Third Five-Year Review Report
Sanitary Landfill Co. Superfund Site
(a.k.a. Cardington Road Landfill Site)
Montgomery County, Ohio

Prepared by

U.S. Environmental Protection Agency
Region 5
Chicago, Illinois

Approved by: **Date:**

Richard C. Karl, Director
Superfund Division

8/13/2012

Sanitary Landfill Co.
(a.k.a. Cardington Road Landfill)
Montgomery County, Ohio
Third Five-Year Review

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Executive Summary

The remedy for the Sanitary Landfill Co. Site (a.k.a. Cardington Road Landfill) in Montgomery County, Ohio, included a solid waste landfill cap, a gas collection and destruction system, surface run-off controls and drainage channels, fencing and institutional controls. The site achieved construction completion with the signing of the Preliminary Close-Out Report on September 24, 1998. The trigger for this five-year review was the Second Five-Year Review which was signed on September 25, 2007.

The assessment of this five-year review for the Cardington Road Site found that the remedy is protective of human health and the environment in the short term. The selected remedy eliminates the principal threats identified in the risk assessment by collecting and destroying the landfill gases, preventing direct contact with landfill waste, and reducing infiltration of water into waste, thus preventing the formation of leachate at the Site. Long-term protectiveness requires implementation of and compliance with effective institutional controls (ICs), as well as maintaining the site remedy components. Based on the site inspection, monitoring data and communication with O&M personnel, no inappropriate land or groundwater use was observed. USEPA is not aware of site or media uses which are inconsistent with the stated objectives of the ICs for the Site.

List of Acronyms

AOC	Administrative Order by Consent
ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CRSG	Cardington Road Site Group
ERC	Environmental Restrictive Covenant
ESD	Explanation of Significant Differences
GMRVBA	Great Miami River Valley Buried Aquifer
ICs	Institutional Controls
MCL	Maximum Contaminant Level
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
PCBs	Polychlorinated Biphenyls
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
scfm	Standard Cubic Feet per Minute
SSI	Supplemental Site Investigation
SVOCs	Semi-Volatile Organic Compounds
UECA	Uniform Environmental Covenants Act
ug/l	Microgram per Liter
USEPA	United States Environmental Protection Agency
UU/UE	Unlimited Use/Unrestricted Exposure
VOCs	Volatile Organic Compounds

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Sanitary Landfill Co. (a.k.a. Cardington Road Landfill) Site		
EPA ID: OHD093895787		
Region: 5	**State:** OH	**City/County:** Moraine/Montgomery

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Linda A. Kern
Author affiliation: U.S. Environmental Protection Agency
Review period: October 4, 2011 – August 2012
Date of site inspection: June 15, 2012
Type of review: Statutory
Review number: 3
Triggering action date: September 25, 2007
Due date *(five years after triggering action date)*: September 25, 2012

Five-Year Review Summary Form (continued)

Issues/Recommendations

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

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	Issue Category: Operations and Maintenance			
	Issue: Proposal made to use an alternative to the 40 CFR 60.18 flare requirements for determining flare exit velocity and fuel gas heat content.			
	Recommendation: Complete evaluation of proposed alternative flare requirements.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA/State	September 2012

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	Issue Category: Monitoring			
	Issue: Limited number of upgradient monitoring locations may impact the ability to assess background water quality and detect upgradient sources of groundwater contamination.			
	Recommendation: Re-assess the upgradient monitoring network following completion of the initial four rounds of baseline monitoring to determine if additional upgradient wells should be required.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	January 2013

Five-Year Review Summary Form (continued)

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 1	**Issue Category: Monitoring**			
	Issue: Additional information is needed to accurately assess groundwater gradients in the area of the MW-9 cluster.			
	Recommendation: Upon completion of the four rounds of baseline monitoring of groundwater, evaluate whether detections observed within this well cluster may require installation of additional water level measurement wells or further assessment of potential off-site sources.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	January 2013

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 1	**Issue Category: Institutional Controls**			
	Issue: Need UECA restrictions on all impacted properties to ensure long-term protectiveness.			
	Recommendation: Continue work to obtain signed UECA agreements on impacted properties at/adjacent to the Site.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	June 2013

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 1	**Issue Category: Institutional Controls**			
	Issue: Need an IC Plan to ensure long-term protectiveness.			
	Recommendation: Develop an IC Plan to ensure that effective ICs are implemented, monitored and maintained.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA/State	June 2013

Five-Year Review Summary Form (continued)

Protectiveness Statement(s)	
Operable Unit: 1	*Protectiveness Determination:* Short-term Protective

Protectiveness Statement:
The assessment of this five-year review for the Cardington Road Site found that the remedy is protective of human health and the environment in the short term. The selected remedy eliminates the principal threats identified in the risk assessment by collecting and destroying the landfill gases, preventing direct contact with landfill waste, and reducing infiltration of water into waste, thus preventing the formation of leachate at the Site. Long-term protectiveness requires implementation of and compliance with effective institutional controls, as well as maintaining the site remedy components. Based on the site inspection, monitoring data and communication with O&M personnel, no inappropriate land or groundwater use was observed. USEPA is not aware of site or media uses which are inconsistent with the stated objectives of the ICs for the Site.

Sitewide Protectiveness Statement (if applicable)
Protectiveness Determination: Short-term Protective

Protectiveness Statement:
The assessment of this five-year review for the Cardington Road Site found that the remedy is protective of human health and the environment in the short term. The selected remedy eliminates the principal threats identified in the risk assessment by collecting and destroying the landfill gases, preventing direct contact with landfill waste, and reducing infiltration of water into waste, thus preventing the formation of leachate at the Site. Long-term protectiveness requires implementation of and compliance with effective institutional controls, as well as maintaining the site remedy components. Based on the site inspection, monitoring data and communication with O&M personnel, no inappropriate land or groundwater use was observed. USEPA is not aware of site or media uses which are inconsistent with the stated objectives of the ICs for the Site.

Sanitary Landfill Co. Superfund Site
(a.k.a. Cardington Road Landfill)
Montgomery County, Ohio
Third Five-Year Review

I. Introduction

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify issues found during the review, if any, and identify recommendations to address them.

The United States Environmental Protection Agency (USEPA) is preparing this five-year review report pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

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

USEPA interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

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

USEPA conducted this five-year review of the remedy implemented at the Cardington Road Landfill Superfund Site in Montgomery County, Ohio. This review was conducted for the Site by the USEPA Remedial Project Manager from October 2011 through August 2012, with assistance from the Ohio Environmental Protection Agency (OEPA). This report documents the results of the review.

This is the third five-year review for the Cardington Road Site. This statutory five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

II. Site Chronology

Table 1 - Chronology of Site Events

Date	Event
1965 to 1980	Site operated as a landfill
January 1971	State of Ohio licensed operation of the Site as a solid waste disposal facility
January 1980	The Sanitary Landfill Company requested lease termination and indicated to the State of Ohio that waste disposal activities were complete
February 1980	A surface water retention pond at the southern-most corner of the Site was filled to bring the area to grade level
Later in 1980	Site was covered with soil ranging in thickness from two to eight feet and over thirty vents were installed into the landfill to control the migration of gases
1981	The Site was reevaluated by the Montgomery County Health Department in response to concerns about the possible discharge of storm water runoff from the Site
June 10, 1986	The Site was included on the National Priorities List (NPL) (48 FR 40674)
December 16, 1987	USEPA, the State of Ohio, and a group of potentially responsible parties (PRPs) entered into a three-party Administrative Order by Consent (AOC)
1989 through 1991	The Remedial Investigation was conducted
November 1992	The Feasibility Study was completed
September 27, 1993	USEPA issued the Record of Decision (ROD)
May 27, 1994	AOC signed between PRPs, USEPA, and OEPA to prepare the Remedial Design
January 25, 1996	USEPA issued an Explanation of Significant Differences (ESD)
August 12, 1996	Remedial Action Consent Decree entered
August 11, 1997	Start of Remedial Action
September 17, 1998	USEPA conducted pre-final inspection, which concluded that all construction activities were complete
September 24, 1998	USEPA signed Preliminary Close-Out Report documenting that the remedy was constructed in accordance with the Remedial Design plans and specifications
September 25, 2002	First Five-Year Review completed
September 25, 2007	Second Five-Year Review completed

III. Background

Physical Characteristics

The Cardington Road Landfill Site is located at 1855 Cardington Road, Moraine, Ohio, in Montgomery County, approximately one mile south of the City of Dayton (see Figure 1). The property parcel on which the Site is located encompasses approximately 53 acres and is bounded on the south by Cardington Road, on the east by Lance Drive, on the northwest by Calvary Cemetery, and on the southwest by active and reclaimed sand and gravel quarries. (See Figure 2.) The actual site area used for waste disposal has been estimated to be about 36 acres. The Site is approximately 2,200 feet in length on the west boundary and 1,000 feet wide at the northern boundary.

Land and Resource Use

The Site is located at the top of a kame terrace in the Great Miami River Valley Buried Aquifer (GMRVBA) system, which has been designated by the USEPA as a sole-source aquifer. Glacial materials deposited in the valley system, which are the primary source of groundwater, can range from 100 to 300 feet in thickness. The Great Miami River, which flows in a southerly direction, lies approximately 2,500 feet north and 4,000 feet west of the Site. No surface water streams are present near the Site. Topography at most of the Site is gently sloping to relatively flat.

Sand and gravel deposits several hundred feet thick lie just beneath ground surface and extend to the GMRVBA, which is an important regional groundwater resource. The infiltration capacity of these deposits is widely used throughout the area for both residential and commercial structures via the use of storm water infiltration basins and direct discharge of surface storm water into the ground.

Both light industrial and commercial developments are located immediately upgradient (east) as well as south of the landfill. Significant commercial development of the area, including construction of a multi-acre shopping complex immediately southeast of the landfill, has occurred since implementation of the remedial action in 1998. While such development is not expected to impart significant effects to the regional groundwater quality or gradients, it may impart more localized effects related to the landfill groundwater monitoring network. The potential effects to the landfill groundwater monitoring network will be discussed further in the Technical Assessment Summary section of this review.

The property surrounding the Site is zoned commercial, light industrial and residential. All residents in the area near the Site are provided with municipal drinking water.

History of Contamination

The Site is situated on property historically owned by two trusts controlled by the Snyder family. The property was leased to Moraine Materials Company, which mined the Site for sand and gravel throughout the 1960s. In January 1971, the State of Ohio licensed operation of the Site as a solid waste disposal facility. The Site was leased for use as a landfill to the Sanitary Landfill Company (subsequently owned by Danis Industries Corporation), which operated the facility during the entire licensed period. During landfilling operations, the excavated sand and gravel pits were filled with commercial, industrial and municipal wastes. In January 1980, the Sanitary Landfill Company requested lease termination and indicated to the State of Ohio that waste disposal activities were complete.

Initial Response

As reported by a former OEPA solid waste inspector, a surface water retention pond at the southernmost corner of the Site was filled by the site owners after February 1980, mainly with construction debris, to bring the area to grade level. Later in 1980, the Site was covered with soil ranging in thickness from two to eight feet and over thirty vents were installed into the landfill to control the migration of gases. The Site was officially closed on July 18, 1980. In 1981, the Site was reevaluated by the Montgomery County Health Department in response to concerns about the possible discharge of storm water runoff from the Site onto Lance Drive. Subsequently, a storm water collection pond was constructed adjacent to the northeast corner of the Site to control runoff along Lance Drive.

The Site was placed on the National Priorities List (NPL) in the Federal Register on June 10, 1986, based on USEPA and OEPA reports. Criteria considered in the site evaluation included the population potentially at risk; the presence of potentially hazardous substances, industrial wastes, and other wastes disposed at the Site; and the potential for groundwater contamination.

Basis for Taking Action

USEPA, OEPA, and a group of potentially responsible parties (PRPs) entered into a three-party Administrative Order by Consent (AOC) effective December 16, 1987. Under the terms of the AOC, the PRPs agreed to conduct the Remedial Investigation and Feasibility Study (RI/FS) for the Site with oversight by USEPA and OEPA. The RI was designed to determine the nature and extent of contamination at the Site through a sampling program for ground water, soils, surface water, sediments and air quality. Also included in the investigation was a cap integrity study and a waste characterization program consisting of geophysical surveys, vent gas surveys, soil gas surveys, and intrusive borings into the cap and leachate sampling from the landfill.

Organic and inorganic compounds were detected in both upgradient and downgradient perimeter monitoring wells. Detected organic compounds ranged from 1 microgram per liter (ug/l) to 210 ug/l. Most of the organic compounds found were at low concentrations of less than 10 ug/l. There was an even distribution of organic and inorganic compounds found between different aquifer zones (depths) that were sampled; however, there was no pattern of consistent detections between individual monitoring wells. No pesticides or polychlorinated biphenyls (PCBs) were detected in the groundwater samples.

The investigation included the collection of liquid and sediment samples from ten sampling locations, both on-site and off-site, and three downgradient seep locations.

No volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, or PCBs were identified in any of the surface water samples above the required detection limits. Numerous inorganic compounds were detected in the surface water samples collected. Numerous organic and inorganic compounds were detected in upgradient, on-site and off-site downgradient sediment samples. Three VOCs and twenty-one inorganic compounds were detected in the seep liquids. The seeps were downgradient of the landfill and found at the same relative elevation as the landfill. No SVOCs, pesticides, or PCBs were detected in any seep sediment samples, but numerous inorganic compounds were detected in the seep sediments.

The air investigation was conducted to determine the migration and dispersion of potential chemical constituents in the ambient air on-site and along the perimeter of the Site (50-foot radius). This investigation included an ambient air survey conducted over the entire Site and perimeter areas located within 50 feet of the Site, and the collection and analysis of perimeter air samples at nine locations along the perimeter of the Site.

Several VOCs were detected both on-site and along the perimeter during this portion of the investigation. Organic compounds detected included, but were not limited to, trichlorofluromethane, toluene, 1,1,1-TCA, acetone, 2-butanone, chloromethane, ethyl benzene, and methane. Many of the organic compounds detected were found in both upwind and downwind locations. No SVOCs were detected in upwind or downwind samples.

As part of the air quality investigation, chemical analyses of indoor air for workers in the Snyder Concrete Products Company were performed. This company's operation occurs on and next to the landfill. The chemical concentrations recorded in the single grab sample were taken under worst case conditions. 1,1-dichloroethylene and methylene chloride were two organic compounds that were detected. These two compounds were used to assess the risk posed by the Site and helped establish in the risk assessment that the principal threat was landfill gas.

The RI identified the following exposure routes for current and future resident scenarios at the site:

Current
1. Inhalation of VOCs in indoor air and outdoor ambient air;
2. Incidental ingestion of surface soils, surface sediments, and seep sediments;
3. Dermal contact with surface soils, surface water, and seep water; and
4. Dermal contact with surface sediments and seep sediments.

Future
1. Inhalation of VOCs in ambient air;
2. Ingestion of on-site groundwater;
3. Inhalation of VOCs while showering;
4. Dermal adsorption of contaminants while showering;
5. Ingestion of contaminants in surface sediment, surface water, and seep sediment; and
6. Dermal adsorption of contaminants in surface sediment, surface water, and seep sediment.

The ecological assessment found that the Site does not pose a significant ecological risk due to the Site's proximity to industrial and residential development, the lack of suitable aquatic habitats, and the limited size and diversity of possible habitats on-site.

IV. Remedial Actions

Remedy Selection

USEPA signed the Record of Decision (ROD) for the Cardington Road Site on September 27, 1993. The remedy selected in the ROD consisted of the following main components:

- Placement of a solid waste cap over the landfill area consisting of a vegetated layer, middle drainage layer, a low-permeability layer, and a subgrade bedding layer;
- A gas management system consisting of the installation of approximately thirty new active gas extraction wells and treatment of the gases;
- Surface water run-off controls to protect the cap system and effectively discharge run-off from the landfill area;
- Monitoring of landfill gas emissions and groundwater to determine whether the remedial actions conducted at the Site are effective;
- Institutional controls to restrict access to and limit future use of the Site, as well as to prevent use of groundwater beneath the Site as drinking water; and

- A Supplemental Site Investigation (SSI) to further define the groundwater flow gradients at the southern end of the landfill and to attempt to determine if the chemical constituents detected at the MW-9 cluster could be attributed definitively to the landfill; and
- Future evaluation of possible groundwater remedial alternatives should the results of the SSI indicate that a groundwater plume definitively originating from the landfill is present.

The purpose of the selected remedy was to eliminate the principal threats posed by the Site by collecting and destroying the landfill gases, preventing direct contact with landfill waste and greatly reducing the infiltration of water into waste, thus preventing the formation of leachate at the Site.

The 1993 ROD stated that "if the results of the SSI indicate that the presence of chemical contamination can be attributed to the landfill then a second phase of the SSI will be initiated to define the vertical and horizontal extent of the plume." Due to the addition of two wells at the southern end of the landfill and 12 rounds (all in 1995) of groundwater level measurements, it appeared that the low-level contamination found in the MW-9 cluster might have been coming from the landfill. Therefore, the 1993 ROD required a second phase of the SSI.

USEPA evaluated groundwater flow conditions at the Site and determined that, with the southerly flow direction at the Site, the trends for groundwater quality indicated that the groundwater conditions were improving. Total VOC concentrations in the MW-9 cluster declined from the time of the RI to the SSI. At the time, total concentrations in the MW-10 cluster remained relatively flat from quarter to quarter.

The results of the Phase I SSI indicated that the total VOC concentrations in the MW-9 cluster declined over time. The RI found that two downgradient production wells (non-drinking wells) are located approximately one-half mile south of the landfill; however, the flow direction at these locations was not conclusively established, and other potential sources have been identified between these wells and the Site. Other than these two downgradient production wells, there are no known users of groundwater within one mile of the Site.

Consideration was given to installing additional groundwater wells to define the limited nature and extent of contamination in the southern part of the Site. In order to facilitate other cleanup activities, the Agencies determined that further field work was not necessary at that time, as it was envisioned that long-term groundwater monitoring would be performed and that if contamination was found in the future that warranted further action, then additional evaluation work would be done at that time.

Based on the results of data generated during the SSI, it was determined that further SSI field work or further evaluation of the remedy as described in the 1993 ROD was not necessary with regard to groundwater. Therefore, USEPA issued an Explanation of Significant Differences (ESD) on January 25, 1996, to memorialize this decision.

Remedy Implementation

An AOC was signed between the PRPs, USEPA and OEPA on May 27, 1994, to prepare the Remedial Design (RD) for the selected remedy. The RD was completed and approved in April 1996. The Remedial Action (RA) Consent Decree was lodged in Federal Court on June 17, 1996, and entered on August 12, 1996. The construction of the RA commenced on August 11, 1997. The contractor conducted remedial activities as planned, but one new area of waste was identified during construction. When gas monitoring probes were being installed east of the Site, a waste area was discovered and high levels of methane were found in the bore holes.

Combustible gas indicators (CGIs) were placed in nearby businesses as an additional precautionary measure. To date, no CGI has indicated that migration of methane has occurred within any monitored structure adjacent to the Site. USEPA and OEPA conducted a pre-final inspection on September 17, 1998, which concluded that all construction activities were completed in accordance with the RD specifications. USEPA signed a Preliminary Close-Out Report (PCOR) on September 24, 1998.

Institutional Controls

Institutional controls are required to ensure the protectiveness of the remedy. ICs are non-engineered instruments, such as administrative and/or legal controls which restrict land or resource use, that help minimize the potential for exposure to contamination and protect the integrity of the remedy. Compliance with ICs is required to assure long-term protectiveness for any areas which do not allow for unlimited use and unrestricted exposure. USEPA and the Cardington Road Site Group (CRSG) are in discussions in an effort to enhance restrictions at the Site by obtaining UECA covenants on the Site, as well as on adjacent properties, as discussed below.

The ROD called for institutional controls to restrict access to and limit future use of the Site, as well as to prevent use of groundwater beneath the Site as drinking water.

Status of ICs and Follow-up Actions Required

The following table summarizes ICs for areas that do not support UU/UE at the Site:

Table 2 – Institutional Controls Summary Table

Media, Engineered Controls, and Areas that do not Support UU/UE Based on Current Conditions	IC Objectives and Restrictions	Title of IC Instrument Implemented	Required as part of the remedy?
Landfill – Capped Area	Prohibit use except maintenance and assure integrity of the landfill cap	Need – UECA compliant access agreement/ Environmental Restrictive Covenant (ERC)	Yes
Groundwater – On Site	Prohibit groundwater use as drinking water until cleanup standards are achieved	Need – UECA compliant access agreement/ERC	Yes
Other Remedial Action Components	Prohibit inconsistent uses and protect the integrity of the remedy components	Need - UECA compliant access agreement/ERC	Yes

Current Compliance: There is no groundwater use at the Site, the landfill cap prohibits direct exposure to the landfilled waste, landfill gases are being destroyed by the landfill gas system, and access to the Site is restricted by a fence. Based on inspections and discussions with site representatives, USEPA is not aware of site or media uses which are inconsistent with the stated objectives of the ROD. The remedy is functioning as intended.

As a follow up to recommendations contained in the 2007 Five-Year Review, the CRSG submitted an Institutional Control Study/Report for the Site on October 6, 2011. The goal of the IC study was to:

- Evaluate whether ICs currently exist that adequately implement the objectives/performance standards specified by USEPA in the ROD;
- Identify and recommend corrective measures to existing ICs necessary for their effectiveness; and
- Recommend new or additional ICs necessary to achieve and maintain the objectives/performance standards noted above.

A total of four distinct IC Areas were identified at the Site. A draft figure (Figure 3) prepared by the CRSG's technical consultant shows the location of remedy elements – the cap, landfill gas extraction wells, gas monitoring probes, combustible gas indicators, and groundwater monitoring wells – and the parcels on which they are located. The following IC Areas are illustrated in Figure 3:

- The Landfill (Area A)
- The West Borrow Area (Area B)
- The Scrimenti Property (Area C)
- Calvary Cemetery (Area D)

Area A (the landfill) includes three contiguous parcels. The Snyder Family Trust, which formally controls both Area A and Area B, has recently been reorganized due to a death in the Snyder family. Sale of Area C to a new owner is in progress.

USEPA has reviewed the IC Report and has requested that the CRSG perform additional activities to obtain access agreements/UECA-compliant Environmental Restrictive Covenants for a number of properties at/near the Site that contain components of the remedial action. The CRSG has been actively working on addressing USEPA's comments. Based on preliminary information contained in the IC Report, it appears that seven additional parcels may require access agreements/UECA-compliant ERCs.

Once the additional IC-related activities have been completed by the CRSG, an IC plan will be developed by USEPA and will include steps necessary to ensure that effective ICs are implemented, monitored and maintained. The IC Plan will incorporate the results of the evaluation plan, will direct any additional needed IC evaluation activities, and will include planning for IC implementation and long-term stewardship. The UECA-compliant ERCs will be filed with the Moraine County Recorder's Office and become a part of the Site's Operation and Maintenance (O&M) Plan.

Long-Term Stewardship: Long-term protectiveness at the Site requires compliance with use restrictions to assure the remedy continues to function as intended. To assure proper maintenance and monitoring of effective ICs, long-term stewardship procedures have been reviewed and a long-term plan is being developed. The plan should include regular inspection of ICs at the Site and annual certification to USEPA and OEPA that ICs are in place and effective.

System Operations/Operation and Maintenance

Long-term operation and maintenance is being conducted by the CRSG. O&M activities for the Site are required to be conducted for a period of 30 years following completion of construction. The O&M activities include regular inspection to ensure the facilities are in proper functioning order, rehabilitation of facilities that have deteriorated or are worn and no longer serve the proper function, continued operation of the gas extraction and thermal destruction systems, sampling as required and regular reporting to the Agencies. All systems appear to be functioning normally.

V. Progress Since the Last Five-Year Review

The Second Five-Year Review Report for the Cardington Road Site was completed on September 25, 2007. This review found the remedy to be protective of human health and the environment. In addition, the 2007 five-year review recommended finalization of the site's Quality Assurance Project Plan (QAPP), analysis of the ICs, and resolution of the flare requirements at the Site. These issues, as well as follow-up actions that have been taken, are itemized in Table 3 below.

Table 3 – Status of Issues Identified in Previous Five-Year Review

Issues from Previous Review	Recommendations/ Follow-Up Actions	Party Responsible	Action Taken and Outcome	Date of Action
Analysis of the ICs in place at the Site is needed to assure effective ICs are in place so that the remedy continues to function as intended, and to ensure effective procedures are in place for long-term stewardship at the Site. This will be performed as part of an IC Study	Complete an IC study for the Site.	PRPs	PRPs submitted Institutional Control Report for the Site.	October 6, 2011
Long-term stewardship must be assured which includes implementing, maintaining, and monitoring effective ICs.	Prepare an IC plan to incorporate IC evaluation activities, propose additional IC evaluation activities and provide for corrective measures, if needed, to assure long-term stewardship of the Site.	USEPA and OEPA	N/A	Not yet completed
The Site's QAPP is not finalized and long-term groundwater monitoring needs to be initiated.	The Site's QAPP should be finalized and long-term groundwater monitoring should be initiated.	PRPs	PRPs submitted Revised QAPP USEPA approved Final QAPP Baseline Groundwater Sampling Event	March 11, 2011 May 27, 2011 August 22, 2011
Proposal to use alternative to 40 CFR 60.18 flare requirements	Complete evaluation of proposed alternative flare requirements.	USEPA and OEPA	Ongoing	Not yet completed

Since the Second Five-Year Review, long-term post closure monitoring and maintenance has been performed at the Site. These activities include monthly inspections of the landfill cap, flare, pneumatic pumps, air compressors, condensate tanks and fence. Sampling of the gas compliance probes and landfill gas extraction wells was conducted to ensure that the Site remained in compliance.

The flare system, which consists of a single candlestick type device, has been designed for a maximum flow rate of 1,000 standard cubic feet per minute (scfm). The flare has been operating within a turndown range of 10:1 allowing for minimum flows in the range of 200 scfm. A single 20-horsepower blower assembly provides flow to the flare. The blower has been operating through integrated control circuitry which disables operation under the following conditions: (1) high condensate level; (2) high inlet gas temperature; (3) high gas pressure; (4) high blower bearing temperature; (5) no visible flame; (6) low flame temperature; and (7) blower surge. The flare controls have been operated in both automatic and manual mode, which has allowed for maximum flexibility in well field operation as gas levels have declined through the post-closure monitoring period.

Due to declining gas yield, the gas extraction system is operated on an intermittent basis. The operating or active burn cycles are correlated to observed gas yield, as well as methane readings within perimeter monitoring probes. Monitoring of subsurface gas monitoring probes is conducted weekly, with gas extraction wells sampled and adjusted every two weeks. These data are used to adjust (extend or shorten) active burn cycles for the flare. It has been noted that with the implementation of the landfill cap and subsequent reduction in moisture infiltration, gas yields from the landfill have been reduced.

Combustible gas indicators located within adjacent structures are inspected for proper operation annually. It should be noted that to date, the CGIs and gas monitoring probes in these off-site properties have not shown a problem with landfill gas over the last 15 years of operation.

In addition, long-term groundwater monitoring has been initiated and two rounds of baseline groundwater monitoring have been performed. Results of this analysis will be discussed further in the Technical Assessment Summary of this report.

VI. Five-Year Review Process

Administrative Components

USEPA has conducted this review of the remedial actions implemented at the Cardington Road Site in Moraine County, Ohio. The preparation of the five-year review was led by Linda Kern, USEPA Remedial Project Manager, with assistance and review provided by OEPA Project Coordinator Scott Glum. Susan Pastor, USEPA Community Involvement Coordinator, provided community outreach support. The five-year review consisted of a review of relevant site documents and monitoring data, as well as discussions with OEPA and technical representatives of the CRSG. In addition, a site inspection was performed on June 15, 2012, to evaluate current site conditions.

Community Notification and Involvement

Activities to involve the community in the five-year review were initiated with a public notice prepared by USEPA and placed in the Dayton Daily News on November 21, 2011, announcing that a five-year review was to be performed for the Site. The notice provided members of the public with general site information, references to USEPA's website, the location of the site's information repositories, names and contact information for the Site, and an opportunity to request additional information from USEPA. Following the publication of the public notice,

USEPA did not receive any inquiries from the public concerning the Site. Community interviews were not conducted due to low community interest.

Notice of the completed five-year review will be placed in the Dayton Daily News and the final report will be available in the Site's information repositories. The information repositories for the Site are located at the Dayton Public Library and the City of Moraine Library. A copy of the public notice is included in Appendix A. A summary of site activities is available on the internet at http://epa.gov/region5/cleanup/cardington/.

Document and Data Review

The five-year review consisted of a review of relevant site-specific documents including the RI, Risk Assessment, ROD, ESD, QAPP, Sampling and Analysis Plan, First and Second Groundwater Baseline Monitoring Reports (August 2011 and December 2011), Post-Closure Monitoring and Maintenance Monthly Progress Reports (2007 through 2012), Institutional Control Report, and site correspondence.

Overall, the system is operating as designed with respect to the collection and treatment of landfill gases. The Performance Standard for perimeter gas probe monitoring is detection of less than the lower explosive limit, or 5% combustible gas, at the property boundary.

It has been noted above that with the implementation of the landfill cap and resulting reduction in moisture infiltration, gas yields from the landfill have declined through the post-closure monitoring period. As a result of the declining gas yield, the gas extraction system is operated on an intermittent basis.

Groundwater monitoring was initiated in August 2011. The second of four baseline events was performed in December 2011. Results of the baseline groundwater monitoring are discussed further in the Technical Assessment Summary of this report.

Site Inspection

A site inspection was conducted on June 15, 2012. The inspection was performed by Linda Kern of USEPA and Scott Glum of OEPA who were accompanied by Ralph Hirshberg, on behalf of the CRSG.

During the inspection, participants walked the Site, inspecting the condition of the landfill cap, monitoring locations, landfill gas treatment components, and perimeter fence. The purpose of the inspection was to assess the overall condition of the remedial components, including the integrity of the landfill cap, the presence of fencing to restrict access, the condition of the landfill gas system (flare, pneumatic pumps, air compressor, well casings, and condensate tanks), and groundwater monitoring locations.

Overall, the inspection found the Site to be in very good condition. No rivulets were observed on or near the landfill and the soil cover appeared to be well maintained. The landfill flare, well casings and condensate tanks are well maintained and in good condition. O&M personnel indicate that there have been no problems with trespassing at the Site.

It was noted that the visibility of some site signage is blocked by overgrowth of vegetation along Cardington Road. O&M personnel indicated that this will be addressed as part of normal O&M activities for the Site.

In addition, personnel discussed the possibility of eliminating some combustible gas indicator locations from future monitoring since both the CGIs and the gas monitoring probes in the

vicinity of those properties have not shown a problem with landfill gas over the past 15 years of site activities. The CRSG representative indicated that they will submit a proposal, along with justification for removal of those locations, to the Agencies for review/approval.

A copy of the complete June 15, 2012, Site Inspection Report, which includes the Site Inspection Checklist and site photographs, is included in Appendix B.

Interviews

Community interviews were not conducted due to low community interest; however, USEPA and OEPA project staff are available in the event of future inquiries.

O&M personnel were interviewed during the site inspection regarding the ongoing site activities. The personnel indicated that there have been no recent problems with respect to trespassing or vandalism at the Site.

No outstanding Environmental Justice Initiative issues were identified for the Site during the course of this review.

VII. Technical Assessment

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

Yes. The review of documents, review of O&M data, and the results of the site inspection indicates that the remedy is functioning as intended by the ROD. The placement of the landfill cap and construction of the landfill gas collection and thermal destruction system have achieved the remedial action objective to mitigate the principal threat of landfill gas presented by the Site. Two rounds of groundwater monitoring have been performed and the results are discussed below in the Technical Assessment Summary. The results of the cumulative four baseline sampling events will be evaluated after all data are available. Long-term protectiveness requires compliance with effective ICs to ensure that the remedy continues to function as intended.

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

Yes. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. While there have been some land use changes adjacent to the Site, no new potential exposure pathways have been identified.

The following standards were identified as applicable or relevant and appropriate requirements (ARARs) in the 1993 ROD for the Site and were reviewed for changes that could affect protectiveness. No changes to ARARs were identified that would affect the protectiveness of the remedy.

Chemical-Specific ARARs

Chemical-specific ARARs regulate the release to the environment of specific substances having certain chemical characteristics. As stated in the 1993 ROD, the selected remedy achieves fence line compliance with chemical-specific ARARs relating to the collection and treatment by flaring of collected landfill gas. Federal and state ARARs relating to air emissions and the quality of ambient air should be met during and after construction of the remedy.

Other ARARs that were identified included Maximum Contaminant Levels (MCLs) established pursuant to the Safe Drinking Water Act, Ambient Water Quality Criteria, and state standards

which give concentration limits for drinking water and surface waters. MCLs and state drinking water standards were identified as relevant and appropriate based on the possibility that groundwater beneath the Site might eventually be used as a source of drinking water. The other water quality standards and limits were identified as being applicable in the event that treated groundwater will be discharged to infiltration ponds or used in ground water re-injection. As has been discussed above, the results of the SSI field investigation demonstrated that no groundwater remedy was required. If contamination is found in the future which warrants further action, then an evaluation will be performed by the Agencies.

Action-Specific ARARs

Action-specific ARARs are requirements that define acceptable treatment and disposal procedures for hazardous substances. As stated in the 1993 ROD, the cap was to be constructed in accordance with the requirements of Ohio Administrative Code (OAC) 3745-27-11, other Ohio Solid Waste Laws, and with RCRA Subtitle D specific requirements. Most RCRA requirements are administered under the State of Ohio's implementing regulations. Because of the topography of the landfill, stability analysis was required pursuant to OAC 3745-27-11(G)(1)(c) to establish alternate slope requirements for portions of the cap which did not allow for a slope between five and twenty-five percent.

Location-Specific ARARs

Location-specific ARARS are those requirements that relate to the geographic position of a site. No location-specific ARARs were identified in the 1993 ROD.

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

No. No additional information has come to light that would call into question the protectiveness of the remedy.

Technical Assessment Summary

As recommended in the 2007 five-year review, the Site's QAPP for long-term groundwater monitoring was revised and approved by USEPA. Two rounds of baseline post-closure groundwater sampling events have been completed to date (August 2011 and December 2011). The sampling and monitoring protocol used for the events was consistent with the Site's QAPP and Sampling and Analysis Plan.

There will be a total of four baseline sampling events for the Site. The data from these baseline sampling events will be used as described below.

Evaluation of the Groundwater Sampling Baseline Reports

The sampling events represent the baseline characterization of groundwater quality at the Site since completion of remedial action activities. Construction of the remedial action components was completed in 1998. The primary intent of the closure design was protection of regional groundwater resources, as well as control of landfill gas migration to adjacent occupied residential and business structures.

Previous groundwater sampling was conducted more than 15 years ago as part of the Site's Phase I SSI. The post-construction baseline sampling events is intended to provide the following information:

- An assessment of current groundwater gradients in each of the three monitored zones, including the potential for temporal variations;
- Evaluation of general groundwater quality in both upgradient and downgradient orientations;
- Preliminary evaluation of the effectiveness of site remedial actions with respect to protection of groundwater resources;
- Evaluation of potential landfill gas/groundwater interactions; and
- Identification of potential upgradient impacts to local groundwater quality.

Both light industrial and commercial developments are located immediately upgradient (east) as well as south of the landfill. Significant commercial development of the area, including construction of a multi-acre shopping complex immediately southeast of the landfill, has occurred since implementation of the remedy. While such development is not expected to impart significant effects to regional groundwater quality or gradients, it may impart more localized effects related to the landfill groundwater monitoring network. Thus, the identification of potential upgradient impacts to groundwater quality is a critical component of groundwater evaluations for this Site. While there is historical groundwater data available for the Site, changes to laboratory Method Detection Limits limit direct comparison to historical data. However, the recent sampling and analysis performed to date (August 2011 and December 2011) appears to be generally consistent with historical groundwater data.

Monitoring well locations/zones

The current monitoring well network is summarized in Appendix C. A total of 21 wells are utilized, with six dedicated to water level measurements only. Two wells are positioned for upgradient sampling, two wells are located in sidegradient positions relative to groundwater flow directions and 11 are positioned for downgradient sampling. One well nest (MW-9 cluster) consists of 2 wells located on the southeast margin of the facility and are described as upgradient/sidegradient monitoring locations. A general diagram of well locations relative to facility boundaries is provided in Figure 2.

Three distinct monitoring zones are present at the landfill. These include an upper perched (P) groundwater zone, and four downgradient wells are located within this zone on the western margin of the landfill. The second or intermediate (I) zone, is monitored with eight wells. The third and lowermost zone is located at the midpoint (M) between the bedrock and the top of the GMRBVA and is monitored with a total of three wells screened within this lower groundwater unit.

Groundwater Gradients

Groundwater gradients in the upper, intermediate, and lower zones generally trend west-southwest. The monitoring wells were re-surveyed during November 2011 and this data has been utilized for evaluating groundwater gradients. Results of the August 2011 elevation gradients have been re-plotted to take into consideration the new elevation data for the Site.

A more detailed assessment of groundwater gradients in the immediate vicinity of monitoring wells MW-9I and MW-9M (located at the southeast corner of the landfill) has been initiated following the second baseline sampling event. Groundwater elevations in these monitoring zones suggest a relatively steep northerly gradient local to these well locations. This gradient pattern may be due to local influence of large infiltration galleries associated with adjacent "dry wells" use for infiltration of parking area and rooftop stormwater runoff from commercial developments located south of the landfill.

Gradients in this area are of significant interest as detections of various compounds including several VOCs were recorded for both the August and December 2011 sampling events in these monitoring wells. Additional and more detailed investigation of groundwater gradients may be

required in the future to accurately assess potential localized influences or the potential off-site sources of groundwater impact in this area. In the interim, completion of the remaining third and fourth baseline sampling events is recommended to assess whether observed gradients remain consistent through seasonal changes at the Site.

Groundwater Quality – Volatile Organic Compounds

VOCs detected within each monitoring zone are summarized in Table C-1 (August 2011) and Table C-2 (December 2011) of Appendix C. No detections exceeded applicable primary MCLs for drinking water.

Groundwater Quality – Metals and Leachate Indicators

Metals detected within each monitoring zone are summarized in Table C-3 (August 2011) and Table C-4 (December 2011) in Appendix C. In addition, various inorganic compounds which are generally referred to as "leachate indicators" are summarized in Table C-5 (August 2011) and Table C-6 (December 2011).

Several leachate indicators including chloride were detected in elevated concentrations in upgradient wells, with chloride concentrations quite variable throughout the monitoring network. While no results suggest significant leachate-derived impact, the results for MW-9I are noted. As shown, elevated ammonia and sulfate concentrations in this monitoring location suggest potential leachate impact although examination of potential off-site sources must be considered given measured groundwater gradients. With the exception of monitoring location MW-9I, no other monitoring data suggest significant leachate-derived impact within the current well network.

A review of metals and the comparison with landfill gas condensate analytical results was initiated by the CRSG's technical consultant during the second baseline report. The purpose of this comparison will be to evaluate potential gas impacts to groundwater as well as to assess the concentration of select metals present in both gas condensate and groundwater.

Identified Data Gaps or Limitations

Based on measured groundwater gradients, only two of the fifteen wells used for baseline monitoring are located in an upgradient orientation. This limited number of upgradient monitoring locations may impact the ability to accurately assess background water quality as well as detect upgradient sources of groundwater impact. The CRSG's consultant has suggested that the upgradient monitoring network be re-assessed following completion of the initial four rounds of baseline monitoring. USEPA and OEPA concur with this recommendation. Should additional upgradient wells be required, the conversion of "water level only" wells or installation of supplemental upgrdient wells to the monitoring well network will be evaluated.

With respect to the MW-9 cluster, additional information may be required to accurately assess groundwater gradients observed in this area. Currently, groundwater gradients suggest a northerly component of flow within intermediate and midpoint monitoring zones. Detections observed within this well cluster may require installation of additional water level measurement wells or further assessment of potential off-site sources.

Prior to the third baseline sampling event (March 2012), the CRSG performed additional activities, including the identification of potential off-site sources of groundwater impact noted in the MW-9 cluster, including areas to the east and south of the landfill. The results of these activities will be summarized in the Third Groundwater Baseline Monitoring Report. The fourth baseline sampling event will be completed in August 2012.

Summary of Post-Closure Sampling Events to Date

Data collected to date does not indicate significant environmental impact to groundwater resources adjacent to the Cardington Road Landfill. It is recommended that the baseline sampling events continue, so that a minimum of four quarterly sampling events be completed. Upon completion, statistical analysis and/or comparative evaluation of wells within the monitoring network for the purpose of evaluating downgradient impacts/trends in overall groundwater quality should be completed.

An outstanding issue remains that was first identified in the last five-year review that requires resolution. OEPA had raised an issue with respect to OAC 3745-31-05, which establishes air permit criteria for "permits to install" and "best available technologies." Generally, a permit is not required for on-site discharges at Superfund sites. However compliance with the substantive portions of a permit is required. The CRSG has proposed to use alternatives to the 40 CFR 60.18 flare requirements for determining flare exit velocity and fuel gas heat content. USEPA, in coordination with OEPA, will determine if the proposed alternatives to the 40 CFR 60.18 flare requirements for determining flare exit velocity and fuel gas heat content may be applied in this case.

VIII. Issues

The table below lists the issues identified during the five-year review that could affect the protectiveness of the remedy.

Table 4 – Issues

Issues	Affects Current Protectiveness	Affects Future Protectiveness
Proposal made to use an alternative to the 40 CFR 60.18 flare requirements for determining flare exit velocity and fuel gas heat content.	No	Yes
Limited number of upgradient monitoring locations may impact the ability to assess background water quality and detect upgradient sources of groundwater contamination.	No	Yes
Additional information is needed to accurately assess groundwater gradients in the area of the MW-9 cluster.	No	Yes
Need UECA restrictions on all impacted properties to ensure long-term protectiveness.	No	Yes
Need an IC Plan to ensure long-term protectiveness.	No	Yes

IX. Recommendations and Follow-Up Actions

Table 5 - Recommendations and Follow-Up Actions

Issue	Recommendations and Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
Proposal made to use an alternative to the 40 CFR 60.18 flare requirements for determining flare exit velocity and fuel gas heat content.	Complete evaluation of proposed alternative flare requirements.	USEPA and OEPA	USEPA and OEPA	September 2012	No	Yes
Limited number of upgradient monitoring locations may impact the ability to assess background water quality and detect upgradient sources of groundwater contamination.	Re-assess the upgradient monitoring network following completion of the initial four rounds of baseline monitoring to determine if additional upgradient wells should be required.	PRPs	USEPA and OEPA	January 2013	No	Yes
Additional information is needed to accurately assess groundwater gradients in the area of the MW-9 cluster.	Upon completion of the four rounds of baseline monitoring of groundwater, evaluate whether detections observed within this well cluster may require installation of additional water level measurement wells or further assessment of potential off-site sources.	PRPs	USEPA and OEPA	January 2013	No	Yes
Need UECA restrictions on all impacted properties to ensure long-term protectiveness.	Continue work to obtain signed UECA agreements on impacted properties at/adjacent to the Site.	PRPs	USEPA and OEPA	June 2013	No	Yes
Need an IC Plan to ensure long-term protectiveness.	Develop an IC Plan to ensure that effective ICs are implemented, monitored and maintained.	USEPA	USEPA and OEPA	June 2013	No	Yes

X. Protectiveness Statement

The assessment of this five-year review for the Cardington Road Site found that the remedy is protective of human health and the environment in the short term. The selected remedy eliminates the principal threats identified in the risk assessment by collecting and destroying the landfill gases, preventing direct contact with landfill waste, and reducing infiltration of water into waste, thus preventing the formation of leachate at the Site. Long-term protectiveness requires implementation of and compliance with effective institutional controls, as well as maintaining the site remedy components. Based on the site inspection, monitoring data and communication with O&M personnel, no inappropriate land or groundwater use was observed. USEPA is not aware of site or media uses which are inconsistent with the stated objectives of the ICs for the Site.

XI. Next Review

The next five-year review will be completed within five years from the signature date of this review.

Figures

Cardington Road Landfill Superfund Site

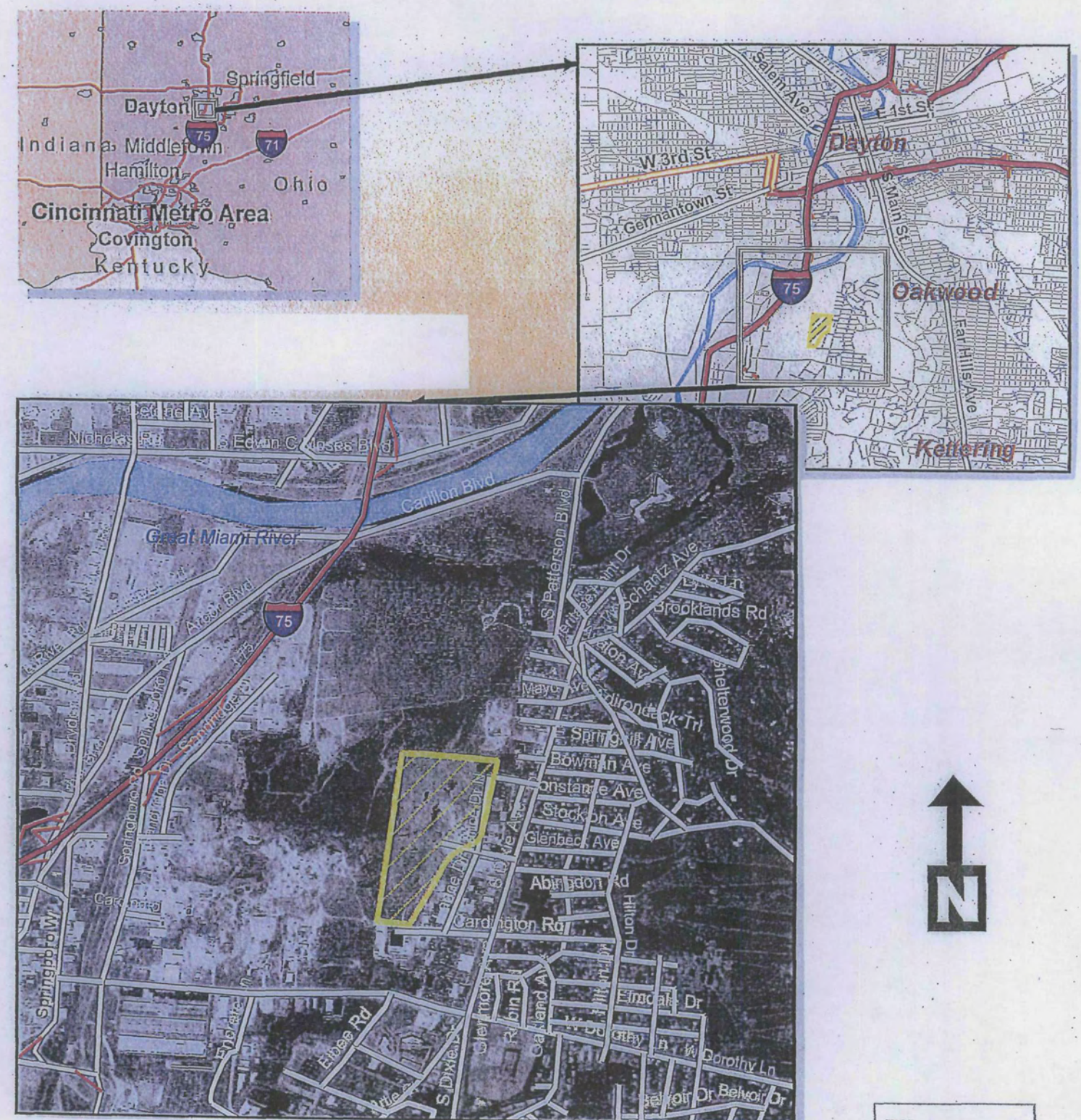

Figure 1

SOURCE: PORTION OF A NATIONAL AGRICULTURAL IMAGERY PROGRAM (NAIP) COLOR COUNTY AERIAL MOSAIC - MONTGOMERY COUNTY, OHIO, 2009.

Path: J:\Projects\2008\080140\Maps\GW_Oct_2011\080140_POT_Map_Oct2011_Fig1.mxd

Civil & Environmental Consultants, Inc.
4274 Glendale-Milford Road - Cincinnati, OH 45242
513-985-0226 - 800-759-5614
www.cecinc.com

CARDINGTON LANDFILL GROUNDWATER MONITORING CARDINGTON AND LANCE ROADS DAYTON, MONGTOMERY COUNTY, OHIO

GROUNDWATER MONITORING WELL LOCATION MAP

DRAWN BY:	MJB	CHECKED BY:	RJS	APPROVED BY:	RH	FIGURE NO:	2
DATE:	OCTOBER, 2011	DWG SCALE:	1 " = 600 '	PROJECT NO:	080-140		

Signature on File *

Legend

Type of Activity

- Landfill O&M
- Groundwater Monitoring
- Gas Monitoring
- CGI Monitoring
- Combustible Gas Indicator Location
- Gas Monitoring Probe Location
- Landfill Gas Extraction Well
- Approximate Monitoring Well Location
- Easements
- Site Boundary (Landfill Boundary)
- Other Listed Owned Parcel Boundary
- Landfill Cap Limit

NOTES:

1) GIS PARCEL BOUNDARY DATA WAS OBTAINED FROM MONTGOMERY COUNTY AUDITOR - FEBRUARY 2012.

SCALE

REVISION RECORD		
NO.	DATE	DESCRIPTION
1		
2		
3		
4		
5		
6		

Civil & Environmental Consultants, Inc.
Cincinnati, OH
(513) 985-0226 (800) 759-5614
Pittsburgh, PA · Chicago, IL · Cleveland, OH · Columbus, OH · Detroit, MI
Export, PA · Indianapolis, IN · Nashville, TN · St. Louis, MO · Phoenix, AZ

CARDINGTON ROAD SITE GROUP
CARDINGTON ROAD LANDFILL
MORAINE, MONTGOMERY COUNTY, OHIO

ACTIVITIES/INSTITUTIONAL CONTROL BASE MAP

DATE:	JULY 27, 2012	DRAWN BY:	MJB
DRAWING SCALE:	AS SHOWN	CHECKED BY:	RH
PROJECT NO:	080-140		
APPROVED BY:	RH		

FIGURE NO: **3**

Signature on File

Appendix A

Public Notice

From the front page

How U.S. exports are hampered around the globe

Argentina has imposed a growing number of customs, licensing procedures and requirements. This has caused substantial delays and makes imports of certain goods from U.S. companies and their third-country affiliates more costly and, in some cases, nearly impossible.

India sets standards for purity in wheat exports that are so strict they are seemingly unattainable. India imposes what critics call non-science-based health standards for poultry, swine, and dairy exports. The nation effectively bans most U.S. products containing genetically modified organisms.

China's policies force U.S. companies to set up joint ventures in China and transfer their own technology to the Chinese partners. China provides huge undisclosed government subsidies to key industries including steel, petrochemical, high technology, forestry and paper products, textiles, hardwood, plywood, machinery and copper and other nonferrous metal industries. The subsidies make Chinese products artificially cheap, crushing U.S. industry and exports.

Source: U.S. Rep. Mike Turner, R-Centerville STAF

Bill takes on trade barriers

Turner

continued from A1

The total for 2010 — which has not been finalized yet — is on track for $2.5 billion, largely because of huge auto industry losses, Dayton Development Coalition data show.

"With unemployment hovering around 9 percent, Ohio workers and businesses deserve a balanced trade process. We must undertake a serious effort to help U.S. companies overcome unfair trade barriers and ensure they have the opportunity to reach the 95 percent of the world's consumers that live outside our borders," Turner said. "U.S. companies should have every opportunity to have their complaints investigated and acted on. Failing to do so costs jobs and impedes the economic growth this country is counting on to get people back to work."

Bill Van Den Brandt of Appleton said losing its case "would have had a significant impact on the business. We were competing against unfair pricing. It would have meant a loss of sales, profits."

Prominent examples of import barriers show up with Argentina, India, Japan and China, Turner said. China — which sold $273 billion more in the U.S. than the U.S. sold there in 2010 — isn't adequately addressing U.S. intellectual property stolen by businesses, restricts many agricultural imports and taxes imports inconsistently, Turner said.

It's not only China. Advanced Drainage Systems of Hilliard, a 40-year-old employee-owned company with 700 workers, has reported discriminatory tactics by the Mexican government.

Ohio Sens. Rob Portman, a Republican, and Sherrod Brown, a Democrat, have called on the Obama Administration to demand Mexico relent. "Though ADS has an existing presence in Mexico, the Mexican government illegally shut out American producers by requiring an arbitrary technical standard without warning," the senators said.

Turner's bill sets a strict time limit — 180 days — for a section of the Commerce Department to decide a company's complaint of illegal trade barriers. They may then attempt to resolve the issue directly with the foreign nation. If there's no resolution, the Secretary of Commerce must issue a decision on whether the complaint is legitimate and, if so, send the complaint to the U.S. Trade Representative. At that point, the U.S. Trade Representative must formally investigate it with the potential of presentations to the World Trade Organization.

That process has worked recently, with China backing down on illegal state subsidies to its wind energy turbine industry.

Now, under the current process, most small and medium companies are required to spend large sums for legal help to petition the U.S. Trade Representative. "This will help to create jobs right here at home. Only the U.S. government can ensure that U.S. trade agreements are enforced," Turner said.

Read more local business news
DaytonDailyNews.com/go/bz2

Panel's failure likely

Debt panel

continued from A1

Aides said any remaining talks had broken off.

"There is one sticking divide. And that's the issue of what I call shared sacrifice," said panel co-chair Sen. Patty Murray, D-Wash., on CNN's "State of the Union."

"The wealthiest Americans who earn over a million a year have to share too. And that line in the sand, we haven't seen Republicans willing to cross yet," she said

Republicans said Democrats' demands on taxes were simply too great and weren't accompanied by large enough proposals to curb the explosive growth of so-called entitlement programs like Medicare and Medicaid.

"If you look at the Democrats' position it was 'We have to raise taxes. We have to pass this jobs bill, which is another almost half-trillion dollars. And we're not excited about entitlement reform,' " countered Republican Jon Kyl of Arizona on NBC's "Meet the Press."

Under the committee's rules, any plan would have to be unveiled Monday, but it appeared that Murray and co-chair Rep. Jeb Hensarling of Texas would instead issue a statement declaring the panel's work at a close, aides said.

"Put a bow on it. It's done," said an aide to a supercommittee Republican.

Failure by the panel would trigger about $1 billion over nine years in automatic across-the-board spending cuts to a wide range of domestic programs and the Pentagon budget, starting in 2013, according to the Congressional Budget Office. This action, called a "sequester," would also generate $169 billion in saving from lower interest costs on the national debt.

Defense Secretary Leon Panetta says the required cuts of up to $454 billion to the Pentagon would be "devastating" and leave a "hollow force," and defense hawks of Capitol Hill promise to unwind them. But that effort will be complicated by the insistence of other lawmakers that the overall amount of the budget cuts be left in place.

The panel's failure also sets up a fight within a battle-weary, dysfunctional Congress over renewing a payroll tax cut and jobless benefits for the long-term unemployed, both of which are set to expire at the end of the year. Both proposals are part of President Barack Obama's $447 billion jobs plan.

Extending the current 2 percentage point payroll tax cut isn't a popular idea with many Republicans, but allowing it to expire could harm the economy, economists say. So too would a cutoff of unemployment benefits averaging about $300 a week to millions of people who have been out of work for more than six months.

EPA Begins Review of Sanitary Landfill Co. Superfund Site
Moraine, Ohio

The U.S. Environmental Protection Agency is conducting a five-year review of the Sanitary Landfill Co. Superfund site (also known as Cardington Road Landfill), 1855 Cardington Road, Moraine. The Superfund law requires regular checkups of sites that have been cleaned up – with waste managed on-site – to make sure the cleanup continues to protect people and the environment. This is the third five-year review of this site.

EPA's cleanup of soil, sediment, surface water and landfill gas contaminated with volatile organic compounds and metals included a solid waste cap placed on the landfill, a gas collection and destruction system, surface runoff controls and drainage channels, institutional controls on the deed, fencing, and long-term monitoring.

More information is available at the Dayton Public Library, 215 E. Third St., Moraine Municipal Building, Clerk of Council's Office, 4200 Dryden Road and at www.epa.gov/region5/cleanup/cardington. The review should be completed by September 2012.

The five-year-review is an opportunity for you to tell EPA about site conditions and any concerns you have.
Contact:

Susan Pastor
Community Involvement Coordinator
312-353-1325
pastor.susan@epa.gov

Linda Kern
Remedial Project Manager
312-886-7341
kern.linda@epa.gov

You may also call EPA toll-free at 800-621-8431, 9:30 a.m. to 5:30 p.m., weekdays.

Appendix B

Site Inspection Report

Site Inspection Checklist

I. SITE INFORMATION

Site name: CARLINGTON ROAD LANDFILL	**Date of inspection:** 6/15/12
Location and Region: MONTGOMERY COUNTY, OH	**EPA ID:** OHD093895787
Agency, office, or company leading the five-year review: USEPA	**Weather/temperature:** SUNNY, DRY, 86°F

Remedy Includes: (Check all that apply)

- ☑ Landfill cover/containment
- ☑ Access controls
- ☑ Institutional controls
- ○ Groundwater pump and treatment
- ○ Surface water collection and treatment
- ○ Other _____
- ○ Monitored natural attenuation
- ○ Groundwater containment
- ○ Vertical barrier walls

Attachments: ○ Inspection team roster attached ○ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** MICHAEL PERCIVAL (Name) PROJECT COORDINATOR (Title) _____ (Date)
   Interviewed ○ at site ○ at office ☑ by phone Phone no. (704) 467-3362
   Problems, suggestions; ○ Report attached _____

2. **O&M staff** RALPH HICKSBERG (Name) SITE MANAGER (Title) 6/15/12 (Date)
   Interviewed ☑ at site ○ at office ○ by phone Phone no. (513) 483-3510
   Problems, suggestions; ○ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency OHIO EPA
Contact SCOTT GLUM — ON SCENE COORDINATOR — 6/15/12 — (937) 285-6645
Name — Title — Date — Phone no.
Problems; suggestions; O Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name — Title — Date — Phone no.
Problems; suggestions; O Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name — Title — Date — Phone no.
Problems; suggestions; O Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name — Title — Date — Phone no.
Problems; suggestions; O Report attached _____

4. **Other interviews** (optional) O Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ✓ O&M manual — ✓ Readily available — ✓ Up to date — O N/A
   - ✓ As-built drawings — ✓ Readily available — ✓ Up to date — O N/A
   - ✓ Maintenance logs — ✓ Readily available — ✓ Up to date — O N/A

   Remarks _____

2. **Site-Specific Health and Safety Plan** — ✓ Readily available — O Up to date — O N/A
   - ✓ Contingency plan/emergency response plan — ✓ Readily available — ✓ Up to date — O N/A

   Remarks AN UP TO DATE PLAN WILL BE PLACED ON SITE

3. **O&M and OSHA Training Records** — ✓ Readily available — O Up to date — O N/A

   Remarks _____

4. **Permits and Service Agreements**
   - O Air discharge permit — O Readily available — O Up to date — ✓ N/A
   - O Effluent discharge — O Readily available — O Up to date — ✓ N/A
   - O Waste disposal, POTW — ✓ Readily available — ✓ Up to date — O N/A
   - O Other permits _____ — O Readily available — O Up to date — O N/A

   Remarks _____

5. **Gas Generation Records** — ✓ Readily available — ✓ Up to date — O N/A

   Remarks _____

6. **Settlement Monument Records** — O Readily available — O Up to date — ✓ N/A

   Remarks _____

7. **Groundwater Monitoring Records** — ✓ Readily available — ✓ Up to date — O N/A

   Remarks _____

8. **Leachate Extraction Records** — O Readily available — O Up to date — ✓ N/A

   Remarks _____

9. **Discharge Compliance Records**
   - O Air — ✓ Readily available — O Up to date — O N/A
   - O Water (effluent) — O Readily available — O Up to date — ✓ N/A

   Remarks _____

10. **Daily Access/Security Logs** — ✓ Readily available — ✓ Up to date — O N/A

    Remarks _____

IV. O&M COSTS

1. **O&M Organization**

C State in-house — O Contractor for State
C PRP in-house — ✓ Contractor for PRP
C Federal Facility in-house — O Contractor for Federal Facility
C Other _____

2. **O&M Cost Records**

C Readily available — O Up to date
C Funding mechanism/agreement in place
Original O&M cost estimate _____ O Breakdown attached

Total annual cost by year for review period if available

From _____ To _____ _____ O Breakdown attached
Date Date Total cost

From _____ To _____ _____ O Breakdown attached
Date Date Total cost

From _____ To _____ _____ O Breakdown attached
Date Date Total cost

From _____ To _____ _____ O Breakdown attached
Date Date Total cost

From _____ To _____ _____ O Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable O N/A

A. Fencing

1. **Fencing damaged** ✓ Location shown on site map ✓ Gates secured O N/A

Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** ✓ Location shown on site map O N/A

Remarks SOME SIGNAGE ALONG CARSINGTON ROAD OBSCURED BY VEGETATIVE GROWTH – WILL BE ADDRESSED

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — O Yes ⊘ No O N/A
Site conditions imply ICs not being fully enforced — O Yes ⊘ No O N/A

Type of monitoring (*e.g.*, self-reporting, drive by) DEED RESTRICTIONS CURRENTLY
Frequency BEING REVIEWED/REVISED
Responsible party/agency CALDWELL ROAD SITE GROUP
Contact MICHAEL PERCIVAL (Name) PROJECT COORDINATOR (Title) 6/15/12 (Date) (706) 467-3362 (Phone no.)

Reporting is up-to-date — ⊘ Yes O No O N/A
Reports are verified by the lead agency — ⊘ Yes O No O N/A

Specific requirements in deed or decision documents have been met — O Yes O No O N/A BEING REVISED
Violations have been reported — O Yes O No ⊘ N/A
Other problems or suggestions: O Report attached
IC STUDY/REPORT SUBMITTED BY CRSG.

2. **Adequacy** O ICs are adequate O ICs are inadequate O N/A
Remarks CURRENTLY BEING UPDATED

D. General

1. **Vandalism/trespassing** O Location shown on site map ⊘ No vandalism evident
Remarks

2. **Land use changes on site** ⊘ N/A
Remarks

3. **Land use changes off site** O N/A
Remarks SOME REDEVELOPMENT IN AREAS SURROUNDING SITE, DOES NOT IMPACT SITE AT THIS TIME

VI. GENERAL SITE CONDITIONS

A. Roads O Applicable O N/A

1. **Roads damaged** O Location shown on site map O Roads adequate ⊘ N/A
Remarks

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS ✓ Applicable O N/A

A. Landfill Surface

1. **Settlement** (Low spots) O Location shown on site map ✓ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** O Location shown on site map ✓ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** O Location shown on site map ✓ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** O Location shown on site map ✓ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** ✓ Grass ✓ Cover properly established ✓ No signs of stress
   O Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** ✓ N/A
   Remarks_____
   _____

7. **Bulges** O Location shown on site map ✓ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** ☑ Wet areas/water damage not evident
- ○ Wet areas ○ Location shown on site map Areal extent_____
- ○ Ponding ○ Location shown on site map Areal extent_____
- ○ Seeps ○ Location shown on site map Areal extent_____
- ○ Soft subgrade ○ Location shown on site map Areal extent_____

Remarks_____

9. **Slope Instability** ○ Slides ○ Location shown on site map ☑ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ○ Applicable ☑ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ○ Location shown on site map ☑ N/A or okay
Remarks_____

2. **Bench Breached** ○ Location shown on site map ☑ N/A or okay
Remarks_____

3. **Bench Overtopped** ○ Location shown on site map ☑ N/A or okay
Remarks_____

C. Letdown Channels ○ Applicable ☑ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ○ Location shown on site map ○ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ○ Location shown on site map ○ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ○ Location shown on site map ○ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ○ Location shown on site map ○ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ○ No obstructions
○ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
○ No evidence of excessive growth
○ Vegetation in channels does not obstruct flow
○ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ✓ Applicable ○ N/A

1. **Gas Vents** ✓ Active ○ Passive
○ Properly secured/locked ✓ Functioning ✓ Routinely sampled ✓ Good condition
○ Evidence of leakage at penetration ○ Needs Maintenance
○ N/A
Remarks_____

2. **Gas Monitoring Probes**
✓ Properly secured/locked ✓ Functioning ✓ Routinely sampled ✓ Good condition
○ Evidence of leakage at penetration ○ Needs Maintenance ○ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
✓ Properly secured/locked ○ Functioning ○ Routinely sampled ○ Good condition
○ Evidence of leakage at penetration ○ Needs Maintenance ○ N/A
Remarks_____

4. **Leachate Extraction Wells**
○ Properly secured/locked ○ Functioning ○ Routinely sampled ○ Good condition
○ Evidence of leakage at penetration ○ Needs Maintenance ✓ N/A
Remarks_____

5. **Settlement Monuments** ○ Located ○ Routinely surveyed ✓ N/A
Remarks_____

E. Gas Collection and Treatment ☑ Applicable ○ N/A

1. **Gas Treatment Facilities**
   ○ Flaring ☑ Thermal destruction ○ Collection for reuse
   ○ Good condition ○ Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   ☑ Good condition ○ Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☑ Good condition ○ Needs Maintenance ○ N/A
   Remarks_____

F. Cover Drainage Layer ☑ Applicable ○ N/A

1. **Outlet Pipes Inspected** ☑ Functioning ○ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☑ Functioning ○ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☑ Applicable ○ N/A

1. **Siltation** Areal extent_____ Depth_____ ○ N/A
   ☑ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☑ Erosion not evident
   Remarks_____

3. **Outlet Works** ☑ Functioning ○ N/A
   Remarks_____

4. **Dam** ○ Functioning ☑ N/A
   Remarks_____

H. Retaining Walls O Applicable ⊘ N/A

1. **Deformations** O Location shown on site map O Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** O Location shown on site map O Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ⊘ Applicable O N/A

1. **Siltation** O Location shown on site map ⊘ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** O Location shown on site map O N/A
   ⊘ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** O Location shown on site map ⊘ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ⊘ Functioning O N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS O Applicable ⊘ N/A

1. **Settlement** O Location shown on site map O Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   O Performance not monitored
   Frequency_____ O Evidence of breaching
   Head differential_____
   Remarks_____

C. Treatment System O Applicable ☑ N/A

1. **Treatment Train** (Check components that apply)
   O Metals removal O Oil/water separation O Bioremediation
   O Air stripping O Carbon adsorbers
   O Filters _____
   O Additive (*e.g.*, chelation agent, flocculent) _____
   O Others _____
   O Good condition O Needs Maintenance
   O Sampling ports properly marked and functional
   O Sampling/maintenance log displayed and up to date
   O Equipment properly identified
   O Quantity of groundwater treated annually _____
   O Quantity of surface water treated annually _____
   Remarks _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   O N/A ☑ Good condition O Needs Maintenance
   Remarks _____

3. **Tanks, Vaults, Storage Vessels**
   O N/A ☑ Good condition O Proper secondary containment O Needs Maintenance
   Remarks _____

4. **Discharge Structure and Appurtenances**
   ☑ N/A O Good condition O Needs Maintenance
   Remarks _____

5. **Treatment Building(s)**
   O N/A ☑ Good condition (esp. roof and doorways) O Needs repair
   O Chemicals and equipment properly stored
   Remarks _____

6. **Monitoring Wells** (pump and treatment remedy)
   O Properly secured/locked O Functioning O Routinely sampled O Good condition
   O All required wells located O Needs Maintenance O N/A
   Remarks _____

D. Monitoring Data

1. Monitoring Data
   ☑ Is routinely submitted on time ☑ Is of acceptable quality

2. Monitoring data suggests:
   O Groundwater plume is effectively contained O Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

O Properly secured/locked O Functioning O Routinely sampled O Good condition
O All required wells located O Needs Maintenance ☑ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

SELECTED REMEDY WAS TO ELIMINATE POTENTIAL THREATS POSED BY THE SITE BY COLLECTING & DESTROYING LANDFILL GASES, PREVENTING DIRECT CONTACT WITH LANDFILLED WASTES & TO REDUCE THE INFILTRATION OF WATER INTO WASTE. PREVENTING THE FORMATION OF LEACHATE. BASED ON THE SITE INSPECTION, DISCUSSIONS WITH O&M PERSONNEL, REVIEW OF O&M DATA COLLECTED TO DATE — THE REMEDY IS OPERATING AS DESIGNED, EFFECTIVE, & PROTECTIVE

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

LONG-TERM PROTECTIVENESS WILL BE SUPPORTED BY CONTINUED O&M, MONITORING, & IMPLEMENTATION OF ICs.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. NO POTENTIAL PROBLEMS IDENTIFIED.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. OPTIMIZATION OPPORTUNITIES - EVALUATE GW MONITORING NETWORK - EVALUATE CGI LOCATIONS - EVALUATE CONDENSATE STORAGE/SAMPLING/DISCHARGE

Photo 1: On site, looking north towards MP-6D.

Photo 2: On site, looking east with MP-3 along fence.

Photo 3: On site, looking east to MP-2 along fence.

Photo 4: On site, looking east on to landfill cover with G-14 on horizon.

Photo 5: On site, looking northeast with residence in background. There is a CGI located in the garage.

Photo 6: On site, looking south onto well established and maintained landfill cover.

Photo 7: On site, looking west – access fence to Calvary Cemetery Property as well as MW 3R, MW 3I, and MW 3A, MW 4I

Photo 8: On site, looking west towards MW 8I, MW 8M, And MW 8A

Photo 9: Condensate sump along western edge of fence.

Photo 10: Off site, looking north towards pond located near the southwest corner of the landfill.

Photo 11: Off site, looking north at the sediment basin near the pond in Photo 10 along the southwest corner of the landfill.

Photo 12: Off site, looking south towards MW 6I, MW 6M, and MW 6A.

Photo 13: Lock with guard on MW 6M.

Photo 14: On site - back of sign posted along fence, not visible from off-site due to heavy vegetation

Photo 15: On site, landfill gas candlestick flare, landfill gas system structure, and associated storage structure.

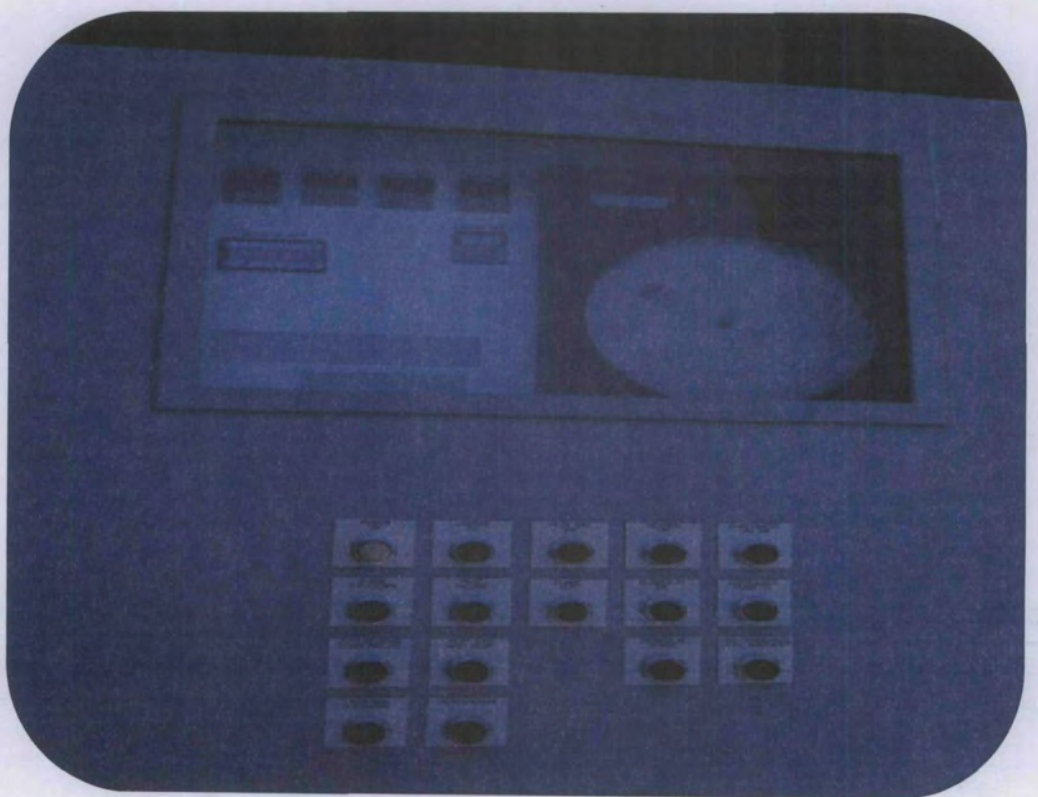

Photo 16: Electronic monitoring panel of landfill gas system.

Photo 17: Condensate storage tanks contained within structure on site.

Appendix C

Groundwater Monitoring Results

Appendix C

Groundwater Well Summary Data
Cardington Road Landfill

Well	Date Installed	Monitoring Zone (1)	Flow-Position/System	Screened Interval (2)	Screen Length (2)	Elevation at Top of Casing (2)	Well Depth from Top of Casing (2)
MW-1I	9/18/1989	I	Upgradient	689.6-709.6	20	815.94	126.3
MW-7I	10/9/1989	I	Upgradient	696.3-706.3	10	844.77	148.5
MW-3I	8/10/1989	I	Downgradient	701.5-711.5	10	866.46	165.0
MW-3A	7/7/1990	P	Downgradient	766.2-776.2	10	866.67	100.5
MW-4I	8/25/1989	I	Downgradient	695.5-705.5	10	865.54	170.0
MW-5A	7/27/1989	P	Downgradient	767.2-777.2	10	831.66	64.5
MW-5I	11/6/1989	I	Downgradient	703.0-713.0	10	833.46	130.5
MW-6A	7/21/1989	P	Downgradient	772.6-782.6	10	830.86	58.3
MW-6I	10/17/1994	I	Downgradient	697.5-712.6	15.1	831.31	133.8
MW-6M	10/12/1994	M	Downgradient	644.2-664.2	20	830.17	186.0
MW-8A	7/6/1990	P	Downgradient	774.7-784.7	10	841.69	67.0
MW-8I	6/29/1990	I	Downgradient	704.1-714.1	10	841.67	137.6
MW-8M	6/26/1990	M	Downgradient	650.2-670.2	20	842.28	192.1
MW-9I	7/5/1990	I	Upgradient/sidegradient	704.6-714.6	10	850.76	146.2
MW-9M	6/26/1990	M	Upgradient/sidegradient	645.4-665.4	20	850.56	205.2
MW-1R	-	-	Water Level Only	-	-	816.10	254.4
MW-3R	-	-	Water Level Only	-	-	866.48	300.0
MW-5R	-	-	Water Level Only	-	-	832.14	-
MW-2I	-	I	Water Level Only	-	-	845.7	-
MW-10I	-	I	Water Level Only	-	-	851.62	851.6
MW-10M	-	M	Water Level Only	-	-	851.54	851.5

Notes: (1) P=Perched water-bearing zone
I=Intermediate zone
M=Midpoint between top of regional water table and bedrock

(2) All value in feet referenced to NAD 1983. Casings to be re-surveyed in October 2011.

Table C-1

Groundwater Well – VOC Detection Summary
Cardington Road Landfill

Well	Monitoring Zone	Flow-Position/System	Detected Compounds (ug/l)										
			1,1,1 - Trichloroethane	1,1 - Dichloroethane	Chlorobenzene	Chloroethane	cis 1,2 – Dichloroethene	1,2 – Dichloroethene (total)	Tetrachloroethene	Trichloroethene	Chloroform	Acetone	Carbon Disulfide
MW-1I	I	Upgradient	0.680	-	-	-	-	-	-	-	-	-	-
MW-7I	I	Upgradient	1.11	-	-	-	-	-	-	-	-	-	-
MW-3I	I	Downgradient	-	-	-	-	-	-	-	-	-	-	-
MW-3A	P	Downgradient	3.78	-	-	-	-	-	-	-	-	-	-
MW-4I	I	Downgradient	-	-	-	-	-	-	-	-	-	-	-
MW-5A	P	Downgradient	-	-	-	-	-	-	-	-	-	-	-
MW-5A	P	(Duplicate)	-	-	-	-	-	-	-	-	-	-	-
MW-5I	I	Downgradient	-	-	-	-	-	-	-	-	-	-	-
MW-6A	P	Downgradient	-	-	-	-	-	-	-	-	-	-	-
MW-6I	I	Downgradient	-	1.00	-	-	-	-	-	-	-	-	-
MW-6M	M	Downgradient	-	1.02	-	-	-	-	-	-	-	-	-
MW-8A	P	Downgradient	-	-	2.25	0.730	-	0.370	-	-	-	-	-
MW-8A	P	(Duplicate)	-	-	2.19	0.670	-	0.410	-	-	-	-	-
MW-8I	I	Downgradient	-	1.19	-	-	-	-	-	-	-	-	-
MW-8M	M	Downgradient	-	-	-	-	-	-	-	-	-	-	-
MW-9I	I	Upgradient/sidegradient	-	1.13	-	-	3.67	3.67	1.37	3.49	-	-	-
MW-9M	M	Upgradient/sidegradient	-	3.82	-	-	-	-	-	-	-	-	-
Field Blank	Well 6A	-	-	-	-	-	-	-	-	-	0.550	-	-
Field Blank	Well 3I	-	-	-	-	-	-	-	-	-	-	6.67	-
Trip Blank	3	-	-	-	-	-	-	-	-	-	-	-	-
Trip Blank	4	-	-	-	-	-	-	-	-	-	-	-	0.610
Trip Blank	5	-	-	-	-	-	-	-	-	-	-	-	0.770
Trip Blank	6	-	-	-	-	-	-	-	-	-	-	-	0.770
Primary MCL (ug/l)			200	-	100	-	70	-	5	5	80(1)	-	-

Notes: P=Perched water-bearing zone
I=Intermediate zone
M=Midpoint between top of regional water table and bedrock

(1) Indicates the parameter is an organic disinfection byproduct (DBP), specifically the total Triahalomethanes (TTHMs). The MCL is the sum of the concentrations of Bromodichloromethane, Dibromochloromethane, Bromoform and Chloroform.

Table C-2

Groundwater Well – VOC Detection Summary
Cardington Road Landfill

Well	Monitoring Zone	Flow-Position/System	Detected Compounds (ug/l)											
			1,1,1 - Trichloroethane	1,1 - Dichloroethane	Chlorobenzene	Chloroethane	cis 1,2 – Dichloroethene	1,2 – Dichloroethene (total)	Tetrachloroethene	Trichloroethene	Carbon Disulfide	Chloroform	2, Butanone (MEK)	Methylene chloride
MW-1I	I	Upgradient	0.810	-	-	-	-	-	-	-	-	-	-	-
MW-7I	I	Upgradient	1.35	-	-	-	-	-	-	-	-	-	-	-
MW-3I	I	Downgradient	-	-	-	-	-	-	-	-	-	-	-	-
MW-3A	P	Downgradient	3.92	-	-	-	-	-	-	-	-	-	-	-
MW-4I	I	Downgradient	-	-	-	-	-	-	-	-	-	-	-	-
MW-5A	P	Downgradient	-	-	-	-	-	-	-	-	-	-	-	-
MW-5I	I	Downgradient	-	-	-	-	-	-	-	-	-	-	-	-
MW-6A	P	Downgradient	-	-	-	-	-	-	-	-	-	-	-	-
MW-6A	P	(Duplicate)	-	-	-	-	-	-	-	-	-	-	-	-
MW-6I	I	Downgradient	-	1.29	-	-	-	-	-	-	-	-	-	-
MW-6M	M	Downgradient	-	2.17	-	-	-	-	-	-	-	-	-	-
MW-8A	P	Downgradient	-	-	3.01	0.540	0.770	0.770	-	-	-	-	-	-
MW-8I	I	Downgradient	-	1.14	-	-	-	-	-	-	-	-	-	-
MW-8M	M	Downgradient	-	-	-	-	-	-	-	-	-	-	-	-
MW-9I	I	Upgradient/sidegradient	-	1.22	-	-	4.59	4.59	1.64	3.74	-	-	-	-
MW-9M	M	Upgradient/sidegradient	-	5.92	-	-	0.920	0.920	-	1.42	-	-	-	-
Field Blank	Well 6A	-	-	-	-	-	-	-	-	-	-	0.630	3.85	-
Field Blank	Well 3A	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Blank	649	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Blank	814	-	-	-	-	-	-	-	-	-	0.500	-	-	0.620
Trip Blank	3	-	-	-	-	-	-	-	-	-	-	-	-	1.02
Trip Blank	4	-	-	-	-	-	-	-	-	-	0.770	-	-	4.32
Primary MCL (ug/l)			200	-	100	-	70	-	5	5	-	80(1)	-	-

Notes: P=Perched water-bearing zone
I=Intermediate zone
M=Midpoint between top of regional water table and bedrock
Shaded compounds = VOCs that have historically been identified in the landfill gas extraction system condensate water.
(1)Indicates the parameter is an organic disinfection byproduct (DBP), specifically the total Trihalomethanes (TTHMs). The MCL is the sum of the concentrations of Bromodichloromethane, Dibromochloromethane, Bromoform and Chloroform.

Table C-3

Groundwater Well – Metals Detection Summary
Cardington Road Landfill

Well	Monitoring Zone	Flow-Position/ System	Detected Compounds (mg/l)																		
			Aluminum	Antimony	Arsenic	Barium	Cadmium	Calcium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Zinc
MW-1I	I	Upgradient	0.0186	-	-	0.216	0.0000520	111	0.000245	0.000639	0.170	0.0000770	27.9	0.00227	0.00116	2.20	-	-	41.3	0.0000334	0.00429
MW-7I	I	Upgradient	0.00361	0.0000407	-	0.150	0.0000535	174	0.000516	0.00150	0.0412	0.0000761	59.5	0.357	0.00329	2.49	-	-	83.5	0.0000783	0.0187
MW-3I	I	Downgradient	0.00913	-	-	0.256	-	125	0.000240	0.000928	0.0172	0.000169	45.8	0.00869	0.00103	2.42	0.00291	-	40.4	0.0000336	0.00602
MW-3A	P	Downgradient	0.0114	-	-	0.244	-	180	0.000252	0.000460	0.0584	0.0000698	46.6	0.000918	-	0.851	-	-	2.84	-	0.00408
MW-4I	I	Downgradient	0.00349	-	-	0.182	-	138	0.000227	0.000627	0.0336	-	50.0	0.0137	0.000438	2.51	0.00386	-	39.3	0.0000735	0.00606
MW-5A	P	Downgradient	0.0149	0.000102	-	0.175	-	81.3	0.000546	0.000440	0.0786	0.000155	20.4	0.0792	0.00106	2.54	-	-	1.88	0.0000259	0.00973
MW-5A	P	(Duplicate)	0.0149	0.0000888	-	0.165	-	86.2	0.000403	0.000337	0.0635	0.000934	21.4	0.0705	0.000375	2.71	-	-	1.96	-	0.00300
MW-5I	I	Downgradient	0.00250	0.000106	-	0.138	0.0000508	138	0.000591	0.000895	0.0332	-	50.2	0.216	0.00560	2.37	0.00112	-	39.9	0.0000655	0.0133
MW-6A	P	Downgradient	0.334	0.000210	-	0.170	-	111	0.00209	0.00165	0.594	0.000139	24.1	0.394	0.00392	6.26	-	-	4.07	0.0000539	0.00571
MW-6I	I	Downgradient	0.004	-	-	0.148	0.0000734	177	0.00173	0.00244	0.0271	0.00139	62.3	0.651	0.00990	3.44	-	0.0000439	46.1	0.000199	0.00378
MW-6M	M	Downgradient	0.0690	0.0000466	-	0.0856	-	131	0.000586	0.00206	0.227	0.000249	50.4	0.0454	0.00214	2.62	-	0.0000575	39.8	0.0000381	0.00228
MW-8A	P	Downgradient	0.0108	0.0000932	0.0121	0.237	0.000113	133	0.00268	0.00458	7.13	0.000310	25.7	0.123	0.00338	2.72	-	0.0000184	3.07	0.0000850	0.00679
MW-8A	P	(Duplicate)	0.00965	0.0000791	0.0121	0.230	0.0000858	136	0.00259	0.00205	7.48	0.000163	26.7	0.111	0.00317	2.86	-	0.0000170	2.98	0.0000817	0.00408
MW-8I	I	Downgradient	0.00660	0.000128	-	0.178	0.0000613	147	0.000723	0.00123	0.0368	0.000164	49.6	0.351	0.00499	2.38	-	-	41.8	0.000121	0.00750
MW-8M	M	Downgradient	0.00781	-	-	0.0698	-	119	0.000742	0.00083	0.0835	0.0000719	44.0	0.467	-	2.16	-	-	25.5	0.0000291	0.00317
MW-9I	I	Up/side gradient	0.00364	0.0000710	-	0.156	0.0000563	191	0.00382	0.00225	0.0770	-	65.4	0.727	0.00635	11.0	-	-	70.1	0.000296	0.00629
MW-9M	M	Up/side gradient	0.0321	0.0000600	0.00240	0.377	0.0000935	7.64	0.000128	0.00197	0.0747	0.0000911	4.78	0.0125	0.00643	80.5	0.00241	0.0000512	112	-	0.00547
Field Blank	Well 6A	-	0.00236	-	-	0.0000375	-	0.147	-	0.000405	-	0.000140	0.0311	-	0.000112	0.0667	-	-	0.113	0.0000364	0.00200
Field Blank	Well 3I	-	0.0110	-	-	0.000276	-	0.115	-	0.000305	-	0.0000848	0.0340	-	0.000877	0.0726	-	-	0.0854	-	0.00551
Trip Blank	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Blank	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Blank	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Blank	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Primary MCL (ug/l)			-	0.006	0.01	2.0	0.005	-	-	1.3	-	0.015	-	-	0.10	-	0.05	-	-	0.002	-

Notes: P=Perched water-bearing zone
I=Intermediate zone
M=Midpoint between top of regional water table and bedrock

Table C-4

Groundwater Well – Metals Detection Summary
Cardington Road Landfill

Well	Monitoring Zone	Flow-Position/ System	Detected Compounds (mg/l)																	
			Aluminum	Antimony	Arsenic	Barium	Calcium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Zinc
MW-1I	I	Upgradient	-	-	-	0.280	118	0.000205	0.000646	0.0101	-	31.6	0.000389	0.000334	2.34	-	-	42.6	-	0.00439
MW-7I	I	Upgradient	-	-	-	0.152	164	0.000528	0.00107	0.0149	-	57.3	0.373	0.00403	2.64	-	-	80.7	0.0000810	0.0526
MW-3I	I	Downgradient	0.00341	-	-	0.236	134	0.000265	0.000625	0.0138	-	49.0	0.0129	0.000664	2.63	-	-	43.8	0.0000552	0.00448
MW-3A	P	Downgradient	0.0158	-	-	0.214	175	0.000297	0.000689	0.0773	0.000105	50.4	0.00153	-	1.01	-	-	3.29	-	0.00659
MW-4I	I	Downgradient	-	-	-	0.198	137	0.000272	0.000683	-	-	49.5	0.00274	-	2.62	0.00170	-	40.7	0.0000930	0.00447
MW-5A	P	Downgradient	0.0170	0.000099	-	0.151	89.6	0.000585	0.000485	0.109	0.000141	22.2	0.0888	0.00109	3.35	-	-	2.34	-	-
MW-5I	I	Downgradient	0.00698	-	0.00172	0.121	143	0.000578	0.000848	0.0433	0.000097	52.7	0.185	0.00562	2.81	0.00299	-	43.7	0.0000554	0.00475
MW-6A	P	Downgradient	0.449	0.000183	0.00196	0.177	116	0.00146	0.00160	0.744	0.000611	25.3	0.249	0.0016	6.82	-	-	4.55	0.0000688	0.00836
MW-6A	P	(Duplicate)	0.351	0.000184	-	0.175	120	0.00124	0.00148	0.576	0.000518	26.1	0.217	0.00266	7.04	-	-	4.72	0.0000628	0.00620
MW-6I	I	Downgradient	0.156	-	-	0.0874	127	0.000617	0.00219	0.410	0.000381	49.6	0.0389	0.00296	2.96	-	0.0000894	44.2	-	0.00453
MW-6M	M	Downgradient	0.0151	-	-	0.185	155	0.00346	0.00108	0.149	0.0000888	56.1	1.13	0.0174	4.03	0.00140	-	61.7	0.000134	0.00457
MW-8A	P	Downgradient	-	-	0.0207	0.199	109	0.00237	0.000429	9.10	-	21.2	0.0606	0.00348	2.66	-	-	2.78	0.0000666	-
MW-8I	I	Downgradient	0.00792	-	0.00125	0.165	152	0.000832	0.00110	0.0383	0.000137	52.6	0.377	0.00515	2.79	-	-	42.6	0.0000944	0.00504
MW-8M	M	Downgradient	0.0140	-	0.00239	0.0686	119	0.000905	0.000831	0.0885	0.000559	46.3	0.573	0.00185	2.67	-	0.0000292	27.2	-	-
MW-9I	I	Up/side gradient	0.00686	0.000135	-	0.121	195	0.00199	0.00250	0.0325	-	66.6	0.753	0.00858	10.1	-	-	66.9	0.000269	0.00729
MW-9M	M	Up/side gradient	0.00310	-	0.00916	0.142	147	0.00266	0.000718	3.54	-	69.3	0.467	0.00309	8.48	-	-	57.2	-	-
Field Blank	Well 6A	-	-	-	-	-	-	-	0.000888	-	-	-	-	-	0.310	-	-	-	-	0.00413
Field Blank	Well 3A	-	-	-	-	0.0000748	-	-	0.00159	-	-	-	-	-	0.140	-	-	-	-	-
Trip Blank	649	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Blank	814	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Blank	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Blank	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Primary MCL (ug/l)			-	0.006	0.01	2.0	-	-	1.3	-	0.015	-	-	0.10	-	0.05	-	-	0.002	-

Notes: P=Perched water-bearing zone
I=Intermediate zone
M=Midpoint between top of regional water table and bedrock
Shaded compounds = Metals that have historically been identified in the landfill gas extraction system condensate water.

Table C-5

Groundwater Well – Leachate Indicators
Cardington Road Landfill

Well	Monitoring Zone	Flow-Position/System	Detected Compounds (mg/l)				
			Chloride	Cyanide	Ammonia (as N)	Nitrate/Nitrite (as N)	Sulfate (as SO4)
MW-1I	I	Upgradient	55.8	-	0.0450	0.621	16.0
MW-7I	I	Upgradient	205	-	0.130	3.35	81.9
MW-3I	I	Downgradient	92.1	-	0.103	1.82	56.8
MW-3A	P	Downgradient	4.21	-	0.0490	0.953	53.4
MW-4I	I	Downgradient	80.8	-	0.0840	2.11	55.8
MW-5A	P	Downgradient	2.46	-	0.0550	0.206	12.4
MW-5A	P	(Duplicate)	2.47	-	0.0700	0.194	12.6
MW-5I	I	Downgradient	97.5	-	0.0460	0.880	62.4
MW-6A	P	Downgradient	2.30	-	0.0600	0.752	25.8
MW-6I	I	Downgradient	108	-	0.158	0.0146	93.0
MW-6M	M	Downgradient	99.1	-	0.0280	0.451	76.9
MW-8A	P	Downgradient	2.86	-	0.823	0.0630	19.6
MW-8A	P	(Duplicate)	2.84	-	0.866	0.0347	19.7
MW-8I	I	Downgradient	103	-	0.0480	1.71	59.4
MW-8M	M	Downgradient	74.7	-	0.0650	0.0729	76.6
MW-9I	I	Upgradient/sidegradient	160	-	6.15	1.08	145
MW-9M	M	Upgradient/sidegradient	226	-	0.871	0.0108	2.46

Notes: P=Perched water-bearing zone
I=Intermediate zone
M=Midpoint between top of regional water table and bedrock

Table C-6

Groundwater Well – Leachate Indicators
Cardington Road Landfill

Well	Monitoring Zone	Flow-Position/System	Detected Compounds (mg/l)				
			Chloride	Cyanide	Ammonia (as N)	Nitrate/Nitrite (as N)	Sulfate (as SO4)
MW-1I	I	Upgradient	84.8	-	0.0350	0.741	19.6
MW-7I	I	Upgradient	190	-	0.0440	3.64	74.1
MW-3I	I	Downgradient	94.1	-	0.0410	2.31	55.0
MW-3A	P	Downgradient	2.47	-	0.0660	0.461	24.9
MW-4I	I	Downgradient	101	-	0.0540	3.76	57.1
MW-5A	P	Downgradient	3.09	-	0.0480	0.594	28.6
MW-5I	I	Downgradient	122	-	0.0300	0.769	65.9
MW-6A	P	Downgradient	2.70	-	0.0590	0.848	27.1
MW-6A	P	(Duplicate)	2.77	-	0.0890	0.825	27.2
MW-6I	I	Downgradient	104	-	0.0550	0.425	77.1
MW-6M	M	Downgradient	126	-	0.195	0.0102	61.6
MW-8A	P	Downgradient	1.95	-	0.824	-	13.9
MW-8I	I	Downgradient	101	-	0.0580	1.26	60.3
MW-8M	M	Downgradient	80.9	-	0.0450	0.0567	79.4
MW-9I	I	Upgradient/sidegradient	156	-	3.50	0.594	142
MW-9M	M	Upgradient/sidegradient	170	-	0.830	0.0188	64.1

Notes: P=Perched water-bearing zone
I=Intermediate zone
M=Midpoint between top of regional water table and bedrock
(-) = not detected above the reporting limit