect efficiency of liquid collection. There will be no way to monitor the effectiveness of liquid collection because there will be no way to accurately determine the percentage of liquid collected. Also, if this alternative does not work properly, it will be difficult to implement a subsequent, effective remedial action, because the integrity of the drums will have already been compromised, and hazardous liquid wastes, previously contained, will now be an uncontrolled release to the environment."

Modification 27: "Alternative RA-7 will be difficult to implement because the technology is unproven in the setting of the Barrel Fill. Also, it is uncertain how sumps can be installed through hazardous waste, how they can be optimally located, and how efficiently they can collect liquid."

Alternatives which cannot claim to be protective, cannot meet the remedial action objectives (RAOs), cannot be shown to be effective, and may result in unacceptable exposures if they fail cannot meet the threshold remedy selection criterion of Overall Protection of Human Health and the Environment as that criterion is defined in the NCP and further described in EPA's guidance. Alternatives 2, 3 and 7 do not meet this threshold criterion and thus are ineligible for selection as final remedies for the Barrel Fill Site.

Response:

EPA acknowledges that Alternatives 2, 3, and 7 will not offer the level of long-term effectiveness and permanence that the excavation alternatives provide. However, EPA believes that all of the alternatives except for the No-Action Alternative will provide overall protection of human health and the environment. This protection is partially dependent on the time period that an alternative will afford protectiveness. In all of these alternatives, potential remedies failure could be identified and corrected before human health or environmental protection would be compromised. It is the likelihood of future remedy adjustments that indicate the weaknesses of the long-term effectiveness of these remedies.

Comment:

EPA's Proposed Plan and Modification and Approval of the FSA both indicate that Ohio's solid waste landfill construction requirements are "to be considered" (TBCs). Ohio EPA disagrees and has concluded that Ohio's solid waste landfill construction requirements are applicable or relevant and appropriate requirements (ARARs) pursuant to CERCLA, 42 U.S.C. 9601, et seq.

Ohio EPA had both technical and legal staff review the site-specific facts of this case pursuant to section 121 (d)(2)(A) of CERCLA. In general, we have concluded that Ohio's solid waste landfill construction requirements meet the threshold requirements, as they were properly promulgated, are more stringent than the federal requirements, and are legally applicable. However, failing that, we would argue that they are at least relevant and appropriate.

We have evaluated EPA's argument equating the re-disposal of the nonhazardous industrial solid wastes in a newly constructed solid waste cell with the consolidation of waste at a CERCLA municipal landfill and we do not find it persuasive. The Barrel Fill is not a municipal landfill, and the alternatives do not call for consolidation of waste within a municipal landfill. None of the Barrel Fill waste is municipal waste. It is exclusively industrial waste.

We also find EPA's argument equating the new landfill with management of hazardous waste under the area of contamination (AOC) concept to be similarly unpersuasive. Alternatives 4a and 4b call for complete excavation of all Barrel Fill waste and contaminated soils, off-site treatment and disposal of all liquid and hazardous wastes and soils, and on-site disposal of all non-hazardous industrial solid waste and soils in a newly constructed solid waste cell. The non-hazardous industrial solid waste, including the waste in the non-hazardous contaminated soil, is "Industrial D" waste and the new solid waste disposal cell is an industrial non-hazardous waste landfill under Part 257 of Subtitle D of RCRA. EPA's web site on solid waste law states: "Part 257 governs only those solid waste disposal facilities that do not meet the definition of a Municipal Solid Waste Landfill (MSWLF), as defined in Part 258. Such facilities include waste piles, *industrial nonhazardous waste landfills*, injection wells, surface impoundments, and land application units" (see http://www.epa.gov/region9/waste/solid/laws.html). This same waste is solid waste under OAC 3745-27-01. The AOC concept discussed in the NCP and relied upon by EPA to determine that Ohio's solid waste landfill construction rules are TBCs applies to hazardous (Subtitle C) waste, not solid (Subtitle D) waste. Ohio's solid waste landfill construction requirements (OAC Chapter 3745-27) apply to the construction of the new solid waste disposal cell.

Omission of the FML component of the composite liner system required by OAC 3745-27-08 requires an NCP waiver. Given Ohio EPA's understanding that the new solid waste disposal cell will meet all other pertinent requirements of OAC 3745-27-08 (see comment above) and given that the engineered clay liner of the new cell will consist of excavated and recompacted tills from the site (natural sand seams disrupted), Ohio EPA is not opposed to an NCP equivalency waiver regarding omission of the FML component of the liner system. Regardless, Ohio EPA supports Alternative 4a as the final remedy for the Barrel Fill.

Response:

EPA agrees with Ohio EPA that the Ohio solid waste construction requirements are ARARs for Alternatives 5a and 5b, but EPA does not agree that they are ARARs for Alternatives 4a and 4b.

EPA's analysis is based on its established position that movement or consolidation, or in situ treatment of hazardous waste in a Superfund site area of contamination (AOC) is not land disposal and does not constitute placement. Since placement does not occur, RCRA minimum

technology requirements, including the requirement of a liner, are not triggered. (See preamble to the NCP at 55 FR 8758-8760 (March 8, 1990).) Alternatives 4a and 4b call for on-site management of non-hazardous solid wastes after separation of those wastes from Site hazardous wastes. The non-hazardous solid wastes would be managed on-site in an area of generally dispersed contamination or AOC. Since the non-hazardous solid waste would not be disposed of, but would be moved and then managed on-site within the AOC, the Ohio solid waste landfill construction requirements are not ARARs for the on-site management of the non-hazardous solid waste for Alternatives 4a and 4b. In contrast, since Alternatives 5a and 5b call for ex situ treatment before the non-hazardous solid waste is managed in the AOC, placement does occur; and the Ohio solid waste landfill construction requirements are considered ARARs. (See March 13, 1996 OSWER memorandum, *Use of the Area of Contamination Concept During RCRA Cleanups*, page 1; and OSWER Directive 9234.2-04FS, October 1989, *RCRA ARARs: Focus on Closure Requirements*, pages 3 and 4.)

EPA recognizes that the NCP preamble and OSWER document references above concern analyses of hazardous waste management. We believe that these analyses extend as well to solid waste management in a Superfund site AOC. Hazardous and non-hazardous waste management has been defined this way in the Superfund program for many years; including at sites in Ohio. Further, Ohio's current *Area of Waste Placement Technical Guidance Compendium*, VA30002.09.004, which provides guidance on the Ohio Administrative Code (OAC) 3745-27-13, is in harmony with our analysis that movement or consolidation of solid waste within a Superfund site AOC is not disposal or placement. The *Summary* of this *Compendium* states, "Reconsolidation of solid waste within the limits of waste placement is NOT disposal but is considered an acceptable management practice."

While we do not consider the Ohio solid waste disposal construction requirements to be ARARs for Alternatives 4a and 4b, we do believe they should be considered in the design of the new waste management cell that is part of both of these alternatives. If one of these two alternatives is selected as the remedial action to be implemented at the Site, the design for the newly constructed waste cell would be consistent with suitable provisions in OAC 3745-27-08 for sanitary landfill facility construction. The new waste cell would be constructed with compacted, low-permeability clay, and the bottom of the cell would be sloped to facilitate the collection and removal of leachate. Consistent with OAC 3745-27-08, a non-hazardous waste cap would be installed over the cell, and surface water control structures would be installed. However, the bottom of the waste cell is not expected to need a flexible membrane liner, due to the low-permeability geology beneath the Barrel Fill. In addition, long-term leachate management, surface water management, waste cap maintenance, and groundwater monitoring would be features of the solid waste landfill, consistent with OAC 3745-27-14 (post-closure care of sanitary landfill facilities).

Comments from the Responsible Environmental Solutions Alliance (RESA):

Comment:

In a June 24, 2010 letter to EPA, RESA objected to the issuance of the Proposed Plan before the administrative record (AR) was completed. As a result, RESA requested that the public

comment period be extended until at least 30 days after EPA's notification that the AR for the Proposed Cleanup Plan is complete, and EPA has responded to RESA's FOIA requests, whichever is later.

Response:

In a July 12, 2010 letter to RESA, EPA extended the public comment period 30 days to August 11, 2010. Extending the public comment period is not related to responding to FOIA requests. Also, the AR is not considered complete until the ROD is issued. (However, in some cases, additional documents may be placed in the AR after the ROD is issued.)

Comment:

In a July 30, 2010 letter to EPA, RESA requested that the public comment period be extended until at least August 28, 2010. RESA's rationale for requesting this second extension is that RESA needed more time to review the many documents that EPA included in its June 27, 2010 update to the AR file.

Response:

In an August 6, 2010 letter to RESA, EPA denied a second extension to the public comment period. EPA's main reason for denying RESA's request for a second extension was that, although EPA completed a significant update to the AR file on June 27, 2010, the AR file contained the necessary documents to support the Proposed Plan at the time the Proposed Plan was issued (June 7, 2010).

The following are comments from RESA's August 11, 2010 letter to EPA:

Comment:

In 2002, eight companies known as Responsible Environmental Solutions Alliance or "RESA" entered into a voluntary administrative consent order with U.S. EPA ("the Agency") to conduct a CERCLA remedial investigation and feasibility study ("RI and FS") for the Tremont City Barrel Fill Superfund Site ("the Site"). Eight years and $8 millions dollars later, the RI/FS was completed and the Agency must now make its decision regarding the preferred remedial action for the Site. In June 2010, the Agency announced its preliminary decision to select a remedial action, Alternative 4a, requiring the removal of all of the Site wastes and off-site disposal of all hazardous wastes, and the re-disposal of non-hazardous waste into an on-Site unlined waste cell. The Agency's process in making that decision was fundamentally flawed and inconsistent with the Agency's own regulations for making such decisions, the National Contingency Plan ("NCP"). The Agency's decision was arbitrary and capricious, and should be modified such that the final remedy selected by the Agency is Alternative 7, enhanced containment with liquid waste removal.

Response:

As the responses below will show, EPA's process to arrive at its preferred alternative in the Proposed Plan was not flawed, not inconsistent with the NCP, and not arbitrary and capricious. EPA found Alternative 4a to be the most preferred among the alternatives considered when evaluated against the criteria in the NCP; therefore, EPA chose it as the preferred alternative.

Comment:

After the RI/FS was completed, the Agency Region 5 team that had overseen the Site investigation work by RESA reached the same conclusion that RESA had: the glacial till beneath the Site would protect the deep potable aquifer from potential Site impacts. Based upon that determination, the RESA and the Agency both agreed that Alternative 7, enhanced containment with liquid waste removal, was the preferred remedial alternative. Ohio EPA, the same agency that made a similar determination when it issued a permit for the Site facility in 1976, arbitrarily reversed itself and strongly opposed leaving the wastes in place, even if enhanced monitoring and liquid waste removal systems were to be added. The Agency's National Remedy Review Board ("NRRB") was asked to review the Region 5 team's preliminary decision and provide the NRRB's comments. After its summary review of only a portion of the scientific data, the NRRB raised some "concerns" regarding the recommended remedial action, based upon Agency "precedence" for removing drums and the implementability of Alternative 7, without specifically citing any data or scientific evidence as bases for its concerns. While precedence may be important to the Agency for the purposes of consistency, it does not have the force of regulations or even policy in determining the appropriate remedial action for a Superfund site. In response to pressure from the State and its headquarters-based NRRB, whose roles are limited to those of advisors to the Region 5 team, Region 5 reversed itself and selected a remedial action that requires removal and off-site disposal of all of the hazardous wastes at a vastly higher cost. Region 5 made this new decision despite the fact that no new data had been gathered and no new scientific conclusions were generated. Region 5's decision requiring removal and off-site disposal of all of the hazardous wastes is not based upon any fact, scientific data or conclusion of law and is therefore arbitrary and capricious.

Response:

In 1976, Ohio EPA granted a permit for the specific purpose of disposal of industrial sludges and solids (containerized and uncontainerized) in the 8.5-acre Barrel Fill. Much of the waste that was subsequently disposed of in the Barrel Fill did not comply with the permit. Therefore, it is not accurate to state that, back in 1976, Ohio EPA made a similar determination that enhanced containment with liquid waste removal would be sufficient for remediation. Ohio EPA did not arbitrarily reverse itself by later not agreeing to Alternative 7.

Prior to the NRRB web conference, EPA Region 5 provided the NRRB with a number of Site documents, including the RI Report, the FS, and the FS Addendum. The NRRB reviewed a sufficient amount of scientific data before offering its recommendations for Site remediation. The NRRB considers national consistency of remedies as well as cost effectiveness; therefore, the NRRB considered factors other than national consistency in its evaluation of Alternative 7, such as the evaluation criteria in the NCP. EPA Region 5 was not pressured by the State and the NRRB to change its recommendation from Alternative 7; rather, it considered the input of these entities.

EPA notes that the NCP values use of site-specific data and national consistency to select a proper remedy for a site. 55 FR 8725 of the NCP Preamble states that "the remedy selection process ... promotes national consistency while allowing consideration of important site-specific factors."

EPA's recommendation of removal and off-site disposal of all of the liquid and hazardous wastes is not arbitrary and capricious. EPA relied on its and Ohio EPA's post-RI Report evaluations of RI Report data that showed the permeability beneath the Barrel Fill to be significantly higher than that estimated in the RI Report. EPA also considered the recommendations of the NRRB in ultimately recommending Alternative 4a.

Comment:

The Agency's remedy selection process was fundamentally flawed.

The first question is whether the Agency followed the NCP-required procedures in selecting Alternative 4a for its Proposed Plan ("PP") at the Site. The Agency did not.

Response:

EPA disagrees that it did not follow the NCP-required procedures in selecting Alternative 4a. EPA's responses below support this statement.

Comment:

Prior to selecting a remedy at a site where action is being taken pursuant to CERCLA authority, the Agency must adhere to NCP process requirements in investigating conditions at the site (the RI) and in evaluating the feasibility of implementing the available remedial alternatives against the statutory requirements in CERCLA (the FS). The Agency must then review all of the information generated in the RI and FS and select the appropriate remedial action that will prevent unacceptable risk to human health or the environment. Fundamentally, CERCLA is a science and risk based statute, and the NCP regulations that define the procedures to be used in deciding whether remedial action is required also require consideration of the uncontroverted scientific data and conclusions.

The Agency's preliminary decision to select a waste excavation remedial action was fundamentally flawed because the Agency failed to follow the requirements of the NCP and thereby mischaracterized and misapplied the remedy selection criteria as applied to the excavation remedial alternatives and to the containment with hazardous liquid removal and treatment alternative (Alternative 7). As a result of the Agency's compromising its remedy selection process the Agency reached a wrong conclusion. The Site Administrative Record ("SAR") and SAR file demonstrate that the Agency pre-determined its desired outcome and then inappropriately manipulated the process to reach that outcome.

Response:

The NCP allows EPA to use information outside of the RI Report and FS in the remedy selection process. RESA's implicit and overarching argument that the RI Report may not be refined and

improved by further analysis prior to selection of the remedy ignores the fact that remedy selection is a process that allows for refinement; e.g., 40 C.F.R. § 300.430(d) (risk exposures may be refined throughout the phases of the RI as new information is obtained); 40 C.F.R. §§ 300.515(d)(2), (3), (4) and 300.515(h)(2) (ARARs may be identified at several points in the process); and 40 C.F.R. § 300.430(f)(2)(ii)(A) (after publication of the proposed plan, in which the Agency identifies the preferred alternative, and prior to adoption of the selected remedy, if new information is made available that significantly changes the basic features, the lead agency must address the change and can, depending on the circumstances, include a discussion in the ROD of the significant changes and underlying reasons).

The conclusions in the RI Report were not uncontroverted. That is why EPA and Ohio EPA conducted post-RI Report evaluations of the RI data. These evaluations showed that the RI Report conclusions related to the permeability beneath the Barrel Fill were flawed.

EPA followed the requirements of the NCP and thereby did not mischaracterize and misapply the remedy selection criteria as applied to the excavation remedial alternatives and to Alternative 7. EPA properly evaluated all alternatives against the evaluation criteria in the NCP. The Administrative Record (AR) supports EPA's preferred alternative (Alternative 4a).

Comment:

The Agency initially determined that Alternative 7, enhanced containment with liquid waste removal, was its preferred alternative and recommended Alternative 7 to the NRRB in a document styled "National Remedy Review Board Consideration, Tremont City Barrel Fill Site, August, 2009" ("the NRRB Consideration"). In making this determination and recommendation, the Agency Region 5 team (that has worked on this Site for over eight years) recognized that Alternative 7 equaled or exceeded the effectiveness evaluations of the excavation alternatives while being much more cost effective. The Agency found, appropriately, that there would be no unacceptable risk to human health or the environment if Alternative 7 were to be implemented.

In response to objections by Ohio EPA (the same state agency that permitted the Site facility in the mid-1970s and determined that the location and operations of the facility were protective of human health and the environment) and questions raised by the NRRB which reviewed only a relatively minor part of the SAR, the Agency then went back and reformulated its comparison of the balancing evaluation criteria an attempt to justify its selection of a different remedial alternative that is no more protective of human health and the environment than Alternative 7, but which costs more than twice as much. In August 2009, the Agency determined that Alternative 7 was "long-term effective and permanent." NRRB Consideration at 32. In June 2010, however, it stated that Alternative 7 is "not thought to be fully long-term effective and permanent, because a percentage of the hazardous liquid waste from the Barrel Fill will eventually migrate to the deep sand and gravel aquifer." Proposed Plan at 14. No new studies were done or new data gathered after August 2009 that would even arguably explain such a radical change in the Agency's conclusions regarding Alternative 7. The Agency now attempts to justify spending approximately $57,000,000 on Alternative 4a, or $35,000,000 more than Alternative 7, by merely reciting some undefined "percentage" without even attempting to quantify any risk that would be mitigated by that expenditure. As explained below, the NCP

requires that decisions on remedial action be based upon an estimation of risks. The Agency's selection of Alternative 4a has no such basis.

Response:

Based on the operations at the Barrel Fill in the late 1970s, Ohio EPA never determined that these operations were protective of human health and the environment.

EPA Region 5 did not re-formulate its comparison of the balancing criteria after conferring with the NRRB. There are degrees of long-term effectiveness and permanence. Stating that an alternative is long-term effective and permanent does not contradict later saying that the alternative is not thought to be fully long-term effective and permanent. EPA determined, as documented in the Proposed Plan, that Alternative 4a was more long-term effective and permanent than Alternative 7. EPA also determined that Alternative 4a has a higher degree of long-term protectiveness than Alternative 7. With Alternative 7, all parties agree that groundwater contamination will reach the deep sand and gravel aquifer; although uncertainty exists as to what the contaminant concentrations will be.

It is true that EPA based its decision to favor Alternative 4a over Alternative 7 partially because of the unquantified future risk associated with the exposure pathway to the deep sand and gravel drinking water aquifer. This risk was not quantified in the RI Report. EPA's estimation of this risk was qualitative, not quantitative.

Comment:

In fact, the only quantification of the possible impact on the deep aquifer in the SAR determined that *no significant* quantities of Barrel Fill wastes will ever reach that aquifer, regardless of remedy selected. See discussion and analysis in Section II below at pages 15-23. A fate and transport evaluation of the movement of the wastes through the till beneath the Site indicated that any wastes released from the Site would be attenuated to such an extent that virtually none would ever reach the deep aquifer. Thus, even under conservative worst case scenarios, there will be no unacceptable risks to the deep aquifer. The Agency's conclusion that an additional $35,000,000 must be spent to protect an aquifer that is already protected is arbitrary and capricious.

Response:

EPA, in consultation with Ohio EPA, determined that this quantification of impact on the deep sand and gravel aquifer in the RI Report was based on an unreasonably low estimate of permeability in the RI Report. Therefore, since EPA determined that the permeability beneath the Barrel Fill was greater than that estimated in the RI Report, the future risk from potable use of the deep sand and gravel aquifer is greater. EPA based this determination on post-RI Report evaluations of the RI Report data.

Comment:

The Agency Arbitrarily Overrated Excavation Alternatives and Underrated Alternative 7

A comparison of the Agency's evaluation of the remedial alternatives in August 2009, with its conclusions in June 2010, demonstrates how the Agency misappropriated valid scientific conclusions in trying to belatedly justify its selection of Alternative 4a. In selecting the preferred remedial alternative, the NCP requires that the Agency evaluate each alternative in the FS based upon nine criteria. The first two criteria are threshold criteria: 1) overall protection of human health and the environment; and 2) compliance with applicable or relevant and appropriate requirements. These threshold criteria must be met for an alternative to be considered further. The next five criteria are "primary balancing criteria" and are comprised of: 3) long-term effectiveness and permanence; 4) reduction of toxicity, mobility or volume through treatment; 5) short-term effectiveness; 6) implementability; and 7) cost. The final two criteria are modifying criteria: 8) State acceptance and 9) community acceptance. These final two criteria cannot be applied until after closing of the public comment period. 40 C.F.R. § 300.430(f)(1).

In its August 2009 submission to the NRRB, the Region 5 team correctly determined that Alternative 7 met the threshold criteria, and after applying the balancing criteria, was the preferred remedial action. By June 2010, Region 5 in its Proposed Plan described Alternative 4a as being preferred after it arbitrarily changed the evaluation of Alternative 7 against some of the balancing criteria. A review of the Agency's comparative analysis provided in its Proposed Plan and other documents contained in the SAR as well as documents provided by the Agency under Freedom of Information Act requests illuminates this arbitrary change:

- **Criterion 1, Protection of Human Health and the Environment:** All alternatives[1] protect human health and the environment and are consistent with RESA's Table 10 (July 2008 FS Report) and Table 8 (April 2009 FS Addendum Report).

- **Criterion 2, Compliance with ARARs:** All alternatives comply with ARARs, although Alternative 5a requires a waiver, and the alternatives are generally consistent with RESA's Table 10 (July 2008 FS Report) and Table 8 (April 2009 FS Addendum Report).

- **Criterion 3, Long-Term Effectiveness and Permanence:** The NCP states the following with respect to this balancing criterion:

> Alternatives shall be assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. Factors that shall be considered, as appropriate, include the following:
>
> (1) Magnitude of residual risk remaining from untreated waste or waste residuals remaining at the conclusion of the remedial activities. The characteristics of

[1] Unless otherwise noted and for purposes of this document, the No Action alternative is not being considered as an alternative.

> the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility and propensity to accumulate.
>
> (2) Adequacy and reliability of controls such as containment systems and institutional controls to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential to replace technical components of the alternative such as a cap, a slurry wall, or a treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.

40 C.F.R. § 300.430(e)(9)(iii)(C).

- The Agency's cleanup option comparison chart in its Proposed Plan, which shows how well the remedial alternatives meet the criteria for selection of the appropriate remedial action, rates the FS's three containment alternatives and five excavation alternatives equally regarding the two threshold criteria. Proposed Plan at 16. However, the Agency then inappropriately underrated the Alternative 7 and overrated the excavation alternatives on how well they meet the balancing criteria. In its presentation to the NRRB, Region 5 determined that Alternative 7 "is long term effective and permanent." NRRB Consideration at 32. Region 5 also determined that Alternative 7 "reduces the majority of the toxicity, mobility, and volume of liquid principal threat waste by extracting and treating the liquid waste." Id. Despite those determinations, Region 5 in its Proposed Plan said, inexplicably, that Alternative 7 does *not* fully meet criteria 3 and 4, long term effectiveness, and reduction of toxicity, mobility, or volume, while stating that the excavation alternatives all met those criteria. Proposed Plan at 14, 16. One can only conclude that Region 5 caved to the pressure from the State and the NRRB and changed its determination even though there was no new scientific evidence or data that could be used to try to justify such a change. Making that change in response to pressure from advisors renders the Agency's selection of Alternative 4a arbitrary and capricious.

Response:

EPA did not inappropriately underrate Alternative 7 and overrate the excavation alternatives in meeting the balancing criteria after conferring with the NRRB. Stating that an alternative is long-term effective and permanent; then, later stating that it is not fully long-term effective and permanent is not contradictory, since there are degrees of long-term effectiveness and permanence.

Similarly, EPA's evaluation of Alternative 7 for reducing toxicity, mobility, or volume of hazardous substances through treatment is not inexplicable. EPA Region 5 told the NRRB that Alternative 7 reduces the majority of the toxicity, mobility, and volume of liquid principal threat

waste. This is not contradictory with the Proposed Plan, which states that Alternative 7 does not address all liquid waste and solid hazardous waste; therefore, Alternative 7 is shown in the Proposed Plan as partially meeting this reduction criterion.

Comment:

- The fact that the Agency arbitrarily changed the scientific conclusions in the SAR and its own correct conclusions on remedy selection is demonstrated by its attempt to justify the selection of Alternative 4a by reference to an unquantified alleged risk to the deep aquifer. The Agency in its Proposed Plan indicates that Alternative 7 is "not thought to be fully long-term effective and permanent, because a percentage of the hazardous liquid waste from the Barrel Fill will eventually migrate to the deep sand and gravel aquifer, which is a potable water source." PROPOSED PLAN at 14. This statement relates to the magnitude of residual risk that is to be considered under the long-term effectiveness and permanence criterion in the NCP. In evaluating the magnitude of residual risk, however, the RI (which was approved by the Agency) stated that *there is no risk from the migration of contaminants to the deep sand and gravel aquifer even with no remedial action.* See analysis in Section II below at pages 11-15. In other words, the magnitude of residual risk to the deep sand and gravel aquifer from all remedy alternatives is within acceptable limits.

Response:

Please see previous Responses. EPA did not arbitrarily change scientific conclusions in the AR. EPA developed alternate conclusions related to the permeability beneath the Barrel Fill after EPA, in consultation with Ohio EPA, determined that the relevant conclusions in the RI Report were flawed.

Although the risk to the deep sand and gravel aquifer is unquantified, EPA determined that this risk must be considered when evaluating remedial alternatives. Although the RI Report stated that there is no risk from the migration of contaminants to the deep sand and gravel aquifer even with no remedial action, EPA later determined, in consultation with Ohio EPA, that this conclusion was based on an unreasonably low estimate in the RI Report of the permeability beneath the Barrel Fill.

Comment:

- Based on the above and using the rationale provided in the Proposed Plan, a comparison of long-term effectiveness and permanence indicates that Alternatives 4 through 7 are comparable and Alternatives 2 and 3 are less long-term effective and permanent. Without any new evidence or data being submitted to the SAR, the Agency nevertheless reversed its decision on the long-term effectiveness of Alternative 7. Such a reversal cannot be made without providing a basis in the SAR.

Response:

Based on EPA's evaluation of the alternatives, Alternative 7 is not as long-term effective and permanent as the excavation alternatives, because a percentage of the liquid waste will migrate to the deep sand and gravel aquifer under Alternative 7. EPA determined that Alternatives 2 and 3 would not be long-term effective and permanent, because a greater percentage of liquid waste would migrate to the deep sand and gravel aquifer than under Alternative 7. As indicated in previous Responses, EPA did not reverse its decision on the long-term effectiveness and permanence of Alternative 7. The administrative record contains the documents that support EPA's conclusions.

Comment:

- **Criterion 4, Reduction of Toxicity, Mobility or Volume Through Treatment:** The ranking of this criterion by the Agency is consistent with RESA's Table 10 (July 2008 FS Report) and Table 8 (April 2009 FS Addendum Report).

Response:

Evaluations in the FS and FS Addendum were modified by EPA in its approval with modifications letters; EPA's ranking of the criterion in question is consistent with these approval with modifications letters.

Comment:

- **Criterion 5, Short-term Effectiveness:** The Agency's equal ranking of Remedial Alternatives 4 through 6 and Remedial Alternative 7 on short-term effectiveness is inappropriate because:

  - The short term risks to which the community would be exposed during implementation of Alternatives 4 through 6 obviously are much greater than for Alternative 7. Alternatives 4 through 6 would require a much greater number of trucks and miles traveled than Remedial Alternative 7 would. (July 2008 FS Report, Appendix F) The risk to the community of traffic injuries and fatalities is directly related to the number of trucks and the number of miles traveled to complete the remedy as they relate to traffic injuries and fatalities. The type of materials hauled in trucks may have some relevance, but is much less significant than truck number and miles traveled when evaluating overall short-term risk to the community. Accordingly the statement in the Proposed Plan that "Alternative 7 presents short-term risks from ... transporting hazardous liquid off-site" is of little significance and no basis of comparison to the other remedy alternatives is provided. Proposed Plan at 14.

  - The potential adverse impacts on workers during remedial action are much greater, and the effectiveness and reliability of protective measures are much less, for Alternatives 4 through 6 than Alternative 7 because:

- Alternatives 4 through 6 require far more work hours to implement than Alternative 7 and are therefore riskier based solely on number of hours worked regardless of any protective measures that may be employed.

- The type of work activities necessary to expose, excavate, handle, sample, transport and dispose of over 50,000 drums and large volumes of uncontainerized liquid wastes inherently have far more occupational risk associated with them than the installation and operation of 50 sumps adjacent to waste cells even if the sumps were installed using excavation techniques.[2]

- The potential environmental impacts of the remedial action and the effectiveness and reliability of protective measures are considered to be relatively equal for Alternatives 4 through 6 and Alternative 7. All of these measures will require hauling solids and liquids, although Alternative 7 will likely entail the hauling of more liquids over the course of the remedy than Alternatives 4 through 6. Alternatives 4 through 6, however, would necessitate the hauling of far more total waste during remedy implementation.

- Alternative 7 will require less time to implement than Alternatives 4 through 6.

- The Agency recognizes that greenhouse gas emissions for Alternative 7 would be less than for Alternatives 4 through 6. Proposed Plan at 14.

- The above analysis clearly demonstrates that Alternative 7 achieves greater short-term effectiveness than Alternatives 4 through 6.

Response:

EPA's evaluation of short-term effectiveness for the excavation alternatives in relation to Alternative 7 is as follows:

There are some concerns regarding short-term effectiveness for the excavation alternatives. It would take about two years to remove and treat the principal threat waste. Short-term risk to workers could be significant during excavation and on-site treatment activities (on-site treatment for Alternatives 5, 5a, 5b, and 6); although, health and safety measures would be in place and likely would provide adequate safety. Risk to the community would exist from trucking hazardous waste off-site. Airborne risk to the community for Alternatives 5, 5a, 5b, and 6 would exist from operation of an on-site HTTD system; although, safeguards would be in place. Risk would exist from potentially contaminating the 1075 Intertill during excavation activities; although, dewatering the waste cells would minimize this risk.

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[2] The sumps in Alternative 7 could be installed using an excavator instead of a drill rig. Such details are more appropriately considered during remedial design than during remedy selection.

Alternative 7 presents significant short-term risks. The installation of the sumps at the bottom and the edge of the cells will require drilling through Barrel Fill hazardous waste; this operation may pierce drums of hazardous waste. Proper placement of the sumps will be difficult. Risk to the community will exist from transporting the collected liquids off-site for treatment.

It is expected that Alternative 7 would have less greenhouse gas emissions overall compared to the excavation alternatives.

Based on this evaluation, Alternative 7 would be similar in short-term effectiveness to the excavation alternatives.

Comment:

- **Criterion 6, Implementability:** The Agency's equal ranking of Remedial Alternatives 4 through 6 and Remedial Alternative 7 on implementability is inappropriate because:

  - The level of difficulty associated with implementing Alternative 7 compared to Alternatives 4 through 6 is much lower. The level of difficulty in excavating, removing and disposing of over 50,000 drums submerged in liquid wastes that are buried more than 10 feet deep is clearly extremely high. In comparison, Alternative 7's installation and operation of sumps adjacent to waste cells is much more easily and safely accomplished. The installation of sumps uses proven standard techniques including Geoprobe drilling and geophysics. Further, sumps are commonly used to remove, and have proven to be successful in removing, liquids from landfills as part of leachate collection systems.

  - The difficulty of implementing additional remedial actions, if ever necessary, associated with Alternative 7 has been overrated. As Alternative 7 is implemented, most of the liquid wastes will be removed as they are released from drums (sumps), and the water table inside the cells will be lowered by operation of the cutoff and water table capture systems. Excavation activities in these conditions will be much easier and safer than in the conditions envisioned for Remedial Alternatives 4 through 6. Although there will be future drum degradation, the drum contents will be contained by the low-permeability environment in which they are located and will be removed by the redundant liquid waste/groundwater capture and pumping systems that would be installed. In addition, the methods and health and safety procedures that would be required to excavate and handle drums in their current condition will essentially be the same as a future action to remove waste not contained in drums. In other words, all the health and safety methods and procedures to handle the drums will be at a high level of difficulty to implement regardless of the condition of the drums.

  - The effectiveness of Alternative 7 will be monitored using established methods in use at many landfill sites, including evaluation of the volume and quality of leachate collection from the sumps and the water table interceptor system in the 1075 Intertill, and in monitoring groundwater quality.

- In addition, conducting a pilot study to provide information on the constructability and performance of the sumps could alleviate many of the Agency's stated concerns regarding implementability issues. In fact, a review of documents received from the Agency through FOIA requests shows the Agency's willingness to consider the value of conducting a pilot study to aid with implementability determinations. The NRRB indicated in comments on draft documents that pilot tests on Alternative 7 sump installation and operation should be undertaken. However in its final document titled "National Remedy Review Board Recommendations for the Tremont City Barrel Fill," the NRRB decided to omit an overt recommendation of pilot testing because of concerns that such a recommendation could bind the Agency to perform a pilot test and implementation would take too much time. These concerns were illustrated by a comment made by Meredith Fishburn of the Agency's Office of Site Remediation and Technology Innovation ("the OSRTI") on the recommendation of a pilot study: "If the Region chooses to not take the Board's recommendation [to conduct a pilot test], this information likely can be used by parties to claim that the Region's decision was arbitrary and/or capricious."

- The above analyses clearly demonstrate that Alternative 7 achieves greater implementability than Alternatives 4 through 6.

Response:

EPA's evaluation of implementability for the excavation alternatives in relation to Alternative 7 is as follows:

The excavation alternatives would be implementable, but difficult. Significant coordination among numerous parties, such as local government agencies, traffic control, contractors, and disposal facilities would be required. There is a concern about excavating the large volume of waste in an unstable setting (waste cells are steep and narrow; cell walls collapsed during the RI field work); although, proper excavation procedures would be followed. For excavation Alternatives 4a, 4b, 5, 5a, and 5b, construction of an on-site landfill would be readily implementable. Construction and operation of an HTTD system on-site for Alternatives 5, 5a, 5b, and 6 is implementable; although, few vendors may be available.

For Alternative 7, collection, treatment, and discharge of groundwater are readily implementable using proven technologies. Significant implementation concerns exist for Alternative 7, as discussed below. Installing collection and diversion trenches is readily implementable. Some coordination with regulatory agencies would be required in the disposal of contaminated or treated groundwater.

Institutional controls are readily implementable for alternatives where waste is left on-site (all except Alternatives 4 and 6). Currently, deed restrictions are in place prohibiting the development of wells or use of groundwater from the Site for anything other than remedial investigation and work, and also prohibiting construction of residences on the Site. Additional institutional controls such as enforceable environmental covenants could be used to enhance those already in place and would be easily implemented once a final remedy decision is in place.

Such restrictions will require the participation of governmental, environmental, and land use agencies, and the Site property owner.

For Alternative 7, although pre-design investigation would attempt to determine the topographic low point of each waste cell using established drilling techniques and geophysics, the implementability of this technology in this setting is unproven and uncertain. There are concerns about how sumps can be installed into areas of hazardous waste, whether the sumps can be optimally located in relation to the waste cells and the bottom of the waste to collect liquid, and to what extent the clogging of the sump screens over time will affect efficiency of liquid collection. There will be no way to monitor the effectiveness of liquid collection because there will be no way to accurately determine the percentage of liquid collected. If this alternative does not work properly, it will be difficult to implement a subsequent, effective remedial action, because the integrity of the drums will have already been compromised, and hazardous liquid wastes, previously contained, will now be released to the environment.

Based on this evaluation, Alternative 7 would be similar in implementability to the excavation alternatives.

EPA does not believe that a pilot study of Alternative 7 would be of benefit. Performance of a pilot system of a small number of sumps and other Alternative 7 components would not necessarily be indicative of the performance of the full-scale system. Furthermore, there would be no way of knowing how efficient the pilot sumps would be to collect liquid, in terms of knowing the percentage of liquid collected.

Comment:

- **Criterion 7, Cost:** The ranking of this criterion by the Agency is consistent with RESA's Table 10 (July 2008 FS Report) and Table 8 (April 2009 FS Addendum Report).

Response:

EPA agrees with this statement.

Comment:

- **Criteria 8 and 9, Community and State Acceptance:** These modifying criteria can only be applied after the public comment period closes.

Response:

These criteria can be fully applied only after the public comment period closes.

Comment:

In sum, RESA's evaluative comparisons of the cleanup options in its draft FS and FSA and the Agency's evaluative comparisons in August 2009 match up almost perfectly. The result was the Agency's recommendation of Alternative 7 as the preferred cleanup option in its submission to

the NRRB. Only after the NRRB raised "concerns" and the State objected did the Agency arbitrarily and without scientific support revise its evaluative comparisons between Alternatives 4 through 6 and Alternative 7 to ensure that an excavation alternative could be selected. In essence, the Agency "cooked the books" to reach a desired outcome. Such a process is not contemplated by the NCP and is arbitrary and capricious.

Response:

Please see previous Responses. After conferring with the NRRB, EPA did not arbitrarily and without scientific support revise its evaluative comparisons between Alternatives 4 through 6 and Alternative 7 to ensure that an excavation alternative could be selected. However, EPA considered the NRRB's recommendations on cost-effectiveness and national consistency of Alternative 7.

Comment:

The Agency compromised its remedy selection process in its detailed comparative analysis of the options.

In addition to the analysis above, the Agency failed to comply with the NCP in its detailed comparative analysis of the alternatives. The NCP states that "The detailed analysis consists of an assessment of individual alternatives against the nine evaluation criteria and a *comparative analysis that focuses upon the relative performance of each alternative against those criteria.*" 40 C.F.R. § 400.430(e)(9) (emphasis added). The essential element missing from the Agency's comparative analysis is the relative performance of each alternative when they are compared with one another. As stated in the Agency's Guidance for Conducting RI/FS Under CERCLA: "The purpose of this comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another so that the key tradeoffs the decision maker must balance can be identified." EPA/540/G-89/004OSWER Directive 9355.3-01 October 1988.

Response:

The FS and FS Addendum, as approved with modifications by EPA, along with EPA's Proposed Plan, includes a comparative analysis of the alternatives against the criteria in the NCP.

Comment:

The Comparison Chart in the Proposed Plan on page 16 and presented at the June 22, 2010 Public Meeting in PowerPoint slide 38 in fact does not compare the alternatives with each other, but simply states the level at which each alternative complies with the individual evaluation criteria. This deficiency was noted by the OSRTI (comments by Ernie Watkins, Amy Legare, and Melanie Culp on the draft Tremont City Barrel Fill Site Fact Sheet / Proposed Plan) where it states "[t]he evaluation of the nine criteria chart, while informative, does not adequately characterize to what extent each alternative fulfills the criteria. Specifically, it is not clear how those alternatives that "partially" or do not fulfill the criteria requirements fail to measure up. Nine criteria evaluations need to be expressed in text form rather than symbolically."

Response:

The EPA Proposed Plan (fact sheet and long version) issued to the public contained a sufficient level of detail to compare the alternatives. The comments from OSRTI refer to a draft version of the Proposed Plan. OSRTI later agreed to the final version of the Proposed Plan.

Comment:

RESA in the draft FS and FSA utilized a text format in its chart comparing the alternatives against each other. This text format is much more typical of the format used by Region 5 at other Superfund sites than is the symbol format used by the Region in this case. Converting the text form in the draft FS to the symbolic chart form, and utilizing a similar system that compares the alternatives with the criteria, yields a revised chart. The key elements of the text in the comparison are:

1. All alternatives meet the threshold criteria of protection of human health and the environment and compliance with ARARs, which means they all are all eligible for further selection consideration based on the comparative evaluation of the balancing criteria provided above.

2. The excavation remedies provide the highest level of long-term effectiveness and permanence and reduction of toxicity, mobility or volume through treatment, followed closely by Alternative 7, with Alternatives 2 and 3 providing the lowest level when the alternatives are compared to one another.

3. Alternatives 2 and 3 provide the highest level of short-term effectiveness and implementability, followed by Alternative 7, with the excavation alternatives providing the lowest level when the alternatives are compared to one another.

4. Alternatives 2 and 3 are the lowest cost alternatives with Alternative 7 falling into the mid-range cost and the excavation alternatives being the most costly.

Response:

The long version of the Proposed Plan that EPA issued to the public contains a similar level of depth as indicated above; however, EPA does not agree completely with the comparative analysis in the comment above. See previous Responses. The format of the Proposed Plan that EPA issued for this Site is typical for that used for other Region 5 Superfund sites. EPA decided to use the long version as well as the fact sheet to better explain the subject matter.

Comment:

Further the NCP states that "Each remedial action selected shall be cost-effective. Cost effectiveness is determined by evaluating the following three of the five balancing criteria noted in the NCP to determine overall effectiveness: long-term effectiveness and permanence, reduction in toxicity, mobility, or volume through treatment, and short-term effectiveness. Overall effectiveness is then compared to cost to ensure that the remedy is cost effective: "[a]

remedy shall be cost effective if its cost is proportional to its overall effectiveness." 40 C.F.R. § 300.430(f)(1)(i)(B).

Based on the above, Alternative 4a as well as the other excavation alternatives should not have been considered cost effective, particularly when compared to Alternative 7. Given the excavation alternatives' low ranking of short-term effectiveness and the comparable ranking of Alternative 7 with respect to long-term effectiveness and permanence, Alternative 7 is clearly the most cost effective.

Response:

Cost-effectiveness compares the effectiveness of an alternative in proportion to its cost of providing environmental benefits. EPA does not consider Alternative 7 to be as cost-effective as Alternative 4a because Alternative 7 is not as long-term effective and permanent, and does not reduce the toxicity, mobility, or volume of hazardous substances through treatment as well as Alternative 4a.

Comment:

In sum, the Agency's Region 5 Site team correctly and appropriately determined after a review of the complete SAR that Alternative 7 met the NCP requirements as the preferred remedial alternative. The State and NRRB in their advisory roles then raised baseless concerns about that determination. Region 5 caved in to the resulting pressure and reversed itself by selecting Alternative 4a in its Proposed Plan. No new scientific evidence or data was added to the SAR to provide a basis for this reversal. Instead the Agency then went back and changed its conclusions and determinations in comparing the remedial alternatives by overrating the excavation alternatives and underrating the containments alternatives. The Agency picked its remedy, *then* created unsupportable conclusions as it manipulated the record in an attempt to back up that decision. Such a decision-making process is fundamentally flawed, is not consistent with the NCP, and is arbitrary and capricious.

Response:

As indicated in previous Responses, EPA followed the NCP properly to arrive at its preferred alternative. None of EPA's conclusions regarding its evaluation of remedial alternatives are unsupported. EPA did not overrate the excavation alternatives and underrate the containment alternatives. EPA changed its recommended alternative from Alternative 7 to Alternative 4a after conferring with the NRRB, because the NRRB raised concerns of national consistency of remedy selection and emphasized concerns of how well Alternative 7 would meet the NCP evaluation criteria.

Comment:

The Agency's selection of Alternative 4a is not supported by the Site scientific evidence.

As stated above, the SAR contains no data or scientific evidence upon which the Agency could base its conclusion that excavation of the Site wastes is necessary. There are no quantitative assessments of risk or even potential risk to human health or the environment upon which such a

decision could be justified. For this reason, the Agency fails to meet the threshold requirement that would authorize it to choose a remedial action in the first place: that the site poses an unacceptable risk to human health or the environment. In fact, the only data in the RI and in the SAR reaches the opposite conclusion: that there is no long or short-term risk of exposure to Site contaminants in the potable (deep) aquifer. Instead, the Agency relies upon unsupported statements such as "[h]owever, since approval of the RI Report, EPA has concluded that contaminant migration to the lower groundwater zone is likely to occur in the future, absent remedial controls. Therefore, EPA has considered the deep sand and gravel aquifer potable use exposure pathway in its evaluation of remedial alternatives." Proposed Plan at 6. The Agency's selection of Alternative 4a, is not, and cannot be supported by a fundamentally flawed and baseless conclusion regarding the potential future risk to the deep aquifer. That faulty conclusion in turn is based upon two invalid assumptions, neither one of which is supported by scientific data: 1) that the conductivity of the tills beneath the Site will allow significant quantities of wastes to reach the aquifer in a reasonable time and at levels that would cause unacceptable risk; and 2) that containment in place with liquid removal is an unproven technology to treat principal threat wastes.

Response:

RESA is incorrect in saying that EPA failed to meet the threshold requirement that would authorize it to choose a remedial action because the Site does not pose an unacceptable risk to human health or the environment. The RI Report identified significant, future risk to human health and the environment; therefore, a remedial action is required.

It is true that EPA based its decision to recommend Alternative 4a partially because of the unquantified future risk associated with the exposure pathway to the deep sand and gravel drinking water aquifer. This risk was not quantified in the RI Report. EPA's estimation of this risk was qualitative, not quantitative. There are a number of documents in the administrative record that discuss the risk to human health from future, potable use of the deep sand and gravel aquifer.

EPA concluded, through its and Ohio EPA's post-RI Report evaluations, that migration of contamination to the deep sand and gravel aquifer is inevitable. Uncertainty exists as to what the contaminant concentrations will be when contamination reaches this aquifer. EPA estimated the corresponding time of travel to be significantly less than that estimated in the RI Report, because EPA, in consultation with Ohio EPA, determined that some of the conclusions in the RI Report related to vertical hydraulic conductivity were flawed and resulted in an unreasonably low estimate of this conductivity.

EPA remains convinced that the Alternative 7 method of extracting liquid from a Barrel Fill via vertical sumps alongside waste cells and portable pumps is an unproven technology. EPA's stance is further explained in its February 10, 2010 FS Addendum approval with modifications letter and other documents in the administrative record.

Comment:

Lack of Required Quantitative Risk Assessment

The Agency approved an RI that concluded that a calculation of risk or potential risk to the deep aquifer was not required because the very long travel times and substantial attenuation factors for contaminants traveling to the deep aquifer made it virtually impossible that Site contaminants would reach the deep aquifer in significant quantities. However, in the June 2010 Proposed Plan, the Agency now indicates that Alternative 7 is not "thought to be fully long-term effective and permanent, because a percentage of the hazardous liquid waste from the Barrel Fill will eventually migrate to the deep sand and gravel aquifer, which is a potable water source." Proposed Plan at 14. A review of the Agency's comparative chart of the alternatives indicates that Alternative 7 "partially meets" the long-term effectiveness and permanence criteria. Proposed Plan at 16. There are no materials in the SAR on which the Agency could base such a reversal of its conclusions.

The NCP requires the following in its evaluation of long-term effectiveness and permanence, as demonstrated by the following relevant sections:

> (C) Long-term effectiveness and permanence. Alternatives shall be assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. Factors that shall be considered, as appropriate, include the following:
>
> (1) Magnitude of residual risk remaining from untreated waste or waste residuals remaining at the conclusion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility and propensity to accumulate.
>
> (2) Adequacy and reliability of controls such as containment systems and institutional controls to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential to replace technical components of the alternative such as a cap, a slurry wall, or a treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.

40 C.F.R. § 300.430(e)(9)(iii)(C)(1, 2). As provided above, the first criterion that shall be considered is the "magnitude of residual risk remaining from untreated waste or waste residuals remaining at the conclusion of the remedial activities." The magnitude of risk, as provided in the NCP, is a component of the RI/FS process as follows:

> (d)(1) The purpose of the remedial investigation (RI) is to collect data necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives. To characterize the site, the lead agency shall, as appropriate, conduct field investigations, including treatability studies, and conduct a baseline risk assessment. The RI provides information to assess the risks to human health and the

> environment and to support the development, evaluation, and selection of appropriate response alternatives. Site characterization may be conducted in one or more phases to focus sampling efforts and increase the efficiency of the investigation. Because estimates of actual or potential exposures and associated impacts on human and environmental receptors may be refined throughout the phases of the RI as new information is obtained, site characterization activities should be fully integrated with the development and evaluation of alternatives in the feasibility study.
>
> (d)(2) The lead agency shall characterize the nature of and threat posed by the hazardous substances and hazardous materials and gather data necessary to assess the extent to which the release poses a threat to human health or the environment or to support the analysis and design of potential response actions by conducting, as appropriate, field investigations to assess the following factors:
>
> (i) Physical characteristics of the site, including important surface features, soils, geology, hydrogeology, meteorology, and ecology;
> (ii) Characteristics or classifications of air, surface water, and ground water;
> (iii) The general characteristics of the waste, including quantities, state, concentration, toxicity, propensity to bioaccumulate, persistence, and mobility;
> (iv) The extent to which the source can be adequately identified and characterized;
> (v) Actual and potential exposure pathways through environmental media;
> (vi) Actual and potential exposure routes, for example, inhalation and ingestion; and
> (vii) Other factors, such as sensitive populations, that pertain to the characterization of the site or support the analysis of potential remedial action alternatives.
>
> * * *
>
> (d)(4) Using the data developed under paragraphs (d)(1) and (2) of this section, the lead agency shall conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to ground water or surface water, releasing to air, leaching through soil, remaining in the soil, and bio-accumulating in the food chain. The results of the baseline risk assessment will help establish acceptable exposure levels for use in developing remedial alternatives in the FS.

40 C.F.R. § 300.430(d)(1, 2, 4). The NCP clearly requires that the Agency assess risks as the basis for making a decision that remedial action is required. The Agency appropriately approved the RI's conclusion that such a specific risk assessment was not required for the deep aquifer

based on the lack of threat to that aquifer. The Agency then reversed itself and selected Alternative 4a without performing the required risk assessment on which to base such a decision.

Response:

Before selecting a remedy, the NCP allows EPA to consider additional information. RESA's implicit and overarching argument that the RI Report may not be refined and improved by further analysis prior to selection of the remedy ignores the fact that remedy selection is a process that allows for refinement; e.g., 40 C.F.R. § 300.430(d) (risk exposures may be refined throughout the phases of the RI as new information is obtained); 40 C.F.R. §§ 300.515(d)(2), (3), (4) and 300.515(h)(2) (ARARs may be identified at several points in the process); and 40 C.F.R. § 300.430(f)(2)(ii)(A) (after publication of the Proposed Plan, in which the Agency identifies the preferred alternative, and prior to adoption of the selected remedy, if new information is made available that significantly changes the basic features, the lead agency must address the change and can, depending on the circumstances, include a discussion in the ROD of the significant changes and underlying reasons).

On the issue of EPA not using the results of the RI Report risk assessment that concludes that there is no future risk to potable use of the deep sand and gravel aquifer, this conclusion was based on an inaccurate and unreasonably low estimate in the RI Report of the vertical hydraulic conductivity beneath the Barrel Fill. EPA, in consultation with Ohio EPA made this determination after performing post-RI Report evaluations of the RI data.

Documents exist in the administrative record to support EPA's stance that a containment remedy such as Alternative 7 would not be fully long-term effective and permanent because it would allow a percentage of the contaminated liquid from the Barrel Fill to reach the deep sand and gravel aquifer, which is a potable water source.

Comment:

This risk pathway was not quantified in the approved RI Report because such risks were clearly not significant. RESA provided calculations in the July 2008 FS that results in a dilution factor of approximately 4.87 million if contaminants were to migrate from the bottom of the waste cells to the deep sand and gravel aquifer. Applying this dilution factor to the highest concentration of any constituent found in any sample from the Site (and not adjusting for constituent solubility) does not result in a single exceedance of an MCL in the deep sand and gravel aquifer. MCLs define the cleanup standard that must be met in potable aquifers. The long travel times of contaminants coupled with the associated dilution through the low permeability tills beneath the Site made it intuitively obvious that risk quantization was not required. Using the most conservative (protective) assumptions, re-calculated values of travel time (without any attenuation) and dilution (as the only attenuation factor) that are post-RI Report (based on a 10^{-8} cm/sec vertical permeability, the thinnest till section along with the thinnest intertill section and connectedness of intertills as evidenced by "most of their flow being horizontal") provide the following:

- Calculated contaminant travel times on the order of several hundred years.
- Dilution of contaminants on the order of 4.8 million times.

The result is the same – a clear conclusion that there is no risk to the deep sand and gravel aquifer from any downward migration of contaminants from the Barrel Fill.

To further demonstrate this concept, RESA performed an analysis of the effects of dilution on contaminant concentration of Barrel Fill constituents even if they could migrate to the deep sand and gravel aquifer. This analysis is based on the dilution factor derived from a 10^{-8} cm/sec vertical hydraulic conductivity of the till and the average thickness of the intertills as measured in the field. Applying that dilution factor to the highest concentration of any constituents detected in any sample at the Barrel Fill (and not accounting for constituent solubility) does not result in a single exceedance of an MCL in the deep sand and gravel aquifer.

Given the above, it follows that:

1. The Agency has not completed NCP required risk assessments with respect to exposures of contaminants in the deep sand and gravel aquifer and has no basis to assert that "[u]nacceptable risk, in the event of a potential, future release to receptors of the deep sand and gravel aquifer." (June 22, 2010 EPA PowerPoint, slide 21.)

2. Utilizing data from the Barrel Fill, undisputed hydrogeologic parameters based on the SAR, and assuming no remedial action is undertaken, not a single exceedance of an MCL[3] is predicted for contaminants that might migrate from the Barrel Fill to the deep sand and gravel aquifer. This is further evidence that the Agency's statements regarding risk associated with the deep aquifer are without merit.

The lack of a quantitative risk assessment was not lost on the NRRB, as it noted the following in review of the Region 5 recommended remedial action, Alternative 7:

> Our document makes an obscure reference at the bottom of page 2 and top of page 3 that future, unacceptable risk to human health or the environment may occur from the following exposure scenarios. This being said, we do not have a clear statement that the potential for drums eventually leaking to groundwater and surface water is the risk trigger for taking this proposed action at the site. This type of statement is definitely required. We also would like to see statements that the risk may occur statement made on page 2 is backed up by statements that all these bulleted future risks are outside of EPA's acceptable risk range, and then provide actual risk numbers in this section. Clarity on why this action is needed and why our Agency is taking an action at this site is lacking in this draft.
>
> It is unclear from the limited information presented in the document how deep the contamination flows from within the barrel fill, or how it has no discernable effect on groundwater. We state that a lower drinking water aquifer is not showing an impact but how extensive was it tested? Additionally, it should be stated (for remedial action objective purposes) if the contamination exists in a

[3] MCLs are appropriately characterized as an ARAR from the Safe Drinking Water Act, and the analysis provided herein does not constitute a risk assessment.

> drinking water aquifer so that the remedy will need to meet MCLs. The public should know if we plan to restore groundwater at the site.

See 3/5/10 Ernie Watkins of OSRTI e-mail to Ron Murawski, attaching OSRTI's comments, at pp. 1-2, attached as Exhibit 2.

There is no evidence in the SAR that the Agency conducted the risk assessments as required in the NCP to arrive at the following statement: there is an "[u]nacceptable risk, in the event of a potential, future release, to receptors of the deep sand and gravel aquifer – not quantified in the risk assessment." (U.S. EPA PowerPoint presentation, June 22, 2010, slide 21). Yet that statement provides the entire and only justification for selection of Alternative 4a over Alternative 7. In sum, the Agency in its Proposed Plan selects a remedial action purportedly based upon a risk to the deep aquifer without taking the necessary first step of estimating that risk. The Agency's selection of Alternative 4a which will cost more than $35,000,000 more than the equally effective Alternative 7 without estimating the risk avoided by that expenditure is arbitrary and capricious.

Response:

Due to EPA's and Ohio EPA's post-RI Report evaluations of the RI data which showed that the RI Report conclusions on the vertical hydraulic conductivity were flawed, the RI Report should have quantified the future risk from potable water use of the deep sand and gravel aquifer.

Estimation of a dilution factor is partially based on the characterization of the hydrogeology beneath the Barrel Fill. Since EPA concluded through its and Ohio EPA's post-RI Report evaluations that this characterization in the RI Report is flawed, resulting in an unreasonably low estimate of permeability, RESA's estimate of a dilution factor is unreasonably large.

As indicated in a previous response, the NCP allows EPA to consider new information in the remedy selection process before selecting the remedy. Some of this new information included post-RI Report evaluations where EPA concluded that unacceptable future risk may exist from potable use of the deep sand and gravel aquifer.

The EPA comments RESA noted were from EPA Headquarters (OSRTI), not the NRRB. These comments were on a draft Proposed Plan and concentrated more on adding text to the Proposed Plan, which EPA Region 5 subsequently did in creating the long version of the Proposed Plan.

Ideally, EPA Region 5 would have been able to provide the quantitative risk information to OSRTI related to the pathway to the deep sand and gravel aquifer; however, this risk was not quantified in the RI Report. Therefore, EPA relied on a qualitative evaluation of this risk.

EPA's contention that there is unacceptable risk, in the event of a potential, future release, to receptors of the deep sand and gravel aquifer is based on the current contaminant concentrations in the Barrel Fill, EPA's post-RI Report estimate of the time of travel for the contamination to reach the aquifer, and any attenuating factors that would decrease the contaminant concentrations during the migration.

EPA does not agree with RESA that Alternative 7 is as "equally effective" as Alternative 4a. As documented in EPA's Proposed Plan, Alternative 4a is more long-term effective and permanent than Alternative 7 and better reduces the toxicity, mobility, or volume of hazardous substances through treatment.

Comment:

Hydrogeology

The Agency and RESA agree that the hydrogeology beneath the Tremont Barrel Fill site consists of "[a] series of low-permeability tills (clay, mostly) and intertills of fine sand exist beneath the waste cells." In addition, "groundwater flow from the intertills is mostly horizontal" and "flow from the Water Table and 1075 Intertill is mostly to the unnamed tributary east of the Barrel Fill." June 22, 2010 Agency PowerPoint, slide 16. In addition, the Agency stated that "[w]aste cell water and water adjacent to the waste cells are highly contaminated," "Water Table contaminant levels 90 feet downgradient of waste cells were below [groundwater] screening levels" and "contamination in lower groundwater zones was less than in upper zones and difficult to trace to the Barrel Fill." June 22, 2010 EPA PowerPoint, slides 16, 20.

These undisputed hydrogeological interpretations lead to the following conclusions:

- The till beneath the Barrel Fill is of very low permeability. Although there has been significant discussion during the course of the RI/FS as to the exact value of the vertical hydraulic conductivity of the tills, there is agreement that the till permeability is very low. This fact is significant because the timeframe for groundwater and contaminants to flow through the till is long and the quantity (and mass) of contaminants that flows through the till is negligible. The latter fact is particularly important when the quantity/mass of contaminants is mixed with much higher volumes of water contained in the intertills. This successive mixing of contaminants with each intertill that would occur at some future time significantly decreases contaminant concentrations as they theoretically migrate slowly downward through the tills and intertills beneath the Barrel Fill.

Response:

EPA acknowledges that till permeability is low. However, the statement that "the timeframe for groundwater and contaminants to flow through the till is long" is subjective. The timeframe is long when compared to a person's lifetime, but not when compared to the time span of generations of receptors of the deep sand and gravel aquifer.

The quantity, mass, and concentration of contaminants that will migrate to the deep sand and gravel aquifer are difficult to estimate meaningfully. It would be difficult to estimate meaningfully to what extent attenuation factors would decrease contaminant concentrations as the contaminants migrated to the deep sand and gravel aquifer.

Comment:

- Groundwater flow in the intertills is mostly horizontal. For groundwater flow to occur horizontally in the intertills as demonstrated during the RI, there must be connection of those intertills throughout even if there are relatively small areas where the intertills pinch out. Accordingly, the intertills are laterally (horizontally) connected. With respect to transport of contaminants, the flow of contaminants (in groundwater) in the intertills is also mostly horizontal. This fact,

coupled with the very low conductivity of the till itself, means that a much smaller quantity (mass) of contaminants flows vertically downward than would flow horizontally. Mixing of contaminants with each intertill that would occur at some distant future time significantly decreases contaminant concentrations as they migrate slowly downward through the tills and intertills beneath the Barrel Fill.

Response:

EPA acknowledges that there is some connectivity between the intertills. EPA acknowledges that the flow of contaminants in the shallow groundwater zones is mostly horizontal and that this would cause most of the groundwater contamination to flow horizontally. EPA also acknowledges that contaminants would migrate slowly downward through the tills and intertills beneath the Barrel Fill; however, meaningfully quantifying the effect of attenuating factors on contaminant concentrations as the contaminants migrate would be difficult. See previous Response.

Comment:

- Contaminant Movement from the Waste Cells is Limited to the Water Table. Despite identification of relatively high levels of waste contaminants in the waste cells and in the Water Table immediately adjacent to the waste cells, contaminant levels 90 feet down gradient of the waste cells were below screening values indicating that those contaminants have not moved 90 feet in the thirty years since the closure of the Barrel Fill. Contamination in lower groundwater zones was less than in upper zones. Finally, the extremely low level contaminants identified in the deep aquifer cannot be traced to the Barrel Fill. In fact, even using the Agency's conductivity number of 10^{-7}, those contaminants could NOT have come from the Barrel Fill in the 34 years since the wastes were first placed in the cells. These facts all indicate the effectiveness of the Barrel Fill, as it exists today and without improvement, as a waste containment structure. As the Agency indicated repeatedly during the Public Meeting Proposed Plan presentation on June 22, 2010, there is no current risk to human health and the environment. Region 5 understands this as indicated by an excerpt from a Region 5 supervisor's (Joan Tanaka) e-mail message dated November 4, 2009:

  > Regarding protectiveness: the Barrel Fill has held large quantities of hazardous waste (including an estimated approximate 1 million gallons of hazardous waste liquids) for approximately 30 years. There are very little releases of contamination to the most shallow gw [groundwater] aquifer, which is really an intertill, and may not be a class I aquifer capable of serving as a drinking water source. There is one well in the shallow intertill, outside of the waste boundary, with an exceedance of MCL(s), but just barely. The nature (of) geologic materials under the waste is very tight.

  See 11/4/09 email of Joan Tanaka, attached as Exhibit 5.

Along with the Agency's statement that "contamination in lower groundwater zones was less than in upper zones and difficult to trace to the Barrel Fill" (EPA June 22, 2010 PowerPoint, slide 20), RESA offers the following excerpt from page 16 of EPA's Consideration to NRRB, dated August 2009:

> [T]here is no strong evidence of low levels of contamination in the deep sand and gravel aquifer being attributable to the Barrel Fill.

There is no dispute between any of the hydrogeologists who have reviewed the data regarding the hydrogeology of the Site that the till is very tight. The Agency's Site team correctly concluded that there was virtually no chance of significant contamination reaching the deep aquifer. However, in response to pressure from advisors and the State, the Agency reversed those conclusions and added unsupported statements to the SAR regarding the Site hydrogeology in an attempt to justify selection of an excavation remedial action.

Response:

EPA agrees with its quoted statements above. EPA does not agree that contaminant movement from the waste cells is limited to the water table. Contamination in the 1075 Intertill indicates that this intertill has been impacted by the Barrel Fill contamination, too.

EPA positions on permeability beneath the Barrel Fill and the related topic of the rate of vertical contaminant migration changed after EPA, in consultation with Ohio EPA, conducted post-RI Report evaluations of the related RI data and concluded that the permeability and the rate of vertical, contaminant migration estimated in the RI Report were unreasonably low. EPA did not reverse any of its conclusions based on pressures from advisors and the State; rather, it developed revised conclusions based on additional evaluations. There are no unsupported statements in the administrative record on Site hydrogeology.

Comment:

Hydraulic Conductivity

The Agency indicated that it (along with Ohio EPA) determined that the RI Report estimate of vertical hydraulic conductivity beneath the Barrel Fill was "unreasonably low." June 22, 2010 PowerPoint, slide 18. The Agency has never provided the scientific basis for this conclusion. In fact, there is no data or scientific evidence in the SAR upon which such a determination could be based. During the RI, several conductivity tests were performed, all of which indicated that the till conductivity was in fact extremely low, near the extreme low end of known conductivities in such material. Further, as RESA has noted on numerous occasions, additional evaluation of the hydrogeologic information collected during the RI has been undertaken. This has included significant work undertaken by RESA in consultation with both the Agency and Ohio EPA which is contained in the SAR. The additional work on hydrogeologic characterization of the vertical permeability (hydraulic conductivity) of the till beneath the Barrel Fill can be captured in a series of excerpts from the SAR as provided below.[4]

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[4] See the documents listed in the May 24, 2010 U.S. EPA Memorandum titled

In his memorandum dated August 6, 2007, Mr. Bob Kay, a hydrogeologist who worked on the Site for the Agency stated:

> H&A's assumption of a permeability in the 10^{-8} cm/sec range seems justified by the permeability tests from the Shelby tube sampling (RI table 11). Although these values are based on samples collected from fairly small amounts of till material in areas peripheral to the BFOU waste, this is an accepted, commonly used method of analysis and I see no reason why it shouldn't be used here.

August 6, 2007 Bob Kay Memorandum to Ron Murawski, pp. 2-3.

Response:

Previous Responses indicate that a number of documents exist in the administrative record that support EPA's contention that the RI Report estimate of vertical hydraulic conductivity beneath the Barrel Fill is unreasonably low. These documents include the August 6, 2007 Bob Kay memo quoted above. In this memo, Mr. Kay points out several flaws with Haley & Aldrich's analysis of the aquifer testing, including the following found on page three:

> Because of the factors cited in the text, K_V (vertical hydraulic conductivity) values obtained from aquifer testing are almost always higher than those obtained from testing of discrete samples of the confining unit (like was done here with the samples from the Shelby tubes). This means that the K_V from the aquifer testing probably should have been greater than the 10^{-8} cm/s(ec) determined from the lab testing, not less than it.

EPA estimates the vertical hydraulic conductivity beneath the Barrel Fill to be 10^{-7} cm/sec.

Comment:

In his memorandum dated July 19, 2007, Matthew Justice, a hydrogeologist from Ohio EPA who worked on the Site, stated at page 3:

> Ohio EPA does not disagree glacial till between the barrel fill and the "1075" sand, may be as low as 10^{-8} cm/sec.

In addition, in his July 19, 2007 memorandum, Mr. Justice used such values in calculations of travel time for groundwater beneath the barrel fill in the same memorandum. Obviously, the Ohio EPA hydrogeologist would not have used values that he did not think were appropriate and supported by the Site scientific data.

Response:

The quote above from the Ohio EPA memo says that " ... glacial till ... <u>may</u> be as low as 10^{-8} cm/sec." (emphasis added). Furthermore, this Ohio EPA memo identifies several problems with the conclusions in the RI Report related to the Site's hydrogeology.

"Information Concerning U.S. EPA's Re-evaluation of and Conclusions Concerning the Hydrogeology Beneath the Barrel Fill; Tremont City Barrel Fill Site, Clark County, Ohio" which is also contained in the SAR.

Comment:

RESA submitted its Technical Memorandum 2 evaluating Site hydrogeological conditions dated September 2007. That Memorandum stated:

> All things considered, the practical conclusion from the hydraulic conductivity testing conducted on the unweathered till between the 1075 and 1050 Intertills is that it is low and below 10^{-8} cm/sec. ...
>
> * * *
>
> The methods/test used to make this determination did not indicate the presence of features that would impart significant vertical permeability.
>
> * * *
>
> Taken as a whole, it is concluded that the vertical hydraulic conductivity beneath the Barrel Fill and more specifically between the 1075 and 1050 Intertills is very low with a calculated range between 10^{-8} cm/sec to 10^{-12} cm/sec depending on the calculation method. These values are at the very lowest range of measurement capabilities of hydraulic conductivity. The variability by calculation method is likely related to the low values themselves. To refine the estimates beyond this range does not change the interpretation, nor does it serve any useful purpose. As presented by Kruseman and deRidder (1990) in their section on Leaky Aquifers, "average results of the calculations...are the most accurate values possible and ...aiming for any higher degree of accuracy would be to pursue an illusion."

Technical Memorandum 2 at 101.

Response:

EPA did not rely on RESA's Tech Memo 2 during the remedy selection process. After consulting with Ohio EPA, EPA concluded that Tech Memo 2 contained faulty interpretations of groundwater data from the RI Report.

Comment:

In addition to the above, significant hydrogeologic testing was undertaken by Mr. Herb Eagon on the same tills[5] on a site adjacent to the Barrel Fill. In his report dated September 2000, Mr. Eagon wrote the following regarding the vertical hydraulic conductivity of the till:

> The most appropriate value for hydraulic conductivity is the 5.0×10^{-8} cm/sec derived from the large field-scale test [aquifer test]. ...

Response: EPA did not review the Eagon report noted above.

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[5] The work conducted by Mr. Eagon was on tills that were lower in elevation than those of the Barrel Fill, but were of the same or similar as the till sequence found at the Barrel Fill.

Comment:

The information provided above clearly establishes that hydrogeology experts who either studied the site or reviewed information concerning such studies arrived at a consensus that the till vertical hydraulic conductivity was at least as low as approximately 10^{-8} cm/sec. These matters were discussed among many of these experts on May 20, 2008 in a meeting in Chicago.

Response:

Information from hydrogeologic experts on EPA's regulatory review team indicates that the vertical hydraulic conductivity could be as low as 10^{-8} cm/sec, but is more likely in the range of 10^{-7} cm/sec.

Comment:

Subsequent to the above work, RESA submitted documents including the FS that calculated groundwater flow quantities, dilution factors and conservative travel times using 10^{-8} cm/sec, as well as other lower values. Included in the FS was a three-dimensional groundwater flow model that used particle-tracking to aid with a continued understanding of contaminant fate and transport based on a 10^{-8} cm/sec vertical hydraulic conductivity of the till. This information was provided at the request of the Agency to aid in its considerations of the FS report. The Agency thereafter unilaterally removed virtually all of this information from the FS as part of its approval with modifications dated November 25, 2008, despite having no scientific data or evidence or other legitimate reason for doing so.

RESA also developed a three-dimensional groundwater flow model simulating a vertical hydraulic conductivity of 10^{-7} cm/sec for the tills beneath the Barrel Fill as a check on the accuracy of the model using 10^{-8} cm/sec vertical hydraulic conductivity of the till . The 10^{-7} cm/sec model resulted in the *disappearance of the water table* that is known to exist at the site. In other words, the model could not duplicate what is actually observed at the site unless vertical hydraulic conductivity of the till was 10^{-8} cm/sec or lower. Facts, as demonstrated by multiple scientific studies approved by the Agency or Ohio EPA, show that the hydraulic conductivity of the till beneath the Barrel Fill is at most 10^{-8} cm/sec. Based upon that hydraulic conductivity, no significant quantity of contaminants from the Barrel Fill could ever reach the deep aquifer, even assuming a catastrophic release of the contaminants from the barrels in the future.

Response:

The agency did not specifically request this information from RESA. This information would be more appropriately included in an RI Report, not an FS. EPA did not rely on this information in the remedy selection process.

Comment:

During a May 2007 CF/Water meeting, the Agency Site RPM (Ron Murawski) indicated that the Agency was considering a 10^{-8} cm/sec vertical hydraulic conductivity estimate to be acceptable and that travel times based on that estimate were on the order of 2,000 to 3,000 years from the bottom of the waste cells to the deep sand and gravel aquifer.

Response:

EPA has no record of supporting an estimate of 10^{-8} cm/sec vertical hydraulic conductivity. This Power Point presentation that Mr. Murawski prepared and presented during the meeting noted above did not contain the information noted above. Furthermore, this meeting predates evaluations by EPA and Ohio EPA that EPA relied on to estimate vertical hydraulic conductivity.

Comment:

In August 2009 the Agency in its submission to the NRRB stated that: "U.S. EPA estimates the overall vertical groundwater flow from the Barrel Fill to the deep sand and gravel aquifer to be about 10^{-7} cm/sec, equating to a time travel of vertical groundwater contamination to be about 1,000 years." Further, the Agency concluded:

> The hydraulic conductivity beneath the Barrel Fill is very low; it is thought to be 10^{-7} cm/sec or less. Therefore, it is reasonable to assume that a release from the Barrel Fill to the deep sand and gravel aquifer will be very slow and will take about 1,000 years. Furthermore, there are three intertills between the bottom of the Barrel Fill and the deep sand and gravel aquifer that will serve as warning monitoring points.

Response:

EPA acknowledges this exchange of information.

Comment:

In an attempt to justify its reversal of its decision in August 2009 that Alternative 7 was the preferred remedy, the Agency added a Memorandum to the SAR dated May 24, 2010. That memorandum referenced as a supporting document a letter from Ohio EPA dated January 4, 2008, signed by Pete Whitehouse. The SAR would be incomplete without inclusion of the following responses to that Ohio EPA letter:

- The Ohio EPA letter states: "Laboratory permeability data presented in the RI is inconsistent with laboratory permeability data generated by previous investigators. In 1976, a consultant working for the owner/operator in support of the permit application for the Barrel Fill conducted borings to 40 feet below the original ground surface. Speaking of glacial till overlying shallow sand seams encountered in borings, the consultant stated 'The till is a mixture of all sizes of particles, with silt (.0625 to .0039 mm) dominant, and is not very permeable (laboratory measurements of permeability yield values between 10^{-5} and 10^{-6} cm/sec).'" Whitehouse letter at pp. 8-9.

  In evaluating the reference provided by Ohio EPA, no laboratory test results were found, there was no discussion of the procedure that was used to measure the permeability of the sample and there was no documentation of the number of samples tested. In short, there is no evidence in the SAR other than the statement

alone that even indicates testing was completed. The reference is completely unverified.

- Ohio EPA also cites a reference from the Site Investigation Summary Report ("SIS Report," TN&A, March 2002) which stated: "laboratory permeability tests conducted by the USGS during EPA's site inspection investigations found that the finer-grained till underlying the Barrel Fill exhibits a hydraulic conductivity of 10^{-5} to 10^{-6} cm/sec." Whitehouse letter at p. 9. In the referenced report, TN&A provided no USGS reference document in its reference list, provided no testing procedures, did not provide the number of samples tested or the testing results. We have reviewed the SAR and cannot find the USGS document that contains this information, assuming one exists. Again, the reference is completely unverified and is not included in the SAR.

Given the above, it is clear that there is agreement between the Agency, Ohio EPA, and RESA that a vertical hydraulic conductivity value of 10^{-8} cm/sec for the tills beneath the Site is an acceptable estimate on which to base fate and transport calculations. It is also clear that groundwater or contaminant travel times through that till are very long, and it is further clear that the Agency did not calculate the fate or concentration of contaminants that could eventually reach the deep sand and gravel aquifer.

Response:

Despite the passages noted above that estimate hydraulic conductivity in the range of 10^{-5} to 10^{-6} cm/sec, EPA placed more emphasis on post-RI Report evaluations of its regulatory review team that supported an estimate of vertical hydraulic conductivity in the range of 10^{-7} cm/sec. EPA is not aware of any agreement between EPA, Ohio EPA, and RESA of a vertical hydraulic conductivity value of 10^{-8} cm/sec.

Comment:

Therefore, the Agency's conclusion that there is an "[u]nacceptable risk, in the event of a potential, future release, to receptors of the deep sand and gravel aquifer" cannot be based upon the SAR. June 22, 2010 PowerPoint, slide 21. RESA provided sound, supportable calculations in the July 2008 FS that results in a dilution factor of approximately 4.87 million if contaminants were to migrate from the bottom of the waste cells to the deep sand and gravel aquifer. Applying this dilution factor to the highest concentrations of any constituent found in any sample from the Barrel Fill testing (and not adjusting for constituent solubility) does not result in a single exceedance of an MCL in the deep sand and gravel aquifer.

Response:

See previous Responses. EPA's conclusion that an unacceptable risk may exist from future, potable use of the deep sand and gravel aquifer is supported in the administrative record in the form of post-RI Report documents that conclude that the vertical hydraulic conductivity estimated in the RI Report is unreasonably low. Furthermore, as indicated in previous Responses, it would be difficult to meaningfully estimate the effect of attenuating factors on

groundwater contaminant concentrations as the contaminants migrate to the deep sand and gravel aquifer.

Comment:

Till Uniformity

The Agency states that a re-evaluation of the RI data showed that tills and intertills were "not as uniform as depicted in the RI Report." June 22, 2010 PowerPoint, slide 18. RESA never asserted that the tills and intertills were uniform and this is a misinterpretation of conceptual drawings. More importantly, the uniformity of the tills and intertills is irrelevant to the conclusions regarding hydrogeological conductivity which were based upon actual field tests. The data gathered in actual field tests done with the Agency's approval and oversight are the most important, accurate and relevant data for assessing fate and transport of contaminants moving into the till.

The RI did not describe or illustrate the tills and intertills as uniform. On the contrary, cross-sections[6] produced in the RI Report (one of which, Figure 27, was used at the Agency's June 22, 2010 PowerPoint presentation as slide 17) contain sands identified on boring logs. In addition, these sands are consistent with those identified by the boring logs contained on the Barrel Fill Boring Log Spreadsheet supplied by Ohio EPA in July and August 2008 and that are referenced in the May 24, 2010 Agency Memorandum. In short, the cross-sections in the RI are based upon uncontroverted facts. The tills and intertills are clearly not uniform; however their thicknesses are factual and based on boring observations, which are in agreement with the July 3 and August 5, 2008 boring log analysis provided in the Agency's May 24, 2010 memorandum.

There is no explanation in the SAR of the significance or relevance of till and intertill uniformity, and RESA can only surmise that the Agency's reference to uniformity may in fact be a commentary on connectedness of the intertills. The connectedness of the intertills is important as it provides the mechanism for preferential horizontal groundwater (and possibly contaminant) flow when compared to vertical flow through the tight tills. RESA interpreted intertills at similar approximate elevations to be connected based upon field tests. The cross-sections clearly show those interpretations. The bases for these interpretations of connectedness are several fold and include the following:

- The presence of seeps at elevations corresponding to the intertills described throughout the SAR. These seeps are clearly identified in the March 2002 SIS

[6] The geologic cross-sections were Figures 27 through 31 in the RI Report, one of which (Figure 27) was provided during the Agency's June 22, 2010 presentation. Given the scale of the cross-sections, very thin (less than 0.1 feet) sands were not able to be shown on the cross-sections in all cases. Conceptual sections (Figures 41 and 42) were created to illustrate flow concepts. These sections were clearly labeled as conceptual and not to scale.

Report. Based on TN&A's work, seven seeps adjacent to Barrel Fill and Tremont City Landfill were found at 1082, 1080, 1075, 1078, 1058 and 1058. These elevations correspond to both the 1075 and 1050 Intertills and will only occur if the intertills are connected and groundwater flow is lateral. As stated in the SIS Report: "Lateral migration of groundwater contaminants within these units [intertills] is known to occur (i.e., the presence of contaminants in nearby surface seeps)." SIS at p. 6-4. Further, the investigators write "Consistent with Eagon (2000), the [groundwater] model recognizes the numerous shallow subhorizontal sand zones underlying the Site that divert a portion of infiltrating groundwater to surface seep locations (especially during and following precipitation events)."[7] SIS at p. 8-6.

- In addition to documents in the SAR on intertill connectedness, Julie Weatherington-Rice provided testimony to the Ohio Environmental Review and Appeals Commission (ERAC) for a site immediately adjacent to the Barrel Fill. In her testimony she states that the intertills are laterally continuous and discharge at seep locations along the small tributaries found at or adjacent to the site: "No. What I am saying is that when I have sand at this boring and sand at the next boring at the same elevation and sand at the next boring at the same elevation and sand in the next boring at the same elevation and on and on, it is an appropriate decision to show that as a continuous sheet, because what it means is that my potential for interconnection exists in that whole horizon." J. Weatherington-Rice ERAC testimony of 10/21/97 at pp. 1509-10. Her testimony is based on evaluation of boring logs and correlations with documented seeps and her primary conclusion is that the intertills are connected and transmit groundwater and contaminants laterally across the site.

- Finally, Eagon (2000) documents the presence of intertills at elevations that are in general agreement with the intertills found beneath the Barrel Fill.

- The documented response of monitoring wells within the 1050 Intertill during the aquifer testing performed at the Site confirms that the intertills are connected. Although aquifer tests were not undertaken in the 1075 Intertill, the deposition of the each of the intertills is the same; these tests support the conclusion that the intertills are connected.

- Finally, the similarity of water levels within each of the intertills (and the lack of similarity of water levels from other intertills), coupled with all of the other information provided above, is further evidence of connection.

[7] For sake of completeness, the SIS Report states that downward hydraulic gradients at the Site indicate downward movement of groundwater. RESA has never disputed that downward groundwater flow occurs; the real issue is how long it takes to reach the deep aquifer and the quantity of groundwater/contaminants that flows downward. The SIS Report did not make such quantifications nor did it reflect any testing for vertical hydraulic conductivity.

Every researcher associated with the Barrel Fill site has come to the same conclusion – the intertills are connected. To our knowledge, not one has asserted that they are uniform. The significance of connection is that groundwater flow in the intertills is mostly horizontal. June 22, 2010 PowerPoint, slide 16. In other words, there must be connection for horizontal flow to occur. Uniformity is not important.

Although there is no explanation for the Agency's attaching significance of till and intertill uniformity in the SAR, uniformity could play a role in calculation of till and intertill thicknesses. Thickness would affect travel time calculations with thinner till units resulting in shorter contaminant travel times. To account for thickness variability, RESA prepared Table 2 in the July 2008 FS Report that provided travel time estimates based on minimum, average and maximum till thicknesses observed and recorded at the Barrel Fill. Using a minimum observed thickness (anywhere beneath the Barrel Fill), groundwater travel times using 10^{-8} cm/sec resulted in a calculated travel time of over 2,000 years.

Also of note is intertill thickness and its affect on contaminant dilution. When intertills are interpreted as being thicker, the amount (volume) of groundwater that flows within the intertills (horizontally) would be greater, thereby causing greater dilution. This evaluation/calculation was not completed for this project; however the result would be to only increase the effects of dilution as contaminants travel downward. Accordingly, the contaminants may travel more quickly, but their concentration would be less than that calculated by thinner intertills. Even without performing this calculation (that is keeping intertills with a thickness as interpreted from boring logs), the dilution factor for groundwater contaminants traveling downward from the bottom of the waste cells to the deep sand and gravel aquifer was over 4.5 million times (July 2008 FS Report). Increasing intertill thickness would only result in *increasing* this dilution factor.

In sum, the data generated during the several Site investigations all come to the same conclusions: that the till is very tight and that the several intertills are not uniform but are connected, allowing horizontal flow of groundwater and possibly contaminants through the intertill. Based upon actual Site data, calculations using most conservative assumptions demonstrate that contaminants from the Barrel Fill will never reach the deep aquifer in significant quantities. There is no significant risk to the deep potable aquifer from the Barrel Fill. The Agency's reliance on possible future risk to that aquifer as the basis for selecting Alternative 4a is not supported by the SAR and is therefore arbitrary and capricious.

Response:

EPA agrees that the degree of uniformity of the tills and intertills beneath the Barrel Fill is not as important as meaningful conclusions drawn from valid hydrogeologic data generated. However, Figures 27 and 41 of the RI Report, in particular, imply a certain uniformity of the tills and intertills and a certain levelness of the intertills. Post-RI Report evaluations by EPA, in consultation with Ohio EPA, showed these depictions not to be accurate.

EPA acknowledges a certain amount of connectivity between the intertills.

EPA estimated a time of travel of groundwater contamination from the bottom of the Barrel Fill to the deep sand and gravel aquifer to be about 1,000 years, based on a 10^{-7} cm/sec vertical hydraulic conductivity and a distance of about 100 feet. The RESA estimate of 10^{-8} cm/sec vertical hydraulic conductivity would equate to a time of travel of about 10,000 years, not 2,000 years, if a distance of about 100 feet was used.

Regarding the effects of dilution on what contaminant concentrations will be present in the deep sand and gravel aquifer, please see previous Responses. The effects of attenuating factors on contaminant concentrations as the contaminants migrate vertically downward to the deep sand and gravel aquifer would be difficult to quantify meaningfully. This statement, in conjunction with EPA's conclusion that the vertical hydraulic conductivity beneath the Barrel Fill is significantly higher than that estimated in the RI Report means that it cannot be stated that contaminants from the Barrel Fill will never reach the deep aquifer in significant quantities and that there will be no related, significant risk.

Comment:

Conclusion

The Agency employed a flawed process when it reversed its initial, and correct, preliminary decision that Alternative 7 met the NCP criteria for selection as the preferred remedy. The Region 5 team that has sole authority for selecting the appropriate remedy abrogated that role to the State and to the NRRB when the Agency reversed its correct decision and selected Alternative 4a in the Proposed Plan. The Agency's justification for that decision, based upon potential future risks to the deep aquifer, is based only upon two fundamentally flawed conclusions: 1) that the Site poses an unacceptable risk to the deep drinking water aquifer without providing any quantitative data for such a conclusion; and 2) that the use of sumps in the cells to remove liquid principal threat wastes is unproven. The only scientific analyses in the SAR concluded that Site contaminants would not reach the drinking water aquifer in quantities that posed an unacceptable risk. The approved RI also indicated that even if some constituents eventually reached the aquifer after many, many years of travel, the concentrations would be so attenuated as to be virtually undetectable. In addition, three separate and independent analyses of the till conductivity, two of which were approved and accepted by Ohio EPA, prove that the till conductivity is at most 10^{-8}. Finally, the use of sumps to remove liquid principal threat waste is proven technology currently in use at other sites under the oversight of the Agency.

Based upon all of the scientific evidence in the Site Administrative Record, the Agency's original decision that the wastes could safely be contained in place with augmented containment actions and liquid removal was correct. The Agency's subsequent reversal of that decision was based upon a premature and inappropriately dominating concern regarding State and community acceptance, rather than scientific data or facts. The Agency's decision that the wastes must be removed from the Site cells is not supported, is arbitrary and capricious and does not meet the legal or technical requirements of CERCLA.

Response:

As indicated in previous Responses, the NCP allows EPA to conduct post-RI Report evaluations in the remedy selection process up to the time the remedy is selected. Region 5 did not abrogate its remedy selection authority to the State or the NRRB; rather, it used these entities to help it select the most cost-effective remedy.

The fact that the risk from the future use of the deep sand and gravel aquifer has not been quantified does not mean that there will not be a related, significant risk. The administrative record contains documents to support EPA's conclusion that vertical hydraulic conductivity beneath the Barrel Fill is significantly higher than that estimated in the RI Report; this conclusion supports the concern of a significant, future risk from use of the deep sand and gravel aquifer.

Neither EPA nor RESA could find examples of where an alternative such as Alternative 7, which includes vertical sumps alongside waste cells, was used successfully in a setting similar to the Barrel Fill. EPA did not find the examples that RESA provided to be similar.

It is difficult to meaningfully quantify the effect of attenuating factors on contaminant concentrations as the contaminants migrate downward toward the deep sand and gravel aquifer. RESA based its dilution modeling partially on the hydrogeologic characterization described in the RI Report; this characterization includes an unreasonably high estimate of vertical hydraulic conductivity which, in turn, skews the results of the dilution modeling to show contaminant concentrations attenuating to a greater extent.

EPA's preference for Alternative 4a instead of Alternative 7 was not based on a premature and inappropriately dominating concern regarding State and community acceptance; rather, it was based on valid input from its regulatory review team and the NRRB. Input from the regulatory review team included post-RI Report scientific evaluations of the hydrogeological data in the RI Report. The NCP, which is the implementation manual of CERCLA, allows EPA to consider new information in the remedy selection process up to the time the remedy is selected. EPA's decision that excavation is a proper remedy for this Site is supported and meets the legal and technical requirements of CERCLA.

Comments from Chemical Waste Management (CWM):

The following are comments from CWM's August 11, 2010 letter to EPA:

Site Hydrogeological Conditions Support Containment.

Comment:

Appendix A of CWM's letter contains a critical review of the hydrogeological conditions at the site. This review by Eagon & Associates confirms that the site subsurface conditions are suitable for a containment remedy consistent with the finding of the approved Remedial Investigation and earlier site investigations. The major points of the review are:

- Based on analysis of voluminous data and test results used to characterize the physical properties of the glacial till, it is reasonable to conclude that the vertical hydraulic conductivity is on the order of 10^{-8} cm/sec.

- The site conceptual model presented in the RI is fundamentally correct. There are no reliable data to indicate physical features that would short circuit advective flow through these cohesive units.

- The fate and transport model presented in the FS using till hydraulic conductivity value of 10^{-8} cm/sec achieved calibration based on observed water levels in multiple site monitoring wells and, therefore, is considered to have reliable predictive value.

- Based on the water-quality data collected to date, it cannot be concluded that any contamination exists deeper than the 1075 intertill sand. Data that might suggest otherwise is simply not reproducible, particularly when comparing the data sets between the TN&A investigation and the RESA investigation.

- Based on use of reasonably conservative values of vertical time of travel, fluid flux, and resulting dilution factors, it can be concluded that the likelihood of measurable contaminant transport to the deep aquifer is extremely small and not a risk to human health and the environment.

Response:

EPA's estimate of the vertical hydraulic conductivity beneath the Barrel Fill is 10^{-7} cm/sec, equating to a time of travel of groundwater contamination from the Barrel Fill waste to the deep sand and gravel aquifer of about 1,000 years. This estimate was based on EPA and Ohio EPA post-RI Report review of the RI data, which showed a non-uniform series of intertills beneath the Barrel Fill and fractures existing in the tills.

EPA's post-RI Report evaluation of the RI data and conclusions indicated that certain information in the RI Report was flawed. Some of these flaws, particularly related to the information on the aquifer tests, are documented in Bob Kay's August 6, 2007 memo.

EPA never concluded with certainty that any groundwater contamination deeper than the 1075 Intertill was related to the Barrel Fill. EPA stated in its November 21, 2007 letter to Haley & Aldrich that:

> "There is no compelling evidence that the landfill adjacent to the barrel fill is a likely source of groundwater contamination in the lower groundwater units beneath the barrel fill, and the U.S. EPA position remains that the source of any groundwater contamination in the lower groundwater units is likely attributable to the barrel fill. Studies previous to the 2006 Remedial Investigation (RI) Report support the U.S. EPA conclusion that the barrel fill is a likely source of the contamination in question. However, review of the RI data from the lower groundwater unit samples indicates considerable uncertainty associated with these data

which can only be resolved through additional sampling. Lab and field-related processes and procedures, and naturally occurring conditions may be the source of some of the inorganic and organic chemical detections in the RI samples of the lower groundwater units."

EPA believes that, for any alternative that leaves hazardous waste in place, migration of hazardous waste to the deep sand and gravel aquifer is inevitable. It is uncertain what the mass or concentrations of this contamination would be when it reaches the deep sand and gravel aquifer.

Comment:

In addition, as described in Appendix A:

- EPA has not identified the information upon which it relied upon to arrive at the conclusions that are being used as the basis for a remedy selection.
- Extensive Site-specific data has been disregarded without justification, such as the conceptual site model set forth in Appendix A of the Feasibility Study.
- No short circuiting pathways such as till fractures are present, and even if short pathways were present, they are not continuous or interconnected – each individual layer of till acts as a natural barrier that prevents any significant downward migration and directs flow in the overlying saturated granular zones horizontally.
- There are legitimate water-quality data questions as to whether most of the "contaminants" are even present, and the data certainly should not be accepted as worst-case values.

Response:

At the time of the issuance of the Proposed Plan which included EPA's preferred alternative to remediate the Site, the administrative record (AR) file contained the information upon which EPA relied to identify the preferred alternative.

EPA has not disregarded Site-specific data in the RI Report; rather, it has challenged some of the conclusions in the RI Report based on that data. In the case of Appendix A of the FS ("Geology Hydrogeology, and Containment Transport with Models"), EPA does not specifically request this information from RESA, nor does EPA believe that this document adds any meaningful information beyond what was in the RI Report; therefore, EPA did not rely on Appendix A in the remedy selection process.

Ohio EPA's and EPA's post-RI Report evaluation of the geology beneath the Barrel Fill revealed that some till fractures exist that could affect the vertical hydraulic conductivity estimates in the RI Report.

EPA has not acknowledged with any certainty that any groundwater contamination beneath the 1075 Intertill was related to the Barrel Fill. See EPA's previous response. Among the groundwater zones present, EPA believes that contamination in the Water Table and 1075 Intertill are related to the Barrel Fill; the source of groundwater contamination beneath the 1075 Intertill is uncertain.

CWM Alternatives 8 or 9 as the Final Remedy.

Appendix B of CWM's letter is a detailed evaluation by Conestoga-Rovers & Associates (CRA) of two new alternatives that provide effective containment of the waste and address the liquid principal threat waste. These alternatives consist of:

- Alternative 8: Installation of a slurry wall, off-Site disposal of cell liquids, installation of a hazardous waste (HW) landfill cap, and a leachate management system including leachate and leak collection to contain waste.
- Alternative 9: Installation of a slurry wall, waste excavation, off-Site disposal of cell liquids and drum liquids, backfilling of remaining non-liquid waste into the excavation, installation of a HW landfill cap, and leachate management system including leachate and leak collection to contain waste.

Comment:

Based on a detailed review of these two alternatives utilizing the seven NCP evaluation criteria, CWM proposes Alternative 8. Appendix B, Table 3 shows the detailed comparative analysis of all remedial alternatives included in the Proposed Plan plus Alternatives 8 & 9. Because Alternative 8 best meets the NCP remedy evaluation criteria, including cost, it should be the preferred alternative. The Alternative 8 remedy consists of:

- relocation of the unnamed tributary east of its current location to eliminate groundwater discharge to surface water;
- collection and off-Site disposal of all uncontained liquids in the barrel cells;
- installation of a slurry wall (subsurface vertical barrier) surrounding the extent of the waste cells and extending from ground surface to a depth of approximately 40-50 feet for the purpose of physically isolating waste, soil and groundwater in the Site. The slurry wall would be keyed 3 to 4 feet into the glacial till below the 1075 Intertill to ensure full containment;
- installation of a leachate collection system to remove any liquids generated in the waste cells;

- installation of a leakage collection system to ensure that any liquids that migrate from the cells can be collected inside the down gradient (east) side of the slurry wall from within the 1075 Intertill;

- construction of a hazardous waste landfill cap over the Site that is keyed into the slurry wall;

- long-term groundwater monitoring; and

- institutional controls.

Response:

EPA has reviewed information about Alternatives 8 and 9 that CWM submitted during the comment period. Alternatives 8 and 9 are new information made available to EPA during the public comment period. This new information significantly changed the basic features of the initially preferred Alternative, 4a with respect to scope, performance and/or cost. After reviewing these two new Alternatives, EPA believes a modified version of Alternative 9 (evaluated and referred to as "Alternative 9a" in the "new" (or revised) Proposed Plan, issued May 31, 2011, and this ROD) best meets the NCP remedy evaluation criteria. Alternative 9a is explained in detail in this ROD.

Comment:

EPA's Actions in Selecting the Preferred Remedy (Alternative 4a) are Inconsistent with the NCP.

After approving the RI Report, the FS (with modifications) and the FS Addendum (with modifications), EPA determined that the Site should be subject to its National Remedy Review Board process. This process was inconsistent with the NCP for the following reasons:

a. EPA did not provide the NRRB with a complete administrative record, but rather a select and incomplete presentation consisting of the 77-page Region 5 Consideration document and Ohio EPA's presentation via web meeting, which has not been incorporated into the Administrative Record nor made available pursuant to FOIA requests.

Response:

EPA Region 5 was not required to provide the NRRB with a complete administrative record (AR), nor would it have been appropriate for EPA to have a complete AR at the time of the NRRB process. As EPA noted in its August 6, 2010 letter to RESA, "consistent with the NCP

and general principles of administrative law, the administrative record will be complete at the time of the remedial action selection decision."

EPA's "77-page Region 5 Consideration document" is part of the AR. At the end of August 2010, at EPA's request, Ohio EPA provided to EPA a copy of Ohio EPA's presentation to the NRRB. EPA subsequently placed this document in the administrative record file and mailed the document to RESA. Prior to the time that Ohio EPA provided its presentation to EPA, EPA did not have the document in its possession.

Comment:

b. EPA did not provide the PRP group that performed the RI/FS (RESA) - any opportunity to present to the NRRB, not even to present or answer questions about the RI findings.

Response:

EPA's internal procedures do not allow for PRPs to be involved in any direct discussions with the NRRB, any NRRB meetings, or any NRRB pre-meeting calls. RESA submitted its 10-page position paper to EPA Region 5; EPA Region 5 included this position paper in its information package to the NRRB.

Comment:

c. While the NRRB is to consider state opinions on proposed actions among many factors as part of its review process (*see* Memorandum re Formation of National Superfund Remedy Review Board (Nov. 28, 1995) at p. 2), Ohio EPA appears to have had as much participation in the NRRB review process as the EPA program staff. *See, e.g.,* NRRB Recommendation Memo (Sept. 23, 2009) at p. 2. This is inconsistent with the NCP, which provides: "Assessment of state concerns may not be completed until comments on the RI/FS are received but may be discussed, to the extent possible, in the proposed plan issued for public comment." 40 CFR 300.430(e) (9) (iii) (H). The concerns to be *assessed* (not to serve as a veto function) are those related to the preferred and other alternatives and on the ARARs and proposed use of any waivers. *Id.*

Response:

EPA does not acknowledge any inconsistency in the State's involvement in the NRRB process and the State's role as described in the NCP. EPA's procedures on the NRRB process allow the State to present technical issues during the NRRB meeting, and they allow the State to summarize in writing its technical issues that the Remedial Project Manager submits to the NRRB as part of the site information package. Since Ohio EPA, as the State agency, is the support agency to EPA for this federal enforcement lead Site, the NCP allows EPA to consult frequently with the State during the RI/FS process.

Comment:

d. NRRB and EPA reviewers ignored the approved RI Report findings and instead presumed that there had to be contamination in the deep aquifer. *See* OSRTI Comments (Ernie Watkins, Amy Legare (NRRB Chair) and Melanie Culp) on the draft Tremont City Barrel Fill Site Fact Sheet, March 5, 2010 — well after EPA's approval of the RI Report — in which the statement is made: "we find ourselves asking whether the PRPs sample shopped during their performance of the RI? The extent of the groundwater contamination is not characterized as being impacted. How is it possible that there is or are no MCL exceedances? Are we to take it that there were no impacts to groundwater at all?" In other words, Region 5's initially preferred alternative (7), was rejected because EPA determined, without any basis in fact, that the RI data was not credible.

Response:

EPA did not determine that the RI data was not credible; rather, that some of the conclusions in the RI Report based on that data were suspect. This determination was not developed from communications with the NRRB; rather, it was developed from communications with Ohio EPA and with EPA Region 5's internal review team.

EPA Region 5 is the decision-maker for this Site, not the NRRB. EPA Region 5 consults with the NRRB. As indicated in previous responses, EPA has not acknowledged with any certainty that any groundwater contamination beneath the 1075 Intertill was related to the Barrel Fill.

Comment:

e. Disregarding the data reported in the RI is not appropriate and is inconsistent with the NCP, which provides: "Using the data developed [in the Remedial Investigation], the lead agency shall conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment ... [which] will help establish acceptable exposure levels for use in developing remedial alternatives in the FS ...." 40 CFR 300.430(d) (4). The approved RI concluded that the potential for the migration of chemical constituents to the deep Sand and Gravel Unit (and the intertills below the 1075 Intertill) is not likely under any reasonably predictable timeframe (*see* page 102 of the approved RI Report).

Response:

EPA has not disregarded Site-specific data in the RI Report; rather, it has challenged some of the conclusions in the RI Report based on that data. Due to EPA's and Ohio EPA's post-RI Report evaluations of the geology beneath the Barrel Fill, EPA determined that the vertical hydraulic conductivity estimate in the RI Report was unreasonably low. Consequently, even though the RI

Report did not evaluate the exposure pathway to the deep sand and gravel aquifer, EPA has added this pathway in its evaluation of risk.

Comment:

f. NRRB preference for drum removal at the Site for "policy" reasons is inconsistent with the NCP because it is not based on Site-specific data (*see, e.g.,* 40 CFR 300.430(d)), and in particular ignores the significant clay confining layer underlying the entire Site (one of the reasons the Barrel Fill was permitted by Ohio EPA in this location in the first place). *See also* Appendix A. NRRB's blanket preference for drum removals at drum sites with no appreciation for site-specific data elevates "policy" over technical data evaluation contrary to the NCP (and contrary to science and fact based decision-making). National consistency as something to be mindful of may have its place, but it cannot and should not be said that drums at sites *always* present such a risk that the remedial decision-making process, supposedly founded in sound site-specific technical data and site-specific risk analyses, should *always* result in the selection of a drum removal remedy.

Response:

The NCP values use of site-specific data and national consistency to select a proper remedy for a site. 55 FR 8725 of the NCP Preamble states that "the remedy selection process ... promotes national consistency while allowing consideration of important site-specific factors."

Well in advance of the NRRB web conference, EPA Region 5 provided the NRRB with key Site documents, including the RI Report, FS, and FS Addendum. Furthermore, EPA Region 5's information package it provided to the NRRB before the web conference included RESA's position paper which included information on the Site hydrogeology and on related issues such as an estimate of vertical hydraulic conductivity. Therefore, EPA Region 5 believes that the NRRB did not ignore information it had on the low permeability beneath the Barrel Fill.

During the NRRB process for the Site, the NRRB stated its preference for removal as a remedy for sites with buried drums; however, neither EPA Region 5 nor the NRRB requires that removal is the selected remedy for all sites with buried drums.

Comment:

g. The NRRB process is not authorized by statute and, at least as it was implemented here, is an inappropriate and unauthorized "hidden room" process that is inconsistent with the NCP. Pursuant to 40 CFR 300.430(f) (1) (ii), remedy selection is to be a two-step process in which the lead agency (here, EPA) first identifies and proposes a preferred remedy, and then selects a final remedy as set forth in a ROD. Here, the preferred remedy was selected in August 2009 when EPA Region 5 staff selected Alternative 7 relying upon the full Site record of data. This preferred remedy was then presented to the NRRB for its review. Ten

months later Region 5 issued a Proposed Plan selecting Alternative 4a as the preferred remedy. Notably, the PRPs who performed the RI/FS were frozen out of EPA's deliberations, hearing virtually nothing from the agency from April 2009, when the FS Addendum was submitted, until February 2010 with the approval of the FS Addendum (with significant selective modifications).

Response:

EPA has authorized the NRRB to review proposed, high-cost, interim and final Superfund response decisions. Other criteria may apply to trigger NRRB review. RESA was allowed to submit a 10-page position paper for NRRB to consider; although, as indicated in a previous response, RESA was not allowed to present to the NRRB.

During the remedy selection process, EPA typically consults with internal and external experts. Internal experts may include the Office of Research and Development, EPA Headquarters, and the NRRB. EPA may also consult with its contractors and/or grantees assigned to a site. Interaction with these entities is not described in detail in the NCP; however, this interaction is allowable and is an important part of the remedy selection process.

EPA's preference for Alternative 7 for NRRB review is considered neither the preferred alternative nor the selected remedy cited in the NCP. Instead, it was a preliminary preference before even the Proposed Plan was issued. As EPA evaluates a number of remedial alternatives for a Site, it is certainly not without precedent that EPA will change its preference as EPA obtains new information.

EPA communicated with RESA's representatives (Haley & Aldrich and Dykema Gossett) from April 2009 to February 2010; although, not at the frequency of some other periods in the RI/FS stage.

Comment:

h. Further, the NRRB ignored its own purpose to ensure cost-effective remedies at Superfund sites. When it was formed in 1995, the stated purpose of the NRRB was to "help control remedy costs and to promote both consistent and cost-effective decisions at Superfund sites ...." NRRB Formation Memo (Nov. 28, 1995). The memo further states that the intent in establishing the Board was to "help control remedy costs by providing a cross-Regional management-level review of high cost (and thus potentially controversial) decisions in "real time" on a *site-specific* basis." *Id.* (emphasis added).

Response:

Cost-effectiveness compares the effectiveness of an alternative in proportion to its cost of providing environmental benefits. EPA has determined that Alternative 4a affords the best overall effectiveness proportional to its cost. EPA does not agree that the NRRB ignored its purpose to ensure cost-effective (and nationally consistent) remedies at Superfund sites.

Comment:

The NRRB did not mandate selection of Alternative 4a; rather it said additional evaluation was needed. In its Advisory Recommendation (dated Sept. 23, 2009, but not made available until March 2010 after EPA selectively modified the FS Addendum to better align with its "new" preferred remedy), the NRRB raised questions regarding the Region's explanation of how Alternative 7 fulfilled certain NCP evaluation criteria:

> Based on the material shared with the Board, it is difficult to evaluate the performance of the recommended alternative with respect to the nine criteria. Due to the unknown time to drum decay, unknown performance of the sump pumps, and uncertainty about fate and transport of contaminants once released from the containers, it is not possible to accurately evaluate whether the recommended alternative will be protective of human health and the environment, or whether the recommended alternative is consistent with the preference for treating principal threat wastes to the maximum extent practicable (citation omitted). .... If the Region decides to implement the recommended alternative, then the Board recommends that the decision documents clearly describe how the sump pumps will be effective and why this alternative provides a better balance of the nine criteria than drum removal.

The Advisory Recommendation did not mandate the selection of another alternative, nor is the NRRB authorized by statute or regulation to do so. However, the Region's response indicates that in reality it used an imprecise "worst case" interpretation of the NRRB communication to "trump" the determinations of Regional staff and instead deferred to Ohio EPA's faulty analyses and predetermined conclusions (*see also* Appendix A discussing erroneous and inappropriate technical "concerns" raised by Ohio EPA in the face of detailed Site-specific data to the contrary). Thus, in coming to its selection of Alternative 4a as the preferred remedy following the NRRB's Advisory Recommendation, EPA inappropriately ignored years worth of data collection and analyses as well as prior resolutions regarding certain technical issues (*see also* Appendix A) — in direct contravention of the NCP (*e.g.*, 40 CFR 300.430(d)). In summary, EPA's response to the NRRB's Advisory Recommendation was to change its mind and select Alternative 4a (after presenting Alternative 7 to the NRRB as the preferred remedy). This response was inconsistent with agency guidance and the NCP.

Response:

The NRRB issued its recommendations on EPA Region 5's preference (Alternative 7) based on cost effectiveness and national consistency. In its recommendations, the NRRB expressed concerns about the protectiveness and effectiveness of Alternative 7, as noted in the comment above. The NRRB also noted in its recommendations that Alternative 7 "does not appear to be consistent with other drum-only site remedial actions where the drums/barrels have been removed." Therefore, the NRRB raised legitimate concerns about Alternative 7 in terms of protectiveness, effectiveness, and national consistency with remedies at drummed sites.

EPA does not agree that it used an imprecise, worst-case interpretation of the NRRB communication and does not agree that it deferred to Ohio EPA faulty analyses and predetermined conclusions. EPA considered NRRB's recommendations on concerns related to Alternative 7, and it considered Ohio EPA's sound input throughout the remedy selection process to arrive at Alternative 4a being the most cost-effective alternative.

EPA's shift from Alternative 7 to Alternative 4a as its preferred alternative was not inconsistent with Agency guidance and the NCP. In particular, the NCP recognizes that remedy selection is a process that allows for refinement; e.g., 40 C.F.R. § 300.430(d) (risk exposures may be refined throughout the phases of the RI as new information is obtained); 40 C.F.R. §§ 300.515(d)(2), (3), (4) and 300.515(h)(2) (ARARs may be identified at several points in the process); and 40 C.F.R. § 300.430(f)(2)(ii)(A) (after publication of the proposed plan, in which the Agency identifies the preferred alternative, and prior to adoption of the selected remedy, if new information is made available that significantly changes the basic features, the lead agency must address the change and can, depending on the circumstances, include a discussion in the ROD of the significant changes and underlying reasons). Furthermore, the NCP does not limit the documents which form the basis for selection of the remedy to the RI Report and the FS, nor does it exclude from the administrative record documents that form the basis for the remedy that are generated after approval of the RI Report (53 FR 51468).

Comment:

> Since April 2009, when the FS Addendum was submitted by RESA, EPA has not involved any PRP stakeholders. Following the NRRB review meeting in August 2009, EPA inappropriately modified the RI Report with no notice to RESA or the public. EPA delayed issuing its approval of the FS Addendum until February 2010 and approved it with selective modifications to justify its revised selection of Alternative 4a as the preferred remedy.

Response:

EPA's May 24, 2010 "bridging memo" identifies the 2007 and 2008 documents EPA used to re-evaluate the hydrogeology beneath the Barrel Fill, after EPA approved the RI Report in November 2006. The 2007 and 2008 documents in question were already in the administrative record before the bridging memo was placed in the administrative record. EPA does not consider the bridging memo, nor the documents it identified to be a modification to the RI Report; these documents help to explain EPA's current thinking on the permeability beneath the Barrel Fill. Other post-RI Report documents exist in the AR on this topic.

It is not true that EPA did not involve any PRP stakeholders since the FS Addendum was submitted in April 2009. In particular, EPA communicated with RESA's representatives (Haley & Aldrich and Dykema Gossett) from April 2009 to February 2010; although, not at the frequency of some other periods in the RI/FS stage.

EPA did not delay issuing its approval of the FS Addendum; it gave this approval a high priority from the time Haley & Aldrich submitted the initial draft of the FS Addendum in January 2009.

EPA modifications to the FS Addendum were selective only in the sense that EPA identified modifications needed to produce an approvable document.

Comment:

> EPA appears to have accepted Ohio EPA's conclusions with respect to key hydrogeologic issues in spite of more current, relevant and valid data that refute those conclusions.

Response:

Any of Ohio EPA's conclusions on the Site hydrogeology that EPA accepted were done so only after EPA consulted with Mr. Bob Kay of the U.S. Geological Survey (USGS) . Mr. Kay is a geologist with USGS and assists EPA via an EPA grant awarded to USGS. On Ohio EPA's most important hydrogeological conclusion that the vertical hydraulic conductivity beneath the Barrel Fill is significantly higher than that estimated in the RI Report, Mr. Kay is very much in agreement.

Comment:

> EPA has not provided any basis for its conclusion, subsequent to approval of the RI Report that "contamination migration to the lower groundwater zone is likely to occur in the future, absent remedial controls." Proposed Plan at p. 6. By memo dated May 24, 2010, EPA modified prior conclusions regarding hydraulic conductivity and projected travel time for vertical migration. The Administrative Record contains no rationale for reaching the conclusion that contamination is likely in the lower aquifer. As discussed in Section A above and Appendix A, the reasonable range for hydraulic conductivity is 10^{-7} to 10^{-8} cm/sec, a reasonable estimate of travel time to the deep aquifer is at least 200 years, but, even so, analysis of dilution factors project that no contamination that has been detected in the barrel cells will exceed an MCL by the time the contaminant can migrate to the deep sand and gravel aquifer.

Response:

There are a number of documents in the AR; most notably, including those identified in the bridging memo described above, that support EPA's contention that contaminant migration to the lower groundwater zones is inevitable. Also, there is much uncertainty associated with what contaminant concentrations will exist when this contamination reaches the lower groundwater zones. Analysis of dilution factors takes into account the "tightness" of the geology beneath the Barrel Fill; a subject of much disagreement between RESA and the EPA regulatory review team.

Comment:

> The Administrative Record which EPA purportedly relied upon in selecting Alternative 4a was not made available to the public with sufficient time for review within the public

comment period, even as extended. Nor is it clear what EPA did rely upon in selecting Alternative 4a. It was not until July 28, 2010, that RESA received what the agency referred to as the "huge update" to the Administrative Record — Update 26, which consists of an estimated 390 documents. Per the Proposed Plan (p.1): "Project documents, including the administrative record file, which contain detailed information that will be used in the selection of the cleanup plan, are available for review on the EPA Website at www.epa.gov/region5/sites/tremont and at the site information repositories ...." As of August 9, 2010, only the following documents were available at that website:

Tremont City Barrel Fill Site meeting transcript, June 2010
Tremont City Barrel Fill Proposed Cleanup Plan, June 2010
Tremont City Barrel Fill Approval with Modifications, February 10, 2010
(regarding the April 2009 feasibility study addendum)
Community Involvement Plan for Tremont City, January 2009
Tremont City Barrel Fill Approval with Modifications, November 25, 2008
(regarding the July 2008 feasibility study)
Feasibility Study, July 2008
Remedial Investigation, October 2006
Tremont City Landfill map set.

None of the Region 5 materials presented to the NRRB have been posted. None of the documents prepared in 2010, other than the FS Addendum with modifications have been posted. Notably the FS Addendum itself is not posted. Neither the NRRB memo, nor any of the Ohio EPA documents that were provided to the NRRB have been included. The vast majority of the documents that should be a part of the Administrative Record (now up to Update #26) have not been posted. EPA has not begun to make the documents used in the selection of the cleanup plan readily available through its website. EPA has not responded to RESA's request that the agency identify the documents and data relied upon in its decision to no longer prefer Alternative 7 (as it did as of August 2009) and to select Alternative 4a instead.

Response:

At the time EPA issued the Proposed Plan, the Administrative Record (AR) file contained the documents that EPA relied on to arrive at the preferred alternative. The AR is available at the Site repositories and in the EPA Region 5 Records Center in Chicago, Illinois. EPA has since updated the AR file and will continue to do so until it issues the Record of Decision (ROD). This is allowable under the National Contingency Plan (NCP); in fact, in certain cases, the AR can be updated after the ROD is issued.

The initial public comment period was open for approximately two months after EPA issued the initial Proposed Plan. EPA believes that this was sufficient time for the public to comment on the initial Proposed Plan.

It is true that the EPA website for the Barrel Fill contains only a small portion of the documents in the AR. EPA never intended for the website to contain the entire AR file. As noted above, the AR is housed at the Site repositories and in the EPA Region 5 Records Center.

At the time that EPA issued the initial Proposed Plan, all NRRB documents in EPA's possession that EPA relied on to arrive at the preferred alternative were in the AR file. Since EPA issued the initial Proposed Plan, EPA added to the AR file Ohio EPA's web conference presentation to the NRRB. Ohio EPA provided this document to EPA after EPA requested it; EPA subsequently provided the document in CD format to RESA.

The AR file contained the documents that EPA relied on to choose Alternative 4a as the preferred alternative over Alternative 7. There are a number of documents in the AR that support EPA's choice of Alternative 4a and explain why Alternative 7 was not the best choice; including EPA's February 10, 2010, FS Addendum approval with modifications letter.

Comment:

> There is nothing in the administrative record as of the issuance of the Proposed Plan (or thereafter) to support a conclusion that an unacceptable risk is posed to the lower aquifer. EPA has failed to rely upon valid, relevant scientific data to support a conclusion that there is any risk to the lower aquifer and did not evaluate that risk pathway (assuming there is one) prior to selecting its remedy. Thus EPA selected a remedy to address an alleged risk that has not been evaluated nor substantiated.

Response:

From EPA's and Ohio EPA's post-RI Report evaluations of the Site hydrogeology, the agencies determined that, because the vertical hydraulic conductivity beneath the Barrel Fill was significantly greater than that estimated in the RI Report, the exposure pathway from the Barrel Fill to the deep sand and gravel aquifer is a valid pathway. However, the risk assessment in the RI Report did not evaluate this pathway. Nevertheless, this pathway must be considered when evaluating remedial alternatives. The AR contains a number of documents that cover this topic. However, it is true that this component of risk has not been quantified.

Comment:

> There is no imminent and substantial endangerment to the public health or welfare or the environment justifying the Alternative 4a remedy. EPA has said the travel times may be shorter than suggested but provided no basis (least of all a scientifically valid and relevant one) for why it is believed to be shorter or how much shorter. Even if one assumes – in spite of no technical support for doing so – that the travel time is shorter, there still is no evidence nor basis for concluding that harm will be realized in the future. *See also* Appendix A. "Substantial" means more than a minimal threat – there must be a combination of a likelihood that contaminants capable of causing adverse health effects will be ingested, a substantial probability that disease will result and a threat of serious harm.

Response:

The risks quantified in the RI Report that trigger remediation are future risks. Also, the risk EPA and Ohio EPA identified from drinking water supplied by the deep sand and gravel aquifer is a future risk.

Implementation of the preferred alternative will reduce these future risks to human health or the environment to insignificant levels. EPA does not believe that implementation of Alternatives RA-2, 3, or 7 will achieve this reduction.

In the AR, there are a number of documents that discuss the basis for EPA's estimate of a shorter time of travel of vertical contaminant migration from the Barrel Fill to the deep sand and gravel aquifer. EPA quantified its estimate of approximately 1,000 years for this time of travel.

It is uncertain what the contaminant concentrations will be when the Barrel Fill contamination reaches the lower groundwater zones. With this uncertainty in place, EPA will choose a remedy that will eliminate a significant risk from future potable use of the lower groundwater zones.

Comment:

Conclusion

In short, EPA's selection of a costly removal remedy is not based on site data, sound science or compliance with the NCP. CWM asserts that its proposed Alternative 8, set forth with these comments, should be the final remedy selected by EPA. It fully satisfies all seven of the NCP evaluation criteria relevant for remedy selection, whereas the EPA proposed remedy (Alternative 4a) only fully satisfies four and is more than three times the cost of Alternative 8. Even Alternative 9 more fully satisfies the NCP evaluation criteria over Alternative 4a by fully satisfying six of the criteria and at half the cost of Alternative 4a. In addition, unlike EPA's selected remedy, both of the alternatives presented in these CWM comments achieve the EPA's sustainable remediation goals.

Response:

EPA used proper post-RI Report evaluations of RI data, as allowed in the NCP, to help identify its selected remedy. As noted in a previous response, based on new information concerning additional Alternatives submitted during the initial public comment period, EPA believes that Alternative 9a (a modification of the submitted Alternative 9) best satisfies the NCP evaluation criteria. Alternative 9a is evaluated in the new Proposed Plan and explained in detail in the ROD.