FOURTH FIVE-YEAR REVIEW REPORT
for the
G&H INDUSTRIAL LANDFILL SUPERFUND SITE

Macomb County, Michigan

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

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4.22.16
Date

Cover photo: View of the G&H Industrial Landfill site looking to the northeast over the Phase I landfill area (Photo by William Ryan, September 1, 2015).

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LIST OF ACRONYMS

BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CAP	Corrective Action Plan
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DWSD	Detroit Water and Sewerage Department
ELCR	Estimated Lifetime Cancer Risk
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Difference
FYR	Five-Year Review
ICs	Institutional Controls
LTS	Long-term Stewardship
MCHB	Macomb County Health Board
MCL	Maximum Contaminant Level (Safe Drinking Water Act)
MCLG	Maximum Contaminant Level Goal (Safe Drinking Water Act)
MDEQ	Michigan Department of Environmental Quality
MWRC	Michigan Water Resource Commission
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OMP	Operation and Maintenance Plan
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
ppb	Parts per Billion
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSRA	Rochester-Utica State Recreational Area
SDWA	Safe Drinking Water Act
SOW	Statement of Work
TCL	Target Compound List
UECA	Uniform Environmental Covenants Act
µg/L	Micrograms per liter ("parts per billion")
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The United States Environmental Protection Agency (EPA), in consultation with the Michigan Department of Environmental Quality (MDEQ), has completed the fourth Five-Year Review (FYR) at the G&H Industrial Landfill Superfund Site (G&H Site or the Site) in Shelby Township, Macomb County, Michigan. The purpose of this FYR is to determine if the site remedy is protective of human health and the environment. The triggering action for this statutory FYR was the signing of the previous FYR report on September 13, 2011.

The G&H Site comprises approximately 70 acres of three former landfill cells, 30 acres of wetlands, and an adjacent former junkyard. It is bounded on the north by 23 Mile Road and on the east by Ryan Road, with residential areas located north of 23 Mile Road and east of Ryan Road. The Clinton River flows through the former Rochester-Utica State Recreational Area (RSRA) which bounds the site to the south and west.

From 1955 to 1973, G&H Industrial Landfill, Inc. accepted used industrial oil, spent solvents, and municipal solid waste for disposal in a former gravel quarry. In the 1960s, State authorities responded to a report of groundwater contaminated with polychlorinated biphenyls (PCBs) seeping out of areas south of the landfill by prohibiting the further disposal of industrial solvents. The State referred the Site to EPA in January 1982 and EPA placed the Site on the National Priorities List (NPL) in September 1983.

After completing a Remedial Investigation and Feasibility Study (RI/FS), EPA issued a Record of Decision (ROD) in December 1990 that required placement of a landfill cap over the Site and construction of a groundwater containment and leachate extraction system to isolate the fill material from the environment (See Appendix A, Remedy Selection, for a completed list of remedy components). Under a 1992 consent decree (CD) with EPA, a group of potentially responsible parties (PRPs) completed remedy construction in August 1999 and has operated the remedial systems since that time.

EPA completed a FYR at the G&H Site in 2011 but deferred issuing a remedy protectiveness statement in the 2011 FYR report, pending further evaluation of the groundwater containment and leachate extraction systems. Upon completing that evaluation, EPA notified the PRP group on November 26, 2013, that it must submit Corrective Action Plans (CAPs) to address deficiencies in these systems and reduce groundwater contaminant concentrations downgradient of the source containment system.

The PRPs responded in January 2014 by submitting CAPs describing proposals to improve the groundwater collection system, install a slurry wall along the eastern alignment of a Detroit Water and Sewerage Department (DWSD) water main, and to ensure the attainment of groundwater cleanup standards downgradient of the source containment system within the timeframe specified by the ROD. EPA has approved these CAPs and the PRPs are currently working on the design and implementation of the required remedy improvements.

The remedy at the G&H Industrial Landfill Site is currently protective of human health and the environment, because all potentially affected properties surrounding the Site have been connected to the municipal water supply, and the *Regulations Governing Water Supplies in Macomb County (Article V, Section 5.1)* prohibit construction of new water supplies (i.e. private wells) without first receiving a permit issued by the County Health District. In addition, the landfill cap and fence are intact and well-maintained preventing exposure to the landfill contents and preventing infiltration of rainwater into the waste. In order for the remedy to be protective in the long term, however, the following actions should be taken: complete implementation of the CAPs addressing improvements to the groundwater collection

system performance and monitoring program, finalize and record appropriate restrictive covenants, develop a Long-term Stewardship (LTS) plan or an amendment to the Operation and Maintenance plan (OMP) that will outline procedures for inspecting and monitoring compliance with the institutional controls (ICs), and complete the methane gas investigation and propose corrective measures to reduce the elevated methane concentrations in perimeter gas probes.

Because hazardous substances remain above levels that would allow unlimited use or unlimited exposure (UU/UE), EPA will conduct the next FYR at the G&H Site within five years of the completion date of this report.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: G&H Industrial Landfill		
EPA ID: MID980410823		
Region: 5	**State:** MI	**City/County:** Shelby Township, Macomb County
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): William J. Ryan		
Author affiliation: EPA, Region 5		
Review period: 5/28/2015 - 4/15/2016		
Date of site inspection: 9/1/2015		
Type of review: Statutory		
Review number: 4		
Triggering action date: 9/13/2011		
Due date *(five years after triggering action date)*: 9/13/2016		

Five-Year Review Summary Form (continued)

Issues/Recommendations				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): OU1/Site-wide	**Issue Category: Monitoring**			
	Issue: The current monitoring well network and list of analytical parameters may not be sufficient for determining the long-term protectiveness of the remedy.			
	Recommendation: The PRPs must fully implement the EPA-approved CAP for addressing down-gradient contaminant concentrations.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/30/2016

OU(s): OU1/Site-wide	**Issue Category: Remedy Performance**			
	Issue: The remedy is not functioning as designed and corrective actions developed to address the deficiencies outlined in EPA's 11/26/13 notice letter have not been fully implemented.			
	Recommendation: The PRPs must fully implement the EPA-approved CAPs for improving collection system performance and addressing down-gradient contaminant concentrations.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/30/2016

OU(s): OU1/Site-wide	**Issue Category: Institutional Controls**			
	Issue: Existing ICs may be insufficient to protect remedy components and/or restrict groundwater use at or around the Site in the long-term.			
	Recommendation: The PRPs should prepare, execute, and record appropriate restrictive covenants for all properties identified by the IC investigation to ensure that all ICs required by the CD are in place and sufficient to protect the remedy, human health, and the environment.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	3/31/2017

OU(s): OU1/Site-wide	Issue Category: Institutional Controls			
	Issue: Planning for LTS is required to ensure that the ICs are maintained, monitored and enforced so that the remedy continues to function as intended.			
	Recommendation: The PRPs should develop an LTS plan or an amendment to the OMP that will outline procedures for inspecting and monitoring compliance with the ICs. An annual report should be submitted to EPA to demonstrate that the Site was inspected, that no inconsistent uses have occurred, that ICs remain in place and are effective, and that any necessary contingency actions have been executed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	3/31/2017

OU(s): OU1/Site-wide	Issue Category: Remedy Performance			
	Issue: Methane concentrations in three perimeter gas probes indicate the potential for the migration of landfill gasses.			
	Recommendation: The PRPs must take appropriate steps to investigate the extent of methane around the perimeter gas probes and propose corrective measures to reduce the elevated methane concentrations in these areas and prevent landfill gas migration.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/30/2016

OU1 and Sitewide Protectiveness Statement

Protectiveness Determination:
Short-term Protective

Protectiveness Statement:
The remedy at the G&H Industrial Landfill Site is currently protective of human health and the environment, because all potentially affected properties surrounding the Site have been connected to the municipal water supply, and the *Regulations Governing Water Supplies in Macomb County (Article V, Section 5.1)* prohibit construction of new water supplies (i.e. private wells) without first receiving a permit issued by the County Health District. In addition, the landfill cap and fence are intact and well-maintained preventing exposure to the landfill contents and preventing infiltration of rainwater into the waste. In order for the remedy to be protective in the long term, however, the following actions should be taken: complete implementation of the CAPs addressing improvements to the groundwater collection system performance and monitoring program, finalize and record appropriate restrictive covenants, develop an LTS plan or an amendment to the OMP that will outline procedures for inspecting and monitoring compliance with the ICs, and complete the methane gas investigation and propose corrective measures to reduce the elevated methane concentrations in perimeter gas probes.

I. INTRODUCTION

The purpose of an FYR is to evaluate the implementation and performance of a remedy in order to determine if the remedy is or will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

EPA prepares FYR reports pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 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."*

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which 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 actions no less often than every five years after the initiation of the selected remedial action."*

EPA conducted this FYR on the remedy implemented at the G&H Industrial Landfill Superfund Site in Shelby Township, Macomb County, Michigan. EPA is the lead agency for developing and implementing the remedy for the Site. The MDEQ, as the support agency, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the fourth FYR for the G&H Site. The triggering action for this statutory review is the completion date of the previous FYR report. The FYR is required because hazardous substances, pollutants, or contaminants remain at the Site above levels that would allow UU/UE. The Site comprises one operable unit (OU), which is addressed in this FYR report.

II. PROGRESS SINCE THE LAST REVIEW

Table 1: Protectiveness Determinations/Statements from the 2011 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
OU1/Site-wide	Protectiveness Deferred	A protectiveness determination for the remedy at the G&H Landfill Site cannot be made until a further evaluation of the groundwater/leachate extraction systems can be conducted. It is expected that these evaluations will take approximately twelve months to complete, at which time a protectiveness determination will be made. EPA will issue an addendum to the Five-Year Review (FYR) once the protectiveness determination is complete. Long-term protectiveness of the remedy will depend on the groundwater extraction and treatment system continuously maintaining an adequate inward

		hydraulic gradient within the slurry wall and effectively treating extracted groundwater to remove contaminants from the Site, monitoring the groundwater and surface water until the completion of the remedy can be demonstrated by the attainment of cleanup standards, and successful implementation of the Institutional Controls listed in the consent decree.

Table 2: Status of Recommendations from the 2011 FYR

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
OU1/Site-wide	Physical and hydraulic containment may not be functioning as designed along the south wall of Phase II, at the southwest corner of Phase II, along the DWSD water main, and at the toe of Phase III.	Develop contingency plans, outlined in the OMP, to achieve physical and hydraulic containment at the south wall of Phase II, at the south west corner of Phase II, along the DWSD water main, and at the toe of Phase III.	PRP	EPA/State	09/30/12	Completed	January 31, 2015
OU1/Site-wide	Orange colored liquids are discharging at the toe of the Phase III landfill.	Develop and execute a sampling and analysis plan to sample the discharge from the Phase III toe and ponded surface waters.	PRP	EPA/State	09/30/12	Completed	August 31, 2013
OU1/Site-wide	The current monitoring well locations and list of analytical parameters may be insufficient.	Evaluate the monitoring network and the 20 compounds identified in the June 23, 2008 sampling event to determine if revisions are needed.	PRP	EPA/State	09/30/12	Ongoing	NA
OU1/Site-wide	Institutional Controls require investigation.	Develop and execute an IC Study to determine whether ICs are in place and effective.	PRP	EPA/State	09/30/12	Completed	March 31, 2013

Status of Recommendation 1

Develop contingency plans, outlined in the Operation and Maintenance Plan (OMP), to achieve physical and hydraulic containment at the south wall of Phase II, at the south west corner of Phase II, along the DWSD water main, and at the toe of Phase III.

The PRPs submitted two CAPs for EPA review in January 2014. The first CAP addresses improving collection system performance. The second CAP addresses reducing contaminant concentrations downgradient of the source containment system. The CAPs were revised based on comments from EPA

and MDEQ, and the final CAPs were submitted in December 2014. EPA issued final approval of the two CAPs in January 2015, after consulting with MDEQ, and the PRPs are currently working on designing and implementing the corrective measures. EPA estimates that all work will be completed by December 30, 2016.

Status of Recommendation 2

Develop and execute a sampling and analysis plan to sample the discharge from the Phase III toe and ponded surface waters.

A Phase III Landfill investigation was completed in August 2013. The investigation sought to characterize the orange colored liquids emanating from the landfill cap perimeter drain discharge pipes, and determine if landfill leachate is passing through the leachate collection trench into the perimeter landfill cap drainage system. The investigation included sampling the landfill cap drains during discharge events, installing six piezometers to evaluate leachate elevations, and installing two landfill gas probes to assess landfill gas migration.

Low-level concentrations of volatile organic compounds (VOCs) were present in the discharge at the time of sampling. The presence of VOCs in the discharge from the landfill cap drain could indicate that there is an inner connection between contaminants in the waste and these discharge points, but the piezometer study suggests that the low-level concentrations of VOCs in the landfill cap perimeter drains are related to the migration of landfill gases. The gases within the waste contain VOCs and methane at higher temperatures than the air present in the cap perimeter drain. When the landfill gases enter the cap perimeter drain, the drop in temperature causes water vapor to condense. The VOCs present in the condensate then discharge to the surface near the cap perimeter drain discharge tiles.

The discharge of liquids with VOCs will need to be addressed. One potential corrective action would be to provide additional passive venting on the slope of the Phase III Landfill to abate the migration of landfill gas. The PRPs submitted a work plan to investigate landfill gas on February 9, 2016, and will be required to address the migration of landfill gas at the toe of the Phase III Landfill. EPA anticipates that corrective measures will be implemented by September 30, 2016.

Status of Recommendation 3

Evaluate the monitoring network and the 20 compounds identified in the June 23, 2008 sampling event to determine if revisions are needed.

The Statement of Work (SOW) requires that compounds found to be above Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs), non-zero SDWA Maximum Contaminant Level Goals (MCLGs), or cleanup standards derived under Michigan's former Act 307, Type B Criteria be added to the list of groundwater cleanup standards for the G&H Site, with the additional cleanup standard being the more stringent of the MCL or the Michigan's former Act 307, Type B Criterion. The SOW also requires that compounds exceeding an estimated lifetime cancer risk (ELCR) of 1×10^{-6}, or a hazard index value of 1.0, be added to the list of groundwater cleanup standards for the Site, provided that the cleanup standard established exceeds the natural background concentration of the contaminant.

The monitoring program was expanded for the December 2014 sampling event to include the full Target Compound List (TCL) for VOCs, and a comprehensive groundwater sampling event was completed in

June 2015. The results from the full TCL sampling events (December 2014, June 2015, and December 2015) and subsequent events will be used to determine whether additional compounds should added to the list of constituents that must achieve groundwater cleanup standards for the Site.

Additional items remaining to be completed under this recommendation include a review of monitoring well locations, an inspection of the monitoring wells to determine whether they are capable of providing representative groundwater samples, and a review of monitoring frequency. EPA anticipates that this work will be completed by December 30, 2016.

Status of Recommendation 4

Develop and execute an Institutional Control (IC) Study to determine whether ICs are in place and effective.

The PRPs submitted a draft IC investigation/study in March 2013. EPA outlined the goals and requirements of the study in a letter attached to the 2011 FYR. The study was developed to determine the following:

- Whether the ICs were put in place by a person with the authority to make the conveyance.
- Whether the ICs are currently valid and have not been lifted or superseded.
- Whether the ICs create rights that can be enforced by EPA and MDEQ in the event that they are violated.
- Whether the ICs are being complied with.
- Whether current ICs adequately implement the objectives and performance standards described in the 1993 CD.
- Whether existing ICs require corrective measures to ensure their effectiveness.
- Whether new or additional ICs are necessary to achieve and maintain the objectives and performance standards described in the 1993 CD.

The study identified four parcels comprising, or adjacent to, the G&H Site (Figure 2, Appendix B):

- Parcel 1 is the former Estate of Leonard Foster, currently owned by the State of Michigan;
- Parcel 2, is a small area on the eastern boundary, currently owned by the Inveterate Investment Company;
- Parcel 3 is the former Rochester Utica State Recreational Area, currently owned by Charter Township of Shelby; and
- Parcel 4 is additional property to the north of Parcel 1 that is currently owned by Lakeshore Shelby Inc.

Further discussion of the easements, deed restrictions, land-use limitations, and other enforceable instruments restricting private property use required by the CD can be found in the Institutional Controls Section, below.

Remedy Implementation Activities

The 2011 FYR deferred issuing a determination that the remedy is protective, pending further evaluation

of the groundwater containment and leachate extraction systems, and on November 26, 2013, EPA notified the PRPs that they must develop CAPs to address deficiencies in these systems and reduce contaminant concentrations downgradient of the source containment system. The primary remedy implementation activities since 2011 have focused on correcting the issues identified in the 2011 FYR.

To address the deficiencies identified in the November 26, 2013 notice, the PRPs submitted two CAPs. The first CAP (*Corrective Action Plan for Improving Collection System Performance*) addresses the requirements under the CD SOW Paragraph II.B.7. The second CAP (*Corrective Action Plan for Reducing Concentrations Downgradient of the Source Containment System*) addresses the requirements under CD SOW Paragraph II.E.6. EPA has approved these CAPs, and the PRPs have taken the following measures to correct the deficiencies in the physical and hydraulic containment systems and support the design and implementation of the proposed corrective actions:

- Installed a test extraction well and piezometers within the collection system drainage media along the barrier wall to examine the potential for additional extraction wells to enhance drawdown along this segment of the collection system.
- Operated this new test extraction well in the collection system drainage media and monitored the effect on water levels along the barrier wall.
- Installed piezometers within the DWSD drainage media to examine conditions closer to the water main.
- Collected drainage media samples from the leachate collection system during installation of the test extraction well and piezometers to evaluate the current condition of the drainage media and assess alternatives to remove the observed clogging.
- Conducted a video inspection and cleaning of the barrier wall collection piping, where feasible.
- Cleaned the barrier wall force main and force main laterals to ensure flows were not restricted.
- Evaluated the current system configuration of the pumps and controls in sumps S-4 and S-5 located along the DWSD water main collection system to assess potential modifications (i.e. changes to pump types and/or elevation of level control switches).
- Redirected the discharge from existing extraction wells along the sump S-4 collection system into a dedicated force main to increase the flows, run-times, and overall performance of the system.
- Completed a sump by sump evaluation of current pump types, system controls, and operating procedures to evaluate potential improvements and/or replacements.
- Assessed alternatives to increase water levels downgradient of the barrier wall to improve the prospects for achieving a consistent two-foot inward gradient.
- Recalculated the remedy's water budget to determine if the current containment system and proposed improvements will be capable of handling maximum water volumes.
- Re-evaluated current operational procedures and initiated proactive maintenance practices for a revised OMP.
- Evaluated the installation of supplemental extraction components along the barrier wall.
- Evaluated the installation of a physical barrier along the DWSD water main alignment.

The following corrective actions, designed to improve collection system performance, have not been fully implemented:

- Installation of supplemental collection drain and media trenches inside the existing slurry wall to

improve hydraulic containment.
- Installation of a new slurry wall to isolate the 96-inch DWSD water main and close the southwest corner of the Phase II Landfill.

The following corrective actions, designed to address the down-gradient concentrations of contaminants, have not been completed:

- Annual trend analyses of groundwater monitoring data.
- Evaluation of the current groundwater monitoring plan including monitoring locations and analytes to be monitored.
- Determination of an EPA-acceptable method for calculating a background value for arsenic.

EPA, in consultation with MDEQ, has agreed to defer implementation of the corrective actions to address the down-gradient concentrations while corrective actions designed to improve collection system performance are being implemented. EPA anticipates that all corrective actions will be completed by December 30, 2016.

Institutional Controls

ICs in the form of deed restrictions are required by the 1990 ROD to restrict property use, maintain the integrity of the remedy, and ensure the long term protectiveness for areas that do not allow for UU/UE. The implemented and planned ICs for the Site are listed in Table 3 and are further discussed below. A map showing the area in which the ICs apply is included as Figure 2 in Appendix B.

Paragraph 22 of the CD sets forth the requirements of the Settling Defendants (as that term is defined in the CD) with respect to obtaining and securing easements, deed restrictions, land-use limitations and other enforceable instruments restricting private property use. Specifically, Paragraph 22 states that the Settling Defendants *"shall timely secure all easements, deed restrictions, land-use limitations, or other enforceable instruments restricting private property use, beyond those deed restrictions secured by the United States from the Estate of Leonard Forster (attached hereto as Appendix 6), necessary to prevent interference with the implementation and completion of the Work to be performed on the Site under this Consent Decree."*

The deed restrictions, which were to be secured by the United States from the Estate of Leonard Forster for Parcel 1 (the Forster property), and recorded with the Macomb County Register of Deeds, impose the following restrictions:

- No consumptive or other use of the groundwater that could cause exposure of humans or animals to the groundwater underlying the Site.
- No residential, commercial, or agricultural use of the Forster property considered part of the Site, including, but not limited to, any filling, grading, excavating, building, drilling, mining, farming, or other development, or placing of waste material at any portion of the Site, including, but not limited to, the Auto Disposal Yard, for any purpose, including residential, commercial, or agricultural purposes, except as approved in writing, by EPA.
- No use of the Site that would allow the continued presence of humans at the Site, other than the presence necessary for implementation of any response actions selected and/or undertaken by EPA pursuant to Section 104 of CERCLA, including such response actions taken by other

responsible parties under a judicial or administrative order. A prohibited use of the Site includes, but is not limited to, recreational use.

- No installation, removal, construction or use of any buildings, wells, pipes, roads, ditches or any other structures or materials at the Site except as approved, in writing, by EPA, and in consultation with the State of Michigan.
- No tampering with, or removal of, the containment or monitoring systems that remain on the Site as a result of implementation of any response action by EPA, or any party acting as agent for EPA, and which is selected and/or undertaken by EPA pursuant to Section 104 of CERCLA.
- No use of, or activity at, the Site that may interfere with, damage, or otherwise impair the effectiveness of any response action (or any component thereof) selected and/or undertaken by EPA, or any party acting as agent for EPA, pursuant to Section 104 of CERCLA, except with the written approval of EPA, in consultation with the State of Michigan, and consistent with all statutory and regulatory requirements.

The obligation to implement and maintain the above restrictions must run with the land and remain in effect until such time as EPA files with the court a written certification that the above restrictions are no longer necessary to meet the purposes of the remedy.

While the Settling Defendants are not relying on governmental controls to satisfy their obligations under the terms of the CD, all potentially affected properties surrounding the Site have been connected to the municipal water supply, and the *Regulations Governing Water Supplies in Macomb County (Article V, Section 5.1)* prohibit construction of new water supplies (i.e. private wells) without first receiving a permit issued by the County Health District.

Table 3: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	**ICs Needed**	**ICs Called for in the Decision Documents**	**Impacted Parcels (See Figure 2, Appendix B)**	**IC Objective**	**Title of IC Instrument Implemented and Date (or planned)**
Land Groundwater	Yes	Yes	Parcel 1: the former Estate of Leonard Forster, currently owned by the State of Michigan.	See CD requirements, directly above.	• Deed Restriction, executed December 10, 1991 (unable to locate). • Regulations Governing Water Supplies in Macomb County (Article V, Section 5.1). • New restrictive covenant planned.

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcels (See Figure 2, Appendix B)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Land Groundwater	Yes	Yes	Parcel 2: a small area on the eastern boundary, currently owned by the Inveterate Investment Company.	See CD requirements, directly above.	• Easement, recorded with the Macomb County Register of Deeds on November 3, 1997, in Liber 7715 Page 652. • Regulations Governing Water Supplies in Macomb County (Article V, Section 5.1) • Restrictive covenant planned.
Land Groundwater	Yes	Yes	Parcel 3: the former Rochester Utica State Recreational Area, currently owned by Charter Township of Shelby.	See CD requirements, directly above.	• Restrictive Covenant, recorded with the Macomb County Register of Deeds on October 1, 2003, in Liber 14492 Page 304. • Regulations Governing Water Supplies in Macomb County (Article V, Section 5.1)
Land Groundwater	Yes	Yes	Parcel 4: additional property to the north of Parcel 1 that is currently owned by Lakeshore Shelby Inc.	See CD requirements, directly above.	• Easement. • Regulations Governing Water Supplies in Macomb County (Article V, Section 5.1) • Restrictive covenant planned.

First American Title Company was retained by the Settling Defendants to complete a title commitment search to document the property information regarding the parcels that are located within the Site boundary.

Parcel 1 The title commitment did not identify the deed restriction that EPA was required to record under the terms of the CD with respect to the Forster property. While an executed copy of the deed restriction, dated December 10, 1991, is included in Appendix 6 of the CD, both the Settling Defendants

and the title company were unable to verify that the deed restriction was recorded. The deed restriction obtained by EPA with respect to Parcel 1 must be recorded with the Macomb County Register of Deeds, pursuant to the terms of the CD. Because the Estate of Forster no longer is the fee owner of Parcel 1, EPA will need to revise the deed restriction and obtain the consent of the current fee owner of Parcel 1 (the State of Michigan) before it can record the deed restriction with the Macomb County Register of Deeds.

Parcel 2 The title commitment identified an Easement Agreement executed on November 3, 1997 between Earl Braxton, Jo An Braxton and Porta-John of America, Inc., as grantors, and the G&H Landfill PRP Group, as grantees. The Easement Agreement is recorded with the Macomb County Register of Deeds in Liber 7715 Page 652, and grants to the G&H Landfill PRP Group a perpetual exclusive easement. The Easement Agreement also includes various restrictions related to protection of the remedial action and property use.

Parcel 3 The title commitment identified a Restrictive Covenant executed and recorded on October 1, 2003, by Shelby Township with the Macomb County Register of Deeds in Liber 14492 Page 304, which covers a portion of the Rochester Utica State Recreational Area. The Restrictive Covenant imposes various restrictions on Parcel 3 of the Site related to the remedial action.

Parcel 4 The title commitment also identified a Permanent Easement Agreement dated September 27, 1996 between Lakeshore-Shelby, Inc., as grantor, and the G&H Landfill PRP Group, as grantees. The Permanent Easement Agreement is recorded with the Macomb County Register of Deeds in Liber 7206 Page 269, and grants to the G&H Landfill PRP Group the exclusive and permanent use of a portion of grantor's property that contains remedial action components related to Parcels 1 and 3 of the Site.

Current Compliance: Based on information gathered by EPA as part of this FYR, including the results of the FYR site inspection, EPA is not aware of site or media uses that are inconsistent with the stated objectives to be achieved by the ICs. Nevertheless, because the easement agreements for parcels 2 and 4 may not be sufficient to meet the requirements of the 1993 CD, and the title commitment search was unable to locate the restrictive covenant required for the Forster property, EPA is recommending that appropriate restrictive covenants be prepared, executed, and recorded with the Macomb County Register of Deeds for all properties identified by the IC investigation/study to ensure long-term protectiveness.

Long-term Stewardship: Since compliance with ICs is necessary to ensure the protectiveness of the remedy, planning for LTS is required to ensure that the ICs are maintained, monitored and enforced so that the remedy continues to function as intended. The PRPs will develop an LTS plan or an amendment to the OMP that will outline procedures for inspecting and monitoring compliance with the ICs, and an annual report will be submitted to EPA to demonstrate that the Site was inspected, that no inconsistent uses have occurred, that ICs remain in place and are effective, and that any necessary contingency actions have been executed.

System Operation/Operation and Maintenance

The PRPs are conducting long-term monitoring and maintenance activities according to the EPA approved OMP. The primary activities associated with operation and maintenance (O&M) include:

- Bi-weekly and monthly inspections conducted in the landfill cap, groundwater/leachate collection systems, slurry wall, wetlands areas, access roads, and perimeter security fence. In

addition, the cap is scheduled to be mowed semi-annually.

- Groundwater samples and water level measurements obtained quarterly from 71 monitoring wells.

III. FIVE-YEAR REVIEW PROCESS

Administrative Components

EPA notified the MDEQ and the PRPs of the initiation of the FYR on or about April 30, 2015. The FYR was led by EPA's Remedial Project Manager (RPM), William Ryan, and the Community Involvement Coordinator (CIC), Cheryl Allen. Kristi Zakrzewski, of the MDEQ, assisted in the review as the representative for the support agency.

The review consisted of the following components:

- Community Notification and Involvement
- Document Review
- Data Review
- Site Inspection
- FYR Report Development and Review

Community Notification and Involvement

Activities to involve the community in the FYR process were initiated with a meeting in May 2015 between the RPM and CIC for the Site. A notice was published in the local newspaper, the *Macomb Daily*, on July 10, 2015, stating that EPA was conducting an FYR and inviting the public to submit comments. The results of the review and the report will be made available at the G&H Site information repository located in the Shelby Township Library, 51680 Van Dyke Avenue, Shelby Township, MI 48316.

Document Review

This FYR included of a review of relevant documents, O&M records, and monitoring data. Applicable groundwater cleanup standards, as listed in the December 1990 ROD and the March 1992 Explanation of Significant Differences (ESD), were also reviewed.

Data Review

A review of the groundwater elevation data from the G&H Site since the 2011 FYR reveals that remedy performance has not changed significantly over the past five years. Several monitoring locations along the barrier wall demonstrate a persistent failure to maintain a two-foot inward hydraulic gradient, and groundwater elevations surrounding the 96-inch DWSD water main remain 10.5 to 13.8 feet higher than the inside bottom elevation of the water main. EPA anticipates that full implementation of the approved CAPs will correct these deficiencies. Summary tables and charts of the groundwater monitoring, landfill gas monitoring, and system performance data can be found in Appendix B.

Arsenic concentrations above the cleanup standard persist in groundwater outside the containment system (Table 1, Appendix B), but the current cleanup standard for arsenic (0.02 micrograms per liter (µg/L)) is 500 times lower than the standard for safe drinking water, the MCL. The 1990 ROD predicted

that, *"naturally occurring (background) concentrations found at the G&H Site may be higher than the cleanup standard. In that event, background levels will become the Cleanup Standard."* MDEQ has proposed adopting the MCL (10 µg/L) as the arsenic cleanup standard. If the MCL cannot be agreed upon as the arsenic cleanup standard, a method of determining background concentrations acceptable to all parties must be applied, and a revised cleanup standard for arsenic established. Meaningful trend analyses for arsenic cannot be conducted until a cleanup standard approaching background concentrations is determined, and the current cleanup standard is likely unattainable.

While concentrations of arsenic, benzene, *cis*-1, 2 dichloroethene, lead, and vinyl chloride continue to exceed cleanup standards (Table 1, Appendix B and Table 6, Appendix A), there are no immediate threats to human health because contaminated groundwater is not being consumed. All potentially affected properties surrounding the Site have been connected to the municipal water supply, and the *Regulations Governing Water Supplies in Macomb County (Article V, Section 5.1)* prohibit construction of new water supplies (i.e. private wells) without first receiving a permit issued by the County Health District.

Once the CAPs have been fully implemented, EPA expects that improved performance of the containment and extraction system will allow the remedy to attain groundwater cleanup standards by 2030, as predicted by the ROD. EPA further expects that increased scrutiny on contaminant concentrations following the November 26, 2013, Notice Letter will ensure continued protection of human health and the environment. In addition to semi-annual and annual groundwater monitoring, the next, comprehensive five-year sampling event is scheduled to occur in June 2018. Following the next five-year sampling event, if contaminant concentrations downgradient of the containment system indicate that improvements to the containment system have failed to improve downgradient contaminant concentrations, EPA may require additional remedial actions, such as increased hydraulic capture or *in situ* treatment.

A condition not noted in the 2011 FYR is the potential for landfill gas migration. The generation of methane is expected within the confines of the landfill. This condition is addressed by venting the landfill gases directly to the atmosphere using vents installed in the landfill cap.

To assess the potential migration of landfill gases beyond the Site, gas monitoring probes have been installed along the perimeter. Gas probes GP-2 through GP-6 are located on the northern boundary of the Phase I Landfill along the south side of 23 Mile Road. Gas probes GP-09 and GP-10 are located along the southeastern boundary of the Phase I Landfill in the industrial area south of the existing automobile disposal yard. And gas probes GP-11 and GP-12 are located along the southwestern boundary of the Phase III Landfill (Figure 3, Appendix B).

The presence of landfill gases at any of the perimeter probes is an indication that the landfill gas venting system may not be adequate to control the migration of landfill gases. The area of greatest concern is northern boundary of the Phase I Landfill because of the residential development directly north of 23 Mile Road, where methane concentrations in gas probes GP-2 and GP-6 show the potential for migration. The presence of landfill gases at the toe of the Phase III Landfill will also require investigation, but this area is not proximal to structures in which methane could accumulate.

The PRPs have submitted a work plan to investigate the extent of methane in the areas surrounding these gas probes, and will propose corrective measures to alleviate the elevated methane concentrations in these areas and prevent gas migration beyond the perimeter of the Site. EPA anticipates corrective

actions to be completed by September 30, 2016.

Site Inspection

EPA inspected the Site on September 1, 2015, accompanied by Barb Vetort, Site Geologist from MDEQ, and Gavin O'Neil and Mohamed Zakkar, representing the PRPs. The group reviewed the Site history and examined the landfill cap, adjacent wetlands, and the groundwater extraction and treatment system. Specific observations include the following:

- Fence - the main part of the fence, which isolates the landfill and treatment plant from public access, appears intact and well maintained.
- Roads - the access roads into the Site, around the perimeter of the capped area, to the treatment plant, and through the wetlands area were properly graded and well maintained.
- Landfill Cap - the cap appears intact and well maintained, no signs of settlement, cracks, erosion, holes, penetrating vegetation, bulges, or slope instability were observed.
- Wetlands - the wetlands associated with the treatment plant and RSRA appear to be in satisfactory condition. Invasive species (*Phragmites*) were observed in portions of the mitigated wetlands and the RSRA.
- Treatment Plant - the treatment plant is also well maintained and functioning properly.

Interviews

Interviews with individuals beyond the FYR project team and treatment plant operator were not conducted. No member of the community or other stakeholders voiced an interest in discussing issues related to the 2016 FYR.

IV. TECHNICAL ASSESSMENT

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

NO. The CD requires that the Settling Defendants must design, construct, operate, and maintain a source containment system that hydraulically and physically controls the Phase I, II, and III landfill areas, and prevents the further migration of hazardous substances from the Site.

The 2016 FYR has determined that portions of the remedy are not functioning as designed, because the physical and hydraulic containment systems do not consistently achieve performance requirements. Specifically, the groundwater containment and leachate extraction systems are not consistent in maintaining a 2-foot inward hydraulic gradient across the slurry wall, the DWSD water main is not being maintained in a dewatered condition, and there are concerns regarding the capacity of the monitoring program for determining the long-term protectiveness of the remedy.

EPA has approved CAPs to address these conditions, and the Settling Defendants are currently working on design and implementation. While EPA cannot confirm that the remedy is currently functioning as intended by the decision documents until the CAPs have been fully implemented, human health is currently protected because all potentially affected properties surrounding the Site have been connected to the municipal water supply, and the Regulations Governing Water Supplies in Macomb County

(Article V, Section 5.1) prohibit construction of new water supplies (i.e. private wells) without first receiving a permit issued by the County Health District. In addition, the landfill cap and fence are intact and well-maintained, preventing exposure to the landfill contents and preventing infiltration of rainwater into the waste.

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

YES. The exposure assumptions, toxicity data, and RAOs used at the time of remedy section are still valid. Nevertheless, the cleanup standard for arsenic, currently set at 0.02 µg/L, needs to be revised. The PRPs are advised to determine the background concentration of arsenic, as envisioned by the ROD, so that meaningful trend analyses can be conducted and the groundwater cleanup standard for arsenic is attainable.

It may also be necessary to update the risk assessment from the 1987 RI to include recreational use and fish consumption in the Holland Ponds Recreational Area.

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

NO. No other information has come to light that could call into questions the protectiveness of the remedy.

Technical Assessment Summary

While EPA cannot confirm that the remedy is currently functioning as intended by the decision documents or capable of meeting operative conditions required by the CD until the CAPs have been fully implemented, human health is believed to be currently protected because all potentially affected properties surrounding the Site have been connected to the municipal water supply, and the *Regulations Governing Water Supplies in Macomb County (Article V, Section 5.1)* prohibit construction of new water supplies (i.e. private wells) without first receiving a permit issued by the County Health District. In addition, the landfill cap and fence are intact and well-maintained, preventing exposure to the landfill contents and preventing infiltration of rainwater into the waste. The exposure assumptions, toxicity data, and RAOs used at the time of remedy section are still valid, and EPA expects that improved performance of the containment and extraction systems following implementation of the CAPs will allow the remedy to attain groundwater cleanup standards by 2030, as estimated by the 1990 ROD.

V. ISSUES/RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Table 4: Issues and Recommendations/Follow-up Actions

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
OU1 Site-wide	The current monitoring well network and list of analytical parameters may not be sufficient for determining the long-term protectiveness of the remedy.	The PRPs must fully implement the EPA-approved CAP for addressing down-gradient contaminant concentrations.	PRPs	EPA	12/30/2016	No	Yes
OU1 Site-wide	The remedy is not functioning as designed and corrective actions developed to address the deficiencies outlined in EPA's 11/26/13 notice letter have not been fully implemented.	The PRPs must fully implement the EPA-approved CAPs for improving collection system performance and addressing down-gradient contaminant concentrations.	PRPs	EPA	12/30/2016	No	Yes
OU1 Site-wide	Existing ICs may be insufficient to protect remedy components and/or restrict groundwater use at or around the Site.	The PRPs should prepare, execute, and record appropriate restrictive covenants for all properties identified by the IC investigation to ensure that all ICs required by the CD are in place and sufficient to protect the remedy, human health, and the environment.	PRPs	EPA	3/31/2017	No	Yes

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
OU1 Site-wide	Planning for LTS is required to ensure that the ICs are maintained, monitored and enforced so that the remedy continues to function as intended.	The PRPs should develop a LTS plan or an amendment to the OMP that will outline procedures for inspecting and monitoring compliance with the ICs. An annual report should be submitted to EPA to demonstrate that the Site was inspected, that no inconsistent uses have occurred, that ICs remain in place and are effective, and that any necessary contingency actions have been executed.	PRPs	EPA	3/31/2017	No	Yes
OU1 Site-wide	Methane concentrations in three perimeter gas probes indicate the potential for the migration of landfill gasses.	The PRPs must take appropriate steps to investigate the extent of methane around the perimeter gas probes and propose corrective measures to reduce the elevated methane concentrations in these areas and prevent landfill gas migration.	PRPs	EPA	9/30/2016	No	Yes

In addition, the cleanup standard for arsenic, currently set at 0.02 µg/l, needs revision, and the responsible parties are charged with determining the background concentration, as envisioned by the 1990 ROD.

VI. PROTECTIVENESS STATEMENT

OU1 and Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedy at the G&H Industrial Landfill Site is currently protective of human health and the environment, because all potentially affected properties surrounding the Site have been connected to the municipal water supply, and the *Regulations Governing Water Supplies in Macomb County (Article V, Section 5.1)* prohibit construction of new water supplies (i.e. private wells) without first receiving a

permit issued by the County Health District. In addition, the landfill cap and fence are intact and well-maintained preventing exposure to the landfill contents and preventing infiltration of rainwater into the waste. In order for the remedy to be protective in the long term, however, the following actions should be taken: complete implementation of the CAPs addressing improvements to the groundwater collection system performance and monitoring program, finalize and record appropriate restrictive covenants, develop a LTS plan or an amendment to the OMP that will outline procedures for inspecting and monitoring compliance with the ICs, and complete the methane gas investigation and propose corrective measures to reduce the elevated methane concentrations in perimeter gas probes.

VII. NEXT REVIEW

The next FYR report for the G&H Industrial Landfill Superfund site is required five years from the completion date of this review.

APPENDIX A – EXISTING SITE INFORMATION

A. SITE CHRONOLOGY

Table 5: Site Chronology

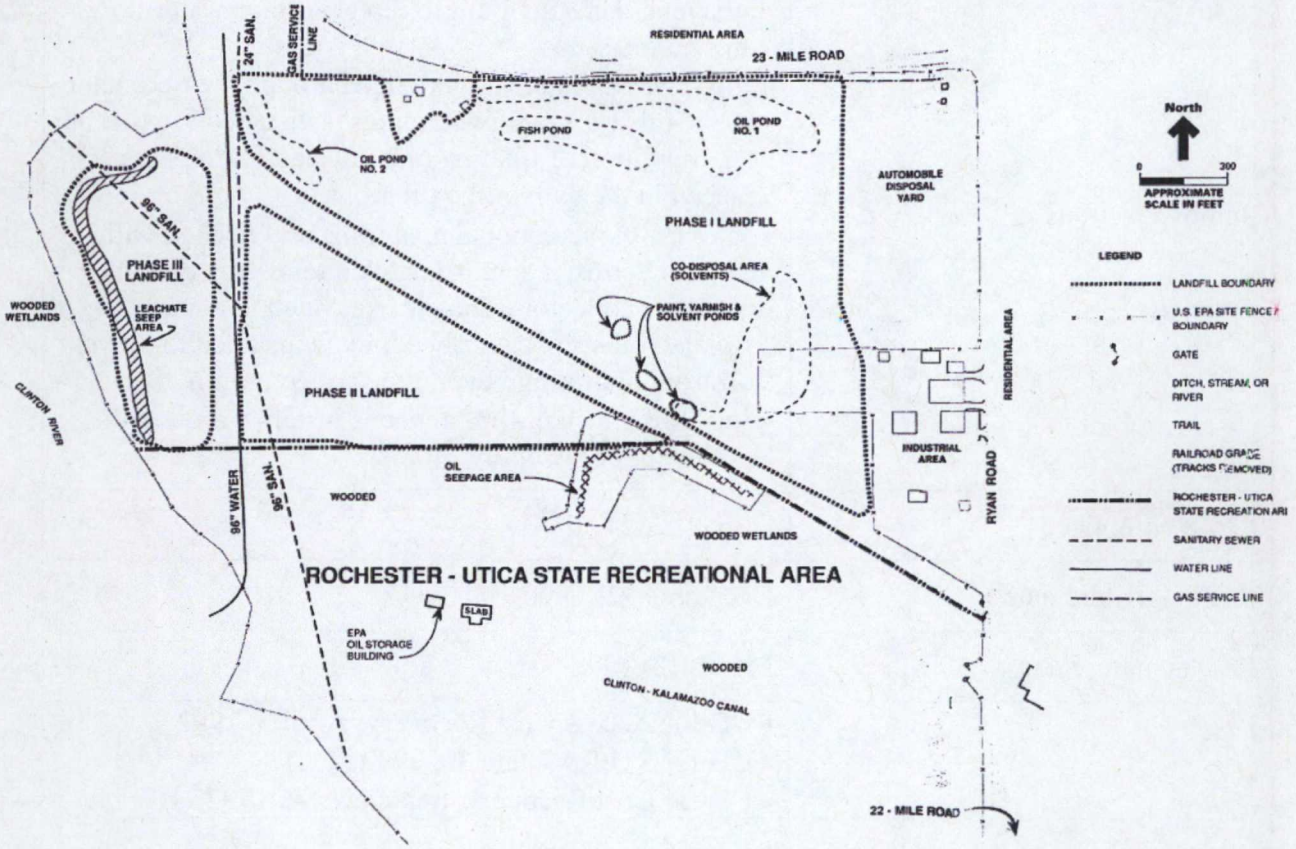
Event	Date
Initial discovery of problem or contamination	Early 1960s
Pre-NPL responses	• Michigan Water Resource Commission (MWRC) conducted a groundwater and surface water investigation in July 1965 • The State investigated the Site several times between 1973 and 1979
Final NPL listing	September 8, 1983
Removal actions	• July 1982: a fence is constructed around the oil seep area, and dams are built to direct surface water flow around the seeps • July 1983: the fence is extended around the perimeter of the oil seeps, an oil skimmer is installed to prevent the migration of floating oil, and clay barriers are placed in the path of the oil seeps • May 1986: recreational area trails are blocked with earthen berms, a gate is installed to restrict public access, a collector trench is excavated to connect isolated oil seeps, and sheet pile is installed to prevent oil from migrating beyond the collector trench • July 1987: a chain-link fence is installed around the perimeter of the entire Site
RI/FS completed	December 21, 1990
ROD signature date	December 21, 1990
ESD signature date	March 13, 1992
CDs	• CD for Access/Cost Recovery, April 3, 1992 • CD for RD/RA, June 30, 1992 • CD for Cost Recovery, September 2, 1992
Remedial design start	September 10, 1992
Remedial design complete	June 2, 1995

Event	Date
On-site remedial action construction start	August 19, 1996
Construction completion date	August 24, 1999
Previous FYRs	• 1st FYR September 5, 2001 • 2nd FYR September 27, 2006 • 3rd FYR September 13, 2011

B. BACKGROUND

Physical Characteristics

The G&H Site is divided into three phases. An abandoned Conrail railroad right-of-way bisects the Site, running from the southeast corner to the northwest corner, separating the Phase I Landfill area to the north from the Phase II Landfill area to the south. The main access road, with a gate located on 23-Mile Road, runs north-south on the Site and separates the Phase III Landfill area on the west from Phases I and II on the east. A portion of the former Clinton-Kalamazoo Canal, an abandoned navigational project, runs east-west through the southern portion of the Site. Groundwater flow in the shallow aquifer at the Site is primarily toward the south and west, controlled by the channel of the Clinton River.



Current Site topography is defined by three capped mounds (Phases I, II, and III) that characterize the three phases of the former landfilling operation. The Site access road and railroad right-of-way are

located at grade, while each of the capped landfill mounds rise approximately 10-15 feet above grade. The railroad right-of-way was capped between the Phase I and Phase II mounds.

Structures on the Site include a groundwater treatment facility located in the southwest corner of the Phase II landfill area, which treats effluent from the landfill and discharges treated water into an adjacent wetland area. Operations at the treatment facility are currently managed by the PRP's technical consultants. The Site includes a system of approximately 80 above-ground vents and monitoring wells distributed across the affected area.

A 200-acre preserve located immediately south of the G&H Site, now known as Holland Ponds, was deeded to Shelby Township by the Michigan Department of Natural Resources in 1993. The area includes seven ponds whose source water includes the treated effluent that leaves the groundwater treatment plant. Two of the seven ponds in the preserve were constructed by PRPs' technical consultants to replace wetlands that had previously existed on the Site. The Holland Ponds area provides habitat for migrating birds and aquatic wildlife. A heron rookery is also located adjacent to the Site.

A DWSD easement that runs through the western portion of the Site (between Phases II and III) contains a 96-inch water supply pipeline and a 24-inch interceptor sewer. The water supply line was constructed in 1967 and serves as the main distribution line from Lake Huron to the Detroit Municipal Water System. The 24-inch interceptor sewer, which serves Shelby Township, is connected to a 96-inch regional interceptor sewer that also runs beneath portions of the Phase II and Phase III landfill areas.

Hydrology

The Site is located just south of a drainage divide between the Main Branch of the Clinton River and the Middle Branch of the Clinton River. Locally, the drainage divide occurs along 23 Mile Road. Generally, rain falling on the north side of 23 Mile Road drains northward, while runoff entering the Site south of 23 Mile Road flows toward the Clinton River to the south and west

The shallowest bedrock unit beneath the Site is a Mississippian-age sandstone, less than 50 feet thick in the vicinity. Data from the remedial investigation indicates depth to bedrock ranges from 92-138 feet. This bedrock surface represents a glacial erosional surface that slopes to the southeast. Glacially deposited materials directly overlay the sandstone bedrock.

The G&H Site itself comprises three unconsolidated hydrostratigraphic units, the upper sand, till, and middle sand, which are underlain by the sandstone bedrock. The groundwater flow direction and flow rate are controlled primarily by the geometry and hydraulic conductivity of these hydrostratigraphic units, and by the presence of the Clinton River to the west and south of the Site. Waste is contained within the upper sand unit, with the exception of the Phase III area, which was excavated to the top of the till.

The till appears to have a significantly lower hydraulic conductivity than the upper or middle sand, based on finer grain size and one in-field hydraulic conductivity test. The presence of the till unit between the upper sand and middle sand units appears to separate them into two distinct hydrostratigraphic units. Nevertheless, the middle sand and sandstone bedrock units appear to function as a single hydrostratigraphic unit based on the similarity in hydraulic head.

The waste remaining on Site is contained within the upper sand unit, with the exception of the Phase III

fill area, which was excavated to the top of the till. The till unit, with its significantly lower hydraulic conductivity, is the hydrostratigraphic unit into which the barrier walls are keyed, providing a degree of hydraulic containment.

Land and Resource Use

The G&H Site is surrounded by a mixture of residential and light industrial uses, including residential developments to the north and east, and several light industrial facilities located to the southeast. The Clinton River runs along the western Site boundary, and the Holland Ponds Natural Area, part of the former Rochester-Utica State Recreational Area, is located south of the Site.

A redevelopment study was conducted in 2006 to determine whether portions of the site could be returned to productive use by the surrounding community. EPA engaged a consultant with expertise in specialized reuse planning to conduct community research, mapping, and analyses to identify reuse challenges and opportunities. The consultant developed a conceptual site reuse model and a project report identifying potential resources and partnerships for planning the site's future use, and in spring 2006, a team met with officials from Shelby Township, EPA Region 5, MDEQ, and PRP representatives to discuss potential options.

With effective planning communities can often return sites to productive use without jeopardizing the effectiveness of the remedy, and local government agencies had indicated strong interest in exploring reuse opportunities for the G&H Site. Nevertheless, EPA's primary responsibility is to ensure the protection of human health and the environment, and, because the ROD required ICs, the deed restrictions placed on the G&H Site as part of the CD with the estate of Leonard Forster preclude any form of use, including recreational use, unless the CD is modified.

History of Contamination

The G&H Site was a sand and gravel quarry until the early 1950s. After quarry operations ceased, the landowner leased the property to the G&H Industrial Fill Company. Waste disposal operations at the Site began in the mid-1950s and continued until 1973. The G&H Industrial Fill Company accepted municipal refuse, solid industrial wastes, and liquid industrial wastes including oils, solvents, paint residues, paints, varnishes, lacquers, and industrial process muds.

From approximately 1955 to 1967, the G&H Industrial Fill Company operated a waste oil disposal system at the Site. Bulk waste oil from various industrial sources was transported to the Site in railroad tanker cars or tanker trucks. Records indicate that as much as 600,000 gallons of waste oil was accepted monthly, although the time period over which this volume was accepted is not known. Initially, the operators attempted to reclaim oil by pumping mixtures to settling ponds and skimming off the recoverable oil for resale. Several attempts were made to reclaim the oil, but none were commercially successful. Thereafter, the oil was reportedly left to settle and the volatile components allowed to evaporate. The resulting sludge was periodically removed from the settling ponds and buried in the landfill.

Initial Response

In the early 1960s, local residents lodged complaints with the Macomb County Health Board (MCHB) regarding chemical odors coming from the Clinton-Kalamazoo canal south of the landfill. An initial

inspection by the MCHB did not locate the source of the odors, however joint surveillance by the MCHB and the Michigan Water Resource Commission (MWRC) discovered that groundwater seeps south of the railroad tracks emitted a strong chemical odor. MWRC noted that the landfill operation accepted waste oils and municipal trash, along with solvents and paints delivered in 55-gallon drums. As a result of the initial inspection the MWRC conducted a groundwater and surface water investigation in July 1965.

The 1965 MWRC investigation determined that groundwater in the upper aquifer flowed generally to the south and that liquid waste disposal operations were responsible for contamination in the groundwater south of the railroad tracks. As a result of this investigation, a Consent Order was issued by the Macomb County Circuit Court in May 1966 prohibiting the disposal of paints, varnishes, paint thinners, and lacquers in the G&H landfill. Waste oils were not addressed by this Consent Order.

A second MWRC investigation in November 1966 concluded that the waste oil disposal/reclamation activities at the landfill were also contributing to groundwater contamination. Based upon these findings, the Macomb County Circuit Court issued a second Consent Order in 1967 banning the disposal of any liquid industrial waste at the landfill.

The State investigated the G&H Site several more times between 1973 and 1979. These investigations documented potential contamination of the Clinton River by leachate seeps west of the Phase III Landfill area and by oil seeps south of the Phase I Landfill area.

Between 1982 and 1987 EPA conducted four removal actions:

- July 1982: a fence is constructed around the oil seep area, and dams are built to direct surface water flow around the seeps.
- July 1983: the fence is extended around the perimeter of the oil seeps, an oil skimmer is installed to prevent the migration of floating oil, and clay barriers are placed in the path of the oil seeps.
- May 1986: recreational area trails are blocked with earthen berms, a gate is installed to restrict public access, a collector trench is excavated to connect isolated oil seeps, and sheet-pile is installed to prevent oil from migrating beyond the collector trench.
- July 1987: a chain-link fence is installed around the perimeter of the entire Site.

Basis for Taking Action

Based on data presented in the 1987 Remedial Investigation Technical Report, EPA assessed the Site's risks and concluded that onsite chemical exposure could occur by direct contact with contaminated media, or by release of volatile compounds and inhalation. Potential exposure routes include: (1) direct contact with surface soil on the Phase I Landfill, (2) direct contact with sediments in the oil seep area, (3) direct exposure to the oil seep water, (4) direct exposure to contaminated groundwater, (5) dermal exposure of people engaged in recreational activities in areas adjacent to the Site through direct contact with contaminated surface water and sediments, and (6) consumption of contaminated wildlife. Risks to the environment included exposure of terrestrial wildlife through direct contact with contaminated media at the G&H Site, and exposure of aquatic organisms in the Clinton River or Clinton-Kalamazoo Canal to contaminants released from the Site by way of groundwater discharge or Site runoff.

The additive estimated lifetime cancer risks (ELCRs) calculated for ingestion of contaminated groundwater at the Site ranged from 5×10^{-4} to 6×10^{-3}, exceeding EPA's target risk range of 1×10^{-4} to 1×10^{-6}, and thus presenting unacceptable potential risks to human health, and the oil seep area had a calculated additive Hazard Index of 77 (153 for a child), for the ingestion and dermal absorption of contaminants if one were to accidentally fall into the oily waters. Hazard Indices above 1.0 represent an unacceptable exposure to non-carcinogens.

Soil Contamination: The areas of the highest soil contamination were in the Phase I Landfill, primarily near the oil ponds and the Co-disposal Area. Soils in or near the Phase II and III landfill areas also showed contamination, but to a lesser extent. Soils in the industrial area to the east showed that contamination extended offsite. Many organic compounds were detected, including benzene, toluene, ethylbenzene, and xylene (BTEX) compounds, polynuclear aromatic hydrocarbons (PAHs) and PCBs. Inorganic compounds were also detected above background concentrations in or near the three landfill areas.

Groundwater Contamination: At the time of the RI the vertical extent of groundwater contamination for BTEX, PAHs, and chlorinated volatile organic compounds (CVOCs) appeared to be limited to the base of the refuse and top of the upper sand unit. The horizontal extent of BTEX and CVOC contamination extended from the north boundary of the Site southward to the south side of the Clinton Kalamazoo Canal. The highest concentrations of CVOCs were adjacent to the old solvent pond. CVOCs were detected around the sheet pile wall in the Oil Seep Area and near the Oil Storage Building. The CVOCs extended to the south side of the Clinton Kalamazoo Canal. PAH contamination in the groundwater appeared to follow the same pattern as BTEX contamination, but to a lesser extent and at lower levels. A till layer isolates the upper aquifer from the lower aquifer. No contamination was detected in the lower aquifer.

Well Sampling: BTEX and CVOCs were detected in residential and commercial well water in the vicinity of the Site. These waste types were consistent with wastes detected onsite. Contamination in the industrial area appeared to be Site related because the waste types were consistent with wastes detected onsite and the contamination was detected upgradient in the auto disposal yard. Given that the types of contaminants found east of Ryan Road were consistent with those found onsite, EPA concluded that the contamination east of Ryan Road was Site related. Nevertheless, no contamination was detected upgradient of this area.

Surface Water and Sediment Contamination: Separate phase liquids and contaminated groundwater from the original Phase I Landfill area were the sources of the sediment and surface water contamination in the Oil Seep Area and the contamination of surface runoff, which in turn contaminated the groundwater south and southwest of the Oil Seep Area. BTEX and PAH compounds were detected in surface water upgradient of the Oil Seep Area.

C. REMEDIAL ACTIONS

Remedy Selection

EPA issued a ROD on December 21, 1990, that called for a remedy comprising the following elements:

- Installation of a modified Resource Conservation and Recovery Act (RCRA) Subtitle C landfill cover to prevent direct contact and reduce the rate of infiltration to the water table.

- Excavation of contaminated soils from areas outside of the landfill cover and placement of the impacted soils beneath the landfill cover.
- Installation of a slurry wall around the landfill areas to physically contain the contaminated groundwater and a toe drain on the west side of the landfill to capture leachate for treatment.
- Installation of a groundwater extraction and treatment system to capture and hydraulically contain the landfill contaminants.
- Extraction and treatment of the groundwater contaminant plume outside of the slurry wall to meet Federal drinking-water standards and State groundwater-quality standards. The treated water shall be discharged into the adjacent Clinton River in compliance with the substantive requirements of the National Pollutant Discharge Elimination System, as administered by the State of Michigan under Part 21 of the Water Resources Commission Act 245 of 1929, as amended. Alternatively, the treated water may be discharged to the DWSD treatment plant if pretreatment criteria are met.
- Implementation of a monitoring program to ensure the adequacy of the groundwater cleanup;
- Restoration of impacted wetlands and creation of new wetlands to replace those lost to contamination or remedial construction.
- Cleanup standards for groundwater outside of the landfill based on federal SDWA MCLs and State of Michigan criteria for protection of groundwater quality
- ICs in the form of deed restrictions to restrict development of the landfill and groundwater use in off-site areas.
- Provision for alternate water supply (connection to municipal water system) to adjacent residences and businesses which are using private wells as a water supply.

EPA's groundwater cleanup policy is to attain MCLs under the SDWA; however, if cleanup to MCLs causes the residual risk levels to exceed the 1×10^{-4} to 1×10^{-6} risk range, which EPA considers to be protective, then the Agency may apply risk-based cleanup levels to reach the goal of protectiveness (a 1×10^{-6} ELCR). Michigan Act 307, Type B cleanup criteria provide for the calculation of risk-based cleanup standards at the 1×10^{-6} ELCR level for each carcinogenic compound. These standards are more stringent than the corresponding MCLs or non-zero MCLGs. EPA has determined that Michigan Act 307, Type B criteria are protective and may be applicable or relevant and appropriate to the G&H Site cleanup. Final cleanup goals for the Site from the 1990 ROD are provided in table 6:

Table 6: Groundwater Cleanup Standards from 1990 ROD

Contaminant	***Cleanup Standard***
1,1-Dichloroethane	0.4 µ/L or parts per billion (ppb)
Arsenic	0.02 ppb*
Benzene	1 ppb
cis-l,2-Dichloroethene	1 ppb
Ethylbenzene	30 ppb
Lead	5 ppb
Tetrachloroethene	0.7 ppb
trans-l,2-Dichloroethene	100 ppb
Trichloroethene	3 ppb
Vinyl chloride	0.02 ppb
Xylene	20 ppb

** Naturally occurring (background) levels found at the G&H Site may be higher than the Cleanup Standard. In that event, background levels will become the Cleanup Standard.*

EPA issued an ESD on March 13, 1992. In the ESD, the Agency determined that:

- The frost protection layer of the landfill cap could be reduced from the 42 inches to 30 inches.
- Containment could be achieved by a combination of physical and hydraulic methods. As a result, the slurry wall did not need to completely encircle the landfill, and a series of extraction wells and french drains were used to provide hydraulic containment where physical containment had been eliminated.
- EPA, in consultation with Michigan Department of Natural Resources, also changed the groundwater cleanup standards for three chemical contaminants to their respective analytical detection limits. The revised groundwater cleanup standards are shown in the table below.

Table 7: Groundwater Cleanup Standards Modified by the ESD

Contaminant	***1990 ROD Cleanup Standard***	***1992 ESD Cleanup Standard***
1, 1-Dichloroethane	0.4 ppb	1.0 ppb
Tetrachloroethene	0.7 ppb	1.0 ppb
Vinyl chloride	0.02 ppb	1.0 ppb

Remedy Implementation

In a CD signed with EPA on June 30, 1992, the PRPs agreed to perform the Remedial Design/Remedial Action (RD/RA). The RD was conducted in compliance with the 1990 ROD as modified by the 1992 ESD. The RD started on September 10, 1992, and was completed on June 2, 1995. RA construction started on August 19, 1996, and was completed on August 24, 1999.

The RD had two parts: (1) the groundwater and leachate treatment system; and (2) the landfill cap and slurry wall. EPA, in consultation with MDEQ, approved one major design change involving the

substitution of a combination of 1 foot of clay and a bentonite-containing geotextile liner for the required 3 feet of clay in a Subtitle C landfill cap, after the PRPs were able to demonstrate that the clay/geotextile liner performed as well as the thicker clay layer.

The major components of the RA included the following:

- Installation of a modified RCRA Subtitle C landfill cover to prevent direct contact and reduce the rate of infiltration to the water table.
- Excavation of impacted soils from areas outside of the landfill cover and placement of the impacted soils beneath the landfill cover.
- Installation of a slurry wall around the landfill areas to physically contain the landfill contents and a toe drain on the west side of the landfill to capture leachate for treatment (This was subsequently modified by an ESD in 1992).
- Installation of a groundwater extraction and treatment system to capture and hydraulically contain the landfill contaminants.
- Implementation of a monitoring program to ensure the adequacy of the groundwater cleanup.
- Mitigation of impacted wetlands and creation of new wetlands to replace those lost to contamination or the cleanup.

APPENDIX B – additional maps, data, figures, or tables for reference

Site Location: Shelby Township, Michigan

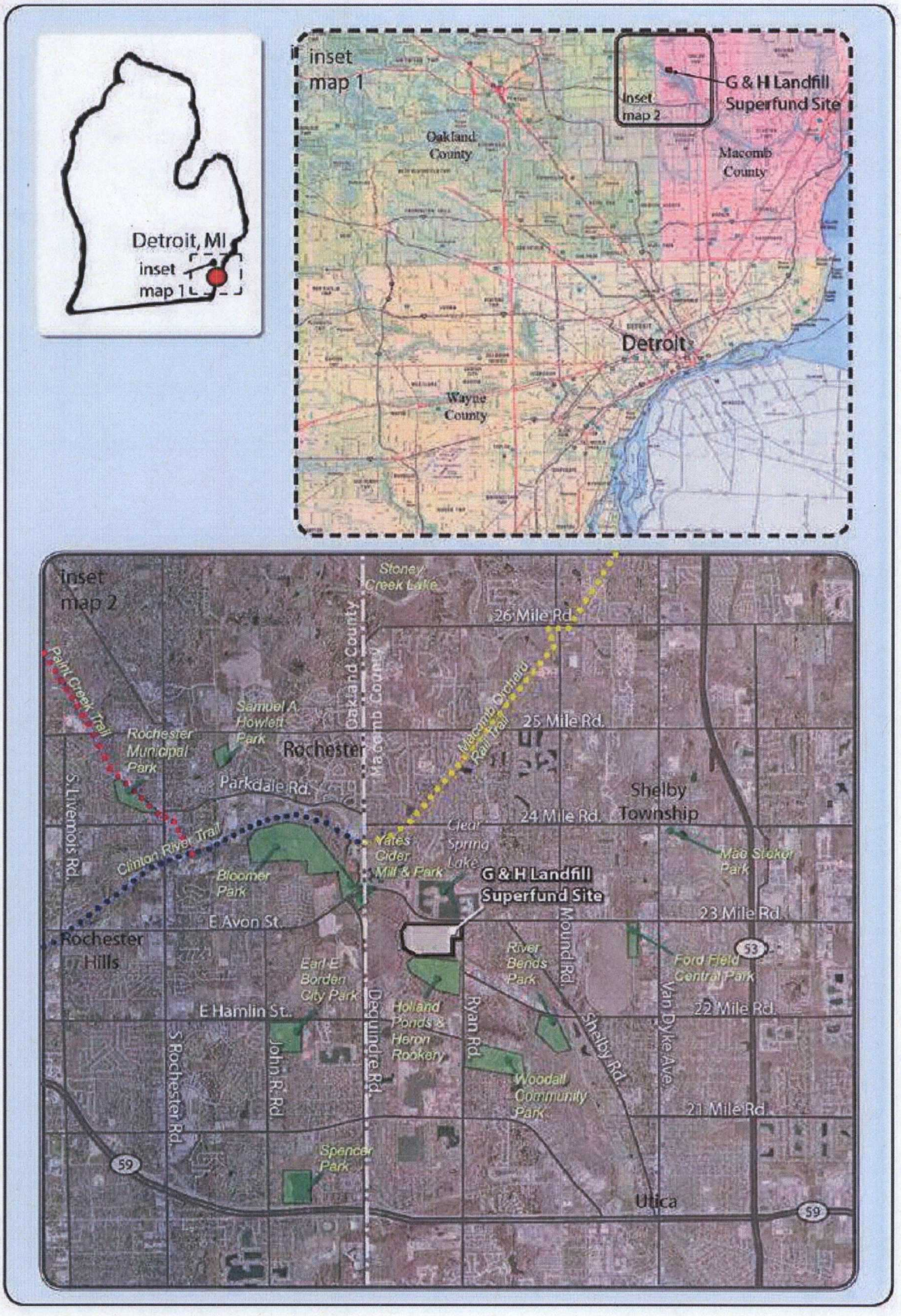
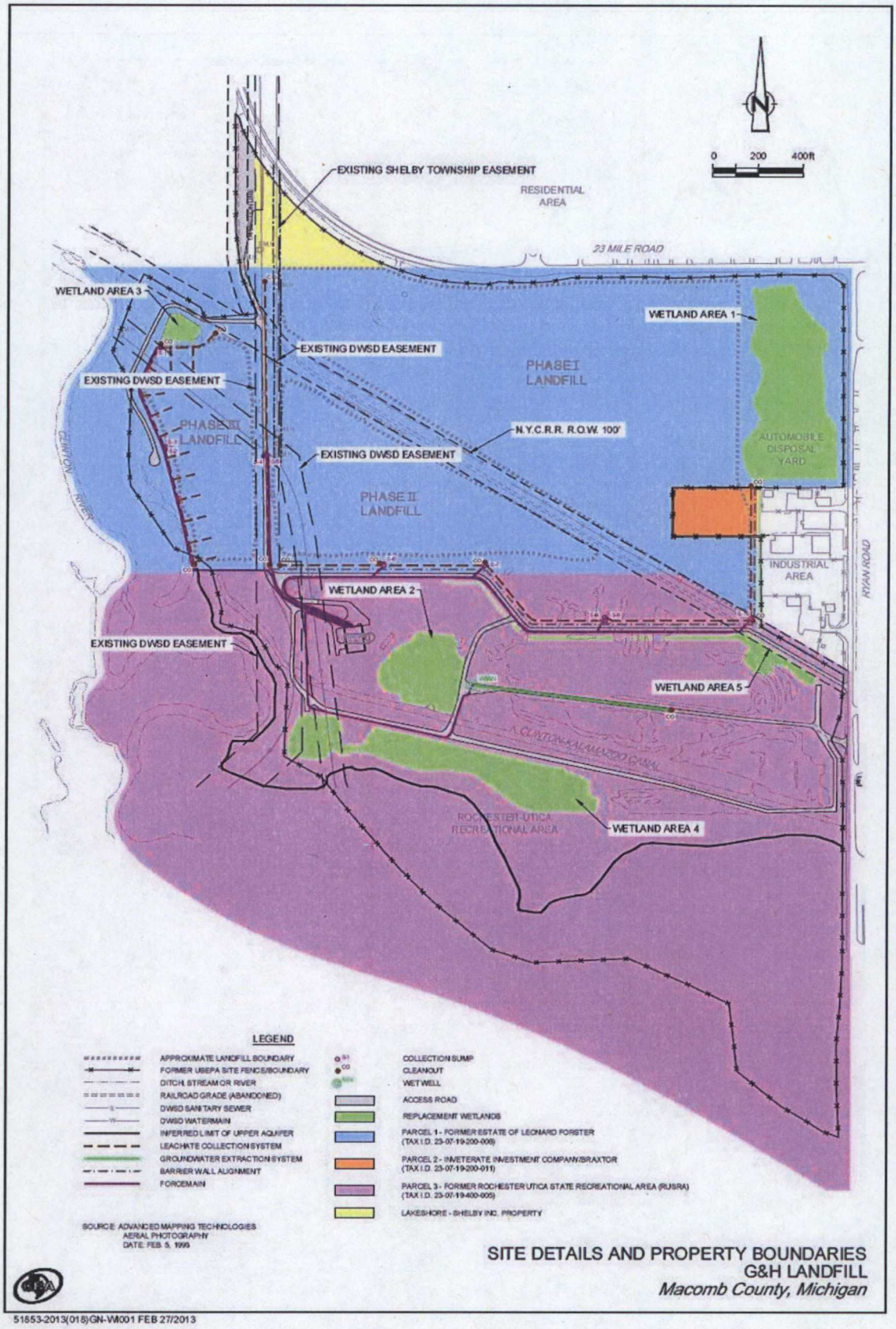


Figure 2: Site Details and Property Boundaries



51853-2013(018)GN-WI001 FEB 27/2013

Figure 3: Gas Probe and Gas Vent Locations

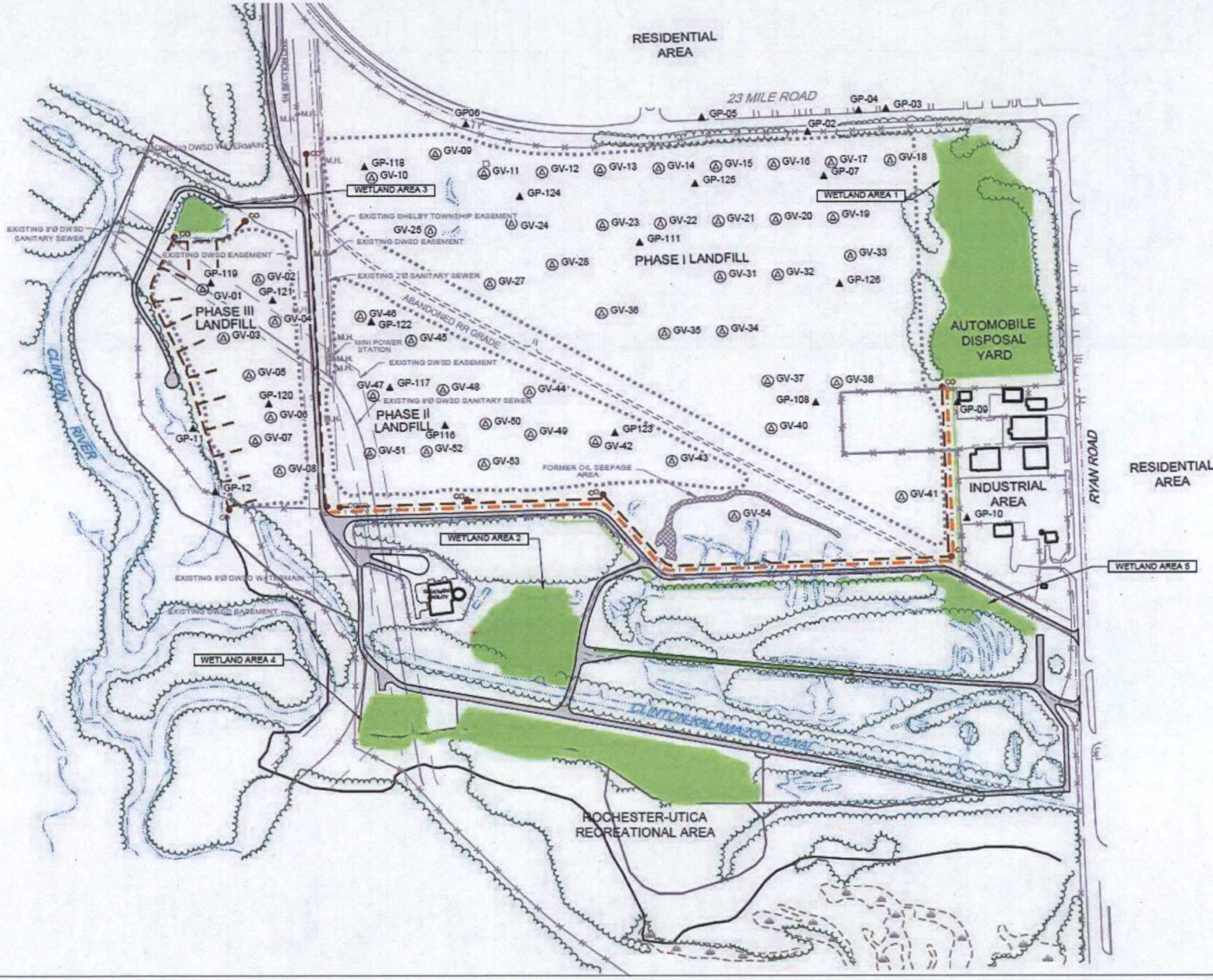


Table 1: Summary of Groundwater Detections
Five-Year Review Sampling Event
June 2013
G&H Landfill Superfund Site, Utica, Michigan

Compound	Units	Federal MCLs[1]	Federal MCLGs	Michigan Act 307 Criteria[2]	Concentration Range	No. of Detections/ No. of Samples	Detections Exceeding MCL	Detections Exceeding Criteria
VOCs								
1,1-Dichloroethane	ug/l	--	--	700	0.42 - 0.42	1/59	--	0
1,2,4-Trichlorobenzene	ug/l	70	70	9	1.0 - 1.0	1/48		
1,2-Dichlorobenzene	ug/l	600	600	600	0.26 - 0.26	2/48	0	0
1,2-Dichloroethane	ug/l	5	0	0.4	0.32 - 0.53	3/48	0	0
1,3-Dichlorobenzene	ug/l	--	--	600	0.18 - 0.78	2/48	--	0
1,4-Dichlorobenzene	ug/l	75	75	1	0.21 - 3.0	3/48	0	0
Acetone	ug/l	--	--	700	1.4 - 2.1	3/48	--	0
Benzene	ug/l	5	0	1	0.87 - 4.5	8/59	1	1
Carbon disulfide	ug/l	--	--	700	0.13 - 1.2	12/48	--	0
Chlorobenzene	ug/l	100	100	100	0.15 - 3.9	15/48	0	0
Chloroethane	ug/l	--	--	9	0.31 - 0.6	3/48	--	0
cis-1,2-Dichloroethene	ug/l	70	70	70	0.28 - 4.7	6/59	0	0
Cyclohexane	ug/l	--	--	--	0.18 - 0.97	5/48	--	0
Methyl Tert Butyl Ether	ug/l	--	--	500	0.25 - 0.28	2/48	--	0
trans-1,2-Dichloroethene	ug/l	100	100	100	0.33 - 0.33	1/59	0	0
Vinyl chloride	ug/l	2	0	0.02	0.23 - 4.1	5/59	1	1
SVOCs								
2,4-Dichlorophenol	ug/l	--	--	20	0.32 - 0.32	1/48	--	1
3 & 4-Methylphenol	ug/l	--	--	400	1.3 - 1.3	1/48	--	1
Benzaldehyde	ug/l	--	--	--	0.44 - 0.44	1/48		
bis(2-Chloroethyl)ether	ug/l	--	--	0.03	0.23 - 0.29	2/48	--	0
bis(2-Ethylhexyl)phthalate	ug/l	6	0	2	13 - 13	1/48	1	1
Caprolactam	ug/l	--	--	--	13 - 13	1/48		
N-Nitrosodiphenylamine	ug/l	--	--	--	0.35 - 0.35	1/48	--	0
Metals								
Aluminum	mg/L	0.05 - 0.2 s	--	0.05, 0.2[3]	0.0077 - 0.05	8/48	3	3
Antimony	mg/L	0.006	0.006	0.003	0.000011 - 0.00084	20/48	0	0
Arsenic	mg/L	0.01	0	0.00002	0.00031 - 0.096	50/59	33	33
Barium	mg/L	2	2	2	0.023 - 1.2	58/59	0	0
Beryllium	mg/L	0.004	0.004	--	0.00029 - 0.00029	1/48		
Cadmium	mg/L	0.005	0.005	0.004	0.000027 - 0.00049	6/48		
Calcium	mg/L	--	--	--	10 - 220	48/48		
Chromium Total	mg/L	0.1	0.1	0.1	0.00013 - 0.015	33/48	0	0
Cobalt	mg/L	--	--	--	0.000059 - 0.0086	39/48	--	0
Copper	mg/L	1 s	--	1	0.0016 - 0.0016	1/48	0	0
Iron	mg/L	0.3 s	--	0.3[3]	0.072 - 28	44/48	45	45
Lead	mg/L	0.015	0	--	0.00093 - 0.013	5/59	0	3
Magnesium	mg/L	--	--	--	14 - 95	47/48	--	0
Manganese	mg/L	0.05 s	--	0.7, 0.05[3]	0.018 - 1.3	46/48	43	43
Nickel	mg/L	--	--	0.01	0.00029 - 0.7	40/48	--	1
Potassium	mg/L	--	--	--	0.9 - 110	48/48		
Selenium	mg/L	0.05	0.05	0.04	0.00036 - 0.00092	9/48	0	0
Sodium	mg/L	--	--	150	5.4 - 550	48/48	--	7
Vanadium	mg/L	--	--	--	0.0039 - 0.0039	1/48	--	0
Zinc	mg/L	5 s	--	1, 5[3]	0.15 - 2.6	9/48	0	1
Pesticides								
alpha-BHC	ug/l	--	--	0.006	0.0045 - 0.0076	3/48	--	0
beta-BHC	ug/l	--	--	0.02	0.0043 - 0.0091	4/48	--	0
delta-BHC	ug/l	--	--	--	0.0051 - 0.0051	1/48	--	--
Heptachlor	ug/l	0.4	0	0.008	0.0085 - 0.0085	1/48	--	--
General Chemistry								
Alkalinity, Total (as CaCO3)	mg/L	--	--	--	130 - 1500	48/48	--	--
Cyanide (total)	mg/L	0.2	0.2	0.1	0.0044 - 0.0069	2/48	1	1
Sulfate	mg/L	250 s	--	250[3]	0.58 - 200	48/48	1	1

Notes:

[1] U.S. EPA, 2003. List of Contaminants and their MCLs. EPA816-F-02-013, June.

[2] MERA Operational Memorandum #8, Revision 1 -- Type B Criteria Rules 299.5709, 299.5711(2), 299.5711(5) and 299.5713

[3] Aesthetic Drinking Water Value

s = Secondary MCL

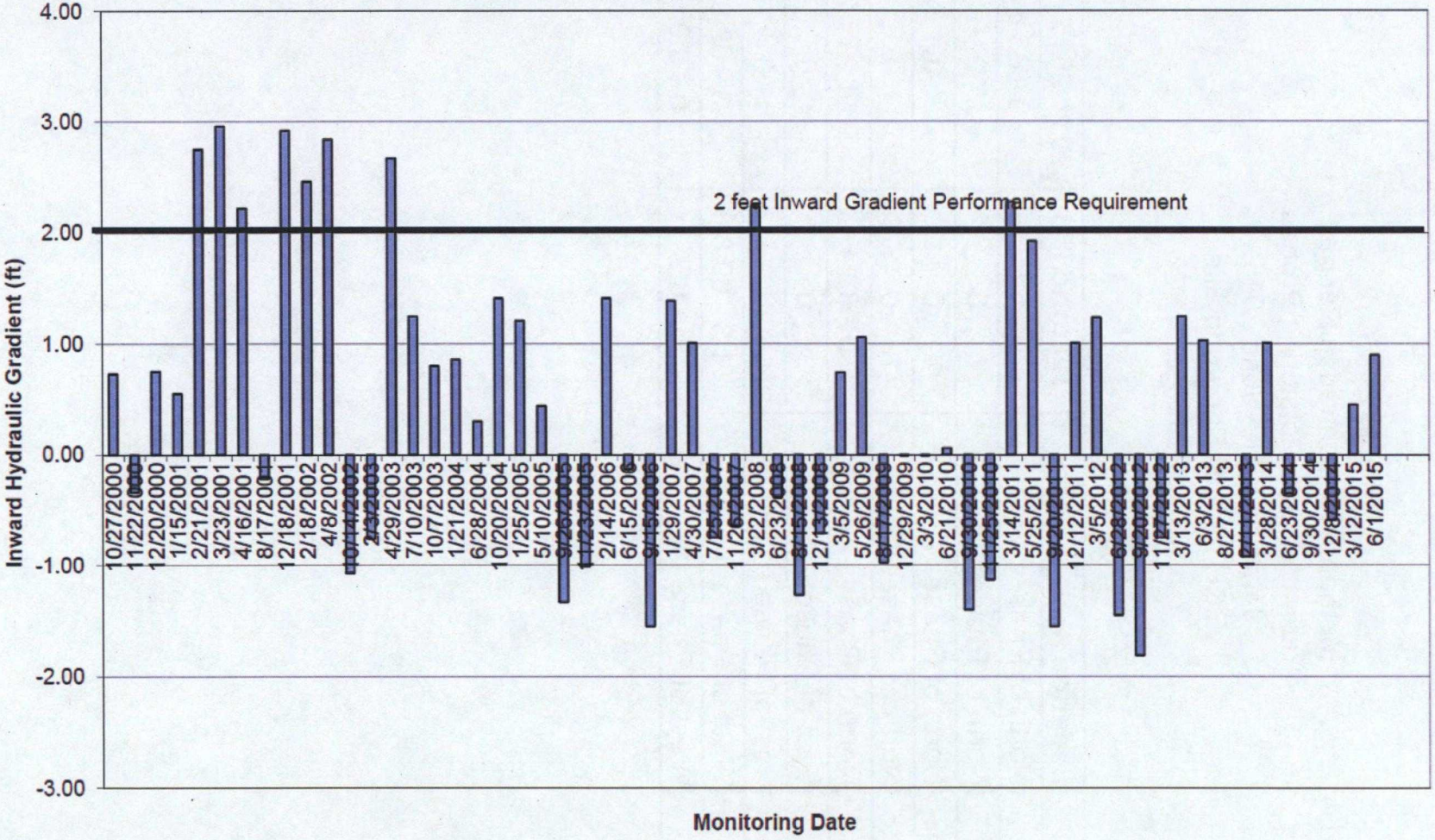
-- = Not Available

Exceeds federal and/or state criteria

Table 2
Methane Concentration Ranges
Perimeter Gas Monitoring Probes
January 2011 - June 2015
G&H Landfill Supefund Site
Utica, Michigan

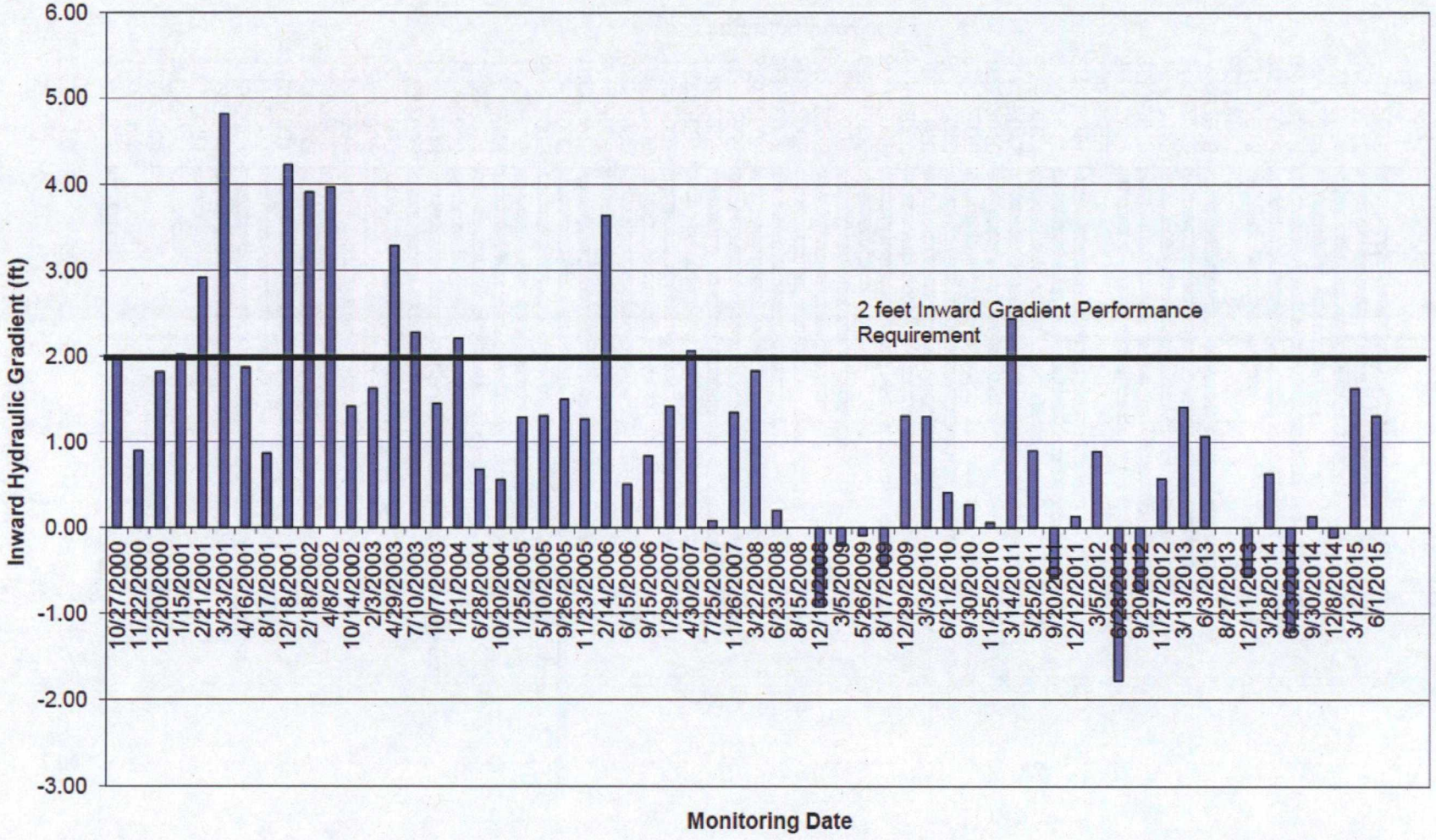
ID	Location	Historic (%)	2011-2015 (%)
GP-02	North of Phases I & II	0 - 69.2	0 - 65.6
GP-03	North of Phases I & II	0	0
GP-04	North of Phases I & II	0	0
GP-05	North of Phases I & II	0	0
GP-06	North of Phases I & II	0 - 83.4	16.1 - 77.3
GP-09	East of Phase I	0	0
GP-10	East of Phase I	0	0
GP-11	West of Phase III	1.3 - 69.6	1.3 - 69.6
GP-12	West of Phase III	0 - 0.9	0 - 0.9

Chart 1: Slurry Wall Inward Gradient Summary at GH-52/GH-53
G&H Landfill Superfund Site, Utica, MI



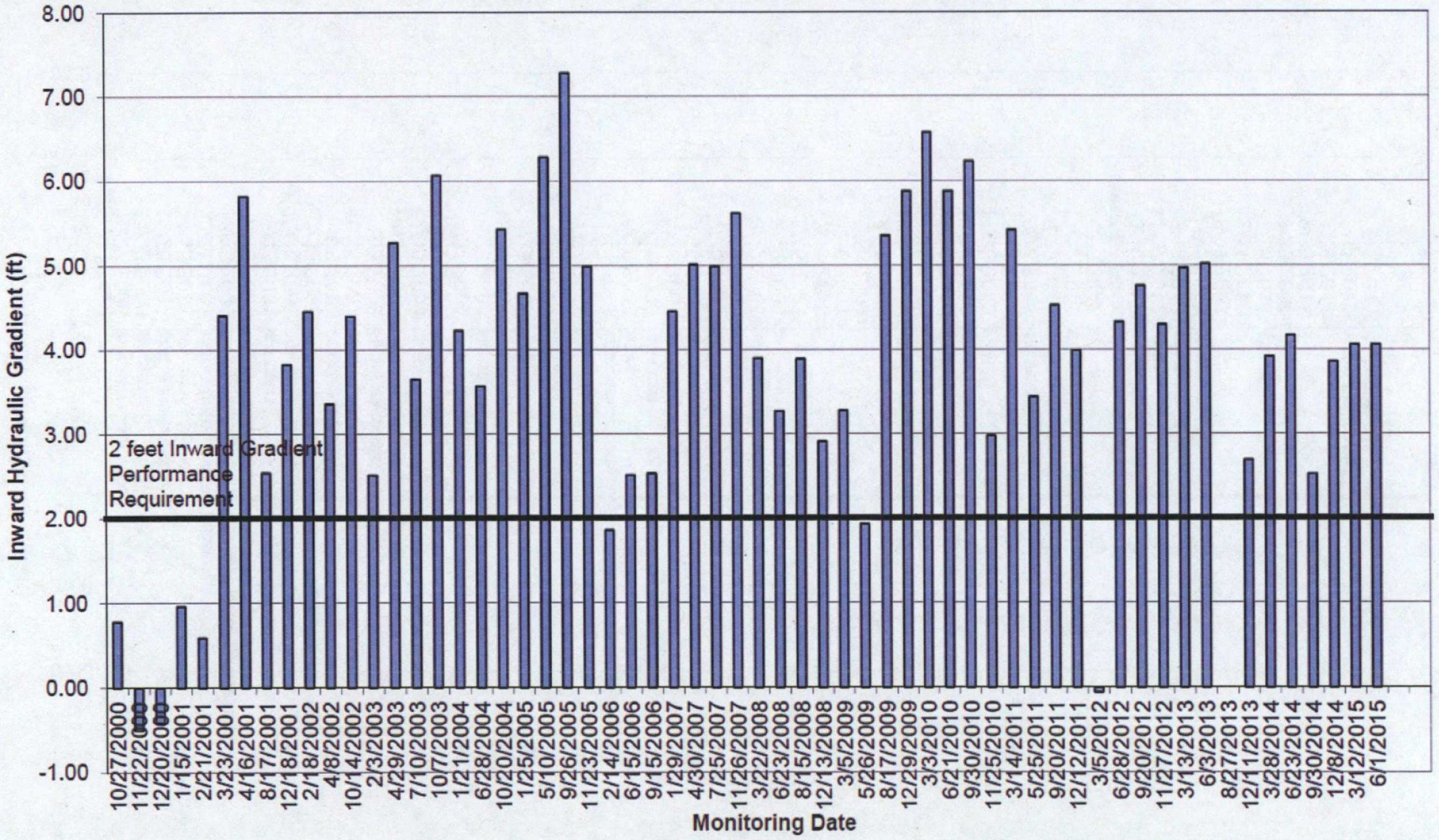
Date Printed 3/14/2016

Chart 2: Slurry Wall Inward Gradient Summary at GH-54/GH-55
G&H Landfill Superfund Site, Utica, MI



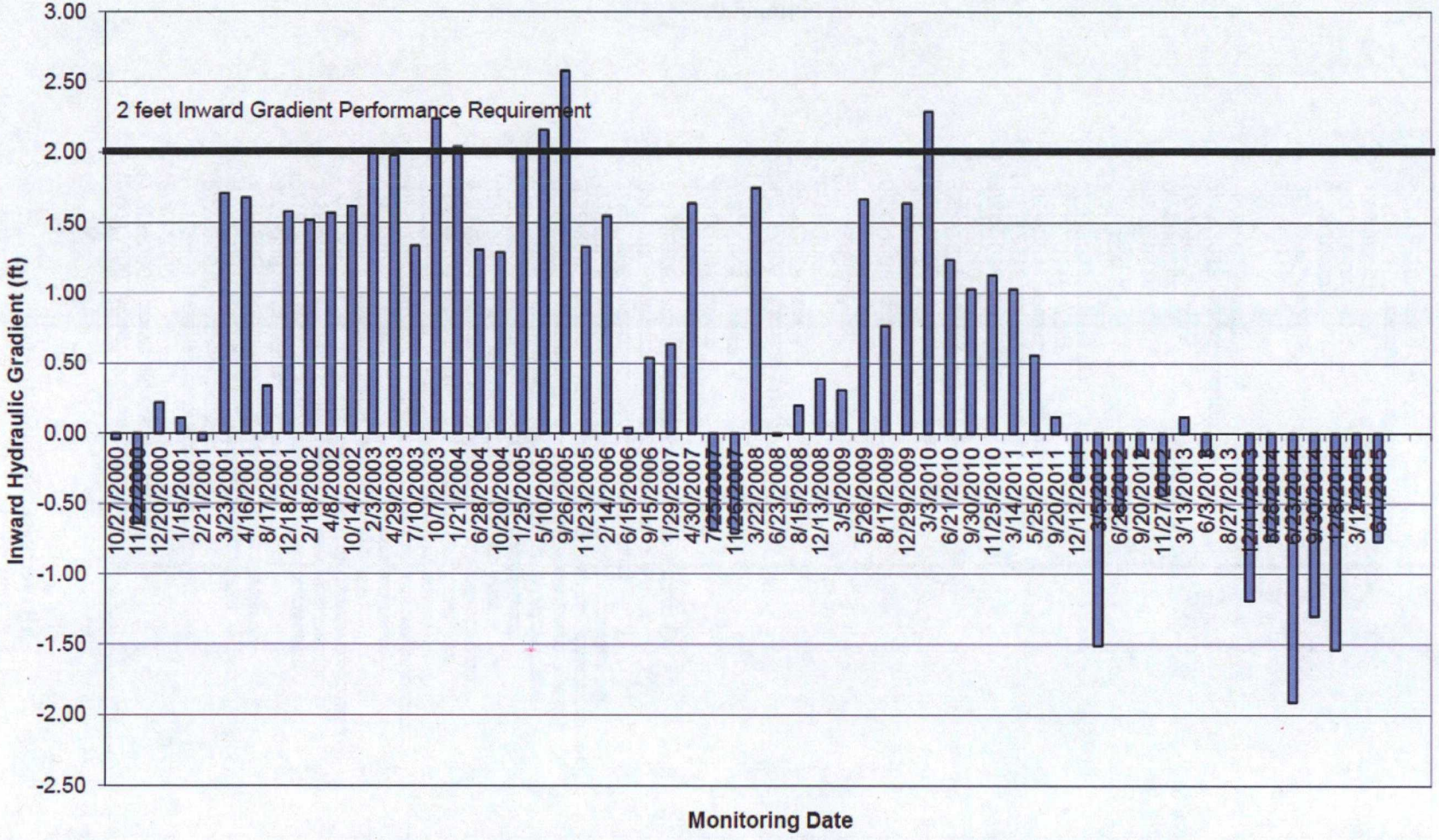
Date Printed 3/14/2016

Chart 3: Slurry Wall Inward Gradient Summary at GH-56/GH-57
G&H Landfill Superfund Site, Utica, MI



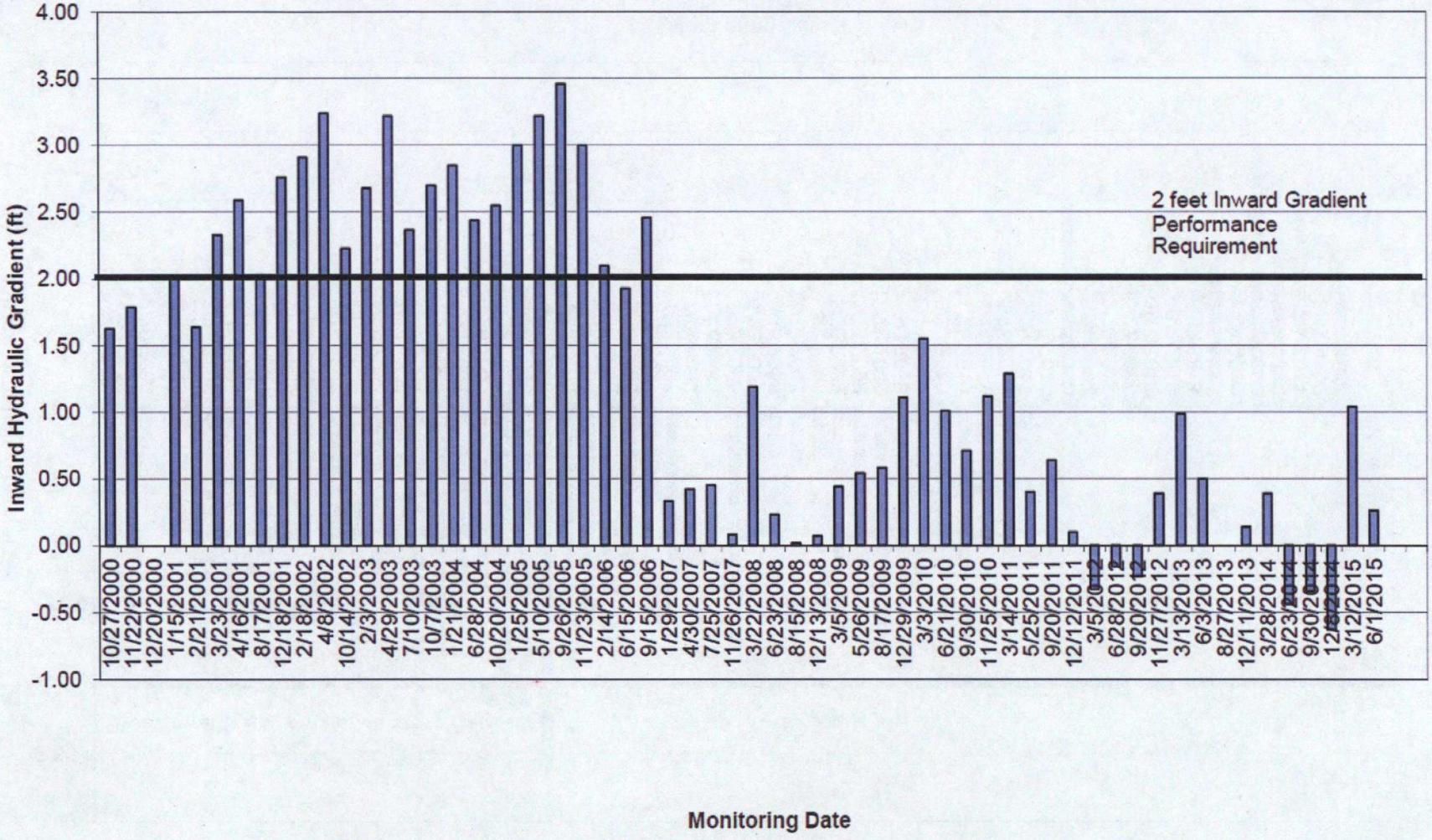
Date Printed 3/14/2016

Chart 4: Slurry Wall Inward Gradient Summary at GH-58/GH-59
G&H Landfill Superfund Site, Utica, MI



Date Printed 3/14/2016

Chart 5: Slurry Wall Inward Gradient Summary at GH-60/GH-61
G&H Landfill Superfund Site, Utica, MI



Monitoring Date

Chart 6: Slurry Wall Inward Gradient Summary at GH-78/GH-79
G&H Landfill Superfund Site, Utica, MI

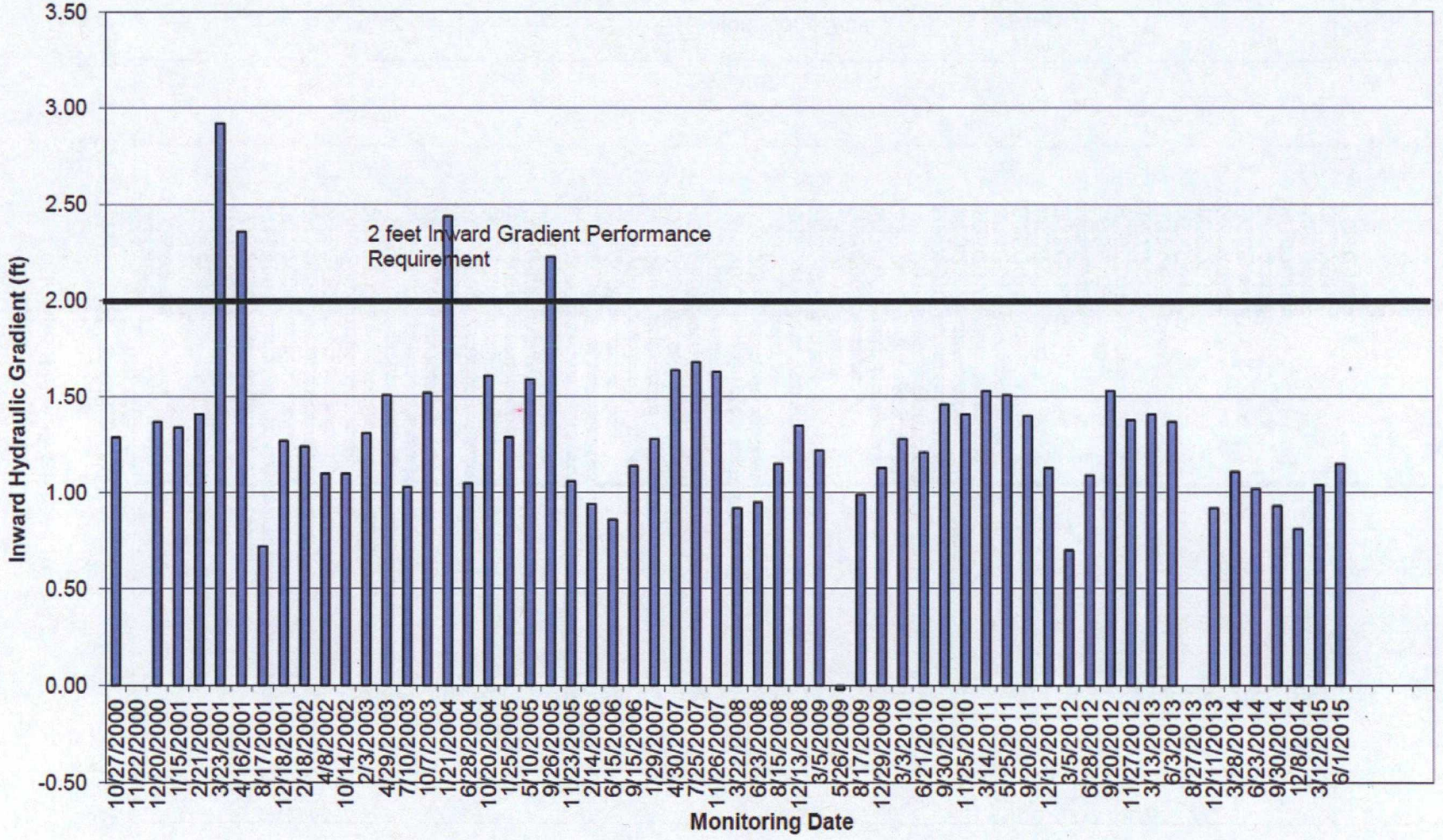


Chart 7: Slurry Wall Inward Gradient Summary at GH-80/GH-81
G&H Landfill Superfund Site, Utica, MI

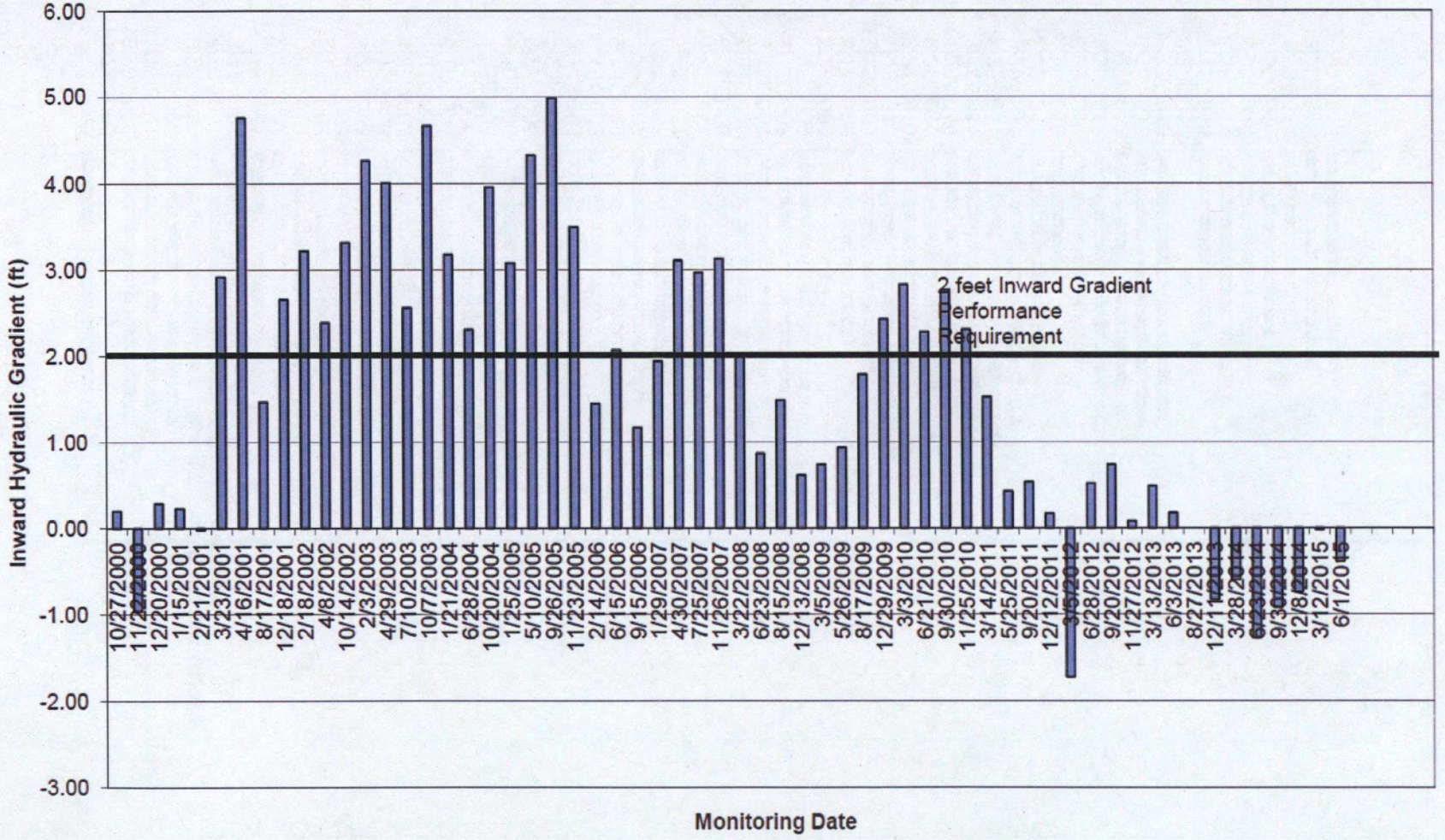


Chart 8: Slurry Wall Inward Gradient Summary at GH-82/GH-83
G&H Landfill Superfund Site, Utica, MI

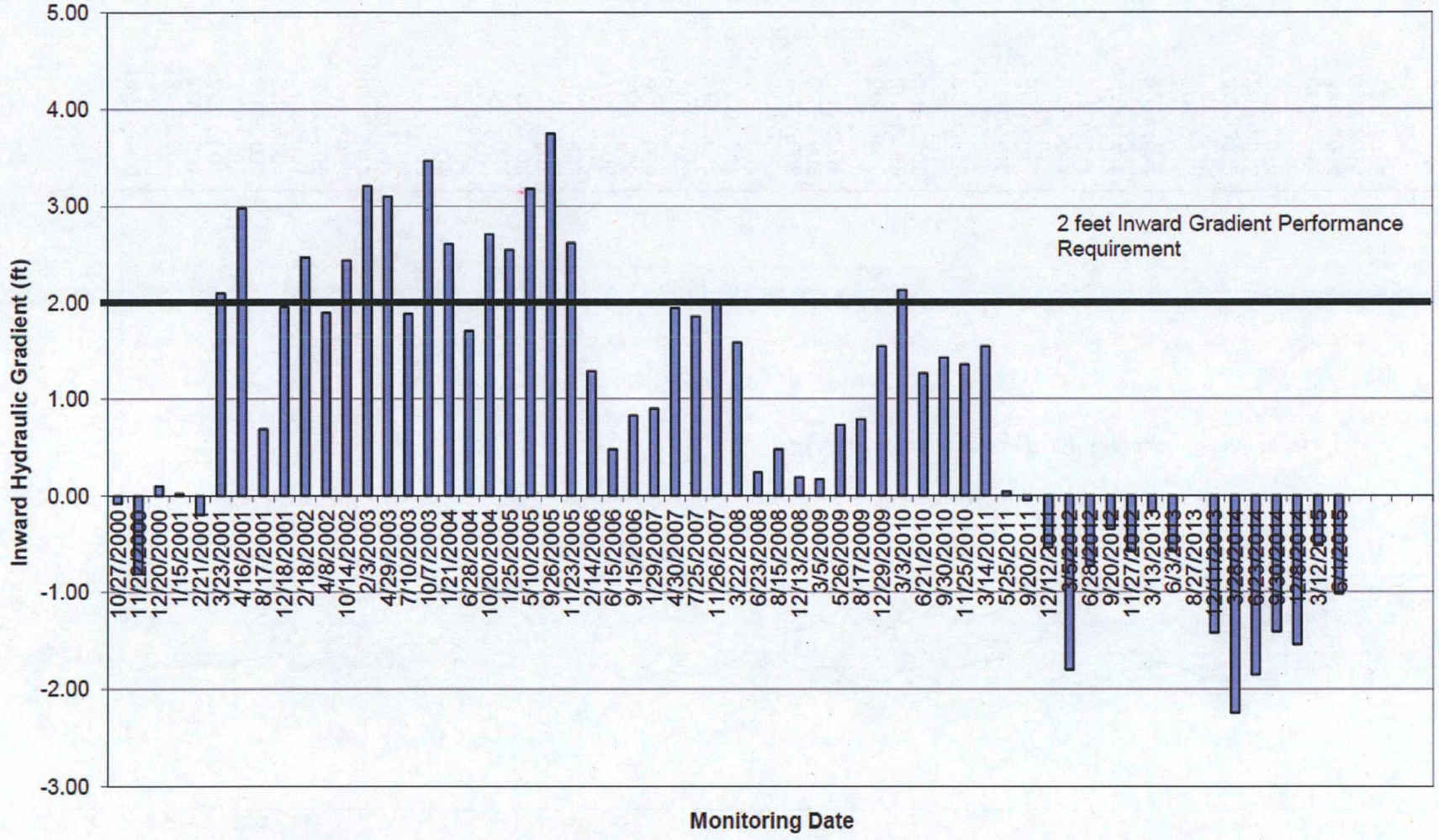


Chart 9: Groundwater Elevations at DWSD Watermain
G&H Landfill Superfund Site, Utica, MI