FOURTH FIVE-YEAR REVIEW REPORT FOR ORMET CORP. SUPERFUND SITE MONROE COUNTY, OHIO

Prepared by

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Date

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMSD	Construction Materials Scrap Dump
COCs	Contaminants of Concern
CRDA	Carbon Runoff and Deposition Area
ESD	Explanation of Significant Differences
EPA	United States Environmental Protection Agency
FDP	Former Disposal Pond
FS	Feasibility Study
FSPSA	Former Spent Potliner Storage Area
FYR	Five-Year Review
ICs	Institutional Controls
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
Ohio EPA	Ohio Environmental Protection Agency
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethylene (perchloroethylene)
RA	Remedial Action
RAO	Remedial Action Objectives
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SDWA	Safe Drinking Water Act
Site	Ormet Corp. Superfund Site
TBC	To be considered
TSCA	Toxic Substances Control Act
UU/UE	Unlimited Use and Unrestricted Exposure
WAD cyanide	Weak-Acid Dissociable Cyanide

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fourth FYR for the Ormet Corp. Superfund Site (Site). The triggering action for this statutory review is the signature date of the third FYR on May 4, 2012. The FYR has been prepared 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).

The Site consists of one operable unit (OU) that will be addressed in this FYR. The remedy at the Ormet Corp. Superfund Site addresses threats related to exposure to contaminated groundwater and soil through capping, excavation, soil flushing, plume containment, installation of fencing, and implementation of institutional controls (ICs).

The Ormet Corp. Superfund Site FYR was led by Katherine Thomas, EPA Region 5 Superfund Division, with input from Shannon Cook of the Ohio Environmental Protection Agency (Ohio EPA). Participants included Adrian Palomeque (EPA Region 5 Community Involvement Coordinator) and John Rochotte (OEPA). The property owner, Hannibal Development Partners (parent company Niagara Worldwide) was formally notified of the initiation of the FYR. The review began on 5/4/2016.

Site Background

The Site comprises part of the northeast portion of the Ormet Primary Aluminum Corporation reduction plant property located in Monroe County, Ohio, approximately 3 miles north of the city of Hannibal in the southeastern part of the state. The property is bounded on the northwest by Ohio State Route 7, and on the east and southeast by the Ohio River. Since the reduction plant started operations in 1958, the main process has been the reduction of alumina to produce aluminum metal. The reduction plant was producing aluminum from alumina until 2013 when Ormet Corp. filed for bankruptcy and closed the facility. Located immediately to the west of the reduction plant is the former Consolidated Aluminum Corporation rolling mill, which was later owned and operated by the Ormet Aluminum Mill Products Corp. The rolling mill shut down in 2005 and the property was sold in 2007. Mixed-use commercial and industrial facilities currently operate on the former rolling mill property. The Ormet Corp. Hannibal facility was acquired in 2014 by Hannibal Development Partners. Hannibal Development Partners has assumed responsibility for operation, maintenance of the remedy and annual groundwater sampling of the Site.

From 1958 to 1968, spent potliner, a hazardous by-product of aluminum production, was placed in an unlined open area in the northeast area of the Site, which is referred to as the former spent potliner

storage area (FSPSA). From 1968 to 1981, much of the potliner waste was removed and transported to an on-site recovery plant that recovered a useable material called cryolite from the potliner. At various times from 1958 to 1981, one or more unlined disposal retention ponds, former disposal ponds (FDPs), were used. Primarily, FDPs No. 1 through 4 were used for the disposal of process wastes from the air emissions wet scrubbing system in the form of a sludge, the primary constituents of which were alumina, particle carbon, and calcium-based salts. A waste slurry from the cryolite recovery plant was routed to FDP No. 5; FDPs No. 1 through No. 4 may have received minor amounts of cryolite plant waste. These tailings were alkaline and consisted primarily of carbonaceous material from the potliner along with sodium and calcium-based salts. Since 1980, the remaining potliner material has been transported off-site for disposal. From about 1966 until mid-1979, Ormet deposited waste construction materials and other miscellaneous plant debris in the southeastern corner of the Ormet property, adjacent to FDP No. 5. This four to five-acre area is designated the construction materials scrap dump (CMSD). An area referred to as the carbon runoff and deposition area (CRDA) contained carbon deposits, probably carried there by storm water runoff from the Ormet plant area. Some of the carbon runoff may also have entered the 004 outfall stream and backwater area.

The alluvial aquifer beneath the surface of the reduction plant was a source of both process and drinking water for the reduction plant and the rolling mill until the rolling mill was shut down in 2005. Prior to 2005, two high capacity Ranney wells, one on the reduction plant's property and the other on the rolling mill's property, pumped close to four million gallons per day. Water from the rolling mill's Ranney well was used for drinking water by both plants. The reduction plant's Ranney well presently produces about 1.0 million gallons per day, the minimum allowed by EPA, as part of the site remedy. Since the shutdown of the rolling mill, its Ranney well has not been pumped and it has now been abandoned. The reduction plant obtains its drinking water from a public water supply and an Environmental Covenant has been signed prohibiting all use of groundwater beneath the Site, rolling mill and reduction plant. See Appendix B for Site chronology.

ORMET FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Ormet Corp.		
EPA ID: OHD004379970		
Region: 5	**State:** OH	**City/County:** Hannibal/ Monroe 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): Katherine Thomas
Author affiliation: U.S. EPA
Review period: 5/4/2012 - 5/4/2017
Date of site inspection: 11/16/2016
Type of review: Statutory
Review number: 4
Triggering action date: 5/4/2012
Due date ***(five years after triggering action date)***: 5/4/2017

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In 1972, a hydrogeology study verified the presence of groundwater contamination in the Ranney well pumping center at the reduction plant. As a result of this study, two interceptor wells (#1 and #2) were installed north of this Ranney well to intercept the plume before it reached the pumping center. Although the groundwater underneath the reduction plant was not used for drinking water, drinking water for about 3,200 employees at both plants was being obtained from this aquifer at the rolling mill. The contamination at the reduction plant source areas, combined with its potential impact on downgradient drinking water supplies, prompted EPA to propose that the Site be placed on the National Priorities List (NPL) in September 1985. See Appendix C Figure 1 for the base Site Map.

The Remedial Investigation (RI) found cyanide, fluoride, chromium, arsenic, and polynuclear aromatic hydrocarbons (PAHs) in solids from the FDPs. The contaminants did not appear to be migrating to any significant degree, either to groundwater or air, except that fluoride was present in groundwater downgradient of FDP No. 5 at levels that exceeded the maximum contaminant level (MCL). A comparison with sample results from 1972 showed that fluoride concentrations downgradient of FDP No. 5 had decreased by one to three orders of magnitude at a given sampling location. Pond solids were found to be characteristically alkaline in nature and no evidence was found of surface runoff from the ponds.

At the FSPSA, relatively high concentrations of PAHs were detected in soils in the 2 to 4-foot horizon. Because PAHs are relatively immobile, they were not expected to contribute significantly to releases to groundwater from the FSPSA. Moderate levels of cyanide and arsenic, both mobile in groundwater, were also identified in the FSPSA. The FSPSA was found to be the primary contributor to cyanide and fluoride contamination in groundwater, and may also be a factor in the presence of arsenic in downgradient wells. In contrast to the situation at FDP No. 5, fluoride levels in and downgradient of the FSPSA were found to have shown an increasing trend since 1972.

A single composite sample from the CRDA showed polychlorinated biphenyls (PCBs) at 56 mg/kg. The CRDA was thought to be a probable source of PCBs and PAHs to the backwater and river bank areas, transported by storm water runoff. Arsenic was also detected as high as 83 mg/kg in soils at the CRDA.

The CMSD was found to be a significant source of cyanide and PCBs in the seeps, backwater sediments, and river water. PAHs were found at levels that contributed to an increased ecological risk but were not believed to be migrating out of the source area.

Groundwater at the Site was found to be contaminated in excess of MCLs for a number of contaminants, including tetrachloroethene (PCE), cyanide, fluoride, arsenic, antimony, and beryllium. The primary source of the plume appeared to be infiltration of precipitation through the FSPSA. The plume extended about 3,000 feet from the FSPSA before it reached the interceptor wells. It was characterized by a basic pH near the FSPSA, which became progressively more neutral with distance from the source. Sodium was also typically elevated in the plume.

A small backwater area at the mouth of the 004 outfall stream created a sink for contamination. PCBs at nearly 100 ppm and total PAHs at over 1100 ppm were identified in the sediments.

Although industrial activity upstream from the Site contributed a certain level of contamination to the Ohio River water and sediments as they reached the Site, some effects from the Site were found in both media. The effects were mainly in the form of elevated pH and concentrations of PAHs, PCBs, and cyanide. Because pumping of the two Ranney wells made the river a losing stream in this stretch, storm water runoff and seep discharge were found to be the most likely transport mechanisms to the river.

The risk characterization for the baseline risk assessment for human health that was performed during the RI indicated that estimated risks were greatest under a future residential land use scenario that included direct contact with and ingestion of contaminated soils and sediments, inhalation of particulate matter, ingestion of contaminated groundwater, and ingestion of fish contaminated with PCBs from the Site. After receiving community input, EPA determined that it was reasonable to assume that the current commercial or industrial land use would continue for the foreseeable future and that residential development of the Site would be highly unlikely. Therefore, the selected remedy was based on cleaning up to standards based on future commercial or industrial use of the property. However, EPA also believed it was reasonable to assume that at some time in the future the Ranney well at the reduction plant might no longer be used, in which case containment of the plume would be lost and contamination might reach the Ranney well at the Rolling Mill which, at the time, supplied drinking water. The remedy selected included the restoration of the groundwater to drinking water quality.

The environmental evaluation performed for the Site for the RI concluded that the contaminants of concern from an ecological standpoint were known to produce sublethal and other toxic effects in the types of organisms found on the Site. The ecological risk assessment indicated 29 inorganic and 39 organic chemicals were present in the environmental media at the Site. Sediments from the southwestern CMSD seeps and the backwater area produced high mortality among bioassay organisms. Surface water in the backwater area and immediately downstream exceeded the four-day average ambient water quality criteria for antimony, lead, cyanide, and PCBs. Cyanide at two locations exceeded the one-hour average criterion. This demonstrated that the Site's contaminants in river water could potentially cause lethal and sublethal effects in aquatic organisms. In addition, concentrations of contaminants in river sediments were compared to reference sites (relatively clean) and sites with a high occurrence of tumors in fish. Sediments on-site and downstream of the Site exceeded the lowest concentrations for PCBs and PAHs observed at the fish tumor sites. Backwater area PAH concentrations exceeded the highest levels reported from the fish tumor sites, indicating the backwater area was likely to pose severe carcinogenic risk to fish entering from the Ohio River due to exposure to PCBs and PAHs in sediments. The CMSD and the CRDA were considered the likely sources for PCBs and PAHs in the backwater area sediments and the river.

Response Actions

EPA proposed the Site for the National Priorities List (NPL) of hazardous waste sites on September 18, 1985, and the Site was listed on July 21, 1987. Ormet Corp. began work pursuant to an Administrative Order by Consent between Ormet Corporation, Ohio EPA and EPA signed May 19, 1987.

Remedy Selection

The selected remedy is based on a cleanup of the soils to standards based on future commercial or industrial use of the property. The remediation goal for the groundwater is restoration to drinking water

quality. Table 1, taken from the 1994 Record of Decision (ROD), shows the ranges of concentrations as well as the clean-up standards specified for chemicals of concern in groundwater at the Site.

Table 1. Clean-up Standards for Chemicals of Concern in Groundwater (ROD 1994)

Chemicals of Concern for Groundwater	Concentration Range (µg/l)	Clean-up Standard (µg/l)
tetrachloroethene	5 0 – 40	5[a]
arsenic	1.8 – 394	10[b]
beryllium	0.25 – 35	4[a]
cyanide	11.0 - 18,600	200[a]
manganese[e]	ND - 15,400	230[c,d]
vanadium	2 6 – 369	260[a]
fluoride	100 - 710,000	4000[a]

a MCL or proposed MCL, for cyanide, the value is the concentration of cyanide amenable to chlorination, not total cyanide
b analytical quantitation limit (greater than background), background, however, has not been firmly established
c risk based
d background
e This is an interim standard for manganese, based on background determined during the risk assessment, further analysis would be needed to determine any changes made to background value

The components of the remedy resulting from the 1994 ROD and the 1997 Explanation of Significant Differences (ESD) are:

- Groundwater. Pumping shall continue at the Ormet Corp. Ranney well and the existing interceptor wells to maintain capture of contaminated groundwater to prevent contaminants from migrating to the Ohio River or to the rolling mill property. Interceptor well water would be treated by ferrous salt precipitation and clarification or other means necessary to achieve standards set by the Ohio EPA National Pollutant Discharge Elimination System (NPDES) program before discharge to the Ohio River. The remedial goal for groundwater is restoration to drinking water quality. Therefore, groundwater cleanup standards were established that, when attained, would allow for potable uses of the groundwater. Compliance with these cleanup standards must be attained throughout the plume. Groundwater would continue to be extracted and partially treated until the groundwater cleanup standards are attained.

- Leachate. Trench drains would be installed to intercept and extract all leachate seeping from the CMSD to prevent seep water from contaminating stream backwater sediments and river water. The leachate would be treated to meet NPDES discharge limits.

- CMSD. The CMSD would be re-contoured and covered with a dual-barrier cap that would meet the requirements of Subtitle C of the Resource Conservation and Recovery Act. A Toxic Substances Control Act (TSCA) cell would be constructed within the CMSD.

- Soils. Residual soil contamination in the FSPSA would be treated by in situ soil flushing. Contaminants would be flushed to the groundwater for ultimate capture and treatment by spraying the area with water that would dissolve the contaminants contained in the soil. The

FSPSA was determined to be the primary contributor of fluoride and cyanide contamination to the underlying groundwater. The goal of the in situ soil flushing is to remove sufficient contaminants from the soils such that the soils no longer cause or contribute to exceedances of the groundwater cleanup standards in the underlying and downgradient groundwater. The ROD provided that during the design phase of the remedy a soil model acceptable to EPA would be used to develop Site-specific soil cleanup standards for the groundwater contaminants of concern for which groundwater cleanup standards had been established. These soil cleanup standards have not been developed and approved by the EPA as yet. Treatment of the FSPSA soils by soil flushing would continue until the soil cleanup standards are achieved and when all compliance points for groundwater in and downgradient of the FSPSA achieve the groundwater cleanup standards. Contaminated soils from the CRDA would be excavated and consolidated under the cover at the CMSD. Soils to be excavated from the trench drains would also be consolidated under the CMSD cap. Soils with PCB levels at or above 50 ppm would be placed in the TSCA cell.

- Sediments. PCB- and PAH-contaminated sediments would be removed by dredging in the outfall 004 stream backwater area. Sediments with PCB concentrations lower than 50 ppm would be stabilized and consolidated under the CMSD cap in the original decision and sediments with PCB concentration higher than 50 ppm were to be disposed of off-site. In the ESD it was decided to build a TSCA cell as part of the CMSD landfill and place all of the PCB-contaminated sediments in the cell.

- Site-wide. Restrictions on Access and Use of the Site: Access to the Site would be physically restricted by installation and maintenance of a 6-foot high chain link fence topped with three strands of barbed wire. Deed restrictions were to be established to prohibit use of groundwater for drinking water until cleanup standards are achieved and to prohibit use of the Site for residential purposes.

The 1997 ESD made two changes to the remedy. The ROD had specified excavation to 1 ppm PCBs. 1997 TSCA protocols allowed for residual concentration up to 10 ppm PCBs if the soil was covered with a 10-inch layer of soil. The remedy at the Site was changed to allow for this accommodation. The other change allowed for the construction of a TSCA compliant cell on the Site, as mentioned above. With this change, it was not necessary to haul soils with greater than 50 ppm PCBs to an off-site TSCA landfill, as all PCB-contaminated soils could now be placed in the cell. This remedy change was implemented because it was found during remedial design sampling that there were more soils with greater than 50 ppm PCBs than previously thought.

A second ESD was signed on March 26, 2012. In 2009, Ormet requested approval from EPA to discontinue the operation of the interceptor wells and the accompanying water treatment system. After evaluating the proposal, EPA decided to proceed with eliminating the requirement for an interceptor well and treatment system at the Ranney well and issued the second ESD.

EPA gave written approval in a letter dated January 29, 2013, to delete PCBs, beryllium, and vanadium from the list of contaminants of concern. Previous data had shown these parameters to be consistently below the cleanup goals or non-detectable. Approval was also granted to replace cyanide amenable to chlorination (amenable cyanide) with weak acid dissociable (WAD) cyanide. WAD cyanide is

considered to be a more reliable surrogate for free cyanide, on which the cleanup goal for cyanide is based.

Status of Implementation

A Consent Decree for remedial design and remedial action between Ormet Primary Aluminum Corporation and EPA was entered on December 18, 1995. Ohio EPA was not a party to this decree. The remedial design was approved April 15, 1997, following the issuance of the ESD on April 1, 1997. The remedial action began on April 14, 1997.

Remedial action activities were separated into two discrete phases. The activities in the first phase were performed from March through April 1997. In summary, these pre-construction activities consisted of:
- Preparation of the Health and Safety/Contingency Plan;
- Preparation of the Backwater Area Isolation Structure submittal; and
- Finalization of the Construction Quality Assurance Project Plan.

The second phase was carried out from May 1997 to June 1998. In summary, these construction activities consisted of:
- Site preparation;
- Removal of contaminated material from portions of the CRDA;
- Re-contouring the CMSD;
- Installation of the CMSD seep collection and treatment system;
- Construction of the TSCA cell;
- Relocation of the outfall 004 discharge;
- Removal of contaminated sediment from the backwater area;
- Installation of the FSPSA soil flushing system and placement of a vegetative soil cover in the area;
- Construction of the Site fencing; and
- Site restoration.

The Ranney well had been operating for many years to furnish water for plant operations and, since plant closure, as part of the remedy. Contaminated groundwater was found to be contributing to a problem with scaling on surfaces in the process water system before the groundwater entered the Ranney well. Around 1972, two interceptor wells were installed to extract the contaminated groundwater with only one interceptor well run at a time. In about June 1994, a groundwater treatment system was added to the interceptor wells to reduce the cyanide concentrations. This pumping system was incorporated into the 1994 remedy to contain the plume and remove contaminants from the groundwater. The 2012 ESD eliminated the requirement for an interceptor well and treatment system at the Ranney well. The groundwater elevation contours in Appendix C, Figure 3 show that the groundwater in the area of the plume is flowing generally northeast to southwest toward the Ranney well, except for a small portion of the plume in the easternmost part of the Site which is no longer being contained. Previous to the discontinuance of the use of the interceptor well and treatment system, the groundwater plume was being fully contained. This is further discussed later in this FYR beginning in Data Review.

The activities of both phases were performed in substantial accordance with the approved Final Design. There were some changes necessitated by field conditions; these changes were requested by Ormet and

approved by EPA. Construction completion for the Site was reached on August 4, 1998, with the issuance of the Preliminary Close Out Report. Activities at the Site were consistent with the ROD and the ESD.

Institutional Controls

ICs are required by the decision documents to restrict property use, maintain the integrity of the remedy, and assure the long-term protectiveness for areas which do not allow for UU/UE. Owner Ormet Primary Aluminum Corporation, Holders Ormet Corporation and Ormet Primary Aluminum Corporation, and EPA entered into an Environmental Covenant, under the Ohio Uniform Environmental Covenants Act, that was recorded with the Monroe County Recorder's Office on April 16, 2010. The Environmental Covenants are binding under the current owner. A summary of the implemented and planned ICs for the Site is listed in Table 2 and are further discussed below.

Table 2: 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 Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Site property: groundwater and soils	Yes	Yes	OU00 Ormet Superfund Sitewide	• Prohibition on use of groundwater that would entail ingestion or dermal contact until groundwater cleanup standards are achieved, but specifically permitted pumping and use of groundwater for industrial purposes; • No use or activities on the property that might interfere with the response activities being performed pursuant to the Consent Decree unless prior written approval from EPA is obtained; • No residential use of the property; and • No excavation, installation, construction, removal or use of any buildings, wells, pipes, roads, ditches or other structures at the Site except with the express prior written approval by EPA.	Environmental Covenant recorded with the Monroe County, Ohio, Register of Deeds, on April 16, 2010

Reduction plant property: remedial components, soils, and groundwater	Yes	Yes	Ormet reduction plant property	• Prohibition on use of groundwater that would entail ingestion or dermal contact until groundwater cleanup standards are achieved, but specifically permitted pumping and use of groundwater for industrial purposes; • No use or activities on the property that might interfere with the response activities being performed pursuant to the Consent Decree unless prior written approval from EPA is obtained, • No residential use of the property, and • No excavation, installation, construction, removal or use of any buildings, wells, pipes, roads, ditches or other structures at the Site except with the express prior written approval by EPA	Environmental Covenant, recorded with the Monroe County, Ohio, Register of Deeds on April 16, 2010

A map showing the area in which the ICs apply is included in Appendix C, Figure 6

Current Compliance: Based on the site inspection and discussions with the property owner and their contractor, EPA is not aware of Site or media uses which are inconsistent with the stated objectives to be achieved by the ICs. The remedy appears to be functioning as intended. No Site uses which are inconsistent with the implemented ICs or remedy IC objectives have been noted during the Site inspection.

IC Follow up Actions Needed: Hannibal Development Partners should conduct a title search to ensure ICs are in place for each parcel. EPA should confirm ICs remain in place and are effective as part of the next FYR.

Long Term Stewardship:
Since compliance with ICs is necessary to assure the protectiveness of the remedy, planning for long-term stewardship is required to ensure that the ICs are maintained, monitored and enforced so that the remedy continues to function as intended. Long-term stewardship involves assuring effective procedures are in place to properly maintain and monitor the Site. Long-term stewardship will ensure effective ICs are maintained and monitored and the remedy continues to function as intended with regard to ICs. The O&M Plan was approved on April 7, 2010. It includes procedures to ensure long-term IC stewardship including regular inspections of the engineering controls and access controls at the Site, reviews of the

ICs, and reports with results of the inspection and review. The latest Semiannual ICs Monitoring review submitted at the Site showed that ICs were in place and effective.

Systems Operations/Operation & Maintenance

Hannibal Development Partners purchased the Ormet Corp. Site in 2014 and has since assumed operation and maintenance (O&M) of the Site remedy. See III. Progress Since the Last Review below. O&M activities at the Site are documented in a monthly operation log or semiannual log for IC monitoring. Logs are completed for:

CMSD Seep Collection System: Inspection of the sump cover, sump casing and liquid discharge line to determine if any deterioration is present. Inspection of the pressure gauge, level switches, pump, and high level indicator to determine proper operation. No flow has been detected in the CMSD Seep Collection System since the willow trees were planted in 2011.

CMSD Pre-treatment System: Pressure measurements are taken to determine system inlet pressure, pressure drop across bag filter, inlet pressure to oil absorbent drum, inlet pressure to carbon, intermediate carbon pressure, discharge pressure, pressure drop across oil absorbent drum, pressure drop across carbon treatment. During the last five years, no flow or pressure readings in CMSD Pre-treatment System have been detected since willow trees were planted in 2011.

FSPSA Flushing System: Inspection of the coverage by FSPSA Flushing System, pump, pressure regulating valve, and sprinkler operation. Flow water reading, system pressure setting, total flow, and timer settings are recorded. During the last five years, pumps to alleviate pooling in the sprayfield were removed, repaired, and replaced and sprinklers were replaced after being hit by a mower.

Semiannual ICs Monitoring: Inspection of the site to determine consistency with ICs on Site. Checklist determines if there is any use or activity that would interfere with the Remedial Action, if groundwater is being used except for industrial use, if a well has been constructed, if there is residential use of the property, if there has been any activity requiring notification to EPA, and if Remedial Action is required. During the last five years, no violations of the ICs were reported.

III. PROGRESS SINCE THE LAST REVIEW

The Site was determined to meet the requirements for Sitewide Ready for Anticipated Use by EPA on September 6, 2012. The 2012 annual groundwater monitoring report was submitted by HMI Environmental Consulting Services on behalf of Ormet. Based upon that report, on January 29, 2013, EPA approved a shift from tri-annual (three times per year) groundwater sampling to annual sampling starting in 2013. PCBs, beryllium, and vanadium were also deleted from the list of groundwater contaminants of concern as data had shown that these parameters were consistently below cleanup goals or non-detectable in the five-years leading up to the 2012 FYR for the Site. Finally, the cleanup goal for cyanide was changed from being based on cyanide amenable to chlorination to WAD cyanide. WAD cyanide is considered to be a more reliable surrogate for free cyanide. The 2013 annual groundwater monitoring report was submitted by Leidos Engineering LLC on behalf of Ormet.

Ormet Corp. filed for Chapter 11 bankruptcy on February 25, 2013. Ormet Corp. subsequently sold specific assets of the Ormet Facility to Hannibal Development Partners, LLC in July 2014. The properties acquired by Hannibal Development Partners include the reduction plant property and the Ormet Corp. Superfund Site. Hannibal Development Partners signed a joint motion to substitute Niagara Worldwide, LLC (parent company to Hannibal Development Partners), for Ormet Primary Aluminum Corporation as the named defendant under the Consent Decree, upon and pursuant to the scheduled transfer of interest at closing. Hannibal Development Partners has assumed responsibility for the continued operation, maintenance, and monitoring of the Superfund Site, including the annual groundwater monitoring. O&M reports and Annual Remedial Action Groundwater Monitoring Reports have been submitted by Geo Resource Group on behalf of Hannibal Development Partners since 2014. Since its acquisition of the Site, Hannibal Development Partners has conducted a variety of demolition activities to prepare a transition from an abandoned industrial facility to its future use.

The following is the protectiveness determination and statement from the last FYR. The 2012 FYR did not identify any issues nor recommendations affecting the protectiveness of the remedy.

Table 3: Protectiveness Determinations/Statements from the 2012 FYR

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Protective	The remedy at the Ormet Corp. Superfund Site is protective of human health and the environment in both the short- and long-term. Exposure pathways that could result in unacceptable risks are being controlled and an Environmental Covenant is preventing exposure to contaminated groundwater and land. Threats at the Site have been addressed through capping, excavation, soil flushing, plume containment, installation of fencing, and implementation of institutional controls.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was made available by newspaper posting in two local newspapers, the Monroe Beacon on 11/24/2016, and the Monroe County Sentinel on 11/28/2016, stating that EPA was conducting a FYR and inviting the public to submit any comments to EPA (Appendix D). EPA received no community comments regarding the Ormet Corp. Superfund Site Five Year Review process. The Ormet Corp. Superfund website was updated by the EPA Community Involvement Coordinator in December 2016. The results of the review and the report will be made available at the Site information repository located at Monroe County Public Library at 96 Home Avenue, Woodfield, Ohio, and online at the Ormet Corp. Superfund Website, www.epa.gov/superfund/ormet-corp.

Data Review

O&M reports were submitted by Ormet Corp. in 2012, 2013 and Hannibal Development Partners in 2016. During the 2014 and 2015 transition from Ormet Corp. to Hannibal Development Partners O&M reports were not submitted. Hannibal Development Partners' consultant documented changes and updates in cover letters submitted with the Annual Remedial Action Groundwater Monitoring Reports.

Groundwater monitoring is conducted under the terms of a Consent Decree between Ormet and EPA (December 18, 1995, revised March 11, 2009) and the Remedial Action Groundwater Monitoring Plan Revision 1 (April 28, 1997). The Statement of Work (SOW) attached to the Consent Decree specifies that the purpose of groundwater monitoring is to document and evaluate changes in the groundwater condition beneath the site associated with the remedial actions. On January 29, 2013, EPA approved a shift from tri-annual sampling to annual groundwater monitoring beginning with the 2013 report. Documents reviewed as part of the FYR include, 2012, 2013, 2014, 2015 and 2016 Annual Remedial Action Groundwater Monitoring Reports (Appendix A).

The following wells are measured for water level elevation data as part of groundwater monitoring (for Site map showing all monitoring wells see Appendix C, Figure 1):

MW-1	*MW-20*	*MW-39 S&D*
MW-2	*MW-21 S&D*	*MW-40 S&D*
MW-3	*MW-22 S&D*	*MW-41*
MW-4	*MW-23 S&D*	*MW-42 S&D*
MW-5	*MW-24 S&D*	*MW-44 S&D*
MW-7	*MW-25*	*PPB-02d+*
MW-8	*MW-26 S&D*	*PPB-04+*
MW-9	*MW-27*	*PPB-06+*
MW-10	*MW-28*	*PPB-09+*
MW-11	*MW-29 S&D*	*PPB-02+*
MW-12	*MW-30*	*TH-3*
MW-13	*MW-31*	*TH-10*
MW-14	*MW-32*	*TH-11*
MW-15	*MW-34 S&D*	*TH-15*
MW-16	*MW-35*	*TH-16*
MW-17	*MW-36*	*TH-17*
MW-18	*MW-37*	*RP-1*
MW-19	*MW-38*	*RP-2*

The following wells are sampled as part of groundwater monitoring:

MW-1	*MW-15*	*MW-32**
*MW-2**	*MW-16**	*MW-34 S&D*
*MW-5**	*MW-17*	*MW-35**
MW-7	*MW-18**	*MW-36**
MW-8	*MW-19*	*MW-37**
MW-10	*MW-28**	*MW-39 S&D*
MW-11	*MW-29 S&D*	*MW-40 S&D*
*MW-12**	*MW-30*	*MW-42 S&D*
MW-14	*MW-31**	

MW-7 and MW-19 are regarded as background monitoring wells; the rest are groundwater monitoring wells. The RA Groundwater Monitoring Plan designated the wells marked with * as Points of Compliance as required under Section II.6 of the Consent Decree SOW (for Site map showing sampled monitoring wells see Appendix C, Figure 2). A summary of the most recent (2016) groundwater monitoring report values for contaminants of concern (COCs) in the compliance wells can be found in Table 4 below.

In 2015, several wells could not be located or accessed. Therefore, they could not be sampled during the 2015 sampling event. MW-1 and MW-40 S&D had new locks and no key. MW-2 (a compliance well), MW-8 and MW-27 could not be located and were listed as "Well Missing". In 2016, these wells were all located and tested as part of the annual groundwater monitoring event. MW-40 S was not tested in 2016. MW-2 and MW-5 are usually monitored for PCE, but were not tested for PCE in 2016.

Groundwater flow

Groundwater elevations measured at the Site show that the water table under much of the Site is deeper than the water level of the Ohio River. The groundwater flow in the alluvial aquifer beneath the Site is generally northeast to southwest, toward the Ormet reduction plant Ranney well. Plots of the concentrations of contaminated fluoride, total cyanide and WAD cyanide show the contaminated plume extending from the FSPSA area downgradient to the Ranney Well.

In the easternmost section of the Site, east of FDP-5 and southeast of the former recreation yard, a component of the groundwater flow appears to be in the east-southeast direction toward the Ohio River. This flow pattern, first identified in 2014, was also present in 2015 and 2016. The Ranney well historically pumped nearly 4 million gallons per day when it was used for process water, but since plant closure it has been operating at the minimum pumping rate specified in the ROD, which is 1 million gallons per day. In addition, the 2012 ESD eliminated the requirement for an interceptor well and treatment system at the Ranney well and pumpage of the plume by the interceptor well was stopped. This results in a lower hydraulic gradient towards the Ranney well. While the pumping of the Ranney well appears to contain the majority of the plume, the current pumping rate does not establish and maintain a full capture zone of contaminated groundwater in the alluvial aquifer, as required in the ROD and the 1995 Consent Decree (see VI. Issues and Recommendations). It is not known at this time whether the portion of the plume not captured contains concentrations of Site contaminants of concern since the monitoring well in that section of the Site, MW-20, is not sampled as part of the annual sampling event. Increasing and decreasing trends in COC concentrations discussed below may be related to the change in hydraulic gradient.

Cyanide

The cleanup goal for cyanide established in the ROD is 0.2 mg/L, the Safe Drinking Water Act MCL for free cyanide. EPA granted approval on January 29, 2013 to use WAD cyanide as a surrogate for free cyanide in determining compliance with the MCL. As of the 2016 annual groundwater monitoring event, total cyanide concentrations show decreasing trends at 10 of the 11 compliance wells, with the exception being MW-35 which was 0.28 mg/L. Decreasing concentration trends for total cyanide have been observed around the FSPSA area at MW-7, MW-5, MW-2 and MW-4 S&D. South of the FSPSA and north of the CMSD there is a noted increasing trend in total cyanide concentrations in MW-12, MW-14,

MW-39D, and MW-42 S&D. The increasing trend in the southeastern portion of the Site could be related to the reduced pumping of the Ranney well and lower hydraulic gradient causing a different migration of COCs. MW-11 and MW-8 also show an apparently increasing trend. The highest concentration of total cyanide observed is at MW-18, directly west of the FSPSA, at 8.2 mg/L, followed by MW-2 at 5.3 mg/L. WAD cyanide concentrations are typically much lower than total cyanide concentrations across the Site. WAD cyanide concentrations exceeded the 0.2 mg/L MCL for free cyanide at MW-35 (in the FSPSA) at 0.28 mg/L, MW-30 (west of the FSPSA) at 0.33 mg/L, and at MW-14 (directly west of FDP-5 and north of the CMSD) at 0.26 mg/L.

Fluoride

The cleanup goal for fluoride established in the ROD is 4.0 mg/L, the MCL for fluoride. Decreasing concentration trends for fluoride have been observed around the FSPSA area at MW-2 and MW-4 S&D. The southernmost well in the FSPSA, MW-17 shows an apparent increasing trend. South of the FSPSA and north of the CMSD, there is a noted increasing trend in fluoride at MW-12, MW-14, MW-29 S&D, MW-39 S&D and MW-42 S&D. Fluoride concentrations have consistently been below the MCL at compliance wells MW-12, MW-28, and MW-37, but remain above the MCL at compliance wells MW-32, MW-35, MW-36 (FSPSA), MW-16, MW-18, MW-31 (downgradient from FSPSA), MW-2, and MW-5 (in the midplant area). As of 2016, MW-16, MW-18, MW-32, MW-39 S&D, and MW-40 S&D show concentrations greater than nine times the MCL cleanup goal.

In recent history, the highest values measured onsite have been at MW-39 S. Between 2012 and 2016 the values have ranged from 110 mg/L to 150 mg/L, measured in 2016. The sampling event in 2016 showed that MW-14 (south of FDP-3) had a large increase in fluoride concentrations compared to 2015, increasing from 4.9 mg/L to 38 mg/L. This change could also be an indicator that the plume may have changed position due to the decreased pumping of the Ranney well. This should be monitored in the future to determine if a trend is present.

Arsenic

The cleanup goal for arsenic established in the ROD is 0.01 mg/L, the MCL. Levels of arsenic in the groundwater appear to be generally decreasing. Compliance wells MW-2, MW-16, MW-18, MW-31, MW-35, MW-36 and MW-37 show decreasing values, while MW-5, MW-12, MW-28, MW-35, MW-36 and MW-37 are already below the cleanup goal for arsenic. Within the FSPSA, MW-32 and MW-34 S&D, tested above the MCL for arsenic along with MW-16, MW-18, and MW-31 (downgradient from the FSPSA) and MW-2, MW-7 (in the midplant area). Ormet had previously proposed that the background level for arsenic, and hence the cleanup goal, should be 0.04 mg/L. EPA does not agree with this suggestion.

Manganese

The cleanup goal for manganese is established in the ROD as 0.23mg/L. Manganese levels have shown a decreasing trend at compliance wells MW-5, MW-16, MW-18, MW-28, MW-31, MW-32, and MW-37. In 2016, manganese concentrations were below the ROD-specified cleanup level at MW-5, MW-18, MW-31, and MW-37. Manganese values remain above the MCL within the FSPSA at compliance wells MW-32, MW-35, MW-36, and MW-37, downgradient of the FSPSA at MW-16 and in the mid plant

area at MW-2. The highest value for manganese on Site was downgradient of the CMSD at MW-12 at 3.2 mg/L.

Ormet had previously proposed that the background level for manganese, and hence the cleanup goal, should be 9.8 mg/L. EPA does not agree with this proposal.

Table 4: COC Concentrations at Compliance Wells

	WAD Cyanide	**Fluoride**	**Arsenic**	**Manganese**
ROD Cleanup Goal	*0 2 mg/L*	*4 0 mg/L*	*0 01 mg/L*	*0 23 mg/L*
Within FSPSA				
MW-32	0.027	**48**	**0.036**	**0.6**
MW-35	**0.28**	**5.4**	<0.010	**0.62**
MW-36	0.054	**12**	<0.010	**0.26**
MW-37	0.028	1.9	<0.010	<0.015
Downgradient from FSPSA				
MW-16	< 0.1	**47**	**0.026**	**0.48**
MW-18	< 0.1	**44**	**0.042**	**0.1**
MW-28	0.01	<1.0	<0.010	<0.015
MW-31	< 0.05	**24**	**0.017**	0.17
Mid Plant Area				
MW-2	0.12	**23**	**0.034**	**0.78**
MW-5	< 0.01	**28**	<0.010	0.15
Downgradient from CMSD				
MW-12	0.18	1.6	<0.010	**3.2**

2016 groundwater monitoring concentrations for COCs at the 11 compliance wells Exceedances from the ROD cleanup goal are shown in bold.

Site Inspection

An inspection of the Site was conducted on 11/16/2016. In attendance were Katherine Thomas, Tim Fischer (EPA); Shannon Cook, John Rochotte, Daniel Tjoelker (Ohio EPA); Eric Spirtas, Jim Moriarity, Darrell Phytlik (Niagara Worldwide, Hannibal Development Partners, Center Point Terminal), and Bob Fargo (Geo Resource Group). The purpose of the inspection was to assess the protectiveness of the remedy. The Site Inspection Checklist can be found in Appendix E.

During the inspection, EPA observed the components of the sprayfield to be operational and in generally good condition. Some pooling was witnessed on the sprayfield, despite changes made to the operational schedule to reduce pooling. The fencing and signage around the site were generally in good shape and up to specifications, though some damage to the fence was noted near the gate to the FSPSA as entering from the reduction plant facility. There were no signs of trespass. Monitoring wells were found to be in

good condition, clearly labeled and visible, and locked across the facility. No signs of damage were noted at any monitoring well examined. Willow trees being used to control leachate seepage were found to be growing and appeared healthy. In September 2016, EPA was notified by Hannibal Development Partners that an industrial facility 3 miles upriver on the West Virginia side of the Ohio River had a chlorine release. Hannibal Development Partners contacted a tree consultant, and the willow trees were pruned and being monitored for possible damage from the airborne chlorine plume. The idle pump formerly used for collecting leachate was found at the top of the CMSD. The cover to the CMSD was in good condition with vegetative cover being maintained and mowed. The Ranney well pump continues to be operational and is in a secured building inside the fenced area of the former reduction plant facility.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

Yes. The remedy is functioning as intended by the decision documents with the exception of the capture of a small portion of the plume on the eastern edge of the Site. The Ranney well is functioning, being pumped at the minimum pumping level required by EPA, and containing the majority of the groundwater plume. The CMSD landfill is in good condition and is properly maintained. The willow trees are in good condition and are capturing the CMSD seep water. The FSPSA sprayfield is functioning as intended. The review of documents, Applicable or Relevant and Appropriate Requirement (ARARs), risk assumptions, and the results of the Site inspection indicate that the remedy is functioning as intended by the ROD, as modified by the two ESDs.

Remedial Action Performance

The remedy continues to operate and function as designed. Cleanup levels are on a path to be achieved in the time frame specified in decision documents, and decreasing calculations of contaminant mass-in-place are documented in the annual groundwater monitoring reports. Containment is effective for most of the contaminated groundwater plume, but a small portion of the plume in the most eastern portion of the Site was not fully contained by the Ranney well during the 2014, 2015, 2016 groundwater monitoring events. This is believed to be due to both the discontinuation of pumpage by the interceptor well (per the 2012 ESD) and a reduction in pumpage by the Ranney well.

System Operations/O&M

The operating procedures could be improved to better maintain the effectiveness of the remedy. Operating the Ranney well at the minimum pumping rate does not appear to fully contain the plume. As suggested in the 2014 Groundwater Monitoring report, the pumping rate should be increased, and the differences between the groundwater elevations and contours should be compared and monitored.

Implementation of Institutional Controls and Other Measures

ICs in the form of an Environmental Covenant are in place. They are proving to be effective in preventing exposure to Site contaminants and prohibit potable use of the groundwater beneath the Site. Fencing and warning signs are in place around the site and are in generally good condition.

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?

Question B Summary:

Yes, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection are still valid. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy.

As the remedial work has been completed, ARARs for remedy construction cited in the ROD and/or amended by the ESD have been met. The ARARs that remain to be satisfied include:

1) The Safe Drinking Water Act (SDWA) (40 CFR 141)--the SDWA maximum contaminant levels are relevant and appropriate to groundwater remedial actions where the groundwater is a current and/or potential sources of drinking water.
2) For the Clean Water Act, Ohio Administrative Code 3745-33, Ohio NPDES Individual Permits--NPDES requirements are applicable to direct discharges of pollutants to surface waters.

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

No. There is no other known information that could call into question the protectiveness of the remedy.

VI. ISSUE S/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 01/Sitewide	**Issue Category: Remedy Performance**			
	Issue: The Ranney Well, operating alone at a lower pumpage rate and without the two interceptor wells, does not fully contain a small portion of the contaminant plume in the eastern portion of the Site. The facility is required to establish and maintain a capture zone of contaminated groundwater in the alluvial aquifer as established by the 1995 Consent Decree and the ROD.			
	Recommendation: Increase the pumping rate of the Ranney well to fully contain the plume.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Other- Property Owner	EPA	6/4/2017

OU(s): 01/Sitewide	**Issue Category: Remedy Performance**			
	Issue: The Ranney Well, operating alone at a lower pumpage rate and without the two interceptor wells, does not fully contain a small portion of the contaminant plume in the eastern portion of the Site. The facility is required to establish and maintain a capture zone of contaminated groundwater in the alluvial aquifer as established by the 1995 Consent Decree and the ROD.			
	Recommendation: Provide a summary report of the effect of the pumping increase in upcoming annual groundwater reports. The reports should include a certification that capture is being maintained in all portions of the plume or that corrective measures are in place to ensure that capture will be maintained in the future. Additionally, sample MW-20 as part of the annual groundwater monitoring program for Site COCs.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Other- Property Owner	EPA	5/4/2020

OU(s): 01/Sitewide	Issue Category: Monitoring			
	Issue: The 2016 Annual Remedial Action Groundwater Monitoring Report shows that MW-2, MW-5, and MW-30 were not tested for PCE. Compliance wells MW-2, MW-5, MW-18 and MW-31 along with MW-30, where PCE was detected in the RI, should be tested for PCE under the RA Groundwater Monitoring Plan.			
	Recommendation: All compliance wells and MW-30 must be tested for PCE during annual groundwater sampling to comply with the RA Groundwater Monitoring Plan.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	Other-Property Owner	EPA	9/30/2017

OTHER FINDINGS

In addition, the following are recommendations that were identified during the FYR that may affect performance of the remedy and compliance with decision documents but do not affect current nor future protectiveness:

- EPA is recommending that future groundwater monitoring reports include data collected related to the performance of the Ranney well. Sampling data collected to demonstrate compliance with Ohio NPDES permit limits for discharge of the water pumped from the Ranney well into the Ohio River, sampling dates, pumping rates, flow data, and the analytical data associated with any determinations made regarding the mass removal estimations of fluoride and cyanide should be included in future groundwater monitoring reports.
- Hannibal Development Partners should conduct a title search to ensure ICs are in place for each parcel. EPA should confirm ICs remain in place and are effective as part of the next FYR.

VII. PROTECTIVENESS STATEMENT

OU1 and Sitewide Protectiveness Statement
Protectiveness Determination Short-term Protective
Protectiveness Statement The remedy at the Ormet Corp. Superfund Site currently protects human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled through capping, excavation, soil flushing, plume containment, installation of fencing, and implementation of effective ICs. However, in order for the remedy to be effective in the long-

term, the following actions need to be taken to ensure protectiveness: increase the pumping rate of the Ranney well to fully contain the plume, and test all compliance wells and MW-30 for PCE during annual groundwater sampling.

VIII. NEXT REVIEW

The next FYR report for the Ormet Corp. Superfund Site is required no less than five years from EPA's signature date of this review.

APPENDIX A – Reference List

2012a, U.S. EPA, Explanation of Significant Differences Ormet Corporation Superfund Site (March 3, 2012) SEMS No. 430740

2012b, U.S. EPA, Sitewide Ready for Anticipated Use (SWRAU)- Ormet Corp. (September 6, 2012) SEMS No. 441992

2013a, HMI Environmental Consulting Services, 2012 Annual Remedial Action Groundwater Monitoring Report Ormet Corporation Superfund Site Hannibal, Ohio (April, 2013) SEMS No. 469334

2014a, Leidos Engineering LLC, 2013 Annual Remedial Action Groundwater Monitoring Report Ormet Corporation Superfund Site Hannibal, Ohio (May, 2014) SEMS No. 475199

2014b, Operation and Maintenance Inspection Report Letter from Ohio EPA District Representative Richard Stewart, to Mr. Mike Griffin, V.P. Operations Ormet Corporation regarding Potential Compliance Issues related to 3745-52-41 Biennial report submission; June 5, 2014

2014c, Asset Purchase Agreement between Niagara Worldwide and Ormet Corporation; June 26, 2014

2014d, Letter from Superfund Division, Richard Karl, Director, to Mr. Eric J. Spirtas President Hannibal Development Partners Accepted change in financial assurance provided under the Consent Decree and Consent Decree Amendment; Dec 18, 2014

2014e, Letter from Mr. Eric J Spirtas to Superfund Director, Richard Karl, Requesting change to the form of financial Assurance; Dec 16, 2014

2015a, Operation and Maintenance Inspection Report Letter from Ohio EPA Project Manager, Michael D. Sherron, to EPA RPM Tom Barounis; May 19, 2015

2015b, Letter from Mr. Eric J. Spirtas to Superfund Director Richard Karl, Requesting a comfort letter regarding the former Ormet Property April 6, 2015

2015c, Geo Resource Group, 2014 Annual Remedial Action Groundwater Monitoring Former Ormet Corporation Superfund Site Hannibal, Ohio (September, 2015) SEMS No. 496305

2015, Environmental Indicator Worksheets: Long-term Human Health Protection Worksheet & Migration of Contaminated Groundwater Under Control Worksheet (October, 2015) SEMS No. 498640

2016a, Geo Resource Group, 2015 Annual Remedial Action Groundwater Monitoring Former Ormet Corporation Superfund Site Hannibal, Ohio (October, 2016) SEMS No. 930195

2016b, Geo Resource Group, 2016 Annual Remedial Action Groundwater Monitoring Executive Summary Former Ormet Corporation Superfund Site Hannibal, Ohio (October, 2016) SEMS No. 930243

APPENDIX B – Chronology

Event	Date
Plant started operations	1958
Placement of spent potliner in former spent potliner storage area (FSPSA)	1958 to 1968
Use of retention disposal ponds (former disposal ponds--FDPs)	1958 to 1981
Wastes to construction materials scrap dump (CMSD)	1966 to mid-1979
Removal of much of the spent potliner	1968 to 1981
Verification of groundwater contamination in the Ranney well at the reduction plant and subsequent installation of interceptor wells	about 1972
Proposed to National Priorities List (NPL)	9/18/1985
Administrative Order by Consent between Ormet Corporation, Ohio Environmental Protection Agency (Ohio EPA), and U. S. Environmental Protection Agency (EPA) for Ormet to perform the remedial investigation (RI) and feasibility study (FS), reported effective date	5/19/1987
Finalize on NPL	7/21/1987
RI Report	12/29/1992
FS Report including Addendum required by EPA	December 1993
Proposed Plan	Undated, reportedly released 4/11/1994
Public meeting for the Proposed Plan, FS Report, RI Report, and other documents	4/20/1994
End of comment period for the Proposed Plan	6/10/1994
Record of Decision	9/12/1994
Consent Decree for remedial design and remedial action between Ormet Primary Aluminum Corporation and EPA	Lodged 9/28/1995 Entered 12/18/1995
First Explanation of Significant Differences (ESD)	4/1/1997
Approval of design	4/15/1997
Preliminary Close Out Report signifying construction completion	8/4/1998
First Five-Year Review Report	5/6/2002
Discovered part of CMSD landfill cover had failed and slid down the side	6/13/2006
Second Five-Year Review Report	5/4/2007
Amendment to the Consent Decree	Entered 3/11/2009
Environmental Covenant recorded	4/16/2010
Second ESD	3/26/2012
Third Five-Year Review Report	5/04/2012
Sitewide Ready for Anticipated Use	9/6/2012
Bankruptcy of Ormet Corp.	2/25/2013
Asset Purchase Agreement between Niagara Worldwide LLC and Ormet Corporation	6/26/2014
Letter of Credit Drawdown for Hannibal Development Partners LLC	12/18/2014
Federal Superfund Interest Reasonable Steps Status Letter	5/29/2015
Fourth Five-Year Review Report	5/04/2017

APPENDIX C – Site Maps

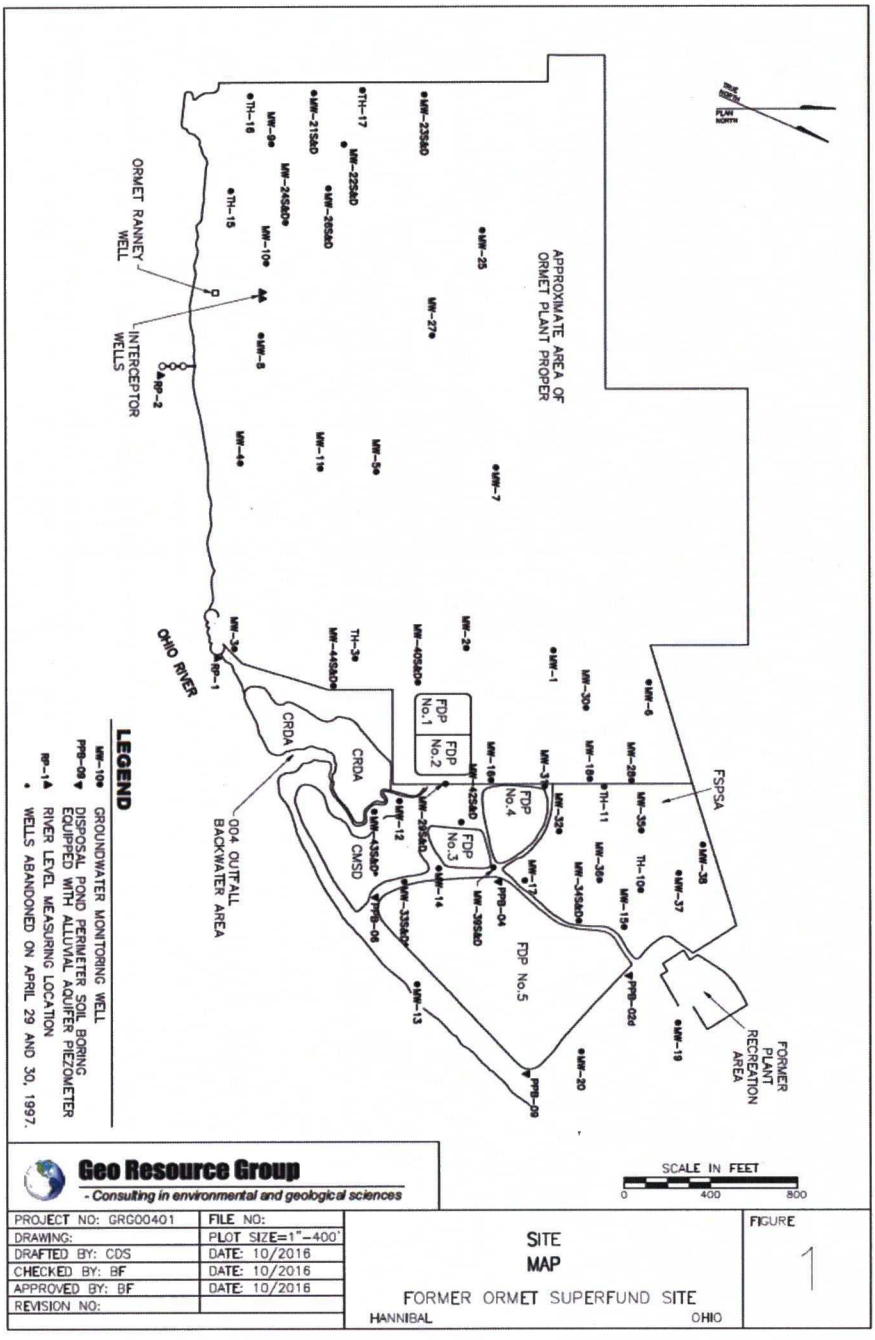

Figure 1. Base Site map of Ormet Corp. Superfund Site (modified from 2016 Remedial Action Groundwater Monitoring Report) showing Former Spent Potliner Storage Area (FSPSA), Construction Materials Scrap Dump (CMSD), CRDA (Carbon Runoff and Deposition Area), Former Disposal Ponds (FDP) No. 1-5, former Ormet Plant Proper, and all monitoring well locations.

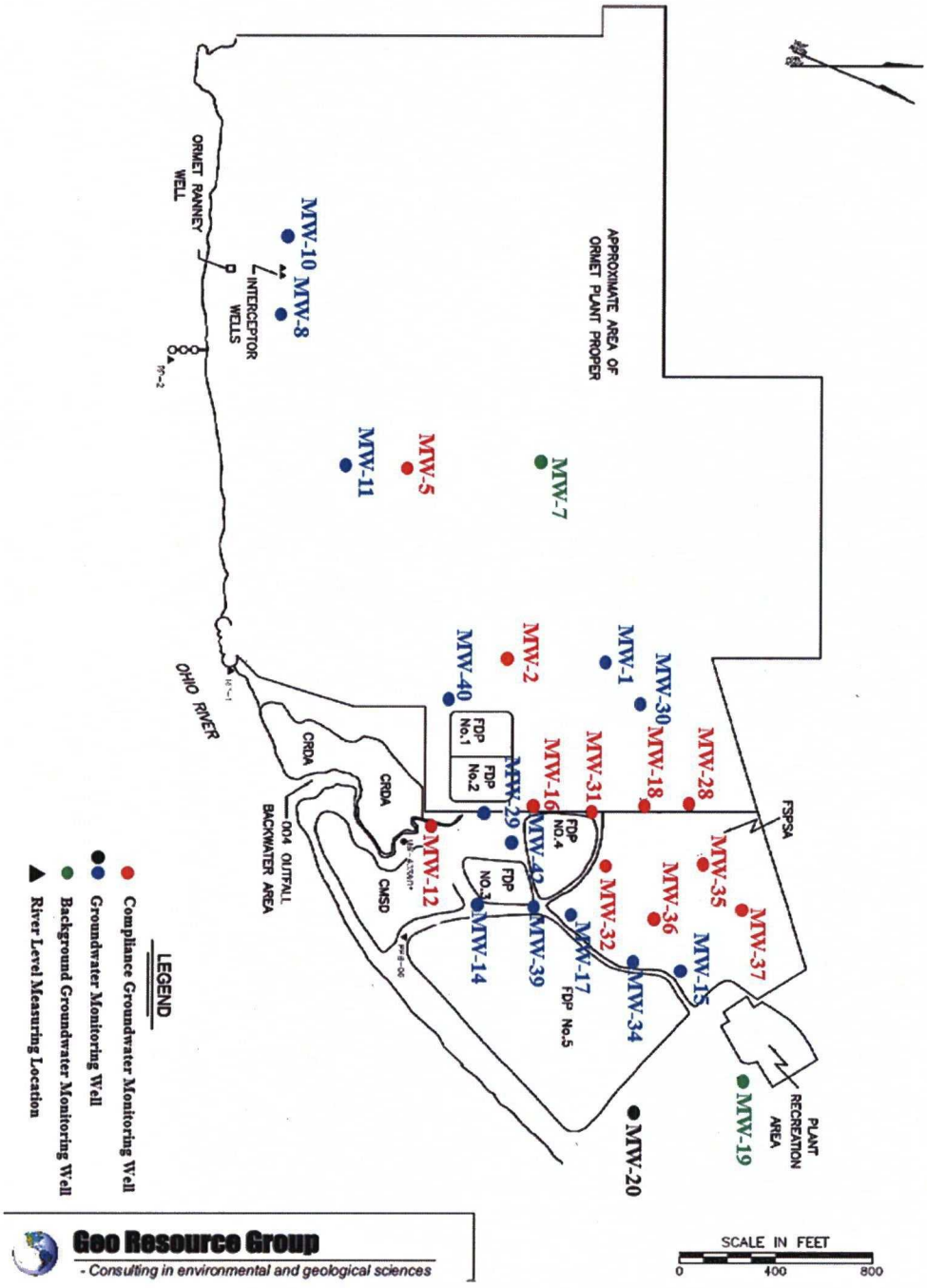

Figure 2. Site Map of Ormet Corp. Superfund Site and former Ormet facility (modified from 2016 Remedial Action Groundwater Monitoring Report) showing compliance wells (red); groundwater monitoring wells: sampled (blue), background (green), additional wells of interested (black).

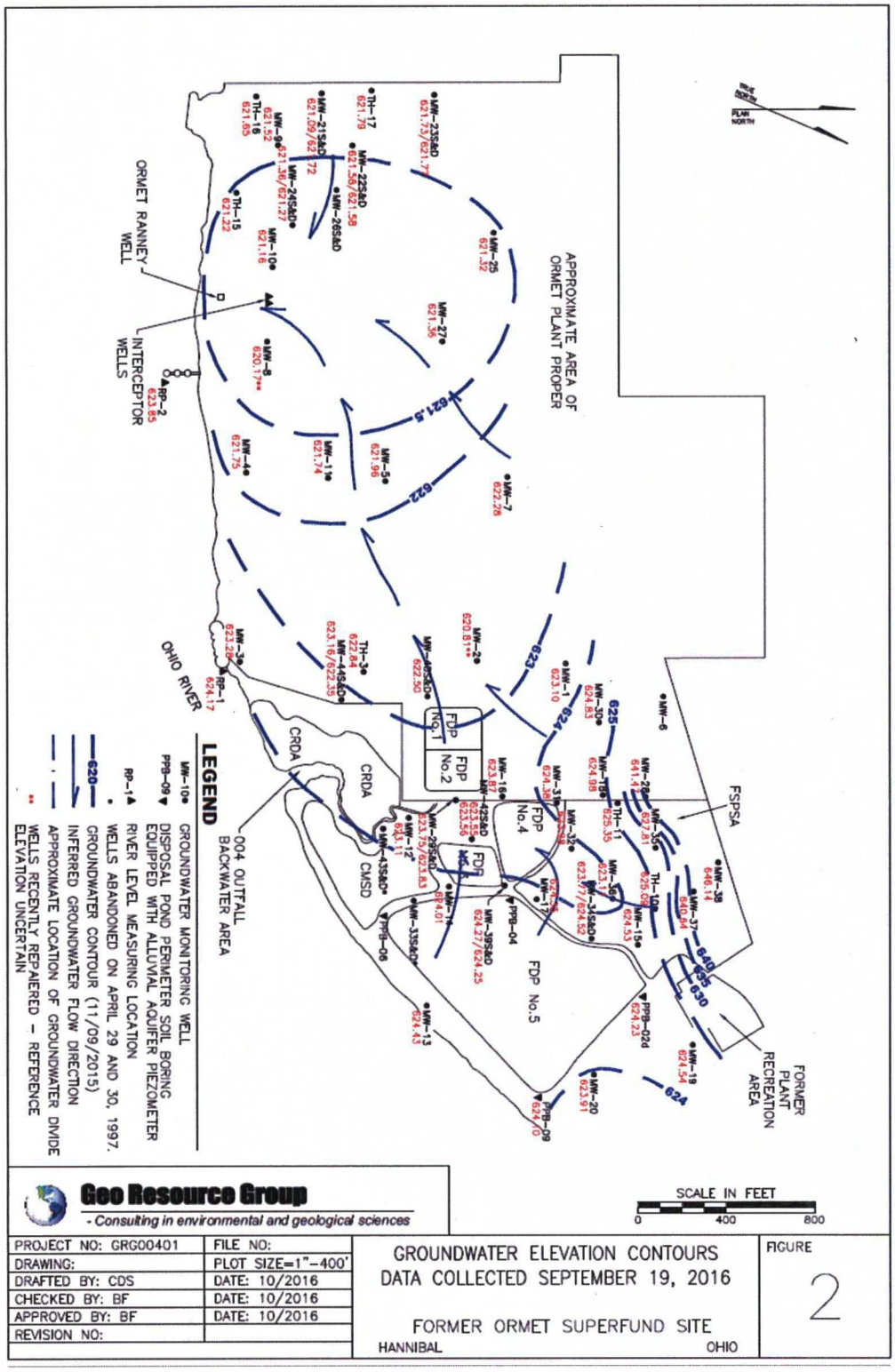

Figure 3. Groundwater elevation contours from 2016 Remedial Action Groundwater Monitoring Report showing general groundwater flow from the northeast to the southwest towards the Ranney Well. Small portion of the groundwater flow on the easternmost part of the Site is not contained by the pumping of the Ranney Well.

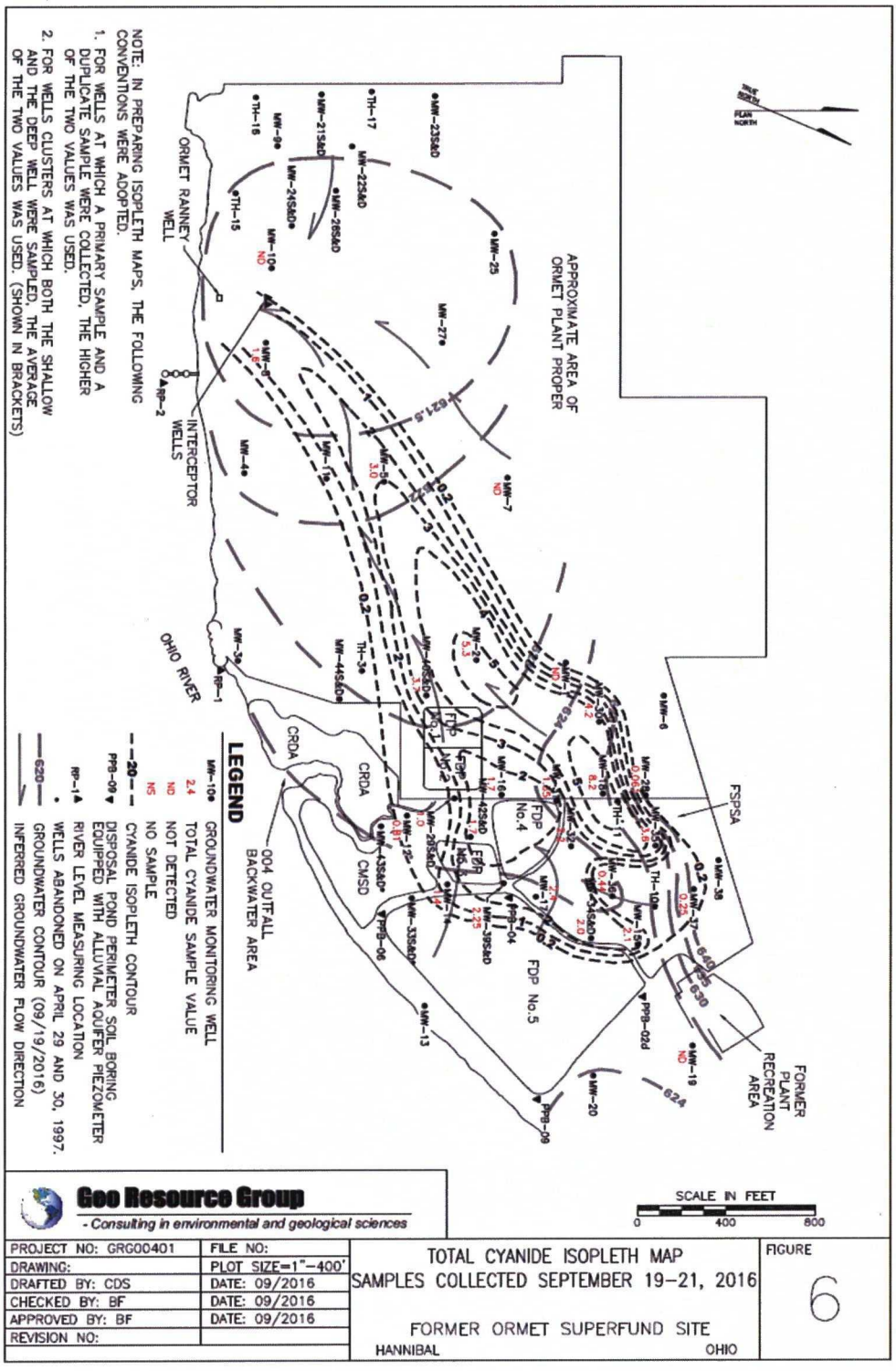

Figure 4. WAD cyanide isopleth map from the 2016 Remedial Action Groundwater Monitoring Report. WAD cyanide concentrations are highest downgradient from the FSPSA to the southwest.

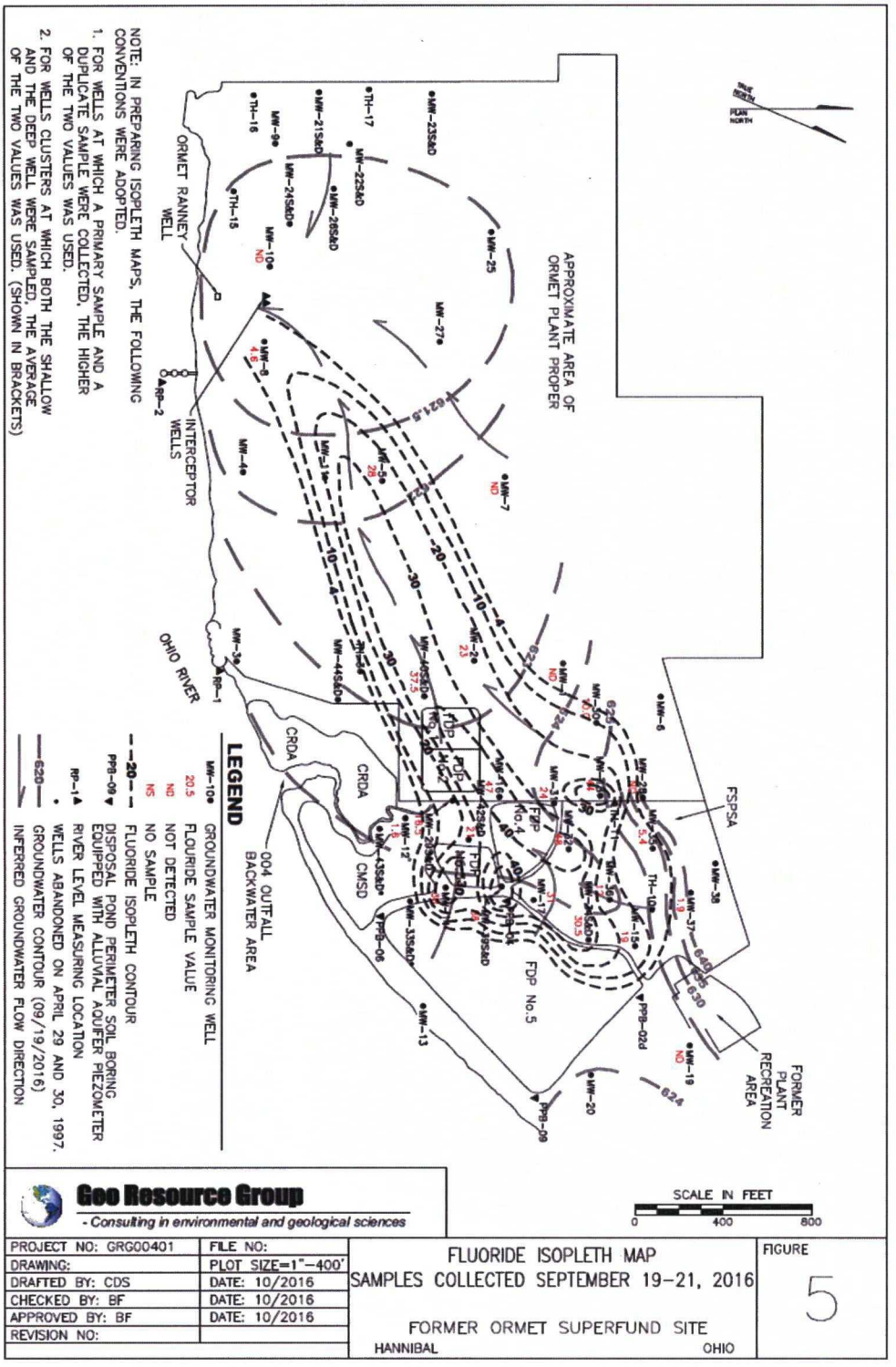

Figure 5. Fluoride isopleth map from the 2016 Remedial Action Groundwater Monitoring Report. Fluoride concentrations are highest downgradient from the FSPSA to the southwest.

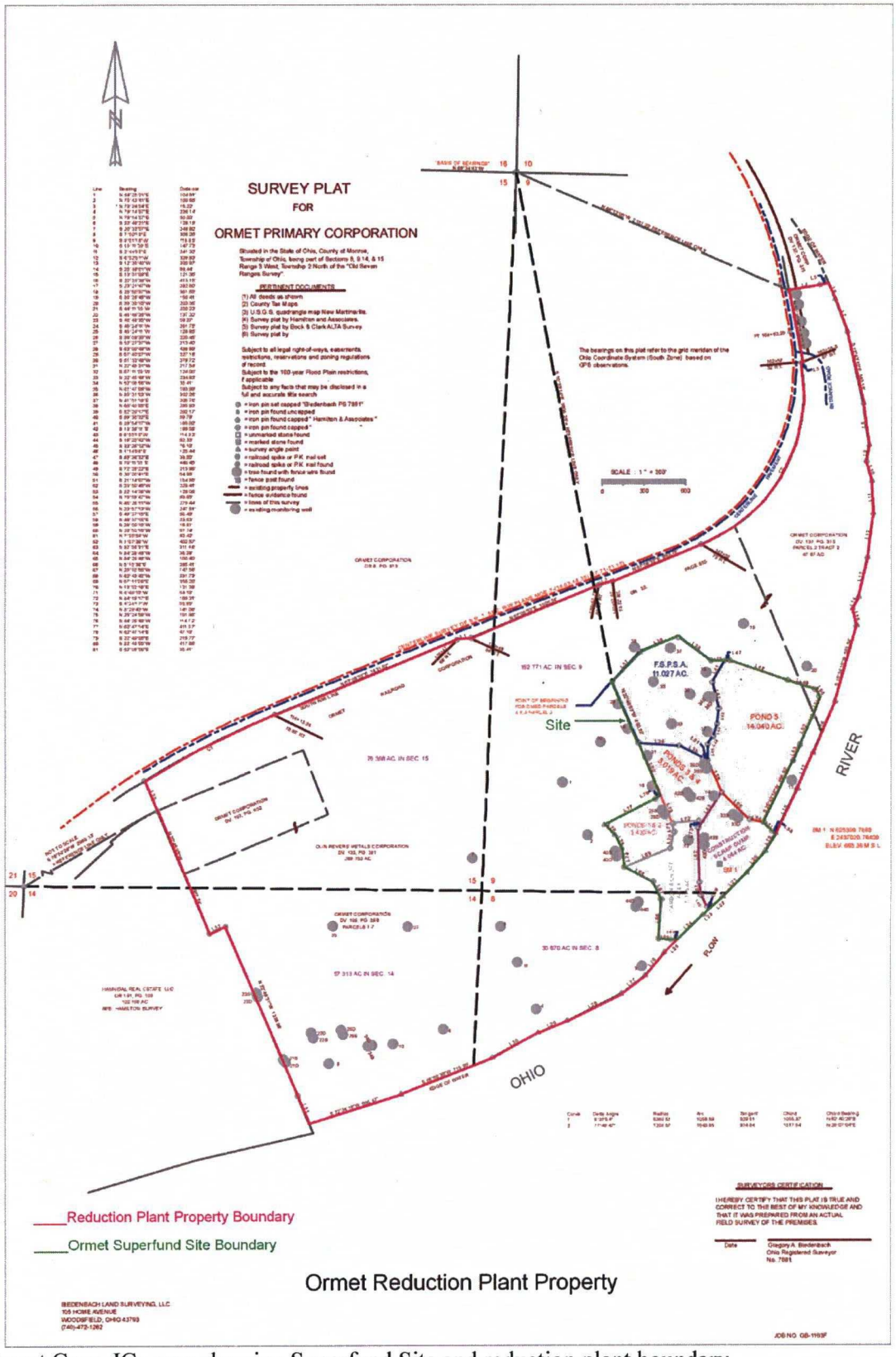

Figure 6. Ormet Corp. ICs map showing Superfund Site and reduction plant boundary.

APPENDIX D – Newspaper Advertisements

EPA Begins Review
of Ormet Corp. Superfund Site
Monroe County, Ohio

U.S. Environmental Protection Agency is conducting a five-year review of the Ormet Corp. Superfund site at State Route 7 in Monroe County, Ohio, approximately 3 miles north of the city of Hannibal. 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 fourth five-year review of this site.

The cleanup of chemical contamination at the site consisted of intercepting and treating contaminated groundwater, continued pumping of a production well, flushing soil in the former spent potliner storage area, constructing a landfill and storage cell, removing contaminated soil and sediment (mud) and placing them in the landfill and storage cell, long-term monitoring, and limiting the use of and access to the site.

More information is available at the Monroe County Public Library, 96 Home Ave., Woodsfield, Ohio; and at www.epa.gov/superfund/ormet-corp. The review should be completed by May 4, 2017.

The five-year review is an opportunity for you to tell U.S. EPA about site conditions and any concerns you have. Please submit your comments. Contact:

Adrian Palomeque
Community Involvement Coordinator
312-353-2035
palomeque.adrian@epa.gov

Katherine Thomas
Remedial Project Manager
312-353-5878
thomas.katheine@epa.gov

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

Figure 1. Advertisement placed in the Monroe County Beacon, Woodsfield, Ohio Thursday November 24, 2016 and in the Monroe County Sentinel, Woodsfield, Ohio Monday November 28, 2016

APPENDIX E – Five-Year Review Site Inspection Checklist

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Ormet Corp.	**Date of inspection:** Nov 16th 2016
Location and Region: Hannibal, OH R5	**EPA ID:**
Agency, office, or company leading the five-year review: USEPA	**Weather/temperature:**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other phytot leachate collection (willow trees near CMSD)
- ☒ Monitored natural attenuation FDP
- ☒ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Jim Moriarity (Name) — Chief Engineer (Title) — Nov 16th 2016 (Date)

Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____

Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Darrell Pytlik (Name) Plant Manager (Title) Nov 16 2016 (Date)
Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
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 Shannan Cook (Name) Site Coordinator (Title) _____ (Date) _____ (Phone no.)
Problems; suggestions; ☐ Report attached _____

Agency Ohio EPA
Contact John Rochotte (Name) Supervisor (Title) _____ (Date) _____ (Phone no.)
Problems; suggestions; ☐ Report attached _____

Agency Ohio EPA
Contact Daniel Tjoelker (Name) _____ (Title) _____ (Date) _____ (Phone no.)
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)
Problems; suggestions; ☐ Report attached _____

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

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

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

   Remarks _____

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

   Remarks _____

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

   Remarks _____

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

   Remarks Effluent monitored by OEPA NPDES permit 01E00005*MD

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

   Remarks _____

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

   Remarks Available at EPA office in Records

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

   Remarks maintained w/ contractor at office, sent to EPA available in Records

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

   Remarks leachate collected by phytoremediation by EPA approval

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

   Remarks Available, filed with OEPA. records sent to EPA on request.

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

    Remarks _____

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ Contractor for State
   - ☐ PRP in-house
   - ☒ Contractor for PRP
   - ☐ Federal Facility in-house
   - ☐ Contractor for Federal Facility
   - ☐ Other _____

2. **O&M Cost Records**
   - ☐ Readily available
   - ☐ Up to date
   - ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate _____ ☐ Breakdown attached

   Total annual cost by year for review period if available

   From _____ (Date) To _____ (Date) _____ (Total cost) ☐ Breakdown attached

   From _____ (Date) To _____ (Date) _____ (Total cost) ☐ Breakdown attached

   From _____ (Date) To _____ (Date) _____ (Total cost) ☐ Breakdown attached

   From _____ (Date) To _____ (Date) _____ (Total cost) ☐ Breakdown attached

   From _____ (Date) To _____ (Date) _____ (Total cost) ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
   Remarks fencing generally on good shape - slight damage at entry to FSPS A

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
   Remarks Warning signs in place.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Annual Inspection

Frequency annual

Responsible party/agency PRPs, EPA

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☒ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☒ No ☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks EC established in 2010

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks No signs of vandalism or trespassing

2. **Land use changes on site** ☒ N/A

Remarks

3. **Land use changes off site** ☐ N/A (Mill, reduction plant)

Remarks Ongoing redevelopment of Site including large-scale demolition of former facilities in the reduction plant.

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks roads leading to Site in good shape, on site no roads are present.

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

CMSD **VII. LANDFILL COVERS** ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
   Areal extent _____ Depth _____
   Remarks _____
   _____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Lengths _____ Widths _____ Depths _____
   Remarks _____
   _____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent _____ Depth _____
   Remarks _____
   _____

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Areal extent _____ Depth _____
   Remarks _____
   _____

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

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

7. **Bulges** ☐ 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 previous system abandoned for phyto

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 ☐ Applicable ☒ N/A

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

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

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

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

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

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

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

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

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

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☒ Good condition ☐ All required wells properly operating ☒ Needs Maintenance ☐ N/A
Remarks PRPs in charge maintaining system, pump is operating. need for maintenance not interfering w/ system

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☒ Needs Maintenance
Remarks See above

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☐ Applicable ☒ N/A

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

   Remarks _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   - ☐ N/A ☐ Good condition ☐ Needs Maintenance

   Remarks _____

3. **Tanks, Vaults, Storage Vessels**
   - ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance

   Remarks _____

4. **Discharge Structure and Appurtenances**
   - ☐ N/A ☐ Good condition ☐ Needs Maintenance

   Remarks _____

5. **Treatment Building(s)**
   - ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
   - ☐ Chemicals and equipment properly stored

   Remarks _____

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

   Remarks _____

D. Monitoring Data

1. Monitoring Data
   - ☐ Is routinely submitted on time ☒ Is of acceptable quality

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

Is mostly contained, but PRPs may need to increase pumping rate

D. Monitored Natural Attenuation

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

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☒ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks All required wells located in 2016 monitoring report.

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.).

Engineering controls and ICs are in place and are effective. CMSD landfill cover is in good condition and the willow trees are effectively taking up seep water. The FSPSA sprayfield is functioning as designed. The Ranney well is functioning and being pumped at the minimum pump rate. Changes in hydraulic gradient since 2012 have resulted in plume not being fully contained, though it is unknown whether the uncontained flow is contaminated.

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.

The Ranney well pumping rate needs to be increased inorder to ensure long-term protectiveness of the remedy and ensure the contaminated groundwater is not entering the Ohio River. A evaluation of the Ranney well and FSPSA sprayfield should be done to determine the effectiveness of the remedies over the long-term.

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.

Change in groundwater flow indicates that minimum pumping rate of the Ranney well may need to be increased to ensure full containment of the plume.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

A study should be conducted to determine the effectiveness of increasing the pumping rate at the Ranney well in containing the groundwater plume. A study could also be conducted to determine the effectiveness of the FSPSA sprayfield in flushing contaminates.