981913

SIXTH FIVE-YEAR REVIEW REPORT FOR MUSKEGON CHEMICAL CO. SUPERFUND SITE MUSKEGON, MICHIGAN

Prepared by

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

4/20/2023

X Douglas Ballotti

Douglas Ballotti, Director
Superfund & Emergency Management Division
Signed by: DOUGLAS BALLOTTI

Table of Contents

LIST OF ABBREVIATIONS & ACRONYMS

APR	Annual Progress Report
ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Chlorex	bis (2-chloroethyl) ether
cis-1,2-DCE	cis-1,2- dichloroethene
COCs	Contaminants of Concern
1,2-DCA	1,2-dichloroethane
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EPA	United States Environmental Protection Agency
FHR	Flint Hills Resources
FYR	Five-Year Review
GSI	Groundwater/Surface Water Interface
ICs	Institutional Controls
ICIAP	Institutional Controls Implementation and Assurance Plan
KCC	Koch Chemical Company
LTMCP	Long-Term Monitoring and Contingency Plan
LTS	Long-Term Stewardship
MCC	Muskegon Chemical Company
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MZGSI	Mixing Zone Groundwater/Surface Water Interface
ng/L	nanograms per liter
NA	natural attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
ppb	parts per billion
ppt	parts per trillion
PCE	tetrachloroethylene
PCOR	Preliminary Close Out Report
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PFAS	per- and polyfluoroalkyl substances
PFHxA	Perfluorohexanoic acid
POTW	Publicly Owned Treatment Works
ppt	parts per trillion
PRP	Potentially Responsible Party
RAG	Remedial Action Goal
RAO	Remedial Action Objective
RAP	Remedial Action Plan

RC	Restrictive Covenant
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
RRML	Regional Removal Management Level
RSL	Regional Screening Level
QAPP	Quality Assurance Project Plan
Site	Muskegon Chemical Co. Superfund Site
SAP	Sampling and Analysis Plan
SDWA	Safe Drinking Water Act
SVE	Soil Vapor Extraction
TBC	To be considereds
TCE	trichloroethylene or trichloroethene
TGDC	triethylene glycol dichloride or bis(2-chloroethoxy)ethane
trans-1,2-DCE	trans -1,2- dichloroethene
ug/L	micrograms per liter
UU/UE	Unlimited Use and Unrestricted Exposure
VI	Vapor Intrusion
VISL	Vapor Intrusion Screening Level
VC	vinyl chloride
VOC	Volatile Organic Compound
WWTP	Wastewater Treatment Plant

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 Oil and Hazardous Substances Pollution Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the sixth FYR for the Muskegon Chemical Co. Superfund Site (the Site). The triggering action for this discretionary[1] FYR was the signing and completion date of the previous FYR. 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 State of Michigan prepared the first through fourth FYRs and EPA prepared the fifth and sixth FYRs. Going forward, the state of Michigan will be preparing the FYRs per the site decision documents, if FYRs are needed according to the State's policies and procedures.

The Site consists of one (1) Operable Unit (OU) that is addressed in this FYR. The interim remedy addresses a portion of the sitewide groundwater remedy by abating the on-going release of contaminated groundwater into the Mill Pond Creek. The remedy amendments addressed the entire Site remedy including remediation of the groundwater and soils and measures for protecting the groundwater and surface water.

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) (formerly the Michigan Department of Environmental Quality (MDEQ[2])) is the lead agency for developing and implementing the remedy for the Site. EPA Region 5 is the support agency, providing document review and input and leading the FYR process for this FYR.

The Site FYR was led by Sheri L. Bianchin, Remedial Project Manager (RPM) at EPA. Participants included Nicolas Dawson, Project Manager, and Matt Baltusis, Geologist, both with EGLE; and Heriberto Leon, Community Involvement Coordinator at EPA. The relevant entities such as the potentially responsible parties (PRPs) and the community were notified of the initiation of the FYR. The FYR review began on 6/2/2022.

[1] The Preliminary Close Out Report (PCOR) (EPA, 1997) stated that policy five-year reviews will be conducted by the MDEQ and the EPA. However, EPA has determined that FYRs are not required to be done by EPA per EPA policy (see 2001 Comprehensive FYR Guidance) since EPA did not sign or concur on the decision documents selecting the Site remedy. This FYR is being conducted as a discretionary review.

[2]EGLE was formed on April 22, 2019 and was previously known as Michigan Department of Environmental Quality and MDEQ and the Michigan Department of Natural Resources (MDNR) at different times.

Site Background

The Site is located in the city of Whitehall and Fruitland Township, Muskegon County, Michigan (sees Figures 1A, 1B and 2 in Appendix B) and extends ½ mile southwest to Mill Pond Creek. The Site is comprised of three property areas and multiple parcels as shown on the maps in Figure 2 in Appendix B. These are the former Muskegon Chemical Company (MCC) Plant Property, the Howmet Property, and the Mill Pond Creek Property.

The former MCC Plant Property, containing impacted soils and groundwater, consists of 19.6 acres and is located at 1725 Warner Street. It is approximately 0.5 mile north of the Mill Pond Creek and is close to White Lake and Lake Michigan in the southern outskirts of the City of Whitehall, Muskegon County, Michigan. That property is bordered on the north by a light industrial area, an open wooded area to the east, the C&O Railroad to the south, and Warner Street to the West. Further, the property is north of the Hart-Montague Bicycle Trail (former CSX railroad) and east of Warner Street. This property is mostly vacant and contains a vacant building and a capped area. The MCC property is zoned MC-1 (Limited Industrial Commercial) but is currently vacant and owned by Flint Hills Resources (FHR)[3]. The reasonably anticipated future use is commercial/industrial. The surrounding area is mixed with commercial and industrial uses along with residential and recreational uses.

The Howmet Property, containing impacted groundwater, is another light/medium industrial area located on the west side of Warner Street, across from the MCC property. The Howmet Property, containing impacted groundwater, is in the City of Whitehall, north of White Lake Drive and west of Warner Street. This property is owned and occupied by the Howmet Corporation (See Figures 1A, 1B and 2 in Appendix B). The current use of the property is commercial/industrial, and that use is likely to continue as the reasonably anticipated future use.

The Mill Pond Creek property, containing impacted groundwater, is an 88-acre vacant parcel in Fruitland Township, south of White Lake Drive. This property is owned by FHR and is a mostly wooded area, south of the railroad tracks and is drained by Mill Pond Creek. The northern one-half of the Mill Pond Creek Property is zoned MDR (Medium Density Residential), and the southern one-half is zoned RR (Rural Residential). The property is currently vacant, and the reasonably anticipated future use is residential. A narrow marshy area is located adjacent to Mill Pond Creek and this area was the location of the interim response action discussed in Response Actions.

Many residences in this area use both the upper and lower aquifers as a source of drinking water. Sampling of residential wells in the vicinity of the site in June 1991 did not show any impact from the contaminated groundwater plume. The nearest residential groundwater wells are located 1 mile north and 1 mile south southwest of the site. A Whitehall municipal well is located 900 feet north of the facility. Much of the area in the vicinity of the Site is served by municipal water from the Whitehall municipality, which

[3] FHR is a wholly owned subsidiary of Koch Industries and is the successor to KCC. As such, FHR retains liability for response actions at the Site. Koch Remediation and Environmental Services, another wholly owned subsidiary of Koch Industries, is in charge of conducting the remediation for FHR.

receives its water from wells and is regulated under the Safe Drinking Water Act (SDWA). However, outside the limits of Whitehall, to the southwest, the residential area is not served by municipal water and the residences draw their domestic water from personal wells. That area is not expected to be affected by the Site because the area is not considered downgradient (e.g., it is side-gradient) of the groundwater contamination and is a far enough distance away from the Site.

The former MCC plant produced specialty chemicals at the Whitehall facility from approximately 1975 to 1993; the facility operated from approximately 1975 to 1983 as MCC and from 1985 to 1992 as Koch Chemical Company's (KCC's) Whitehall Specialty Chemical Plant.

Groundwater contamination was initially discovered in 1977[4] when a hydrogeological investigation began while a well was being installed at the facility. The probable source of contamination was identified as leaks in the drainage system inside the MCC plant. These leaks contaminated the local water table (upper) aquifer near the plant. Later investigations tracked the groundwater contaminant plume approximately one-half mile south-southwest to its discharge point in Mill Pond Creek. EPA placed the Site on the National Priorities List (NPL) on February 21,1990.

[4] In 1977, MCC began a hydrogeological study of the manufacturing area. In mid-1979, organic compounds were detected during routine sampling of the five onsite observation wells installed in 1977. One purpose of these wells was to monitor for possible groundwater contamination. Organic constituents were originally detected in observation well OW5, about 50 feet north of the main process building. This discovery began the process of investigating and remediating groundwater contamination at the Site.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Muskegon Chemical Co.		
EPA ID: MID072569510		
Region: 5	**State:** MI	**City/County:** Whitehall/Muskegon

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): Sheri L. Bianchin
Author affiliation: U.S. EPA
Review period: 6/2/2022- 12/2/2022
Date of site inspection: 11/4/2022
Type of review: Discretionary
Review number: 6
Triggering action date: 4/3/2018
Due date *(five years after triggering action date)*: 4/3/2023

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The Remedial Investigation (RI) for the Site was designed to determine the nature and extent of contamination through a sampling program for groundwater, soils, surface water, and sediments. The RI was conducted by the potentially responsible parties (PRPs[5]) and completed in 1991 (CH2M HILL, 1991). An addendum to the RI was issued in 1992 to further address the extent of groundwater contamination. The RI included a human health risk assessment (CH2M HILL, 1992). Contaminants of concern (COCs) in Site soil and groundwater include the following organic compounds: tetrachloroethylene (PCE), bis (2-chloroethyl) ether (Chlorex), 1,2-dichloroethane (1,2-DCA or DCA), and bis (2-Chloroethoxy)ethane (or triethylene glycol dichloride (TGDC))[6] **.**

The human health risk assessment (carcinogenic and non-carcinogenic) conducted for the Site showed there was no present exposure pathway to site-related COCs under the then-current conditions. However, the risk assessment indicated that several potential exposure pathways posed a carcinogenic risk. One potential pathway was determined to be a concern if future development of the Site occurred, which could cause occupational or residential exposure to contaminated subsurface soil through direct contact or ingestion. Potential pathways considered included the potential for dermal contact with, accidental ingestion of, and inhalation of volatile organic contaminants and fugitive dust from surface soil contamination. The second potential exposure route is the future use of groundwater as a potable residential water source at or near the Site or other domestic uses of the water. Potential exposure pathways may include inhalation of volatilized contaminants during showering or bathing, ingestion of, and dermal absorption of organic compounds through water usage. A third pathway is the potential for human exposure to hazardous substances from contact with contaminated surface water or incidental ingestion of the surface water. Potential pathways may include dermal contact with accidental ingestion of, and inhalation of volatile organic contaminants from surface water and sediments. Ecological impacts from Site-related contamination were evaluated but did not identify unacceptable risk to aquatic life as a result of the discharge of the groundwater plume to Mill Pond Creek. The potential pathways prompted the action provided for in the 1993 interim Record of Decision (ROD) (Michigan, 1993) to help prevent further degradation of contaminated groundwater, surface water and sediments.

Response Actions

Early Actions

Groundwater contamination was initially discovered in 1977, during testing for the installation of an industrial water supply well at the facility. It was found then that the direction of groundwater flow in the area is to the south/southwest towards Mill Pond Creek. Information obtained from the interim response action and remedial investigation studies indicate that groundwater in the upper sand aquifer discharges to Mill Pond Creek.

[5] PRPs are Muskegon Chemical and its successor Koch Chemical.

[6] Other COCs have been identified since that time such as trichloroacetic acid (TCA) and including the breakdown products of PCE such as VC.

A hydrogeologic investigation conducted in 1980, identified volatile organic compounds (VOCs) in the groundwater. The contaminant plume was estimated to be 1,150 feet in length, flowing in a southwesterly direction from the facility. MCC and subsequent property owners installed one purge well, centrally, in the path of the plume. As a result of several groundwater investigations by the Site owners, several remedial measures were implemented in the early to mid-1980s in an attempt to address the groundwater contaminant plume and to prevent further discharge to Mill Pond Creek. A system of small diameter interceptor wells was installed along the toe of the bluff north of Mill Pond Creek to prevent further discharge to the creek. The system was only partly effective in capturing the contaminant plume. In addition to the interceptor well system, MCC installed four (4) recovery wells in the main process building and near the creek to control and remediate the contaminant plume between the source area and the creek. Flow from the Mill Pond Creek system and the four recovery wells was directed to the MCC plant where it was treated with granular activated carbon before being discharged to the Whitehall Area Publicly Owned Treatment Works (POTW). That system was updated several times to assist in effectively controlling the discharge of contaminated groundwater to the surface waters of Mill Pond Creek area. Interceptor wells, monitoring wells, and a conveyance system were constructed between November 1992 and January 1993 on the bluff north of Mill Pond Creek. The three (3) interceptor wells were brought on-line in January 1993. This work transitioned to the remedial action which is discussed below. A long-term groundwater monitoring plan was instituted to monitor the effectiveness of the groundwater interceptor system.

Remedial Action

Investigation and remediation of MCC as part of the remedial action began in 1977 under state enforcement actions and has continued through the present day under state and federal oversights. The State of Michigan, then Michigan Department of Natural Resources (MDNR), signed an interim ROD on March 10, 1993 (ROD, Michigan, 1993) to address environmental contamination and specifically address the contaminated groundwater plume in the vicinity of Mill Pond Creek. This decision document presents the selected interim response action for the Site and is referred to as an Interim Remedial Action.[7] The purpose of the interim action remedy was to reduce the potential for human exposure to hazardous substances from contact with contaminated surface water. The principal threats will be mitigated by a groundwater extraction and treatment system. The interim ROD stated that prevention of further degradation of the presently contaminated groundwater, surface water and sediments is an environmental remedial objective that needs to be addressed by any final remedy chosen for the Site. In essence, the interim ROD consisted of removal or extraction of contaminated groundwater in the vicinity of Mill Pond Creek and treatment of the contaminated groundwater prior to disposal or discharge. EPA chose not to review the decision document at that time and thus did not sign nor concur on the 1993 ROD. The major selected remedy components of the interim ROD included the following:

[7] The interim response action was chosen consistent with the requirements of the Michigan Environmental Response Act, 1982 PA 307, as amended; the CERCLA as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA); and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

* extraction of groundwater to capture and halt the flow of the contaminated groundwater plume before it reaches Mill Pond Creek;
* removal of organic contaminants by carbon adsorption;
* discharge of treated water to the Whitehall Area Publicly Owned Treatment Works; and
* surface water, groundwater, soil and air monitoring to assess the effectiveness of the system at halting the migration of contamination and reducing the levels of contamination in the groundwater, surface water and air. Should monitoring indicate any component of the remedy is ineffective, corrective action will be taken.

The groundwater and surface water cleanup levels articulated in the ROD are found in Table 1 below:

TABLE 1
MUSKEGON CHEMICAL SITE
INTERIM RESPONSE ACTION
COCs

COCs	Groundwater Maximum Concentration (ppb*)	Surface Water Maximum Concentration (ppb) Water	Cleanup Standards (ppb)
1, 2-Dichloroethane	200	5	1
Tetrachloroethene	16	2	1
bis(2-Chloroethyl)ether	7	5	5
Chloroethyl)ether bis(2-Chloroethoxy) ethane	250	N/D	5

*ppb: parts per billion

Although no formal Remedial Action Objectives (RAOs) were identified in the ROD, it stated that generally the objectives of the remedial actions were to: reduce the potential for human exposure to hazardous substances from contact with contaminated surface water and mitigate the principal threats.

After the interim ROD, the state of Michigan prepared several Remedial Action Plans (RAPs) to update the remedial action components and entered into enforcement agreements with the PRPs to implement those actions. This remedial action proceeded as a state enforcement lead.

The initial RAP for the final Site remedy was approved by MDEQ on June 5, 1997 (Michigan. 1997). The Site remedy implementation proceeded under a 1997 Consent Decree between MDEQ and KCC. That remediation strategy used a tiered remediation approach. The RAP was amended in 2000 (Michigan, 2000) and 2009 (Michigan, 2009).

The remediation strategy, as contained in the RAPs, was to address the Site-wide contamination and risks, involved active treatment consisting of groundwater extraction and treatment, thermally enhanced soil vapor extraction (SVE) with air sparging, institutional controls (ICs), and monitoring of soil and groundwater. Tier 1 remedial action goals (RAGs) were established to be protective of human health and the environment as long as land-use restrictions are used to limit the land-use to industrial development and to restrict the groundwater use not to include potable purposes. Tier 2 goals were established to be protective of human health and the environment without any restrictions.

For groundwater, Tier I goals were to be met by extraction of the groundwater using the existing wells plus installation of two new extraction wells, treatment of the groundwater using an air stripper to remove VOCs followed by granular activated carbon polishing, and discharge of the treated water by reinjection back into the aquifer and discharge to the Whitehall Area POTW. Groundwater monitoring will continue until at least unrestricted groundwater criteria have been met. According to the RAP, Tier 2 goals were to be met through natural attenuation (NA). For soil, Tier 1 goals will be met by conducting soil vacuum extraction (SVE), followed by air sparging. Tier II goals will be met through NA.

Once active treatment at the Site was deemed to be no longer necessary by the State of Michigan (then known as MDNR) in 1998, the remedy focus shifted to one of limiting exposures. The RAP was updated in 2000 and 2009, and these updates were implemented as amendments to the Consent Decree between the PRPs and MDNR that was last amended in 2008. Those amendments clarified the cleanup standards, shut-off criteria for the air sparging system, and ICs.

Regarding groundwater cleanup standards, the 2009 RAP amendment replaced the Tier 1 RAGs[8] with the mixing groundwater/surface water interface (GSI) otherwise known as the mixing zone groundwater/ surface water interface (MZGSI) based discharge criteria. These revised criteria were approved as part of the 2009 RAP amendment. The current Tier 1 MZGSI and Tier II RAGs per 2000 RAP and 2009 RAP Amendments are shown in Table 2 below.

[8] The original Tier 1 groundwater RAGs were established in the 1997 RAP using a computer model. The model was used to derive what has been termed "attenuated" GSI values. The attenuated GSI value was the concentration of a specific chemical constituent in groundwater such that by the time the groundwater reached Mill Pond Creek, the concentration of the chemical constituent will be equal to or below the published generic GSI value for that compound. Since then, a standardized method has become available to evaluate contaminated groundwater discharges to surface water bodies which is termed a mixing zone determination. KCC requested a mixing zone determination for the Site, and site-specific discharge criteria were developed for the COCs at the Site based on this determination.

Table 2:
Revised Tier 1 MZGSI and Tier II RAGs for Groundwater per 2000 RAP and 2009 RAP Amendments

	Current Tier 1 MZGSI (ppb)	Current Tier 1 MZGSI (ppb)	Tier II RAGs (Drinking Water Standards) (ppb)
COCs	Acute	Chronic	
Chlorobenzene	850	750	100
1,2-Dichloroethane	15,000	-	5
Cis-1,2- Dichloroethene	-	-	70
Trans -1,2- Dichloroethene	-	-	100
Tetrachlorethene	710	-	5
Trichloroethene	3,500	3,200	5
Vinyl chloride (VC)			2
Bis(2-chloroethoxy)ethane (TGDC)	18,000	23,000	5
Bis(2-chloroethyl) Ether (Chlorex)	26,000	770	2

The groundwater remedy addresses groundwater as a direct pathway and is intended to protect the surface water. This approach used GSI NA assumptions rather than direct measurements of surface water quality.

The Site achieved construction completion with the signing of the PCOR by EPA in 1997. In the future. EPA may consider a final ROD and Final Close Out Report to address the final actions taken at the Site for Site closeout such as for a deletion or partial deletion of the Site from the NPL. In terms of future remedial action(s), the Muskegon Chemical Co. Superfund Site will remain a state enforcement lead Site.

Status of Implementation

All active remedial action activities have been terminated because they are no longer necessary since the source of contamination has been treated and contained. The groundwater extraction and treatment system and air sparging and SVE equipment are gone from the Site. The MCC Plant Property is protected by a fence which has warning signs posted, and a permanent marker is located at the entrance. These access controls ensure that the Plant Property is not used for inappropriate land uses. Effective ICs are in-place to prevent any unacceptable exposures (*see* Institutional Controls below for further details). A multi-media cap covers the former process building footprint, a 12,000-square foot area on the plant property. The cap prevents direct contact with residual contaminants and limits infiltration of precipitation and storm water. In addition, permanent markers are located at the corners of the area.

For groundwater, Tier 1 goals were met by active treatment consisting of extraction of the groundwater via extraction wells, treatment of the groundwater using an air stripper, followed by granular activated carbon polishing, and discharge of the treated water to the Whitehall Area POTW. According to the 2009 RAP Amendment, Tier 2 goals will be met through NA. Groundwater monitoring and appropriate ICs will continue until unrestricted groundwater Tier II criteria have been met.

For soil, Tier 1 goals were met by conducting SVE, followed by air sparging to strip VOCs from the soil matrix. Since the Tier 2 goals allowing for unlimited use/unrestricted exposure were not met, the contaminated soils were capped, and ICs were instituted per the 1997 RAP. As is discussed below in Data Review, while Tier I standards for the identified COCs have been met, Tier II standards have not been fully met.

Post Remedy Issues

Vapor Intrusion Pathway

A Vapor Intrusion Evaluation Report (FTCH, 2017) was submitted by the PRPs in 2017 which concluded no formal VI assessment was necessary. EGLE and EPA reviewed it and provided comments. EPA and EGLE comments regarding the VI Evaluation Report are paraphrased as follow:

- Since 2017, VI screening levels have been updated and data presented in the 2017 Evaluation should be compared to current screening levels.
- Vapor sources should be compared to potential receptors using a 100-foot screening radius.
- Utility corridors and other preferential pathways should be evaluated with respect to VI potential.
- Groundwater data compared to VI screening levels should be from as near to the top of the shallowest saturated zone as practicable or near the water table.
- FHR should consider revising ICs to include the prevention of redevelopment or ensure an additional VI investigation is completed prior to construction of new building(s).

No formal VI sampling or data evaluation was conducted in 2020 or 2021 due to the suspension of high-risk activities including sub-slab and indoor sampling during the COVID-19 pandemic, and the investigation was put on hold until pandemic concerns lessened. In April 2022, the PRPs submitted updated information to supplement the VI Evaluation Report (FHR, 2022). After reviewing the information in that report and other information, EPA and EGLE concluded that additional VI assessment work is necessary to determine if VI is a future potential pathway of concern and there was no reason to delay the VI study any longer due to pandemic concerns, and the PRPs were re-engaged in discussing the VI concerns. It is anticipated that the VI study will be initiated in 2023.

Table 3
U.S. EPA VI Screening Levels
For Groundwater

	Residential		Commercial/Industrial	
COC	10^{-6} ELCR or HQ of 1 (ppb or µg/L)	10^{-5}	10^{-6} ELCR or HQ of 1 (ppb or µg/L)	10^{-5}
PCE	15	58	65	242
Trichloroethene (TCE)	1.2	5.2	7.4	22
VC	0.15	1.5	2.5	1.5

To ensure that there is no potential for future risk, additional assessments are recommended such as exploring the preferential pathway and ensuring that VOCs in groundwater represent the values at the water table.

Several lines of evidence exist to support the conclusion that VI does not affect current receptors nor the current protectiveness of the remedy. Here is a summary of the important information. First, regarding VI, the levels of VOCs in the groundwater have been greatly reduced due to the many active remediation components and NA. Assuming no rebound occurs, the footprint of the plume has shrunk, and the concentrations have met all the MCLs and drinking water standards (Tier II standards) except in a limited area. Based on the most recent sampling event in 2021, PCE was detected above the MCL or Tier II standards at two locations and Chlorex and TDGC at another location. The concentrations that exceed the MCLs or Michigan's Tier II cleanup standards occur in a limited area on the southwestern portion of the MCC Plant Site and the northeast portion of the Howmet Site. See Figures 8A and 8B in Appendix B. Next, the levels are below the VISLs for commercial/industrial uses with the exception of Chlorex at the MCC Plant property, which is vacant. The relevant VISLs are not exceeded at the Howmet Property nor the Mill Creek Pond Property (see Figures 8B and 8C in Appendix B). The levels of COCs in groundwater are below the VISLs for residential use at the Mill Creek Pond property. Also, important in making a short-term protectiveness finding, there are limited receptors currently at or directly adjacent to the Site. Both the Mill Creek Pond property and the MCC Plant property are currently vacant. The Howmet property is a commercial or light industrial facility and therefore, receptors are limited to commercial/industrial users and there are no relevant VISLs exceedances. (See maps with VI information in Figures 8A, 8B, and 8C in Appendix B.) There does not appear to be any current receptors within 100 feet of the plume footprint (which EPA's VI guidance notes could trigger indoor air and subslab sampling). The additional work recommended in this FYR includes completing a conceptual site model, a preferential pathway analysis and ensuring that the concentrations of VOCs in groundwater adequately represent concentrations at the water table which are likely to volatilize in wells. It is likely after that information is collected no additional field work will be necessary.

Institutional Controls

ICs are required at the Site to ensure the protectiveness of the remedy as is described in the RAPs, RAP amendments and state enforcement documents. The requirements are summarized below. ICs are non-engineered instruments, such as administrative and/or legal controls, that help minimize the potential for exposure to contamination and protect the integrity of the remedy. ICs for the Site are in-place and effective. Compliance with ICs is required to assure long-term protectiveness for any areas which do not allow for UU/UE.

The RAP Amendments issued by the State of Michigan updated the IC requirements. The RAP Amendments include: 1) updating the Restrictive Covenants (RCs) or deed restrictions on the former MCC Plant Property and the Mill Pond Creek Property to replace the existing RCs so that they are binding and run with the land and include specific objectives and restrictions; and 2) updating the Muskegon County Sanitary Regulations known as the County Ordinance, which restrict the consumptive use of groundwater on the Howmet Property, the MCC Plant Property, and the Mill Pond Creek Property (in addition to the RCs on the last two properties). These properties are also listed in the County's database which will trigger a denial of any Water Supply Construction Permit requested for that property in accordance with the Ordinance. See Table 4 below which summarizes the existing ICs in place for the Site.

Table 4: 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 (RAPs)	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil: Capped Area of Site- Former MCC Processing Plant. Multi-Layer Capped Area.	Yes	Yes	MCC Processing Plant- Multi-Layer Capped Area	Prohibit interference with the cap; Prohibit use of Site except those uses that are consistent with zoning designation of MC-1: limited industrial; residential uses prohibited	Restrictive Covenant recorded at vol (liber 3834 page 958) at county recorder's office on 1/22/2010. Permanent Markers are also present at the Site.
Soil: Former MCC Plant property boundary except the capped area cleaned up to commercial/industrial uses and remedy components.	Yes Yes	Yes Yes	Former MCC Plant property boundary except the capped	Prohibit use of Site except those uses that are consistent with zoning designation of MC-1;	City of Whitehall Zoning Ordinance and Restrictive Covenant recorded at vol (liber 3834

			area and remedy components	residential uses prohibited	page 958) at county recorder's office on 1/22/2010. Permanent Markers are also present at the Site.
Groundwater: Mill Pond Creek Property area	Yes	Yes	Mill Pond Creek Property	Prohibit consumptive uses of groundwater unless a permit is obtained	County Ordinance also restricts groundwater use. (implemented on 4/26/2020)
Groundwater: Former MCC Plant property boundary. Approx. 20 acres where groundwater exceeds performance standards within plant (includes buffer area). (Area is bounded by White Lake Drive to the North, Berquist Road to the South, Simonelli Road to the East and Zellar Road to the West.)	Yes	Yes	Former MCC Plant property boundary	Prohibit consumptive use of the groundwater in the plume area (required at least until performance standards are achieved).	Restrictive Covenant recorded at vole (liber 3834 page 958) at county recorder's office on 1/22/2010. County Ordinance also restricts groundwater use. (implemented on 4/26/2020)
Groundwater: Area of the Site where the groundwater plume exceeds performance standards outside of MCC Plant property boundary known as the Howmet property (approximately 82 acres)	Yes	Yes	Howmet Property	Prohibit consumptive use of the groundwater plume area until performance standards are achieved	Restrictive Covenant recorded at vol (liber 3834 page 958) at county recorder's office on January 22, 2010. County Ordinance also restricts groundwater use. (implemented on 4/26/2020).

Appendix E contains copies of the IC information. Additional maps should be prepared for further clarification regarding the boundaries of the ICs and to ensure the ICs fully cover the areas which do not allow for UU/UE.

Status of Access Restrictions and ICs:
A fence surrounds the MCC Plant Property and access is restricted. The gate leading to the plant is closed and locked and the fence contains warning signs. Also, one large permanent marker is located at the front gate and 4 smaller permanent markers are located at each corner of the capped area to identify this area. The main marker is located at the primary entrance to the Site and includes a line drawing of the property boundary and the containment area along with text that briefly describes the restrictions. The signage on the fence and permanent markers informs the public that the property should not be accessed. The fencing, signage and markers serve as an important reminder that waste was left in place and to affirm the continuing effectiveness and integrity of the response activity.

Multiple ICs are in-place and effective. ICs are in-place for groundwater and the soil to ensure no inappropriate site uses occur for long-term protectiveness. RCs, or deed restrictions, are in-place for the two property areas, both the MCC Plant Property and the Mill Pond Creek Property. The RCs restrict land use, groundwater use, and prohibit interference with the multi-media cap for the disposal areas at the Site.

Groundwater use restrictions are also embodied in governmental controls in the form of ordinances which regulate groundwater uses in the area. In addition, a review of the Muskegon County Sanitary Regulations indicates the groundwater use restriction is still in place. The Muskegon County Health Officer confirmed EGLE's online Environmental Mapper is used to check for sites of environmental contamination in the event a well permit request is received. If the proposed well is within one-half mile of the Site, EGLE is consulted prior to approval of the permit. Per the Muskegon County Sanitary Regulations (Section 7.2.2), the Health Officer shall deny a Water Supply Well Construction Permit in areas defined by MDEQ [EGLE] as "Facilities" under Part 201…and…no well permit variance shall be given without written approval from MDEQ [EGLE].' The Site qualifies as a facility. Finally, the PRPs prepared and sent an annual reminder letter to the current owners of the restricted parcels. Copies of the letters from 2022 are provided in Appendix E.

Recordation and Title work: On January 10, 2010, RCs were recorded for the MCC Plant Property and the Mill Pond Creek Property. No title work has been presented to review. Performing title work is required to confirm ownership, to determine if the RCs were appropriately recorded and to determine if any prior-in-time recorded encumbrances, such as utility easements, may interfere with the ICs. If prior-in-time encumbrances exist, then additional work is needed to ensure protectiveness of the remedy and to protect human health and the environment regarding any future repair work (excavations). Each RC states that the restrictions may be enforced by MDEQ and are binding on future owners.

Site-Wide Groundwater Restriction Ordinance: Although the contamination in the groundwater has declined and the Tier I standards have been met; it is not anticipated that the groundwater will meet the Tier II cleanup standards for some time. Groundwater use restrictions are necessary to prohibit usage of the groundwater until groundwater cleanup standards are met

throughout the plume. In 1985, Muskegon County adopted Sanitary Regulations. In 2000, the State of Michigan amended the RAP to allow the Ordinance to be used as an acceptable IC in lieu of a deed restriction for the down-gradient plume area based on amendments that were required to be made to the Ordinance to make it more protective. Chapter III, Sections 7.2.2 and 15 relate to the issuance or denial of a water supply construction permit for well installation in certain areas. On April 26, 2005, the County of Muskegon amended its Ordinance to be consistent with the RAP requirements.

This Ordinance is currently still in effect and requires the County to give advanced notice to the State if any changes are to occur. The Ordinance is enforceable by the County government. The current groundwater area that exceeds cleanup standards is identified in Figures 4 and 5 in Appendix B. The Ordinance covers the entire County and therefore covers the entire geographical area of groundwater that exceeds groundwater cleanup standards as well as a buffer zone. Also, the maps should be updated as new information becomes available.

Current Compliance of ICs: Based on annual inspections by the PRPs and periodic Site visits conducted by the EPA and EGLE, and the FYR Site inspection, there are not any uses of the Site or contaminated media which are inconsistent with the objectives of the implemented ICs.

Long Term Stewardship: Long-term protectiveness at the Site requires continued compliance with use restrictions in the ICs to assure the remedy continues to function as intended. A plan including long-term stewardship (LTS) procedures for Site ICs is needed to assure proper maintenance, monitoring and enforcement of effective ICs continues to occur at the Site. The LTS plan or Institutional Controls Implementation and Assurance Plan (ICIAP) will formalize regular inspection of ICs at the Site and require annual certification to the agencies that the required ICs are in place and effective. Additionally, development of a communications plan should be explored for LTS. In 2020, the Site PRPs submitted Revision 1 of the Operation & Maintenance Plan (Revised O&M Plan, Koch, 2020) which addresses IC Assurance and LTS in Section 7. That LTS Plan is currently being reviewed by EGLE and EPA and still needs EGLE approval. However, upon a cursory review, more information is still needed. In the meantime, the PRPs are implementing some LTS activities and documenting them annually.

Per the 2021 annual progress report (APR) (FHR, 2022), current ongoing LTS activities include inspecting permanent markers and preparing groundwater use restriction reminder letters to several property owners. Additionally, the APR includes a statement of compliance:

Other IC Follow up Actions Needed: Pending results of the VI study, consideration should be given to placing restrictions on the Mill Pond Creek properties for potential future VI concerns, as well as consideration of adding ICs for some current remedy components, such as for the monitoring wells. For example, additional maps are necessary to clarify the area subject to ICs and to ensure the ICs fully cover the areas which do not allow for UU/UE. Title Work is needed to ensure the ICs are not adversely affected. Additionally, development of a communications plan should be explored for LTS especially between the state permitting authority and the environmental professionals at EGLE, and the PRPs. Lastly, a review of whether ICs exist for all groundwater monitoring wells is needed to ensure long-term protectiveness. Finally, the LTS Plan needs to be finalized.

Systems Operations/Operation & Maintenance

O&M activities are underway to ensure long-term protectiveness by FHR. Carr and Huber has also been retained by Koch Remediation to undertake O&M activities at the Site. Long-term O&M activities are conducted by the PRPs pursuant to the interim ROD, the RAPs and the Long-Term Monitoring and Contingency Plan (LTMCP) (FTCH, 2009). This Plan identifies on-going O&M requirements for the Site. No changes to this Plan occurred during the previous FYR period except one-time sampling for PFAS as is discussed below.

The groundwater monitoring program consists of three (3) types of monitoring wells that are designated as compliance wells, NA wells and hydraulic monitoring wells. See Figure 2 in Appendix B. There are 39 groundwater monitoring or extraction wells currently included in routine sampling or gauging.

The October 2022 monitoring event marks the completion of the 14th year of Site maintenance and groundwater monitoring under the Amended RAP. As specified in the LTMCP, since 2018, the groundwater sampling frequency was reduced to a biennial (every other year) frequency. Since 2009, APRs have been prepared for the Site and submitted to EGLE and EPA. Those reports discuss routine Site maintenance and include the long-term monitoring data. The LTMCP has been designed to address the following primary goals:

- Assure compliance with groundwater remedial goals for the MCC site (see Table 1 above).
- Monitor the Site-wide groundwater flow conditions.
- Monitor and evaluate NA processes and the effectiveness of air sparging that are continuing to lower both the mass and concentration of COCs that remain in the groundwater at the site.
- Evaluate the need for contingency measures which will be taken in the event that Tier I goals (MZGSI criteria) are exceeded or are anticipated to be exceeded at compliance wells.

Groundwater monitoring is currently conducted on a biennial basis in odd years and includes 13 locations. Well inspections occur annually across 38 groundwater monitoring wells throughout the Site. Static groundwater elevations and total well depths are measured at 38 locations every five years, most recently in 2020.

The following O&M activities were conducted since the last FYR:

- All Site monitoring wells were inspected. Annual inspections include visual observation of the location and condition of each well, including inspection of the outer casing, well cover, protective bollards, and cap/locking system;
- The multi-media cap was inspected, and maintenance performed, as needed, to provide a stable and erosion-resistant vegetative cover;
- Annual inspection of the MCC Plant Property perimeter fence was completed;
- Annual inspection of the Site permanent markers was completed; and
- Annual review and monitoring of the ICs was completed, and groundwater use restriction reminder letters were sent to the designated parcel owners. See recent letters found in Exhibit E.

Routine maintenance at the Site also included seasonal mowing and maintenance to site security features and monitoring devices, as needed. The frontage portion of the Site adjacent to Warner Street is mowed several times per season to comply with local ordinance requirements, and the fenced portion of the Site is mowed at least once per season.

In summary and review of the last five years of information, no major issues have been identified.

The following activities will be conducted in 2023:

- Groundwater monitoring in accordance with the LTMCP (outlined in Table 6 in Appendix F);
- All Site monitoring wells will be inspected. The annual inspection will include visual observation of the location and condition of each well;
- The multi-media cap will be inspected, and maintenance performed, as needed, to provide a stable and erosion-resistant vegetative cover;
- Annual inspection of the Plant Property perimeter fence;
- Annual inspection of the Site permanent markers; and
- Annual review and monitoring of the ICs and preparation of groundwater use restriction reminder letters to designated parcel owners.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR as well as the recommendations from the last FYR and the current status of those recommendations.

Table 5A: Protectiveness Determinations/Statements from the 2018 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1/ Sitewide	Short-term Protective	The remedy at the MCC site is currently protective of human health and the environment. There is currently no known exposure pathway to MCC-related contaminants under existing conditions. The remedy is functioning as intended. Effective ICs are in place. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: conduct a study to address the relevance of the VI pathway for long-term protectiveness and finalize and implement the LTS Plan.

Table 5B: Status of Recommendations from the 2018 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	Vapor Intrusion	Conduct a study to address the relevance of the VI pathway for long-term protectiveness.	Ongoing	The PRPs submitted a Vapor Intrusion Evaluation Report (FTCH, 2017) in 2017 which concluded no formal VI assessment was necessary. EGLE and EPA reviewed it and provided comments. In April 2022, the PRPs submitted an updated information to supplement the VI Evaluation Report (FHR, 2022). After reviewing the information in that report and other information, EPA and EGLE concluded that additional VI assessment work is necessary to determine if VI is a future potential pathway of concern and there was no reason to delay the VI study any longer due to pandemic concerns, and the PRPs were re-engaged in discussing the VI concerns. It is anticipated that the VI study will be initiated in 2023.	
1	An approved LTS plan is needed to ensure that ICs are monitored, maintained and enforced to help ensure that long-term protectiveness is maintained.	Implement LTS plan once approved.	Ongoing	A draft LTS Plan was reviewed by EGLE and EPA. Discussions between the PRPs, EPA and EGLE have taken place regarding the updates that are needed to the LTS plan. Therefore, an updated LTS Plan still needs to be reviewed and approved by EGLE.	

OTHER FINDINGS from the 2018 FYR

In addition, the following was a recommendation that was identified during the 2018 FYR but does not affect current nor future protectiveness:

Although possible per- and polyfluoroalkyl substances (PFAS) contamination should be further investigated, it is very unlikely to be found. However, in an abundance of caution, this will be further pursued.

In summary, PFAS is an emerging contaminant of concern in the United States. It is not found naturally in the environment. Use and disposal patterns of PFASs generally result in a variety of release mechanisms to the environment and also result in varied human exposures. PFAS may contain perfluorooctanoic acid (PFOA), perfluorooctane sulfonate

(PFOS) and other PFAS. They were used by a variety of industries. Per- and polyfluoroalkyl substances (together, PFASs otherwise known as perfluorinated compounds (PFOCs)) are a class of man-made chemicals. PFOA and PFOS have been the most extensively produced and studied of these chemicals. Both chemicals are very persistent in the environment and in the human body. Due to their persistence, PFASs can travel long distances through the air. They are widespread in part because they are persistent in the environment; that is, they do not break down when exposed to air, water or sunlight.

The Site records indicate that the former MCC manufacturing facility operated from 1977 to 1985 as MCC and from 1985 to 1992 as Koch Chemical Company's Whitehall Specialty Chemical Plant. Release of chemicals to the ground occurred from the manufacturing facility. Since the Site records indicate that the specialty chemicals were used for manufacturing pharmaceuticals, it is possible that the discharges may have PFASs.

…Under Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451 as amended (NREPA), which is MDEQ's clean-up program, there is currently a drinking water standard of 70 ppt combined PFOS and PFOA concentration in groundwater. Currently, there is a water quality standard for both PFOS and PFOA under Rule 57 of Part 31, Water Quality of NREPA. The water quality standard is the clean-up standard under Part 201 by action of rule (see Section 120e of Part 201) for the GSI and they are published and final. The Part 201 clean-up GSI criteria for PFOS is 12 ppt for most waters of the state, but if the groundwater discharges into a surface water that is used for drinking water, the standard is 11 ppt. The GSI criteria for PFOA are 12,000 ppt for most waters of the state, but if discharged into a surface water that is used for drinking water, the standard is 420 ppt. These GSI criteria are published, final and enforceable.

Progress Since the 2018 FYR

In July 2018, MDEQ, now EGLE, requested that the PRPs test the groundwater for PFAS. A copy of the letter can be found in Appendix G. Based on that request, some of the wells were tested for PFAS in 2018. Results show that while there may be an upgradient source, PFAS has been detected in the groundwater at the Site above relevant standards. Three (3) monitoring wells sampled in 2018 exceeded Michigan's 2020 PFAS standards (*See* Data Review Section for additional information).

The Site is also part of the Michigan PFAS Action Response Team (MPART[9]) program. Muskegon Chemical Company (Whitehall, Muskegon County) (michigan.gov)

In addition, on May 18, 2022, EPA announced that it is adding five PFAS compounds to the list of Regional Screening Levels (RSLs) and Regional Removal Management Levels (RMLs). In March 2023, EPA proposed Maximum Contaminant Levels (MCLs) and Maximum Contaminant

[9] MPART was established in 2017 to address the threat of PFAS contamination in Michigan, protect public health, and ensure the safety of Michigan's land, air, and water, while facilitating inter-agency coordination, increasing transparency, and requiring clear standards to ensure accountability. MPART is charged with providing recommendations to the department director's and coordinates efforts between them.

Level Goals (MCLGs) for six (6) PFAS/PFOA compounds. In light of this new information, if needed, EPA will work with the State to assess whether EPA's updated screening levels will impact the Site. More PFAS investigative work is needed to ensure future protectiveness and an issue/recommendation has been included in this FYR for that necessary evaluation.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was made available by a newspaper posting in the paper titled the *White Lake Beacon*, in Whitehall, MI, on 9/4/2022, stating that there was a FYR and inviting the public to submit any comments to EPA. There were no public comments or inquiries received. The results of the review and the report will be made available at the Site information repository located at the Whitehall Library located at 3900 W. White Lake Dr., Whitehall, Michigan, and in the electronic records at the following Site website: MUSKEGON CHEMICAL CO. | Superfund Site Profile | Superfund Site Information | US EPA or https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0502603.

In the fall of 2022, one resident was interviewed. The resident contacted EPA concerned about the water quality in their potable well. Although the well is side-gradient of the Site instead of downgradient, EPA agreed to sample the residential well. The resident then decided not to allow their well to be sampled, and EPA and EGLE closed out the request, and no further communications have been received to date.

Data Review

Review of the data for the last five years confirms that previous groundwater treatment activities had resulted in greatly reduced groundwater contamination levels and that active treatment conducted at the Site had reduced contaminant levels to industrial (Tier 1) goals.

As mentioned, there are three (3) types of monitoring wells that are designated as compliance wells, NA wells and hydraulic monitoring wells. See Figure 2 in Appendix B. There are 39 groundwater monitoring or extraction wells currently included in routine sampling or gauging.

Analytical results continue to demonstrate that Site groundwater contaminant levels are in compliance with Tier 1 MZGSI criteria for the more stringent of the two values (acute and chronic). However, levels continue to exceed the Tier II (SDWA drinking water) standards for unlimited use. The extent of Tier II exceedances for the time period 2017 - 2021 can be seen in Figure 5 provided in Appendix B. For comparison, Figure 4 in Appendix B depicts the extent of contamination form 1985 –1991. In addition, Table 7 in Appendix F summarizes the groundwater results in comparison to the remedial goals for NA wells at the Site for the years 2013-2021.

Groundwater flow continues to move to the southwest, as expected, based on hydraulic monitoring performed during the FYR review period. See Figure 3 in Appendix B and Table 9 - Groundwater Elevation Summary in Appendix F. The horizontal hydraulic gradient from the Plant Property boundary to the downgradient-most wells is approximately 0.01 foot per foot.

Based on groundwater quality data from 2021, all five (5) compliance wells and five (5) of the eight (8) NA wells have achieved Tier II remedial goals. See Figure 5 in Appendix B presents results from 2017-2021 (exclusive of PFAS). Two (2) NA wells had not met Tier II goals based on the last sampling event conducted in 2018, which was noted in the 2018 FYR report (EPA, 2018). However, levels have since decreased in monitored constituent concentrations. Specifically, groundwater impacts of TGDC and Chlorex have attenuated to non-detect concentrations less than Tier II goals:

- In 2021, there were no detections of TGDC or Chlorex at MCC-16. MCC-16 is a NA well located downgradient of the Plant property on the southwest corner (right outside the fence line). This represents a significant decrease from elevated detections of 2,620 μg/L and 304 μg/L, respectively, at this location compared to 2017.
- In 2021, there were no detections of TGDC or Chlorex at MCC-24R in 2021. MCC-24 R is a NA well located further downgradient than (MCC-16) of the Plant property. This represents a significant decrease from elevated detections of 253 μg/L and 38.8 μg/L, respectively, at this location compared to 2019.
- The extent of groundwater impacts in 2021 that remained greater than Tier II goals is limited to the area represented by monitoring wells KCC-5S, which is a NA well located on the northwest area of the Plant property (near the fence), and MCC-3SR, which is a NA well located near the west border of the fence of the Plant property; and MCC-21R located on the Howmet Property. In 2021, results from these three NA wells exceeded the Tier II remedial goals for PCE on the MCC Plant Property and TGDC and Chlorex on the Howmet Property.
- In 2021, KCC-5S exhibited a concentration of PCE of 31 ug/L, greater than the Tier II remedial goal of 5 ug/L.
- In 2021, MCC-3SR exhibited a concentration of PCE of 19 ug/L, greater than the Tier II remedial goal of 5 ug/L. MCC-21R exhibited a concentration of TGDC and Chlorex of 150 ug/L and 8 ug/L, respectively. These values are greater than the Tier II remedial goals of 5 ug/L and 2 ug/L, respectively, for these constituents.
- Farther downgradient, on the Mill Pond Creek Property, compliance wells FP-1, P-2, P-5, P-6, and P-9 near Mill Pond Creek continue to demonstrate compliance with Tier II goals although PCE has been detected in P-9.

In summary, the monitoring results from 2017 to 2021 demonstrate that NA of groundwater impacts continues, the footprint of groundwater impacts is contracting based on Tier 1 and Tier 2 goals, and the remaining area of groundwater impacts above cleanup goals is limited to the MCC Plant Property and the northwest corner of the Howmet Property. As noted above, NA wells MCC-16 and MCC-24R have exhibited significant decreases and currently represent points of Tier II compliance within the historic extent of groundwater impacts. Additional NA wells farther downgradient that are routinely monitored continue to exhibit low or non-detect concentrations of monitored constituents. Furthermore, Tier II compliant NA wells include MCC-36R and MCC-30RS on the Howmet Property, and OW-4 on the Mill Pond Creek Property. Tier II goals have been met on the Mill-Pond Creek Property although some low-level contamination is still detectable. Ongoing biennial groundwater monitoring is expected to demonstrate continued NA.

In addition, during the review of information for the FYR, EGLE found and reported that groundwater sampled at the former Whitehall Wastewater Treatment Plant (WWTP) demonstrated numerous exceedances of the Michigan Part 201 criteria for PFAS compounds. The highest was 1100 ppt PFOA. The State, County and City are investigating the possible source of that contamination, including looking at this Site due to past discharges to the WWTP.

Surface Water and Sediments
There is no requirement to sample surface water and sediment, so no data was reviewed. However, the GSI criteria are used as a surrogate to ensure that the surface water and sediments are protected. Recent groundwater data confirm that the GSI criteria have been met on the Mill Pond Creek Property.

PFAS
Since January 2019, EGLE has promulgated updated drinking water criteria for six PFAS congeners as presented below. Compared to current generic cleanup criteria, results from October 2018 indicate detections at two locations that exceed the generic drinking water criteria. A complete summary of results compared to current generic GSI cleanup criteria is provided in Table 10 in Appendix F. Well locations and results for 2018 PFAS sampling in groundwater can be found in Figures 6 and 7 in Appendix B and Table 11 in Appendix F. Below in Table 5 is a summary of PFAS Criteria and 2018 groundwater exceedances.

Table 5. Summary of PFAS Criteria and 2018 Groundwater Exceedances

PFAS Congener	Michigan's Drinking Water Criteria	EPA's Proposed MCL/ MCLG	EPA's Tapwater RSL	GSI Criteria	KCC-22S (Offsite)	KCC-34 (Onsite)	KCC-5S4
Perfluorononanoic acid (PFNA)	6	N/A	59	N/A	ND	ND	
Perfluorooctanoic acid (PFOA)	8	4/0	60	12,000	11	18	7.2
Perfluorohexanoic acid (PFHxA)	400,000	N/A	N/A	N/A	ND	ND	
Perfluorooctane sulfonic acid (PFOS)	16	4/0	40	12	ND	ND	4.5
Perfluorohexane sulfonic acid (PFHxS)	51	N/A	390	N/A	0.23	0.33	
Perfluorobutane sulfonic acid (PFBS)	420	N/A	6,000	N/A	0.3	ND	

All values are parts per trillion (ppt) or nanograms per liter (ng/L)
N/A = No criteria established
ND = No detections greater than method detection limit

Discussions will continue with the PRPs to conduct additional assessments for PFAS to determine the extent of contamination in groundwater and whether the detections are Site-related.

Site Inspection

The FYR inspection of the Site was conducted on 11/4/2022. In attendance was Sheri L. Bianchin, RPM from EPA which is the Support Agency. Lead agency representatives Nicholas Dawson and Matt

Baltusis of EGLE also participated. Representing the PRP group were Michael Christopher with Flint Hills Resources (FHR) and Daniel Sopoci and Ben Giese, of Tetra Tech, contractors for the PRPs. The purpose of the inspection was to assess the protectiveness of the remedy. During the Site inspection, the attendees toured the grounds of the former MCC Plant, inspected the cap and some of the wells located on the MCC Plant Property, and toured the Mill Pond Creek property. The results of the inspection indicated that the Site is well-maintained. The fence is intact with signage present. The permanent marker is prominent at the gate entrance and is also in good shape. The multi-media cap on the disposal area is in good shape and the vegetation is in good shape. Field observations at three locations indicate a need for maintenance:

- At the KCC-22 well cluster, the surrounding asphalt surface has subsided after installation of a new parking lot. The inner compression caps were secure and did not appear to allow surface infiltration. This area will be monitored for evidence of surface ponding and infiltration into the well casing.
- At FP-1, the protective stick-up casing is tilted approximately 45 degrees with the surface and is loose.
- At MCC-24R, there is evidence of significant frost heaving of the well cover such that it is not aligned with the well casing.

See additional details in the Site Inspection Checklist and list of attendees in Appendix D. Photographs taken during the annual site inspection conducted in the fall of 2022, which document current Site conditions, are also included in Appendix D (FHR, 2023).

V. TECHNICAL ASSESSMENT

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

Question A Summary:

For groundwater, Tier I goals were met in 1998 by extraction of the groundwater using the existing wells, plus installation of two additional extraction wells in 1997, as well as treatment of the groundwater using an air stripper to remove VOCs followed by granular activated carbon polishing. Discharge of the treated water by reinjection back into the aquifer and discharge to the Whitehall Area POTW occurred. Active treatment was discontinued in 2000. Tier II goals will be met through NA in accordance with the RAP and RAP amendments.

The MCC property is zoned industrial and is expected to remain so. KCC plans to maintain ownership of the MCC plant property for the foreseeable future and the property is zoned for commercial/industrial use. Tier I MZGSI RAGs, established as part of the 2009 RAP Amendment, have been achieved. At this time, only concentrations exceeding Tier II RAGs (drinking water standards) remain, resulting in the need to continue to monitor groundwater. Effective ICs are in place consistent with the RAP and RAP amendments and are discussed elsewhere in this document.

Groundwater monitoring results from 2017, 2019, and 2021 demonstrate continued NA and contraction of the extent of groundwater impacts. During each monitoring event, all groundwater monitoring wells remained compliant with Tier I remedial goals (MZGSI criteria); there were no detections greater than Tier I remedial goals in compliance wells nor NA wells.

Based on monitoring of the groundwater for COCs found at this Site, the most recent monitoring results from 2021 also indicate that all five compliance wells and five of the eight NA wells have achieved Tier II remedial goals. Table 7 in Appendix F presents groundwater sampling results from 2013-2021, and Figures 4 and 5 in Appendix B presents results from 2017-2021. Three NA wells which had not met Tier II goals at the time of the 2018 FYR report have since decreased in monitored constituent concentrations. Specifically, groundwater impacts of TGDC and Chlorex have attenuated to non-detect concentrations less than Tier II goals. Additional Tier II compliant NA wells include MCC-36R and MCC-30RS on the Howmet Property, and OW-4 on the Mill Pond Creek Property. Farther downgradient, compliance wells near Mill Pond Creek continue to demonstrate compliance with Tier II goals. The remaining area of groundwater impacts is limited to the MCC Plant Property and the northwest corner of the Howmet Property. Only one well is exhibiting residual groundwater contamination on Mill Pond Creek Property for the COCs; however, those levels are below the RAGs. This progress is due to previous groundwater treatment and then NA.

System Operations/O&M: O&M at the Site consists of groundwater sampling, inspection and maintenance of monitoring wells, cap maintenance and inspection, and inspection of the fencing and permanent markers to assure that they remain in-place and undamaged. With several modifications, these activities are adequate to determine the protectiveness and effectiveness of the remedy. This follow-up is noted in the issues/recommendations section below.

No major issues have been identified during O&M activities at the Site during this FYR period. Per the FYR Site Inspection conducted in November 2022, the Site is well-maintained. The fence is intact with signage present. The permanent marker is prominent at the gate entrance and is in good shape. The multi-media cap on the contaminated soil area and the vegetation are also in good shape so that these remedy components are working as intended. Several minor issues were identified during the last inspection. While those items do not affect the protectiveness of the remedy, they must be addressed and are listed below:

- At the KCC-22 well cluster, the surrounding asphalt surface has subsided after installation of a new parking lot. The inner compression caps were secure and did not appear to allow surface infiltration. This area will be monitored for evidence of surface ponding and infiltration into the well casing.
- At FP-1, the protective stick-up casing is tilted approximately 45 degrees with the surface and is loose.
- At MCC-24R, there is evidence of significant frost heaving of the well cover such that it is not aligned with the well casing.

The remaining area of groundwater impacts is limited to the MCC Plant Property and the northwest corner of the Howmet Property. The contamination on Mill Pond Creek is no longer evident due to treatment and then NA. Ongoing biennial groundwater monitoring is expected to demonstrate continued NA. Also, PFAS has been detected at the Site and in upgradient wells. More work is needed to investigate PFAS in the groundwater.

Implementation of Institutional Controls and Other Measures: Access controls, to prevent exposure to Site-related soil contamination, are intact and functional. At the Site, access controls consist of Site fencing and the existing cap. In addition, ICs are called for to prevent exposures to site-related COCs. Based on inspections during this FYR period, effective ICs are in-place and functioning as intended. RCs are in-place which restrict the land and groundwater use at the Site.

A county groundwater use ordinance is in-place to prevent wells from being installed inappropriately, and the ordinance appears to be functioning as intended. The 2009 RAP Amendment provided for an update to the RC on the plant property. The RC was modified to prevent future development of the residually contaminated soil under the process building. Other measures include the use of permanent markers.

Based on inspections and monitoring, there appears to be compliance with the land and groundwater use restrictions conducted by the PRPs annually and verified by EPA and EGLE periodically. Long-term protectiveness requires continued compliance with the ICs. In 2017, LTS procedures were put in place by the PRPs based on discussions with EPA and the State of Michigan. The LTS Plan, proposed amendment to the O&M Plan, was submitted by the PRPs. The LTS plan is under review; however, it does appear to include required information such as a mechanism for inspecting and monitoring compliance with land use restrictions and groundwater restrictions along with enforcement, if needed, of the restrictions. Follow up work includes finalizing the LTS Plan, exploring whether ICs exist to protect the integrity of the monitoring wells; checking title work to ensure that there are no inconsistencies; and including a communications plan.

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? NO

Question B Summary:

Changes in Standards and TBCs: The Tier II groundwater standards (RAGs) allowing unlimited use remain unchanged. The Tier 1 standards were modified as part of the 2009 RAP Amendment to allow for groundwater/surface water mixing zone to protect surface water (MZGSI).

Changes in Risk Assessment Methods:
There has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy.

Changes in Toxicity and Other Contaminant Characteristics:
There have been no changes in the toxicity factors for the COCs that were used in the baseline risk assessment. These assumptions are considered to be conservative and reasonable in evaluating risk and developing risk-based cleanup levels. No change to these assumptions or the cleanup levels developed from them is warranted. There has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy.

Changes in Exposure Pathways:
There have been no changes in the land use, routes of exposure, identified contaminants or contaminant sources, possible byproducts of the remedy, or physical site conditions in a way that could affect the protectiveness of the remedy at the Site. The exposure assumptions used to develop the Human Health Risk Assessment included both current exposures and potential future exposures (older child trespasser, adult trespasser) and potential future exposures (young and older future child resident, future adult resident and future adult worker).

Vapor Intrusion

While this FYR is recommending that the VI pathway be assessed with regard to potential future receptors, several lines of evidence exist to support the conclusion that VI does not affect current receptors nor the current protectiveness of the remedy. Here is a summary of the important information.

First, regarding VI, the levels of VOCs in the groundwater have been greatly reduced due to the many active remediation components and NA. Assuming no rebound occurs, the footprint of the plume has shrunk, and the concentrations have met all the MCLs and drinking water standards (Tier II standards) except in a limited area. Based on the most recent sampling event in 2021, PCE was detected above the MCL or Tier II standards at two locations and Chlorex and TDGC at another location. The concentrations that exceed the MCLs or Michigan's Tier II cleanup standards occur in a limited area on the southwestern portion of the MCC Plant Site and the northeast portion of the Howmet Site. See Figures 8A and 8B in Appendix B. Next, the levels are below the VISLs for commercial/industrial uses with the exception of Chlorex at the MCC Plant property, which is vacant. The relevant VISLs are not exceeded at the Howmet Property nor the Mill Creek Pond Property (see Figures 8B and 8C in Appendix B). The levels of COCs in groundwater are below the VISLs for residential use at the Mill Creek Pond property. Also, important in making a short-term protectiveness finding, there are limited receptors currently at or directly adjacent to the Site. Both the Mill Creek Pond property and the MCC Plant property are currently vacant. The Howmet property is a commercial or light industrial facility and therefore, receptors are limited to commercial/industrial users and there are no relevant VISLs exceedances. (See maps with VI information in Figures 8A, 8B, and 8C in Appendix B.) There does not appear to be any current receptors within 100 feet of the plume footprint (which EPA's VI guidance notes could trigger indoor air and subslab sampling). The additional work recommended in this FYR includes completing a conceptual site model, a preferential pathway analysis and ensuring that the concentrations of VOCs in groundwater adequately represent concentrations at the water table which are likely to volatilize in wells. It is likely after that information is collected no additional field work will be necessary.

Emerging Contaminants

Additionally, based on site historical uses, it would be appropriate to sample Site groundwater for emerging contaminants PFAS and 1,4-dioxane. Although much of Muskegon gets its domestic water from the Muskegon Water treatment Plant which comes from Lake Michigan and is regulated under the SDWA, there are residential wells located about 1 mile to the west northwest of the Site. Although those wells are not directly downgradient, and are not close to the Site, the extent of contamination, if detected, should be identified to ensure that the residential wells are not likely to be impacted by the Site.

1,4-dioxane should be investigated since it was used as a stabilizer in commercial chlorinated solvents, and chlorinated solvents were found at the site (e.g., PCE and TCE). 1,4-dioxane is water soluble and therefore highly mobile. Given the presence of VOCs at the Site, especially TCE, it is appropriate to sample for the presence of 1,4-dioxane to verify that the potential COCs in groundwater are fully characterized. Although there are no drinking water wells directly downgradient, it would be prudent to determine if this COC may have been released from the Site.

Regarding PFAS, the State of Michigan also has formally requested that the PRPs sample for

PFAS at this Site, (See letter dated August 7, 2018 in Appendix G). Based on that request, one round of groundwater at selected wells was sampled for PFAS in 2018.[6] Five groundwater monitoring wells were sampled on the MCC Plant Property along with one upgradient monitoring well to assess whether the MCC Plant Property is a source of PFAS. PFAS constituents were detected in some of those groundwater wells at the Site. However, PFAS was also detected in one of the wells that is likely upgradient of the Site, so it is not clear whether levels of PFAS in groundwater at the Site are fully or partially from another upgradient source. See Figure 6 in Appendix B which shows which wells were sampled for PFAS, Figure 7 in Appendix B shows wells with PFAS detections and Table 11 in Appendix F which shows the results of the PFAS sampling event. Samples were not taken downgradient of the Site; therefore, the extent of contamination is not clear. Additional sampling is required to help determine if these contaminants are site-related and if they may need to be addressed to ensure that the Site remedy remains protective of human health and the environment. To that end, the PRPs shall amend the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) for State approval to include sampling groundwater for emerging contaminants; specifically, 1,4-dioxane and PFAS compounds.

The MCC Plant Property is zoned commercial /industrial and is expected to remain so for the foreseeable future. KCC plans to maintain ownership of the MCC plant property for the foreseeable future. The land is currently fenced and is vacant. Uses on adjacent parcels are not anticipated to impact the capped disposal area/landfill.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy? NO

Question C Summary:

No other information, such as additional ecological impacts, unforeseen weather events, or land use changes have been identified as part of this FYR that would call into question the protectiveness of the remedy.

VI. ISSUES/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): 1/ Sitewide	**Issue Category: Remedy Performance**
	Issue: Emerging contaminants, including 1,4-dioxane and PFAS, in groundwater have not been fully explored to determine if they are site-related contaminants that may need to be addressed.

	Recommendation: The PRPs will amend the SAP and QAPP for State approval and sample groundwater for emerging contaminants, including 1,4- dioxane and PFAS compounds, to help determine if they are Site-related contaminants that may need to be addressed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	State	12/31/2023

OU(s): 1/ Sitewide	**Issue Category: Institutional Controls**			
	Issue: An approved LTS plan is needed to ensure that ICs are monitored, maintained and enforced to help ensure that long-term protectiveness is maintained.			
	Recommendation: Implement LTS plan once approved.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	State	6/30/2023

OU(s): 1/ Sitewide	**Issue Category: Monitoring**			
	Issue: Vapor intrusion.			
	Recommendation: Conduct a study to address the relevance of the VI pathway for long-term protectiveness.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	State	12/31/2023

VII. PROTECTIVENESS STATEMENT

OU1 and Sitewide Protectiveness Statement(s)
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedy at the Site currently protects human health and the environment. There is currently no known exposure pathway to the current site COCs under existing conditions. The remedy is functioning as intended. Effective ICs are in place to prevent unacceptable exposures. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure long-term protectiveness: Conduct a study to address the relevance of the VI pathway for long-term protectiveness; implement LTS plan once approved; and amend the SAP and

QAPP for State approval and sample groundwater for emerging contaminants including 1,4-dioxane and PFAS compounds to determine if they are Site-related and need to be addressed.

VIII. NEXT REVIEW

This FYR was conducted by EPA as a discretionary review, however EPA will not be conducting further FYRs. The Site will remain a state enforcement-lead Site at this juncture per EPA and state agreement. Future FYRs of the remedy may be conducted by EGLE pursuant to state authority and according to the RAPs.

APPENDIX A

REFERENCE LIST

References

2018 Annual Progress Report (Haley Aldrich, 2019)

2019 Annual Progress Report (Haley Aldrich, 2020)

2020 Annual Progress Report (Haley Aldrich, 2021)

2021 Annual Progress Report (FHR, 2022)

2022 Annual Progress Report (FHR, 2023)

Remedial Investigation (RI) (Hill, 1991)

Remedial Action Plan (Michigan, 1997)

Remedial Action Plan Amendment (Michigan, 2000)

Remedial Action Plan Amendment (Michigan, 2009)

Interim ROD (Michigan, 1993)

Preliminary Close-Out Report (EPA, 1997)

Long-Term Monitoring and Contingency Plan (LTMCP) (FTCH, May 2009)

2008 FYR report (Michigan, 2008)

2003 FYR report (Michigan, 2003)

2013 FYR report (Michigan, 2013)

2018 FYR report (EPA, 2018)

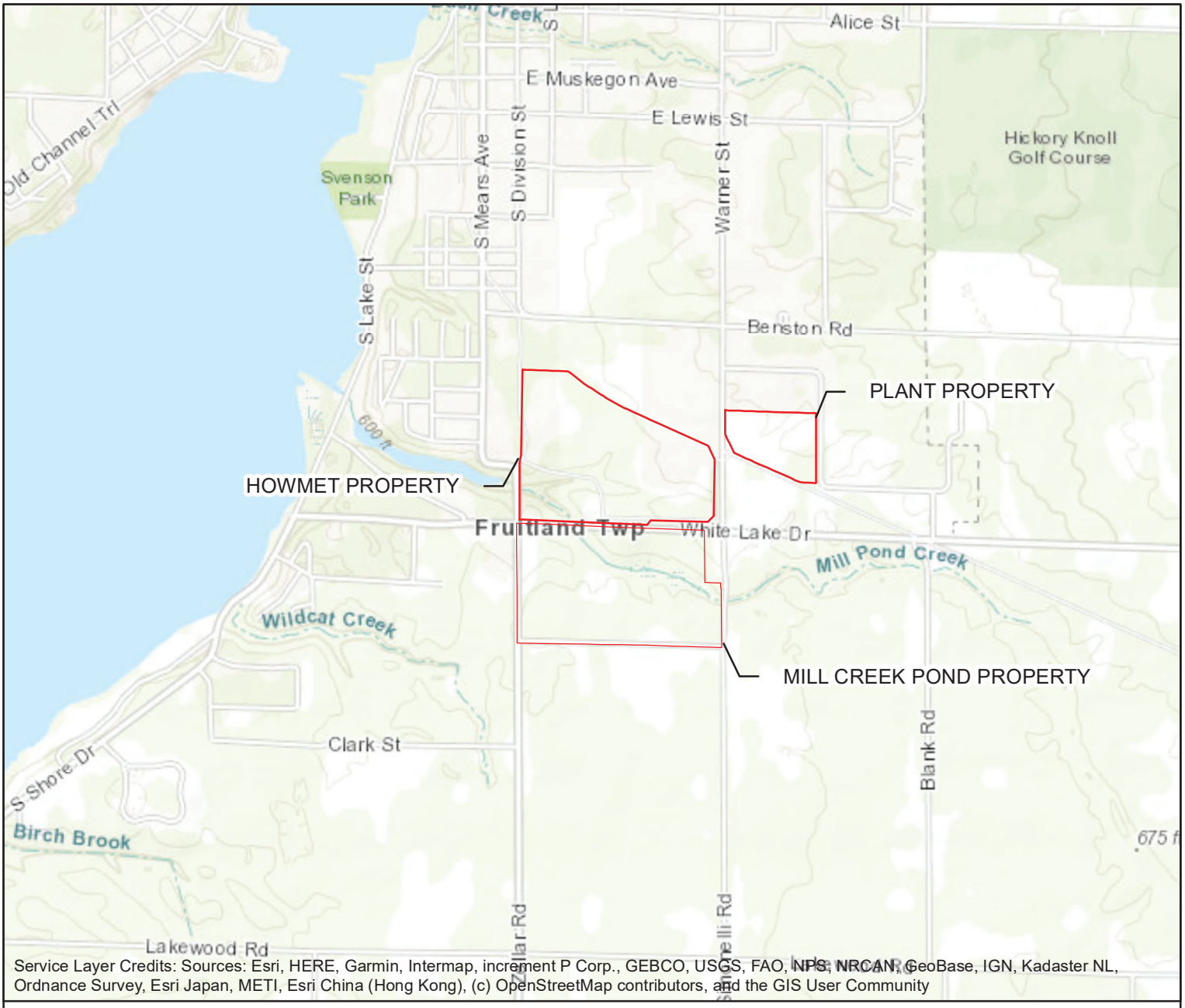
Vapor Intrusion Evaluation Report, February 15, 2017 (FTCH, 2017)

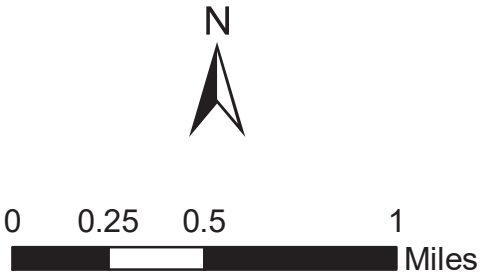
VI Evaluation Report (FHR, 2022)

Status Update PowerPoint Presentation: Muskegon Chemical Company Vapor Intrusion Screening, October 29, 2019 (Haley Aldrich, 2019)

APPENDIX B

FIGURES



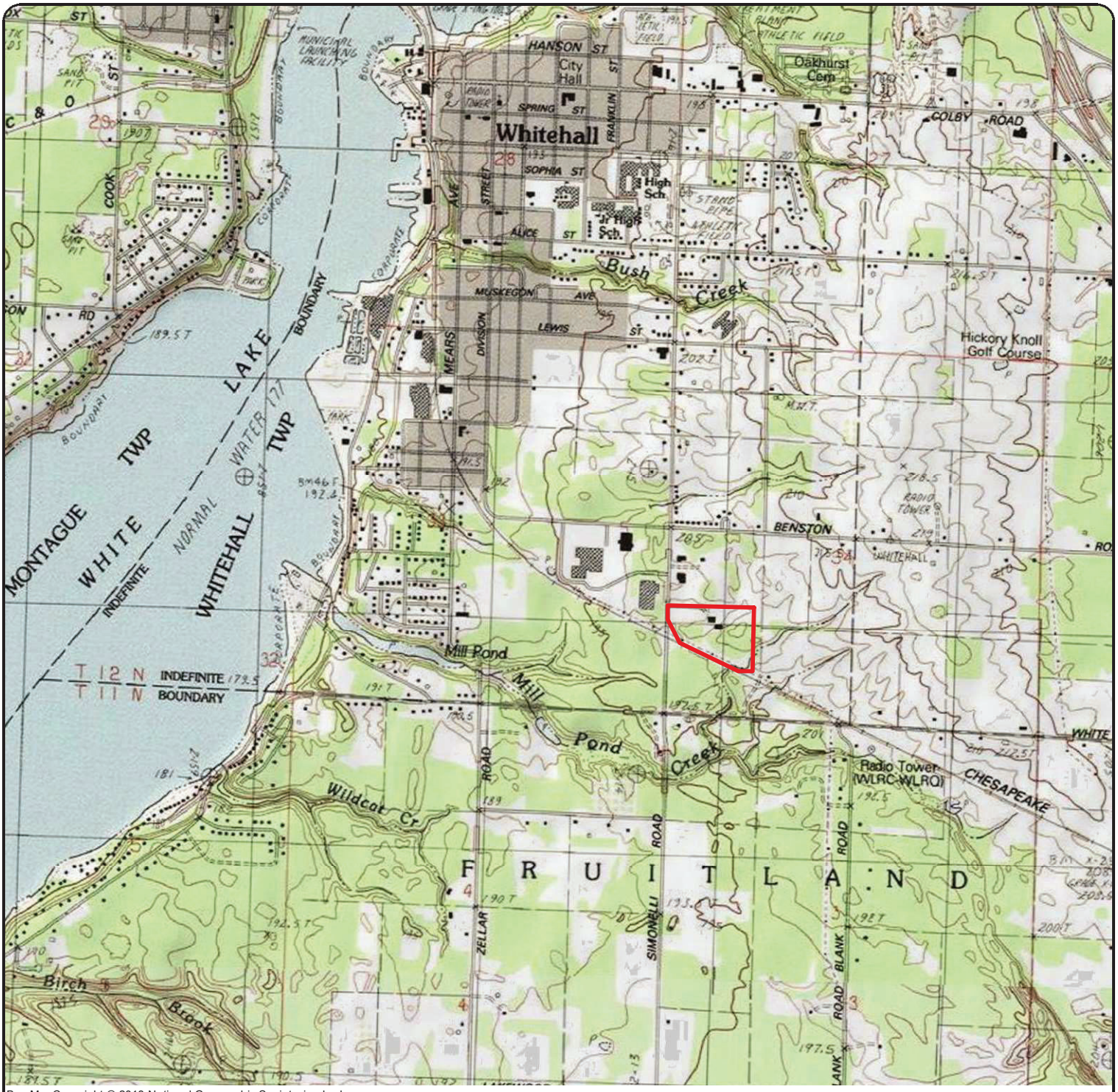


Title:	SITE LOCATION
Location:	MUSKEGON CHEMICAL COMPANY NPL SITE (MID072569510) 1725 WARNER ST., WHITEHALL, MICHIGAN

TETRA TECH

Approved	BWG
Drafted	RSW
Project #	117-4124SMP5410
Date	12/27/2021

FIGURE 1



Muskegon Chemical Company Property Line

N

0 1,000 2,000

Feet

TETRA TECH

WWW.TETRATECH.COM

710 AVIS DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: 734.665.6000

INVESTIGATION SUMMARY

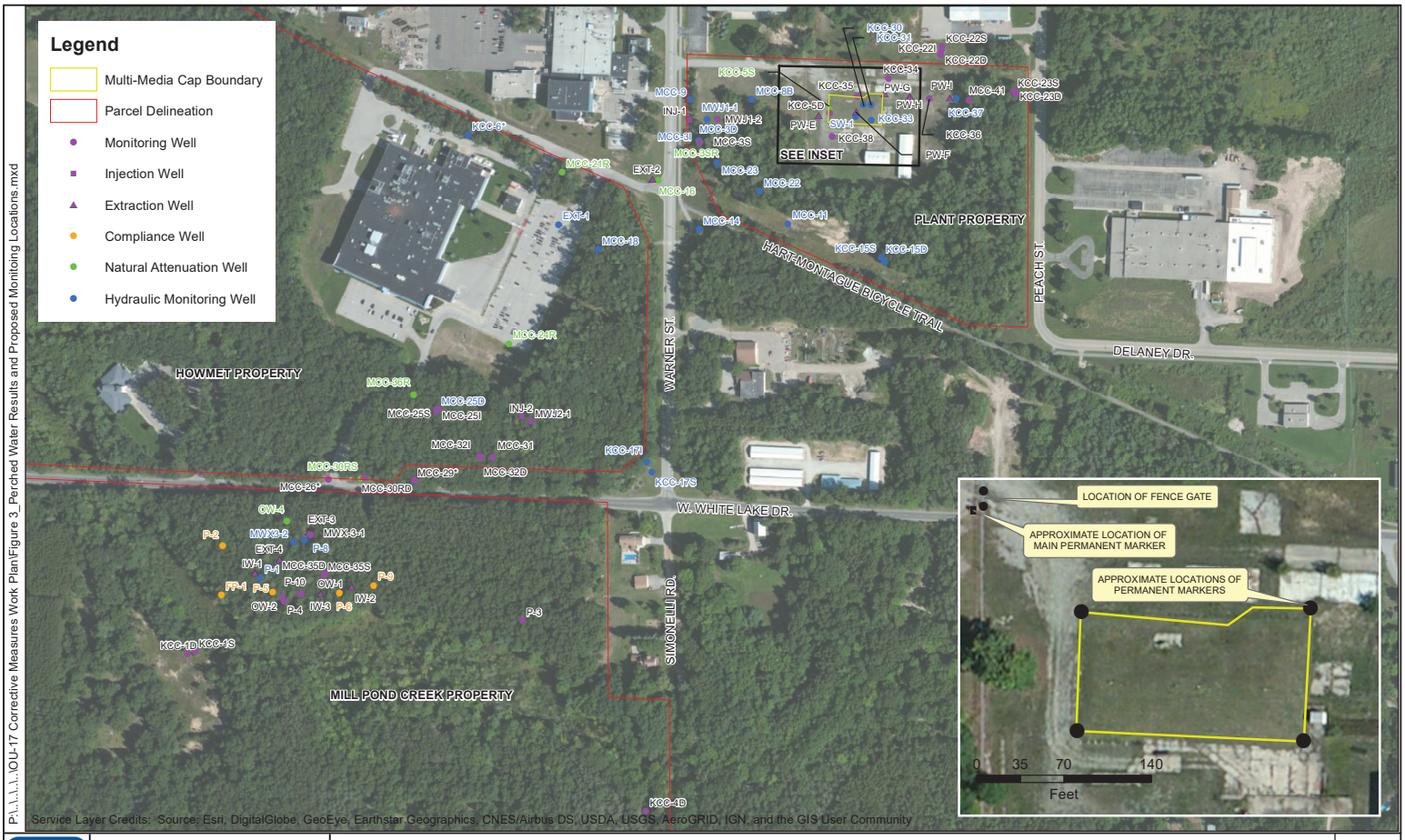
MUSKEGON CHEMICAL COMPANY SITE
WHITEHALL, MICHIGAN

SITE LOCATION MAP

Project No:	117-7686001
Date:	12/7/2018
Designed by:	MC

FIGURE
1

Bar Measures 1 inch



P:\...\...\OU-17 Corrective Measures Work Plan\Figure 3_Perched Water Results and Proposed Monitoring Locations.mxd

ORIGINAL BY: RSW	
DATE: 12/27/2021	
PROJECT #: 117-4124SMP5410	
APPROVED: BWG	

Notes
* Approximate location retrieved from 2019 Annual Progress Report (Fishbeck, 2019)

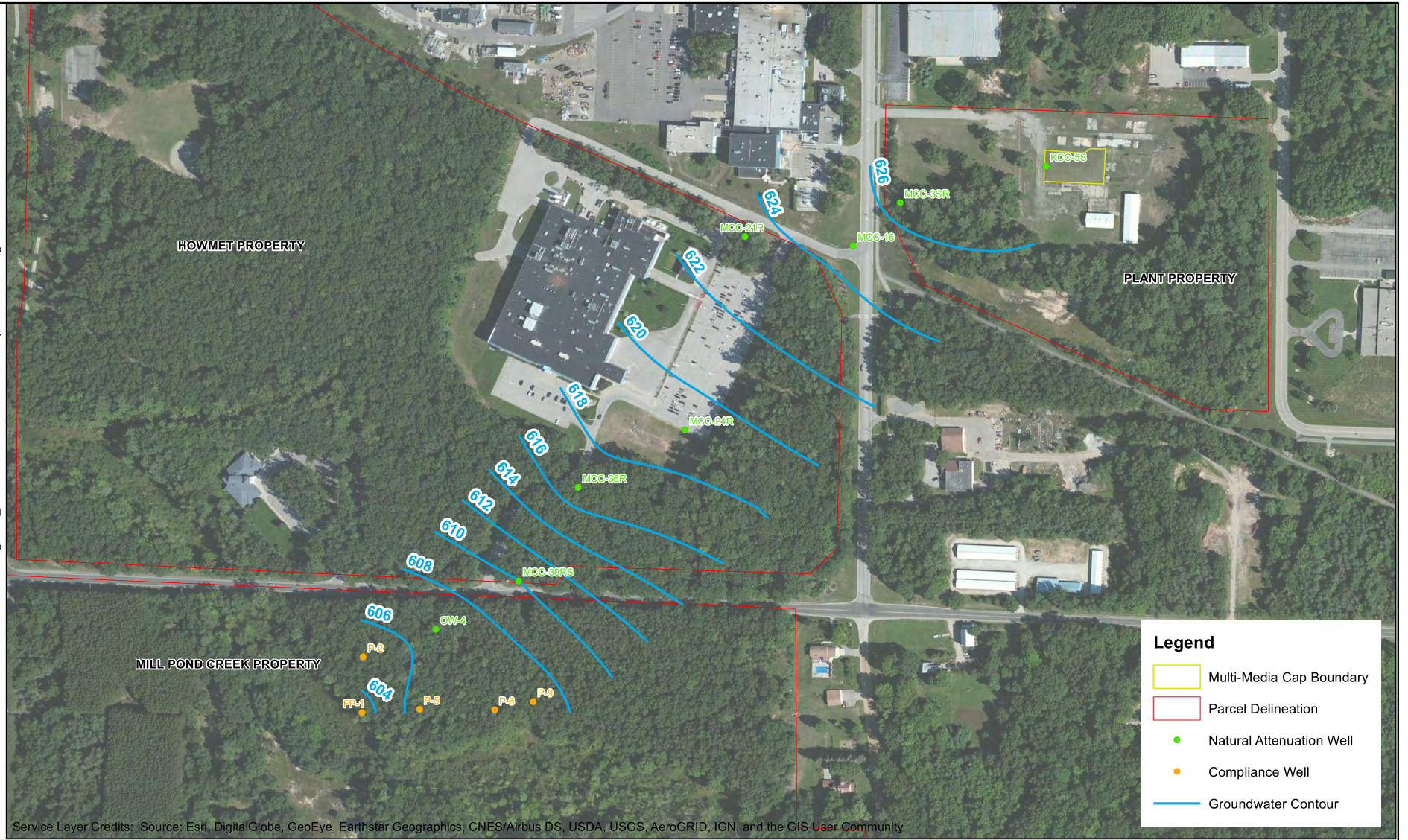
2021 ANNUAL PROGRESS REPORT
MUSKEGON CHEMICAL COMPANY NPL SITE (MID072569510)
WHITEHALL, MI

SITE LAYOUT

N

0 150 300 600
Feet

FIGURE
2



P:\..\..\..\OU-17 Corrective Measures Work Plan\Figure 3_Perched Water Results and Proposed Monitoing Locations.mxd

ORIGINAL BY:	RSW
DATE:	12/27/2021
PROJECT #:	117-4124SMP5410
APPROVED:	BWG

Notes

Digital Elevation Model used to generate groundwater level contours retrieved from USGS Earth Explorer (SRTM 1 Arc-Second Global)

2021 ANNUAL PROGRESS REPORT
MUSKEGON CHEMICAL COMPANY NPL SITE (MID072569510)
WHITEHALL, MI

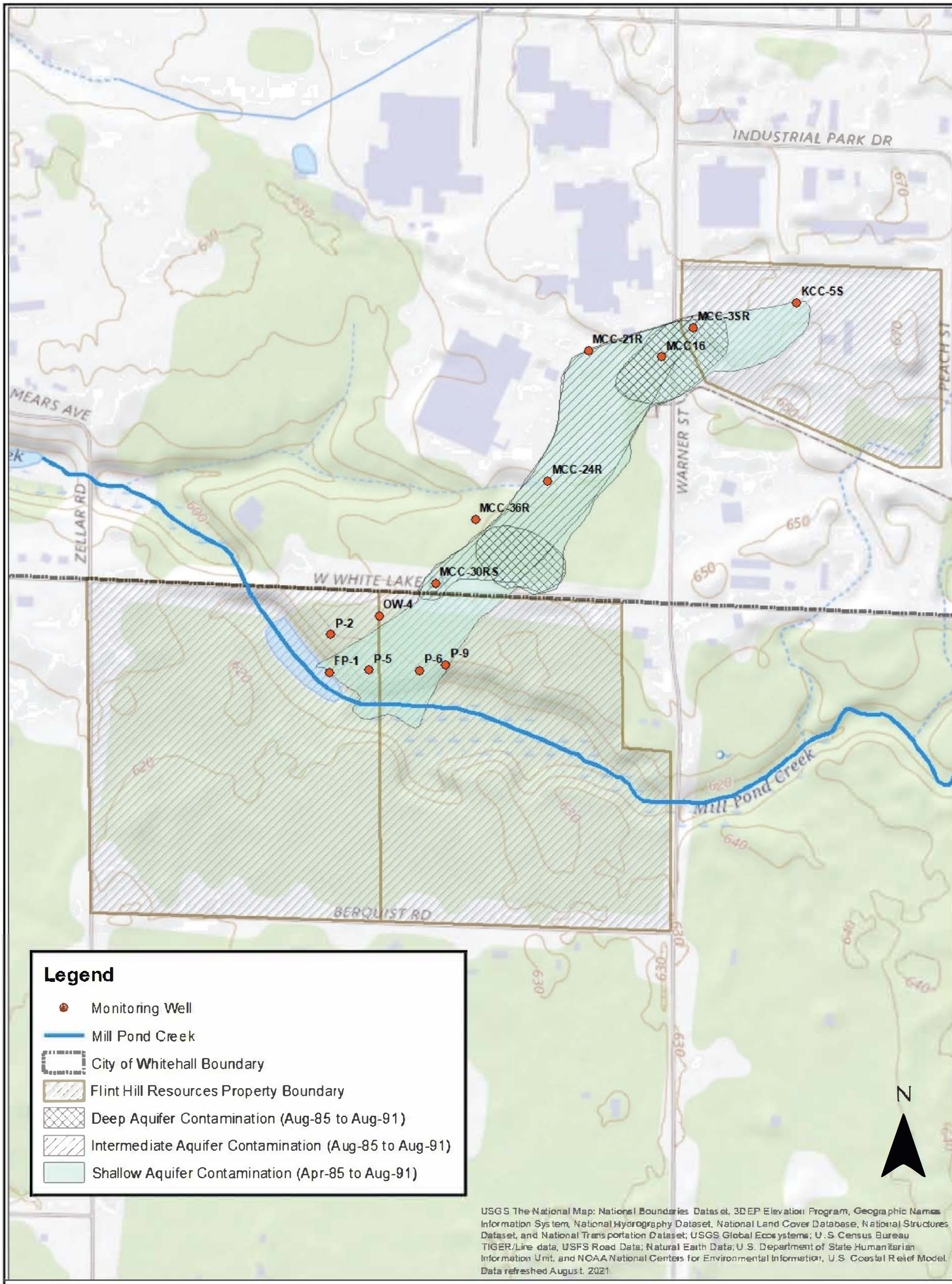
POTENTIOMETRIC SURFACE MAP

N

0 135 270 540
Feet

FIGURE
3

FIGURE 4



250 125 0 250 500 750 1,000 Feet

Site Address: 1725 Warner Street, Whitehall, MI 49461
Site Name Synonyms: Koch Refining Co. Koch Chemical Co. Div.

Extent of Groundwater Contamination - 1985 to 1991

Muskegon Chemical Co. Superfund Site

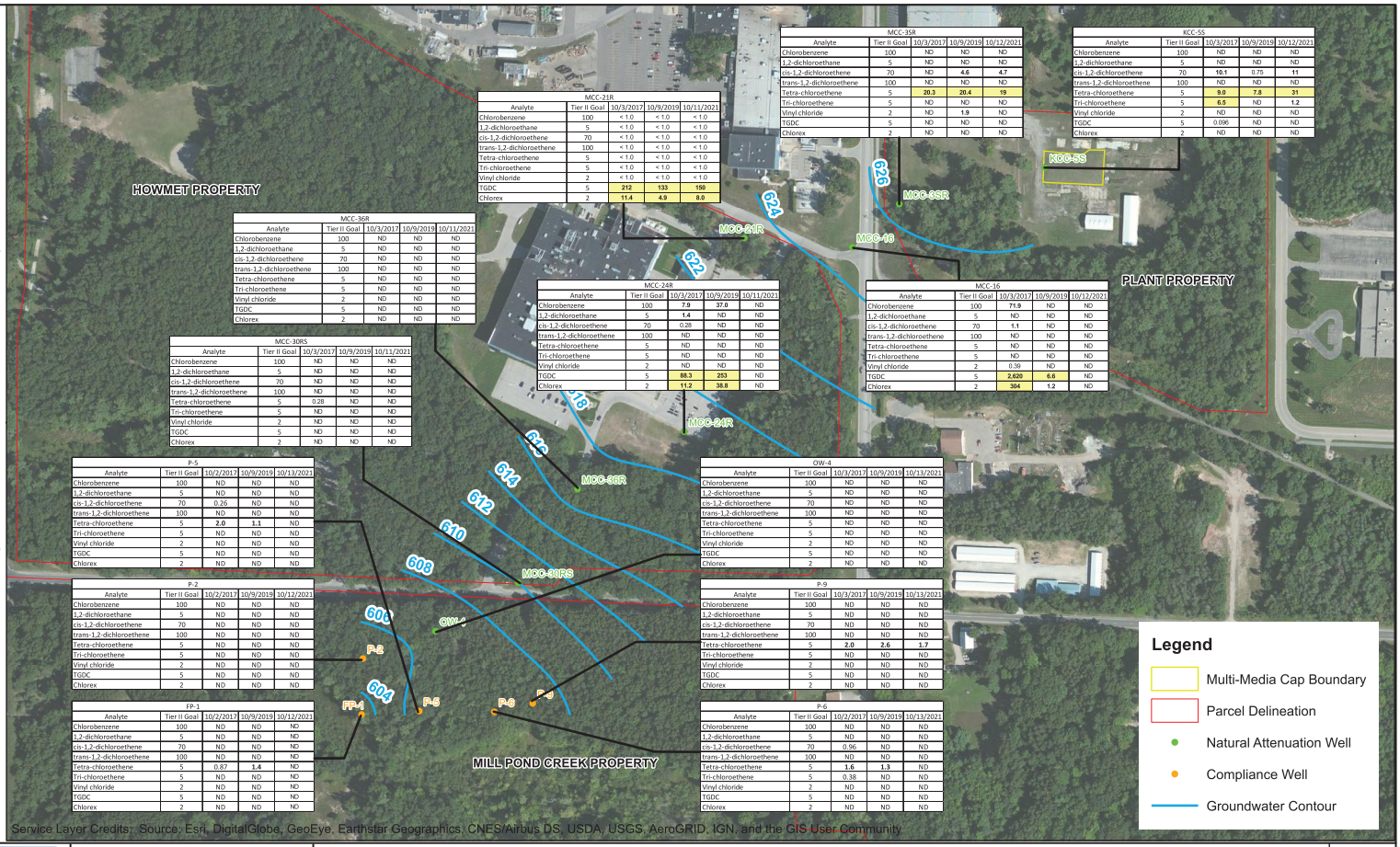
Whitehall, Michigan

EGLE

Drawn By: MAB
Date Drawn: 4/9/2022

Scale: As shown
Imagery Date: As shown

EGLE-RRD-Superfund-GDSMU



MCC-21R

Analyte	Tier II Goal	10/3/2017	10/9/2019	10/11/2021
Chlorobenzene	100	< 1.0	< 1.0	< 1.0
1,2-dichloroethane	5	< 1.0	< 1.0	< 1.0
cis-1,2-dichloroethene	70	< 1.0	< 1.0	< 1.0
trans-1,2-dichloroethene	100	< 1.0	< 1.0	< 1.0
Tetra-chloroethene	5	< 1.0	< 1.0	< 1.0
Tri-chloroethene	5	< 1.0	< 1.0	< 1.0
Vinyl chloride	2	< 1.0	< 1.0	< 1.0
TGDC	5	**212**	**133**	**150**
Chlorex	2	**11.4**	**4.9**	**8.0**

MCC-35R

Analyte	Tier II Goal	10/3/2017	10/9/2019	10/12/2021
Chlorobenzene	100	ND	ND	ND
1,2-dichloroethane	5	ND	ND	ND
cis-1,2-dichloroethene	70	ND	**4.6**	**4.7**
trans-1,2-dichloroethene	100	ND	ND	ND
Tetra-chloroethene	5	**20.3**	**20.4**	**19**
Tri-chloroethene	5	ND	ND	ND
Vinyl chloride	2	ND	**1.9**	ND
TGDC	5	ND	ND	ND
Chlorex	2	ND	ND	ND

KCC-5S

Analyte	Tier II Goal	10/3/2017	10/9/2019	10/12/2021
Chlorobenzene	100	ND	ND	ND
1,2-dichloroethane	5	ND	ND	ND
cis-1,2-dichloroethene	70	**10.1**	0.75	**11**
trans-1,2-dichloroethene	100	ND	ND	ND
Tetra-chloroethene	5	**9.0**	**7.8**	**31**
Tri-chloroethene	5	**6.5**	ND	**1.2**
Vinyl chloride	2	ND	ND	ND
TGDC	5	0.096	ND	ND
Chlorex	2	ND	ND	ND

MCC-36R

Analyte	Tier II Goal	10/3/2017	10/9/2019	10/11/2021
Chlorobenzene	100	ND	ND	ND
1,2-dichloroethane	5	ND	ND	ND
cis-1,2-dichloroethene	70	ND	ND	ND
trans-1,2-dichloroethene	100	ND	ND	ND
Tetra-chloroethene	5	ND	ND	ND
Tri-chloroethene	5	ND	ND	ND
Vinyl chloride	2	ND	ND	ND
TGDC	5	ND	ND	ND
Chlorex	2	ND	ND	ND

MCC-24R

Analyte	Tier II Goal	10/3/2017	10/9/2019	10/11/2021
Chlorobenzene	100	**7.9**	**37.0**	ND
1,2-dichloroethane	5	**1.4**	ND	ND
cis-1,2-dichloroethene	70	0.28	ND	ND
trans-1,2-dichloroethene	100	ND	ND	ND
Tetra-chloroethene	5	ND	ND	ND
Tri-chloroethene	5	ND	ND	ND
Vinyl chloride	2	ND	ND	ND
TGDC	5	**88.3**	**253**	ND
Chlorex	2	**11.2**	**38.8**	ND

MCC-16

Analyte	Tier II Goal	10/3/2017	10/9/2019	10/12/2021
Chlorobenzene	100	**71.9**	ND	ND
1,2-dichloroethane	5	ND	ND	ND
cis-1,2-dichloroethene	70	**1.1**	ND	ND
trans-1,2-dichloroethene	100	ND	ND	ND
Tetra-chloroethene	5	ND	ND	ND
Tri-chloroethene	5	ND	ND	ND
Vinyl chloride	2	0.39	ND	ND
TGDC	5	**2,620**	**6.6**	ND
Chlorex	2	**304**	**1.2**	ND

MCC-30RS

Analyte	Tier II Goal	10/3/2017	10/9/2019	10/11/2021
Chlorobenzene	100	ND	ND	ND
1,2-dichloroethane	5	ND	ND	ND
cis-1,2-dichloroethene	70	ND	ND	ND
trans-1,2-dichloroethene	100	ND	ND	ND
Tetra-chloroethene	5	0.28	ND	ND
Tri-chloroethene	5	ND	ND	ND
Vinyl chloride	2	ND	ND	ND
TGDC	5	ND	ND	ND
Chlorex	2	ND	ND	ND

P-5

Analyte	Tier II Goal	10/2/2017	10/9/2019	10/13/2021
Chlorobenzene	100	ND	ND	ND
1,2-dichloroethane	5	ND	ND	ND
cis-1,2-dichloroethene	70	0.26	ND	ND
trans-1,2-dichloroethene	100	ND	ND	ND
Tetra-chloroethene	5	**2.0**	**1.1**	ND
Tri-chloroethene	5	ND	ND	ND
Vinyl chloride	2	ND	ND	ND
TGDC	5	ND	ND	ND
Chlorex	2	ND	ND	ND

OW-4

Analyte	Tier II Goal	10/3/2017	10/9/2019	10/13/2021
Chlorobenzene	100	ND	ND	ND
1,2-dichloroethane	5	ND	ND	ND
cis-1,2-dichloroethene	70	ND	ND	ND
trans-1,2-dichloroethene	100	ND	ND	ND
Tetra-chloroethene	5	ND	ND	ND
Tri-chloroethene	5	ND	ND	ND
Vinyl chloride	2	ND	ND	ND
TGDC	5	ND	ND	ND
Chlorex	2	ND	ND	ND

P-2

Analyte	Tier II Goal	10/2/2017	10/9/2019	10/12/2021
Chlorobenzene	100	ND	ND	ND
1,2-dichloroethane	5	ND	ND	ND
cis-1,2-dichloroethene	70	ND	ND	ND
trans-1,2-dichloroethene	100	ND	ND	ND
Tetra-chloroethene	5	ND	ND	ND
Tri-chloroethene	5	ND	ND	ND
Vinyl chloride	2	ND	ND	ND
TGDC	5	ND	ND	ND
Chlorex	2	ND	ND	ND

P-9

Analyte	Tier II Goal	10/3/2017	10/9/2019	10/13/2021
Chlorobenzene	100	ND	ND	ND
1,2-dichloroethane	5	ND	ND	ND
cis-1,2-dichloroethene	70	ND	ND	ND
trans-1,2-dichloroethene	100	ND	ND	ND
Tetra-chloroethene	5	**2.0**	**2.6**	**1.7**
Tri-chloroethene	5	ND	ND	ND
Vinyl chloride	2	ND	ND	ND
TGDC	5	ND	ND	ND
Chlorex	2	ND	ND	ND

FP-1

Analyte	Tier II Goal	10/2/2017	10/9/2019	10/12/2021
Chlorobenzene	100	ND	ND	ND
1,2-dichloroethane	5	ND	ND	ND
cis-1,2-dichloroethene	70	ND	ND	ND
trans-1,2-dichloroethene	100	ND	ND	ND
Tetra-chloroethene	5	0.87	**1.4**	ND
Tri-chloroethene	5	ND	ND	ND
Vinyl chloride	2	ND	ND	ND
TGDC	5	ND	ND	ND
Chlorex	2	ND	ND	ND

P-6

Analyte	Tier II Goal	10/2/2017	10/9/2019	10/13/2021
Chlorobenzene	100	ND	ND	ND
1,2-dichloroethane	5	ND	ND	ND
cis-1,2-dichloroethene	70	0.96	ND	ND
trans-1,2-dichloroethene	100	ND	ND	ND
Tetra-chloroethene	5	**1.6**	**1.3**	ND
Tri-chloroethene	5	0.38	ND	ND
Vinyl chloride	2	ND	ND	ND
TGDC	5	ND	ND	ND
Chlorex	2	ND	ND	ND

P:\...\...\...\OU-17 Corrective Measures Work Plan\Figure 3_Perched Water Results and Proposed Monitoing Locations.mxd

ORIGINAL BY: RSW
DATE: 11/01/2022
PROJECT #: 117-4124SMP5410
APPROVED: BWG

Notes
Bold value indicates laboratory detection greater than laboratory reporting limit.
Highlighted value indicates laboratory detection greater than Tier II remediation goal.
All result in µg/L.
ND - Not detected above the method detection limit.

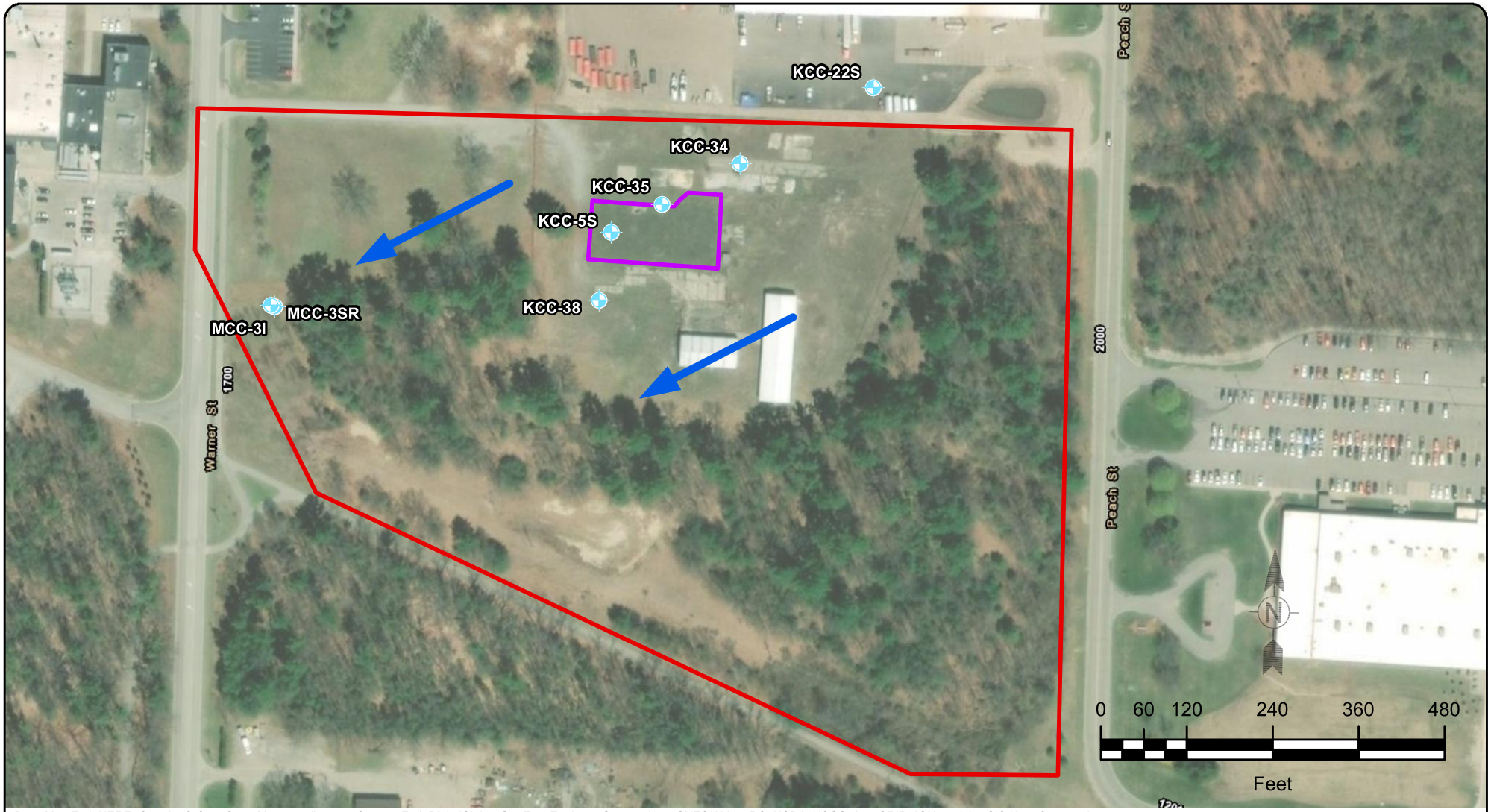
2023 FIVE YEAR REVIEW
MUSKEGON CHEMICAL COMPANY NPL SITE (MID072569510)
WHITEHALL, MI

2017-2021 GROUNDWATER DATA SUMMARY

N

0 135 270 540
Feet

FIGURE
5



Base Map Esri, HERE, Garmin, © OpenStreetMap contributors, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Sampling Location

Multi-Media Cap Boundary

Muskegon Chemical Company Property Line

Groundwater Flow Direction

Groundwater flow direction is based on Figure 3 of the Muskegon Chemical Company 2017 Annual Progress Report, FTC&H January 11, 2018

TETRA TECH
www.tetratech.com
710 AVIS DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: 734.665.6000

INVESTIGATION SUMMARY

MUSKEGON CHEMICAL COMPANY SITE
WHITEHALL, MICHIGAN

WELLS SAMPLED FOR PFAS IN 2018

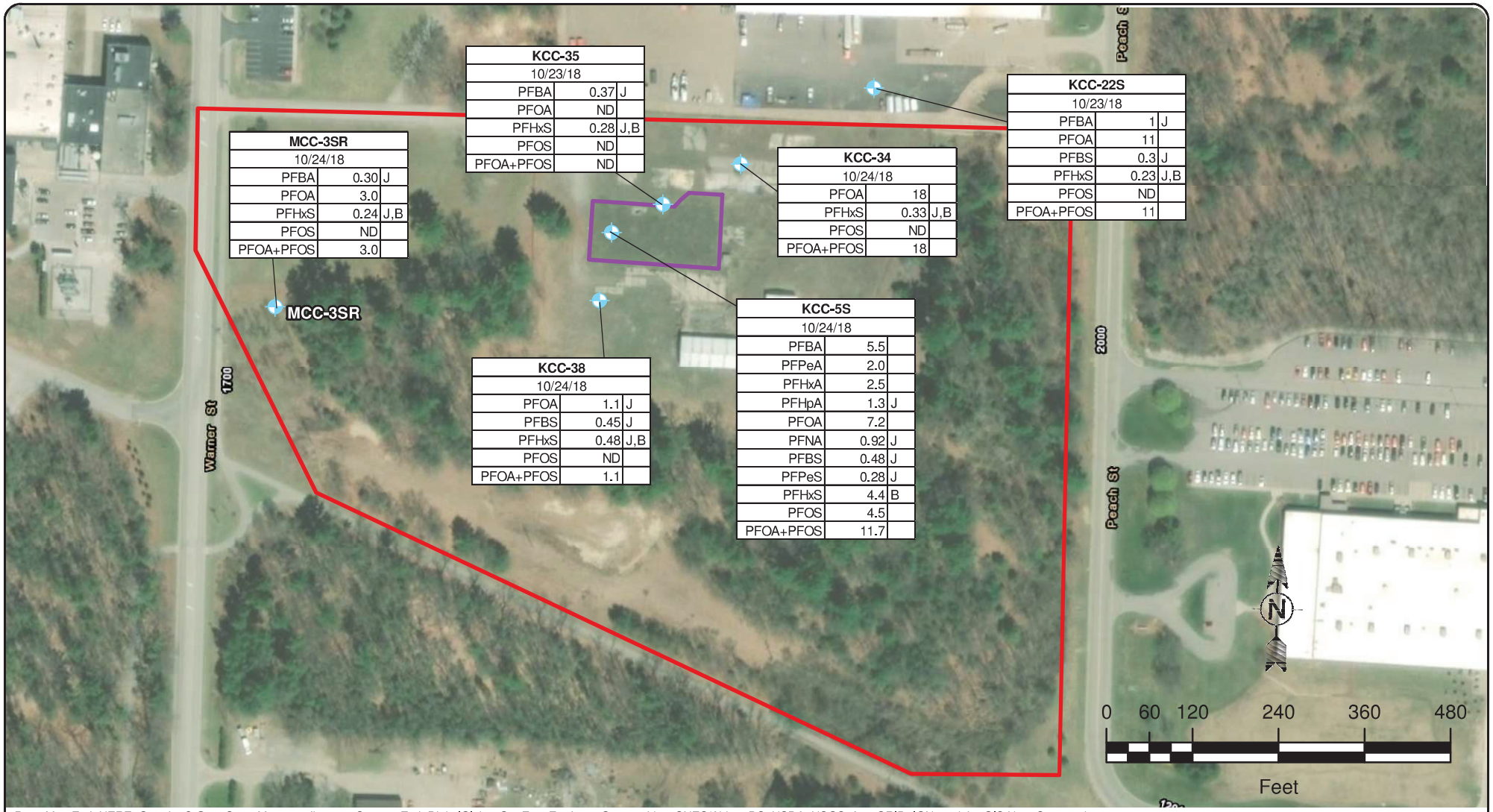
Project No:	117-7686001
Date:	12/9/2018
Designed by:	MC

FIGURE
6

Bar Measures 1 inch

12/9/2018 - 11:37:55 PM - C:\Users\marco.capodivacca\Desktop\Figure 2_ Site Layout Map.mxd - marco.capodivacca

Base Map



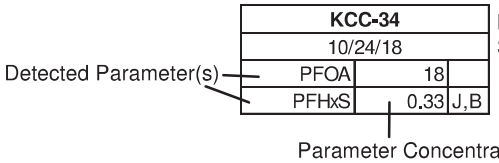
Base Map Esri, HERE, Garmin, © OpenStreetMap contributors, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Monitoring Well

Multi-Media Cap Boundary

MCC Property Line

Notes:
1. Parameter concentrations are reported in nanograms per liter (ng/L).
2. Acronyms for the detected parameters are used in this figure. Consult Table 1 for the complete name of the reported parameter and an explanation of the parameter qualifiers.
3. ND = Not detected.
4. MCC = Muskegon Chemical Company.



TETRA TECH
www.tetratech.com
710 AVIS DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: 734.665.6000

INVESTIGATION SUMMARY

MUSKEGON CHEMICAL COMPANY SITE
WHITEHALL, MICHIGAN

SAMPLING LOCATIONS AND ANALYTICAL RESULTS

Project No:	117-7686001
Date:	12/7/2018
Designed by:	MC

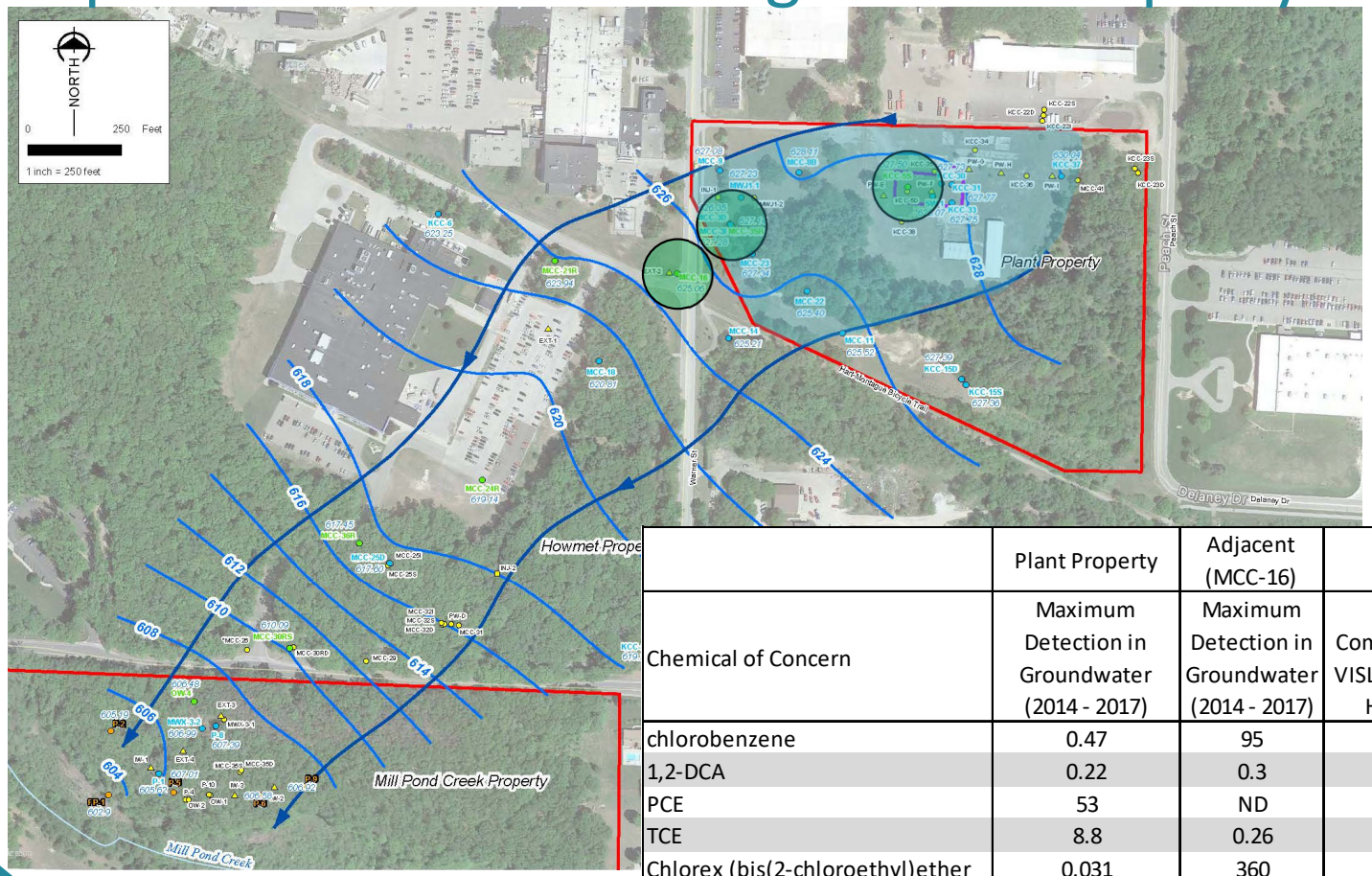
FIGURE
7

Bar Measures 1 inch

Base Map

Figure 8A

Vapor Intrusion Screening – MCC Property



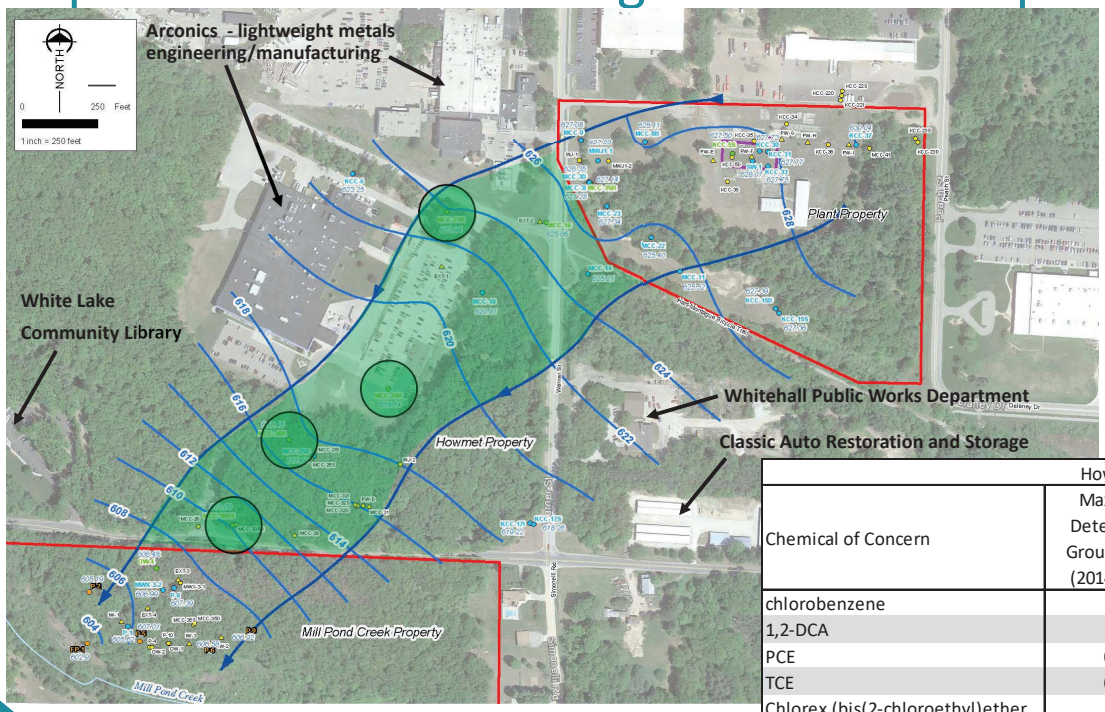
= 100 ft. radius

- Currently zoned Limited Industrial/Commercial;
- Screened against EPA Commercial VISL and 2017 DEQ Non-Residential screening levels;
- Also calculated Commercial Cancer Risk;
- Only exceedance of screening level (EPA 10^{-6} VISL for Chlorex) is at MCC-16, adjacent to the MCC property – it's below the 10^{-5} VISL; and TCE on Plant Property, slightly above the 10^{-6} VISL;
- Cancer risk at $7x10^{-6}$ or lower;
- MCC has restrictive covenant limiting future use to commercial/industrial.

	Plant Property	Adjacent (MCC-16)				
Chemical of Concern	Maximum Detection in Groundwater (2014 - 2017)	Maximum Detection in Groundwater (2014 - 2017)	EPA Commercial VISL (1E-06 / HI = 1)	EPA Commercial VISL (1E-05 / HI = 1)	DEQ 2017 VI Screening Levels - NONRES	Commercial Cancer Risk
chlorobenzene	0.47	95	1700	--	2700	NC
1,2-DCA	0.22	0.3	9.6	--	NA	2E-08
PCE	53	ND	64	--	320	8E-07
TCE	8.8	0.26	7.4	--	21	1E-06
Chlorex (bis(2-chloroethyl)ether	0.031	360	53	530	NA	7E-06

FIGURE 8B

Vapor Intrusion Screening – Howmet Property



- Currently zoned Industrial;
- Screened against EPA Residential VISL and 2017 DEQ Residential screening levels;
- Also calculated Residential Cancer Risk;
- No exceedances of Residential screening levels;
- Cancer risk at $1x10^{-6}$ or lower.

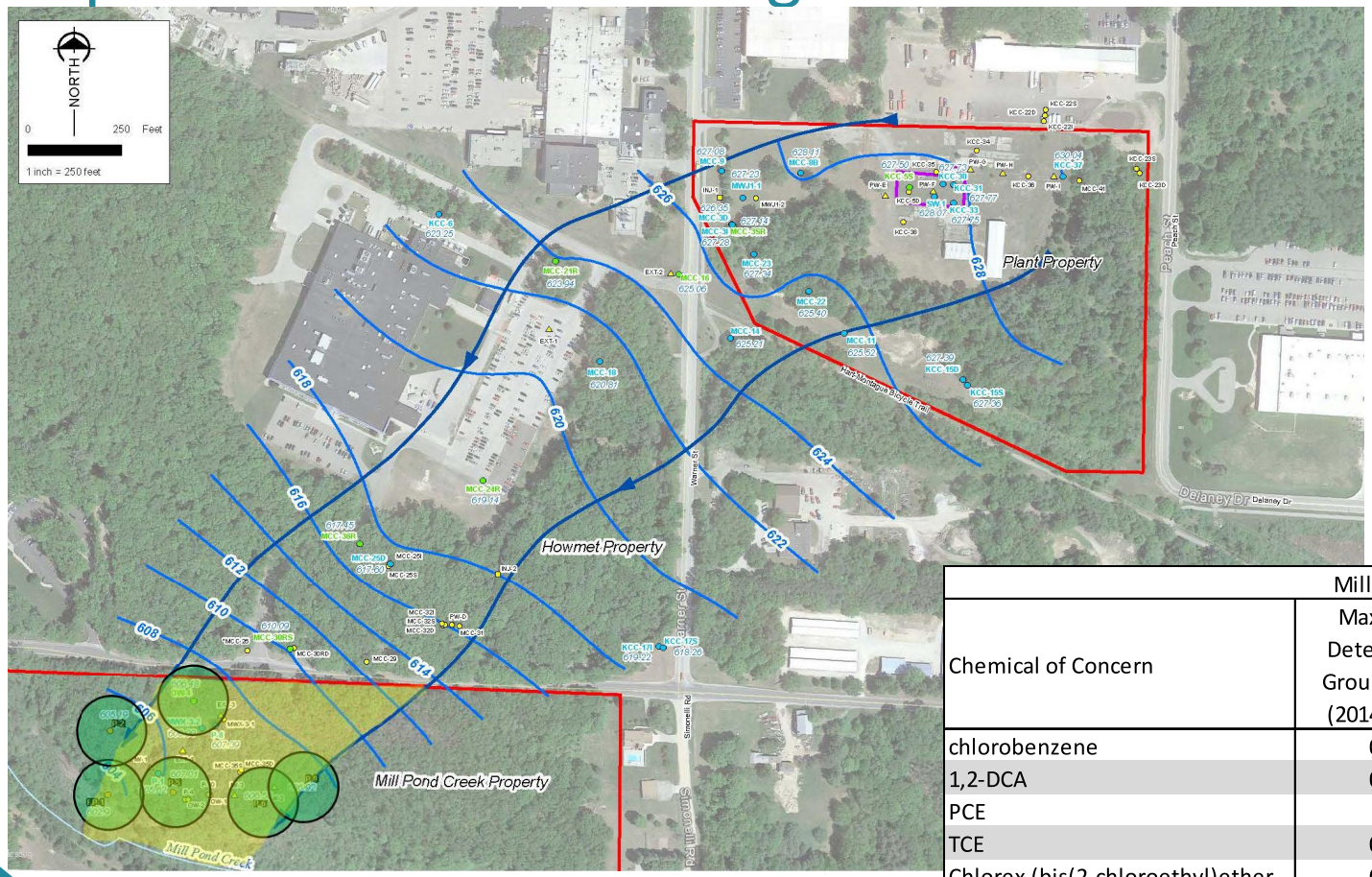
= 100 ft. radius

Howmet Property				
Chemical of Concern	Maximum Detection in Groundwater (2014 - 2017)	EPA Residential VISL	DEQ 2017 VI Screening Levels - RES	Residential Cancer Risk
chlorobenzene	9.9	410	540	NC
1,2-DCA	1.4	2.2	NA	6E-07
PCE	0.28	15	96	2E-08
TCE	0.37	1.2	6.1	3E-07
Chlorex (bis(2-chloroethyl)ether	11.4	12	NA	1E-06

HALEY ALDRICH

FIGURE 8C

Vapor Intrusion Screening – Mill Pond Creek Property



- Currently zoned medium density residential;
- Screened against EPA Residential VISL and 2017 DEQ Residential screening levels;
- Also calculated Residential Cancer Risk;
- No exceedances of Residential screening levels;
- Cancer risk at $3x10^{-7}$ or lower.

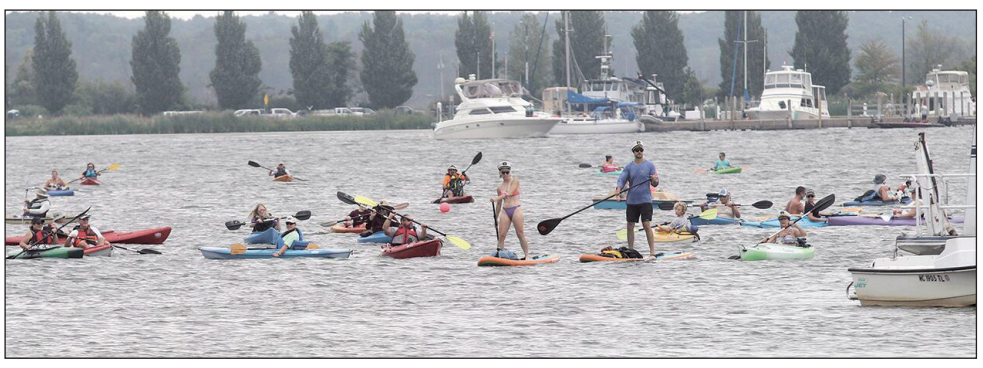
= 100 ft. radius

Mill Creek Property				
Chemical of Concern	Maximum Detection in Groundwater (2014 - 2017)	EPA Residential VISL	DEQ 2017 VI Screening Levels - RES	Residential Cancer Risk
chlorobenzene	0.24	410	540	NC
1,2-DCA	0.67	2.2	NA	3E-07
PCE	4.6	15	96	3E-07
TCE	0.38	1.2	6.1	3E-07
Chlorex (bis(2-chloroethyl)ether	0.15	12	NA	1E-08

HALEY ALDRICH

APPENDIX C

NEWSPAPER ANNOUNCEMENT ANNOUNCING THE FYR START



Float

Continued from 1A

manning the boat launches or transporting people to and fro.

"We had 40 volunteers between the boat marshals, the Whitehall and Montague high schools supporting with their students out here helping to take kayaks off people's boats," Ghazal said. "We had bus drivers from the Montague school bus system shuttling people back and forth from the school and the launch sites. We had people at registration going on over there. All these people were volunteers and had to give up their Sundays to work with us today."

The event had the side benefit of bringing White Lake residents physically closer together. Ghazal marveled at the fun and conversation being had by those in the water. Tommy Foster provided live music, which added to the atmosphere.

"I met somebody out there who brought his goose, and ironically his name is Goose as well," Ghazal chuckled. "He had his bird out there on his boat, jumping on and off. People with dogs, the kids were all having a great time. You saw them out there. Everyone just talking to each other. All strangers meeting each other on the lake. It was a fun time. It's what lake living is all about."

The SnowFarmers may have actually benefited by not getting closer to breaking the flotilla record. As much help as they had, another thousand or so people would have created a daunting scenario for a quickly-arranged event. Hanson, though, did say that he was optimistic when the idea took hold that they would get more registrants than they ended up with. However, ideas are already starting to formulate about how to make future editions of this event even better, and Hanson said the goal is to triple their registrations next year, which could push the event over 1,000 kayaks.

A lot of those ideas surround technology — Ghazal called this year's registration process "clunky", having to go through two websites, and added that he hoped check-in could be done electronically next year — but there are some practical things the SnowFarmers hope to improve, too.

"We didn't have an anchor in the middle of the water to hold us all together," Ghazal said. "It was pretty windy out there and it was tough to stay together as a big flotilla."

Andy Roberts/BEACON

Over 280 floats were able to be spotted on White Lake as kayakers gathered in an attempt to break the world record for largest floatilla as part of the White lake Float-a-Palooza.

Playhouse welcomes young actors to youth theatre program

By Hayden Dobb
Beacon Staff Writer

Each year, as the summer months wind down and schools open their doors for a new academic year, The Playhouse at White Lake welcomes area kids over their 106th anniversary to engage in their theater program for those aged between 2 and 18 called the White Lake Youth Theatre (WLYT).

Through dance and movement, drama and acting, participating kids can use WLYT classes as a creative outlet to build their confidence, self-worth, and better understanding of teamwork skills. Cindy Beth Davis-Dykema, Arts Education Director at The Playhouse at White Lake, said, "Arts education doesn't just shape future artists, actors and dancers. At White Lake Youth Theatre, we aim to cultivate a compassionate community, leadership and life skills through arts education at The Playhouse."

As a branch of The Playhouse at White Lake, the WLYT program has served as a creative outlet and socio-emotional development tool for children since 1973. Over the course of the pandemic, the WLYT program has grown exponentially as children and their families look for new ways to express themselves creatively within their community. Every Saturday over the span of four weeks, children are taught performance and social skills. The program has recently seen a record number of new students involved and it has affected the WLYT by further expanding their offerings in variety and for ages of participants. The WLYT hopes to even surpass their numbers this year by reaching out to those who may not have already heard about the program and may wish to join this year.

The first classes begin Sept. 24 and end the weekend of Oct. 15. To sign up for courses, visit http://theplayhouseatwhitelake.org/. Those who wish to sign their children up are able to do so until the first morning classes start, but a minimum of five students are needed to run each class.

To support WLYT, visit http://theplayhouseatwhitelake.org/wlyt_getinvolved. On the site, those who wish to support the program can join the Adopt-a-Costume program, where donated money can either be used to pay for a child's costume or cover a student's scholarship so they're able to participate in the WLYT, regardless of familial financial constraints.

In addition to WLYT, Gentle Yoga will also be available at The Playhouse in the upcoming seasons. For more information and updates, visit http://theplayhouseatwhitelake.org. More productions and events to be announced soon.

Coach

Continued from 1A

up through his system, unlike those early years, he said everyone who's played for the Vikings has a role.

"We're standing on people's shoulders," Sigmon said. "We can't be here without what we did in 2013, 2014 and so on. We had to go through that. Growth works in a different way. Everyone thinks it's just a straight shot, but really it's the ebbs and flows of it. I'd tell you our 2019 team forced us to grow as much as anything else because we had to look at the way our infrastructure was set up. We had to find a way to, in the future, withstand injury. That was something we had to learn from. Since we've done that, last year we had a significant injury again (star players Graycen Shepherd and Ira Jenkins each missed the season with injuries), but we were able to be co-conference champions and win a playoff game on the road."

Sigmon said the team has responded very well to the huge week one win, especially praising Tuesday's practice. If that continues, the Vikes could be in for a special year.

"(Wednesday), we had our meeting before practice, and it was very little film-based or anything like that," Sigmon said. "It was really more about life lessons...It's those types of messages that these kids are old enough and mature enough, it matters to them. Football matters to this group. I think they're much more locked in to hearing those messages and wanting those types of lessons."

EPA

EPA and MDEQ begin review of Muskegon Chemical Superfund Site
Whitehall, Michigan

U.S. Environmental Protection Agency and Michigan Department of Environment, Great Lakes, and Energy, or EGLE, are conducting a five-year review of the Muskegon Chemical Company Superfund site located in Whitehall. 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 sixth five-year review of this site.

The site formerly produced a variety of specialty chemicals that caused contamination in the soil and groundwater. The cleanup remedy required treatment of soil and groundwater, implementation of institutional controls, or ICs, and operation, maintenance and monitoring activities and long-term stewardship. The completed soil remedy required soil vapor extraction and air sparging followed by natural attenuation, capping and ICs. The completed groundwater remedy consisted of groundwater extraction, treatment and reinjection followed by natural attenuation and ICs. Construction of the remedy finished in 1995 and was overseen by EPA and EGLE. Operation, maintenance and monitoring activities and long-term stewardship are ongoing. Lastly, additional vapor intrusion and groundwater investigations are underway which were required in the last five-year review.

More information is available at the White Lake Community Library, 3900 White Lake Dr., Whitehall, Michigan, and at www.epa.gov/superfund/muskegon-chemical. The review should be completed by April 2023.

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

Heriberto León
EPA Community Involvement Coordinator
312-866-6163
leon.heriberto@epa.gov

Sheri Bianchin
EPA Remedial Project Manager
312-886-4745
bianchin.sheri@epa.gov

Nicolas Dawson
EGLE Project Manager
517-284-5084
dawsonn1@michigan.gov

You may also call EPA toll-free at 800-621-8431, 9:00 a.m. to 5:30 p.m., weekdays.

APPENDIX D

FYR SITE INSPECTION CHECKLIST AND PHOTOS

Site Inspection Checklist

I. SITE INFORMATION	
Site name: **Muskegon Chemical Co. Site**	**Date of inspection:** **11/4/2022**
Location and Region: **Muskegon, MI in Region 5**	**EPA ID:** MID072569510
Agency, office, or company leading the FYR: U.S. EPA	**Weather/temperature:** Moderate -40 degrees and overcase

Remedy Includes: (Check all that apply)

☒ Landfill cover/containment	☒ Monitored natural attenuation
☒ Access controls	☐ Groundwater containment
☒ Institutional controls	☐ Vertical barrier walls
☐ Groundwater pump and treatment	☐ Other: Click or tap here to enter text.
☐ Surface water collection and treatment	

Attachments:

☒ Inspection team roster attached	☒ Site map attached

Site Inspection Checklist

II. INTERVIEWS (Check all that apply)

1. **O&M Site Manager** Michael Christopher**,** **Project Manager - Flint Hills Resources ,** **11/4/2022**

Interviewed: ☒ at site ☐ at office ☐ by phone Phone Number: 832.264.3654

Problems, suggestions: ☐ Report attached

Click or tap here to enter text.

2. **O&M Staff** Daniel Sopoci and Ben Giese**,** Contractors-Tetra Tech**,** **11/4/2022**

Interviewed: ☒ at site ☐ at office ☐ by phone Phone Number: see below

Problems, suggestions: ☐ Report attached

Phone numbers:
Mr. Giese 269.986.2110
Mr. Sopoci 734.330.3083

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: Click or tap here to enter text.

Contact: Name , Title , Click or tap to enter a date., P: Phone Number

Problems, suggestions: ☐ Report attached

Click or tap here to enter text.

Agency: Click or tap here to enter text.

Contact: Name , Title , Click or tap to enter a date., P: Phone Number

Problems, suggestions: ☐ Report attached

Click or tap here to enter text.

Agency: Click or tap here to enter text.

Contact: Name , Title , Click or tap to enter a date., P: Phone Number

Problems, suggestions: ☐ Report attached

Click or tap here to enter text.

Agency: Click or tap here to enter text.

Contact: Name , Title , Click or tap to enter a date., P: Phone Number

Problems, suggestions:

Click or tap here to enter text.

4. **Other Interviews (optional):** ☐ Report attached

Click or tap here to enter text.

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: **Records are kept off Site**

2. Site-Specific Health and Safety Plan ☐ Readily available

☐ Contingency Plan/Emergency Response Plan ☐ Readily available

Remarks: **Records are kept off Site**

3. O&M and OSHA Training Records

☐ Readily available ☐ Up to date ☐ N/A

Remarks: **Records are kept off Site**

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: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

5. Gas Generation Records

☐ Readily available ☐ Up to date ☐ N/A

Remarks: Click or tap here to enter text.

6. Settlement Monument Records

☐ Readily available ☐ Up to date ☒ N/A

Remarks: Click or tap here to enter text.

7. Groundwater Monitoring Records

☐ Readily available ☒ Up to date ☐ N/A

Remarks: Records are kept off Site

8. Leachate Extraction Records

☐ Readily available ☐ Up to date ☒ N/A

Remarks: Click or tap here to enter text.

9. Discharge Compliance Records

☐ Air ☐ Readily available ☐ Up to date ☒ N/A

☐Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A

Remarks: Click or tap here to enter text.

10. Daily Access/Security Logs

☐ Readily available ☐ Up to date ☐ N/A

Remarks: Click or tap here to enter text.

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

Remarks: Currently Tetra Tech

2. O&M Cost Records

☐Readily available ☐ Up to date ☐ Funding mechanism/agreement in place

Original O&M cost estimate Click or tap here to enter text. ☐ Breakdown attached

Total annual cost by year for review period if available

From	To	Total cost	
Click or tap to enter a date.	Click or tap to enter a date.	Click or tap here to enter text.	☐ Breakdown attached
From	To	Total cost	
Click or tap to enter a date.	Click or tap to enter a date.	Click or tap here to enter text.	☐ Breakdown attached
From	To	Total cost	
Click or tap to enter a date.	Click or tap to enter a date.	Click or tap here to enter text.	☐ Breakdown attached
From	To	Total cost	
Click or tap to enter a date.	Click or tap to enter a date.	Click or tap here to enter text.	☐ Breakdown attached
From	To	Total cost	
Click or tap to enter a date.	Click or tap to enter a date.	Click or tap here to enter text.	☐ Breakdown attached

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

Describe costs and reasons:

Click or tap here to enter text.

V. ACCESS AND INSTITUTIONAL CONTROLS

☐ Applicable ☐ N/A

1. Fencing Damaged ☐ Location shown on site map ☐ Gates secured ☒ N/A

Remarks: Click or tap here to enter text.

2. Other Access Restrictions ☐ Location shown on site map ☒ Gates secured

Remarks: Click or tap here to enter text.

3. Institutional Controls (ICs)

A. 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)	Click or tap here to enter text.		
Frequency	Minimum of once per year		
Responsible party/agency	PRP		
Contact: Name , Title , Click or tap to enter a date., P: Phone Number			
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:

Click or tap here to enter text.

B. Adequacy ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: Click or tap here to enter text.

4. General

A. Vandalism/Trespassing ☐ Location shown on site map ☒ No vandalism evident

Remarks: Click or tap here to enter text.

B. Land use changes on site ☒ N/A

Remarks: Click or tap here to enter text.

C. Land use changes off site ☒ N/A

Remarks: Click or tap here to enter text.

VI. GENERAL SITE CONDITIONS

1. Roads ☒ Applicable ☐ N/A

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

Remarks: Click or tap here to enter text.

B. Other Site Conditions

Remarks: Click or tap here to enter text.

VII. LANDFILL COVERS

1. Landfill Surface ☒ Applicable ☐ N/A

A. Settlement (Low Spots) ☐ Location Shown on Site Map ☒ Settlement Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

B. Cracks ☐ Location Shown on Site Map ☒ Cracking Not Evident

Lengths: Click or tap here to enter text. Widths: Click or tap here to enter text. Depths: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

C. Erosion ☐ Location Shown on Site Map ☒ Erosion Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

D. Holes ☐ Location Shown on Site Map ☒ Holes Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

E. Vegetative Cover ☒ Grass ☒ Cover Properly Established

☐ Tress/Shrubs (indicate size and locations on a diagram ☐ No Signs of Stress

Remarks: Click or tap here to enter text.

F. Alternative Cover (armored rock, concrete, etc.) ☒ N/A

Remarks: Click or tap here to enter text.

G. Bulges ☐ Location Shown on Site Map ☒ Bulges Not Evident

Areal Extent: Click or tap here to enter text. Height: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

H. Wet Areas/Water Damage ☒ Wet Areas/Water Damage Not Evident

☐ Wet Areas	☐ Location Shown on Site Map	Areal Extent: Click or tap here to enter text.
☐ Ponding	☐ Location Shown on Site Map	Areal Extent: Click or tap here to enter text.
☐ Seeps	☐ Location Shown on Site Map	Areal Extent: Click or tap here to enter text.
☐ Soft Subgrade	☐ Location Shown on Site Map	Areal Extent: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

I. Slope Instability ☐ Location Shown on Site Map ☐ Slope Instability Not Evident

☐ Slides Areal Extent: Click or tap here to enter text.

Remarks: N/A

2. 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.)

A. Flows Bypass Bench ☐ Location Shown on Site Map ☐ N/A or Okay

Remarks: Click or tap here to enter text.

B. Bench Breached ☐ Location Shown on Site Map ☐ N/A or Okay

Remarks: Click or tap here to enter text.

C. Bench Overtopped ☐ Location Shown on Site Map ☐ N/A or Okay

Remarks: Click or tap here to enter text.

3. 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.)

A. Settlement ☐ Location Shown on Site Map ☒ Settlement Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

B. Material Degradation ☐ Location Shown on Site Map ☒ Degradation Not Evident

Material Type: Click or tap here to enter text. Areal Extent: Click or tap here to enter

text.

Remarks: Click or tap here to enter text.

C. Erosion ☐ Location Shown on Site Map ☒ Erosion Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

D. Undercutting ☐ Location Shown on Site Map ☒ Undercutting Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

E. Obstructions ☐ Location Shown on Site Map ☒ Undercutting Not Evident

Type: Click or tap here to enter text.

Areal Extent: Click or tap here to enter text. Size: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

F. Excessive Vegetative Growth ☐ Location Shown on Site Map ☐ Excessive Growth Not Evident

Areal Extent: Click or tap here to enter text. ☐ Vegetation in channels does not obstruct flow

Remarks: Click or tap here to enter text.

4. Cover Penetrations ☐ Applicable ☒ N/A

A. Gas Vents ☐ Active ☐ Passive

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled

☐ Good condition ☐ Evidence of leakage at penetration

☐ Needs Maintenance ☐ N/A

Remarks: Click or tap here to enter text.

B. Gas Monitoring Probes

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled

☐ Good condition ☐ Evidence of leakage at penetration

☐ Needs Maintenance ☐ N/A

Remarks: Click or tap here to enter text.

C. Monitoring Wells

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled

☐ Good condition ☐ Evidence of leakage at penetration

☐ Needs Maintenance ☐ N/A

Remarks: Click or tap here to enter text.

D. Leachate Extraction Wells

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled

☐ Good condition ☐ Evidence of leakage at penetration

☐ Needs Maintenance ☐ N/A

Remarks: Click or tap here to enter text.

E. Settlement Monuments ☐ Located ☐ Routinely Surveyed ☒ N/A

Remarks: Click or tap here to enter text.

5. Gas Collection and Treatment ☐ Applicable ☒ N/A

A. Gas Treatment Facilities

☐ Flaring ☐ Thermal Destruction ☐ Collection for Reuse

☐ Good condition ☐ Needs Maintenance

Remarks: Click or tap here to enter text.

B. Gas Collection Wells, Manifolds, and Piping

☐ Good condition ☐ Needs Maintenance ☒ N/A

Remarks: Click or tap here to enter text.

C. Gas Monitoring Facilities (e.g. gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs Maintenance ☒ N/A

Remarks: Click or tap here to enter text.

6. Cover Drainage Layer ☐ Applicable ☒ N/A

A. Outlet Pipes Inspected ☐ Functioning ☒ N/A

Remarks: Click or tap here to enter text.

B. Outlet Rock Inspected ☐ Functioning ☒ N/A

Remarks: Click or tap here to enter text.

7. Detention/Sediment Ponds ☐ Applicable ☒ N/A

A. Siltation ☐ Siltation Not Evident ☐ N/A

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

B. Erosion ☐ Erosion Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

C. Outlet Works ☐ Functioning ☐ N/A

Remarks: Click or tap here to enter text.

D. Dam ☐ Functioning ☐ N/A

Remarks: Click or tap here to enter text.

8. Retaining Walls ☐ Applicable ☒ N/A

A. Deformations ☐ Location Shown on Site Map ☐ Deformation Not Evident

Horizontal Displacement: Click or tap here to enter text.

Vertical Displacement: Click or tap here to enter text.

Rotational Displacement: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

B. Degradation ☐ Location Shown on Site Map ☐ Deformation Not Evident

Remarks: Click or tap here to enter text.

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

A. Siltation ☐ Location Shown on Site Map ☐ Siltation Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

B. Vegetative Growth ☐ Location Shown on Site Map ☐ N/A

☐ Vegetation Does Not Impede Flow

Areal Extent: Click or tap here to enter text. Type: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

C. Erosion ☐ Location Shown on Site Map ☐ Erosion Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

D. Discharge Structure ☐ Functioning ☐ N/A

Remarks: Click or tap here to enter text.

VIII. VERTICAL BARRIER WALLS

☐ Applicable ☒ N/A

1. Settlement ☐ Location Shown on Site Map ☐ Settlement Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

2. Performance Monitoring Type of Monitoring: Click or tap here to enter text.

☐ Performance Not Monitored ☐ Evidence of Breaching

Frequency: Click or tap here to enter text. Head Differential: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

IX. GROUNDWATER/SURFACE WATER REMEDIES

☒ Applicable	☐ N/A

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

A. Pumps, Wellhead Plumbing, and Electrical ☐ N/A

☒ Good Condition ☒ All Required Wells Properly Operating ☐ Needs Maintenance

Remarks: Minor maintenance required- see comments

B. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances

☐ Good Condition ☐ Needs Maintenance

Remarks: no extraction system

C. Spare Parts and Equipment ☐ Needs to be Provided

☐ Readily Available ☐ Good Condition ☐ Requires Upgrade

Remarks: not kept on Site

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

A. Collection Structures, Pumps, and Electrical

☐ Good Condition ☐ Needs Maintenance

Remarks: Click or tap here to enter text.

B. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances

☐ Good Condition ☐ Needs Maintenance

Remarks: Click or tap here to enter text.

C. Spare Parts and Equipment ☐ Needs to be Provided

☐ Readily Available ☐ Good Condition ☐ Requires Upgrade

Remarks: Click or tap here to enter text.

3. Treatment System ☐ Applicable ☒ N/A

A. Treatment Train (Check components that apply)

☐ Metals removal ☐ Oil/Water Separation ☐ Bioremediation

☐ Air Stripping ☐ Carbon Absorbers

☐ Filters Click or tap here to enter text.

☐ Additive (e.g. chelation agent, flocculent) Click or tap here to enter text.

☐ Others Click or tap here to enter text.

☐ 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 Click or tap here to enter text.

☐ Quantity of surface water treated annually Click or tap here to enter text.

Remarks: Click or tap here to enter text.

B. Electrical Enclosures and Panels (properly rated and functional)

☐ N/A ☐ Good Condition ☐ Needs Maintenance

Remarks: Click or tap here to enter text.

C. Tanks, Vaults, Storage Vessels ☐ N/A

☐ Proper Secondary Containment ☐ Good Condition ☐ Needs Maintenance

Remarks: Click or tap here to enter text.

D. Discharge Structure and Appurtenances

☐ N/A ☐ Good Condition ☐ Needs Maintenance

Remarks: Click or tap here to enter text.

E. Treatment Building(s)

☒ N/A ☐ Good condition (esp. roof and doorways)

☐ Needs repair ☐ Chemicals and equipment properly stored

Remarks Click or tap here to enter text.

F. Monitoring Wells (Pump and Treatment Remedy) ☐ N/A

☐ Properly secured/locked ☐ Functioning

☐ Routinely sampled ☐ All required wells located

☐ Good condition ☐ Needs Maintenance

Remarks Click or tap here to enter text.

4. Monitoring Data

A. Monitoring Data:

☒ Is Routinely Submitted on Time ☒ Is of Acceptable Quality

B. Monitoring Data Suggests:

☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

5. Monitored Natural Attenuation

A. Monitoring Wells (natural attenuation remedy) ☐ N/A

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled

☒ All required wells located ☒ Needs Maintenance ☒ Good condition

Remarks: minor maintenance needed Field observations at three locations indicate a potential need for maintenance. KCC-22 well cluster, At MCC-24R and FP-1- see FYR 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

1. 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.).
No issues observed. The active remedy components have been discontinued and the groundwater contamination is decling due to natural attenuation

2. 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.

Adequate

3. 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.

None

4. Early Indicators of Potential Remedy Problems

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

None

ANNUAL INSPECTION PHOTO LOG

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 1	Direction: SE	Description: NW Permanent Marker	Date and Time: October 12, 2022 12:36 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 2	Direction: WSW	Description: NE permanent marker	Date and Time: October 12, 2022 12:37 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 3	Direction: WNW	Description: SE permanent marker	Date and Time: October 12, 2022 12:38 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 4	Direction: NE	Description: SW permanent marker	Date and Time: October 12, 2022 12:39 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 5	Direction: SE	Description: Plant Property from main gate.	Date and Time: October 12, 2022 12:42 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 6	Direction: SE	Description: Permanent marker by main gate of Plant Property.	Date and Time: October 12, 2022 12:43 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 7	Direction: WNW	Description: KCC-35	Date and Time: October 12, 2022 12:51 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 8	Direction: WNW	Description: KCC-30	Date and Time: October 12, 2022 12:52 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 9	Direction: W	Description: KCC-31	Date and Time: October 12, 2022 12:53 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 10	Direction: S	Description: PW-F and SW-1	Date and Time: October 12, 2022 12:53 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 11	Direction: W	Description: KCC-33	Date and Time: October 12, 2022 12:54 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 12	Direction: ESE	Description: KCC-38	Date and Time: October 12, 2022 12:55 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 13	Direction: ESE	Description: KCC-5D	Date and Time: October 12, 2022 12:58 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 14	Direction: W	Description: KCC-5S	Date and Time: October 12, 2022 12:59 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 15	Direction: WNW	Description: KCC-34	Date and Time: October 12, 2022 1:00 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 16	Direction: WSW	Description: KCC-36	Date and Time: October 12, 2022 1:01 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 17	Direction: ENE	Description: PW-I	Date and Time: October 12, 2022 1:02 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 18	Direction: SSE	Description: KCC-37	Date and Time: October 12, 2022 1:02 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 19	Direction: E	Description: NW gate of Plant Property.	Date and Time: October 12, 2022 1:03 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 20	Direction: ESE	Description: SE gate of Plant Property.	Date and Time: October 12, 2022 1:05 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 21	Direction: SSW	Description: SW gate of Plant Property.	Date and Time: October 12, 2022 1:07 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 22	Direction: NE	Description: PW-H	Date and Time: October 12, 2022 1:09 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 23	Direction: SSW	Description: PW-G	Date and Time: October 12, 2022 1:10 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 24	Direction: SSE	Description: Main gate of Plant Property.	Date and Time: October 12, 2022 1:13 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 25	Direction: NW	Description: Plant Property access road.	Date and Time: October 12, 2022 1:18 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 26	Direction: NNE	Description: MWJ1-2	Date and Time: October 12, 2022 1:20 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 27	Direction: WSW	Description: MWJ1-1	Date and Time: October 12, 2022 1:31 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 28	Direction: SE	Description: INJ-1	Date and Time: October 12, 2022 1:34 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 29	Direction: W	Description: MCC-9	Date and Time: October 12, 2022 1:36 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 30	Direction: SSE	Description: MCC-3R	Date and Time: October 12, 2022 1:38 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 31	Direction: SE	Description: MCC-3D and MCC-3I	Date and Time: October 12, 2022 1:41 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 32	Direction: SW	Description: MCC-23	Date and Time: October 12, 2022 1:49 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 33	Direction: SE	Description: MCC-14	Date and Time: October 12, 2022 2:02 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 34	Direction: ENE	Description: MCC-22	Date and Time: October 12, 2022 2:04 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 35	Direction: ESE	Description: MCC-11	Date and Time: October 12, 2022 2:07 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 36	Direction: ESE	Description: KCC-15D and KCC-15S.	Date and Time: October 12, 2022 2:11 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 37	Direction: NE	Description: KCC-23S and KCC-23D	Date and Time: October 12, 2022 2:17 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 38	Direction: E	Description: MCC-41	Date and Time: October 12, 2022 2:19 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 39	Direction: S	Description: KCC-22I, KCC-22S, and KCC-22D	Date and Time: October 12, 2022 2:29 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 40	Direction: S	Description: KCC-22D	Date and Time: October 12, 2022 2:29 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 41	Direction: S	Description: KCC-22I	Date and Time: October 12, 2022 2:30 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 42	Direction: NW	Description: MCC-8B	Date and Time: October 12, 2022 2:35 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 43	Direction: NNE	Description: EXT-3 and MWX-3-1	Date and Time: October 12, 2022 3:22 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 44	Direction: S	Description: P-8	Date and Time: October 12, 2022 3:22 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 45	Direction: E	Description: OW-4	Date and Time: October 12, 2022 3:24 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 46	Direction: ESE	Description: MWX 3-2	Date and Time: October 12, 2022 3:24 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 47	Direction: WSW	Description: EXT-4	Date and Time: October 12, 2022 3:27 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 48	Direction: WNW	Description: P-2	Date and Time: October 12, 2022 3:33 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 49	Direction: SW	Description: IW-1	Date and Time: October 12, 2022 3:36 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 50	Direction: W	Description: P-1	Date and Time: October 12, 2022 3:36 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 51	Direction: SW	Description: P-5	Date and Time: October 12, 2022 3:37 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 52	Direction: SW	Description: FP-1	Date and Time: October 12, 2022 3:38 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 53	Direction: NE	Description: KCC-1S or KCC-1D (no markings, unable to locate second well)	Date and Time: October 12, 2022 3:46 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 54	Direction: WSW	Description: OW-2 and P-4	Date and Time: October 12, 2022 3:51 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 55	Direction: ESE	Description: P-10	Date and Time: October 12, 2022 3:52 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 56	Direction: SE	Description: IW-3	Date and Time: October 12, 2022 3:53 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 57	Direction: W	Description: P-6	Date and Time: October 12, 2022 3:54 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 58	Direction: ENE	Description: IW-2	Date and Time: October 12, 2022 3:54 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 59	Direction: S	Description: P-9	Date and Time: October 12, 2022 3:55 PM

TETRA TECH

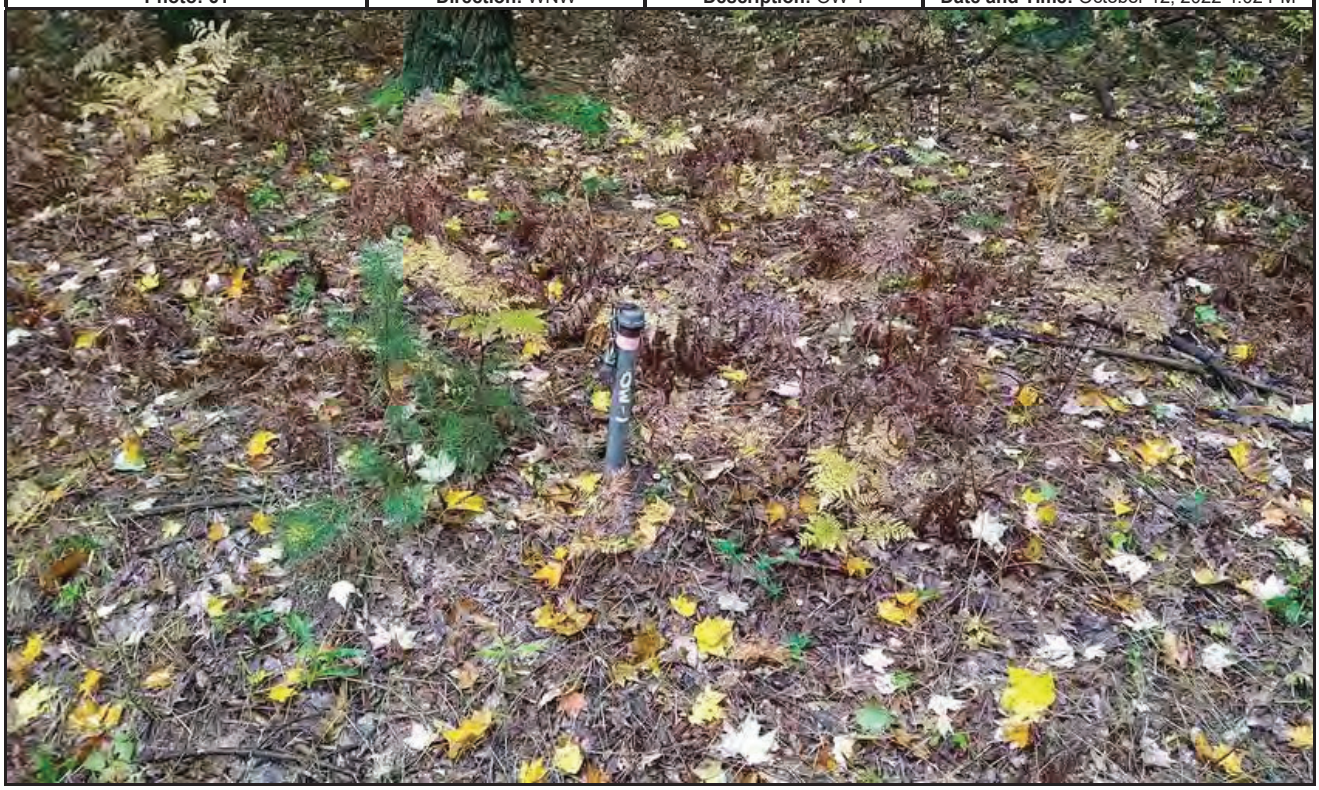
2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 60	Direction: SW	Description: MCC-35S and MCC-35D	Date and Time: October 12, 2022 3:57 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 61	Direction: WNW	Description: OW-1	Date and Time: October 12, 2022 4:02 PM



TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 62	Direction: SW	Description: Gate to Mill Pond Creek property.	Date and Time: October 12, 2022 4:06 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 63	Direction: SSW	Description: MCC-24R	Date and Time: October 12, 2022 4:15 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 64	Direction: S	Description: INJ-2	Date and Time: October 12, 2022 4:17 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 65	Direction: SE	Description: MW-J2-1	Date and Time: October 12, 2022 4:18 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 66	Direction: S	Description: MCC-31	Date and Time: October 12, 2022 4:22 PM

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 67	Direction: SSE	Description: MCC-32I, MCC-32D, and MCC-32S.	Date and Time: October 12, 2022 4:24 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 68	Direction: ENE	Description: MCC-30RS and MCC-30RD	Date and Time: October 12, 2022 4:28 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 69	Direction: N	Description: MCC-25D	Date and Time: October 12, 2022 4:33 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 70	Direction: S	Description: MCC-36R	Date and Time: October 12, 2022 4:35 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 71	Direction: S	Description: KCC-17I and KCC-17S	Date and Time: October 12, 2022 4:41 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 72	Direction: NNW	Description: MCC-18	Date and Time: October 12, 2022 4:47 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 73	Direction: WSW	Description: MCC-16	Date and Time: October 12, 2022 4:49 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 74	Direction: SSE	Description: EXT-2	Date and Time: October 12, 2022 4:50 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 75	Direction: S	Description: MCC-21R	Date and Time: October 12, 2022 4:52 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 76	Direction: NNW	Description: KCC-6	Date and Time: October 12, 2022 4:54 PM

TETRA TECH

2022 Annual Inspection Photo Log
Former Muskegon Chemical Company, Whitehall, MI
Flint Hills Resources, LP

Photo: 77	Direction: SW	Description: EXT-1	Date and Time: October 12, 2022 4:56 PM

APPENDIX E

INSTITUTIONAL CONTROLS INFORMATION

Restrictive Covenant - Plant Property

DECLARATION OF RESTRICTIVE COVENANT

MDEQ Reference No.: RC-RRD-2

This Declaration of Restrictive Covenant ("Restrictive Covenant") completely supersedes the De of Restrictions and Covenants recorded at liber 2078, page 594 (MDEQ Reference No. RC-ERD Muskegon County Register of Deeds, and has been recorded with the Muskegon County Regist Deeds for the purpose of protecting public health, safety, and welfare, and the environment by p or restricting activities that could result in unacceptable exposure to environmental contaminatio at the 19.6 acres of property located in the City of Whitehall, County of Muskegon, and legally de Exhibit 1 attached hereto ("Property"). The Property is associated with the Muskegon Chemical Site, Site ID No. 61000029, for which a remedial action plan is being conducted. The remedial a is being implemented to address environmental contamination is fully described in the Remedial Plan for the Muskegon Chemical Company NPL Site ("RAP"), dated June 1997 and submitted b Chemical Company. The Michigan Department of Environmental Quality ("MDEQ") approved th pursuant to Part 201, Environmental Remediation, of the Natural Resources and Environmental Act, 1994 PA 451, as amended ("NREPA"), MCL 324.20101 et seq. The RAP was then incorpo a Consent Decree that was entered by the United States District Court for the Western District o on November 25, 1997. The RAP and the Consent Decree were amended by order of that cour December 11, 2000. On January 6, 2010, the MDEQ approved the second amendment to the F submitted by Flint Hills Resources, LP ("FHR"), entitled "Remedial Action Plan Amendment, Mus Chemical Company NPL Site," dated May 8, 2009. Pursuant to the terms of the Consent Decre second RAP amendment was incorporated into and made an enforceable part of the Consent D upon its approval by the MDEQ. The RAP and RAP amendments are together hereinafter refer the "RAP."

The RAP required the recording of this Restrictive Covenant with the Muskegon County Registe to: 1) restrict unacceptable exposures to hazardous substances located on the Property; 2) ass the use of Property is consistent with the exposure assumptions utilized in the development of cl criteria pursuant to Sections 20120a(1)(i) and (2) of Part 201 of the NREPA and the exposure cc measures relied upon in the RAP; and 3) to prevent damage or disturbance of any element of th response activity constructed on the Property. The restrictions contained in this Restrictive Cove based upon information available to the MDEQ at the time the RAP was approved by the MDEQ of the response activities to achieve and maintain the criteria, exposure controls, and requireme specified in the RAP; future changes in the environmental condition of the Property or changes i cleanup criteria developed under Sections 20120a(1)(i) and (2) of Part 201 of the NREPA; the di environmental conditions at the Property that were not accounted for in the RAP; or use of the P a manner inconsistent with the restrictions described herein, may result in this Restrictive Coven being protective of public health, safety, and welfare, and the environment.

The "*Limits of Land or Resource Use Restrictions,*" attached hereto as Exhibit 2, provides the leg description(s) and a survey that distinguishes those portions of the Property that are subject to la resource use restrictions as specified herein.

Summary of Response Activities

Hazardous substances, including 1,2 dichloroethane, bis (2-chloroethyl) ether (Chlorex), and trig dichloride were discovered in groundwater and soils on the Property. Prior to recording of this R Covenant, response activities have been undertaken to remove or treat in-place some of the contamination. However, residual contamination remains present at levels that require controls unacceptable exposures. Tetrachloroethylene, trichloroethylene, and bis (2-chloroethoxy) ethan present in groundwater at levels that require controls to prevent unacceptable exposures. 1,2-dichloroethane, bis (2-chloroethoxy) ethane, and bis (2-chloroethyl) ether remain present in soils that require controls to prevent infiltration through soils into groundwater and unacceptable expo hazardous substances. An infiltration and exposure barrier, consisting of geomembrane and ge layers, has been placed, as described below, to prevent infiltration and direct contact with the im soils.

Definitions

"MDEQ" means the Michigan Department of Environmental Quality, its successor entities, persons or entities acting on its behalf.

"Owner" means at any given time the then current title holder of the Property or any portion there

All other terms used in this document which are defined in Part 3, Definitions, of the NREPA; Pa the NREPA; or the Part 201 Administrative Rules ("Part 201 Rules"), 1990 AACS R 299.5101 et have the same meaning in this document as in Parts 3 and 201 of the NREPA and the Part 201 of the date of filing of this Restrictive Covenant.

NOW THEREFORE,

Declaration of Land Use or Resource Use Restrictions

Pursuant to the Consent Decree, FHR, as Owner of the Property at the time this Restrictive Cov recorded, hereby declares and covenants that the Property shall be subject to the following restr and conditions:

1. The Owner covenants to restrict the use of the Property to industrial purposes only. I of industrial purposes include manufacturing, utilities, industrial research and development, and bulk storage. The Owner shall prohibit agricultural or residential uses of the Property including, l limited to, living quarters of a watchman or caretaker, currently permissible under the City of Whi zoning code M1 District – Limited Industrial, Permitted Accessory Uses, 15-13-3. Except for this use, the Property shall only be used for the purposes that are described in the zoning code for in zoned property, attached hereto as Exhibit 3.

2. Soils and Exposure Barrier. The Owner shall prohibit activities on the Property that m in exposures to hazardous substances in soils above levels established in the RAP. These proh activities include:

A. Any excavation or other intrusive activity that could disturb or affect the integrity geomembrane and geotextile layers, on the 0.37 acres of property designated in as the "exposure barrier area," except as authorized as part of an MDEQ-appro response activity.
B. Any excavation or other intrusive activity anywhere on the Property unless such performed in full compliance with the requirements of Section 20107a(1)(a)-(c) c 201 of the NREPA, except as authorized as part of an MDEQ-approved respons
C. The Owner covenants to manage all soils within the Property in accordance with requirements of MCL §324.20120c and MCL §§324.11101-11152 of the NREPA Subtitle C of the Resource Conservation and Recovery Act, 42 USC §6901 of th Waste Disposal Act, and the administrative rules promulgated thereunder, and a

relevant and applicable state and federal laws. This includes, but is not limited t removing soil from the facility to an offsite location or relocating soil within the fa without first determining whether or not such removal to an offsite location pose: to the public health, safety, or welfare, or the environment, or such relocation ex the environmental condition of the facility.

3. Groundwater. The Owner shall prohibit activities on the Property that may result in e: to hazardous substances in groundwater above levels established in the RAP. These prohibited include:

A. Any construction of wells or other devices to extract groundwater for consumptic irrigation, or any other use, except for wells and devices that are part of an MDEQ-approved response activity.
B. Any use of existing wells or other devices to extract groundwater for consumptio irrigation, or any other use, except as authorized as part of an MDEQ-approved activity.

4. The Owner shall prohibit activities on the Property that may interfere with any elemer RAP, including the performance of operation and maintenance activities, monitoring, or other me necessary to ensure the effectiveness and integrity of the remedial action in the RAP. These prc activities include:

A. Any activities that would interfere with access to the monitoring wells identified ir RAP.
B. Any activities that would interfere with access to the exposure barrier area show Exhibit 2.
C. Any activities that would interfere with the groundwater treatment system identifi RAP.
D. Any activities that would interfere with contingency measures identified in the RA

5. Permanent Markers. The Owner shall not remove, cover, obscure, or otherwise alter interfere with the permanent markers placed at the approximate locations noted in Exhibit 2. The shall keep vegetation and other materials clear of the permanent markers to assure that the mar readily visible.

6. Contaminated Soil Management. Soils beneath the exposure barrier identified in Exh were, at the time of recording of this Restrictive Covenant, material that would constitute a "Haza Waste," as defined in Part 111, Hazardous Waste Management, of the NREPA, when generated Owner undertakes any excavation or otherwise disturbs those soils, the Owner shall, at that time whether the soils are a Hazardous Waste. If so, the Owner shall handle and dispose of the soils compliance with all relevant requirements of state and federal laws that govern Hazardous Waste including, but not limited to, Part 111 of the NREPA; and Subtitle C of the Resource Conservation Recovery Act, 42 U.S.C. Section 6901 et seq.; and the administrative rules promulgated thereunc soils are not Hazardous Waste at the time of excavation or disturbance, the Owner shall manage soils in accordance with the requirements of Section 20120c of the NREPA, the Part 201 Admini Rules promulgated thereunder, and all other relevant state and federal laws.

7. Access. The Owner shall grant to the MDEQ and its designated representatives the r enter the Property at reasonable times for the purpose of determining and monitoring compliance RAP, including the right to take samples, inspect the operation of the response activities and insp records relating thereto, and to perform any actions necessary to maintain compliance with Part 2 the RAP.

8. Conveyance of Property Interest. The Owner shall provide notice to the MDEQ of the intent to transfer any interest in the Property at least fourteen (14) business days prior to consum the conveyance. A conveyance of title, easement, or other interest in the Property shall not be consummated by the Owner without adequate and complete provision for compliance with the ter conditions of this Restrictive Covenant and the applicable provisions of Section 20116 of the NRE

notice required to be made to the MDEQ under this Paragraph shall be made to: Director, MDE P.O. Box 30473, Lansing, Michigan 48909-7973; and shall include a statement that the notice is made pursuant to the requirements of this Restrictive Covenant, MDEQ Reference Number RC-09-016. A copy of this Restrictive Covenant shall be provided to all future owners, heirs, successo lessees, easement holders, assigns, and transferees by the person transferring the interest.

9. Term and Enforcement of Restrictive Covenant. This Restrictive Covenant shall run Property and shall be binding on the Owner; future owners; and all current and future successor easement holders, their assigns, and their authorized agents, employees, or persons acting und direction and control. This Restrictive Covenant may only be modified or rescinded with the writt approval of the MDEQ.

The State of Michigan, through the MDEQ, and FHR, as Owner of the Property, may enf restrictions set forth in this Restrictive Covenant by legal action in a court of competent jurisdictic

10. Severability. If any provision of this Restrictive Covenant is held to be invalid by any competent jurisdiction, the invalidity of such provision shall not affect the validity of any other pro hereof, and all such other provisions shall continue unimpaired and in full force and effect.

11. Authority to Execute Restrictive Covenant. The undersigned person executing this I Covenant is the Owner, or has the express written permission of the Owner, and represents and that he or she is duly authorized and has been empowered to execute and deliver this Restrictive Covenant.

IN WITNESS WHEREOF, Flint Hills Resources, LP, as Owner of the Property, has caused Restrictive Covenant, RC-RRD-201-09-016, to be executed on this 18th day of January, 2010.

FLINT HILLS RESOURCES, LP
a Delaware limited partnership
By: FHR/GP, LLC, Its General Partner

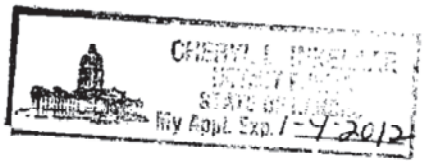
By: _____
Signature

Name: Phil Gearder
Print or Type Name

Its: VP Operations
Title

STATE OF Kansas
COUNTY OF Sedgwick

The foregoing instrument was acknowledged before me this 18th day of January, 2010, by Phil Gearder, VP-Oper. of FHR/GP, LLC, General Partner of Flint Hills Resources, LP limited partnership.



_____
Notary Public

Acting in Sedgwick County, Kansas

My Commission Expires: 1-4-2012

THIS DOCUMENT PREPARED BY
AND WHEN RECORDED RETURN TO: (Fed X) REI
H. Kirk Meadows
HONIGMAN MILLER SCHWARTZ AND COHN LLP
222 N. Washington Square
Suite 400
Lansing, Michigan 48933-1800
(517) 377-0739

53364
L-3834 P-
01/22/2010
Page: 5 of

EXHIBIT 1

LEGAL DESCRIPTION OF PROPERTY

5336
L-3834
Mark Fairchild, Muskegon Co ROD 044
01/22/20
Page: 7

LIBER 1336 PAGE 367

SAFECO TITLE INSURANCE

AFFIX REAL ESTATE TRANSFER TAX STAMP AFTER RECORDING

WARRANTY DEED - CORPORATION

KNOW ALL MEN BY THESE PRESENTS: That Muskegon Chemical Company

whose address is 1725 Warner Street, Whitehall, Michigan 49461

Convey(s) and Warrant(s) to Koch Refining Company

whose address is 4111 East 37th Street North, Wichita, Kansas 67220

the following described premises situated in the ____________ of ____________

County of Muskegon and State of Michigan, to-wit:

See Attachment "A"

RECORDERS ARCHIVE INFORMATION
IRREGULAR ORIGINAL

for the full consideration of Ten Dollars ($10.00) and other good and valuable consideration, receipt of which is acknowledged,

subject to

See Attachment "B"

Dated this 31 day of December 85,

Witnesses: Signed and Sealed:

John Snider, II Muskegon Chemical Company

William Whitlock By John R. Yost

Its PRESIDENT

STATE OF MICHIGAN

COUNTY OF MUSKEGON

Attest: David R. Nance

Its SECRETARY

The foregoing instrument was acknowledged before me this thirty first day of December 85 by John R. Yost and David R. Nance, President and Secretary, respectively of Muskegon Chemical Company ... corporation on behalf of the corporation.

My commission expires 3/29/88.

I. John Snider, II
Notary Public Muskegon County, Mich.

Prepared by Gary A. Gorman, Atty at Law Address P. O. Box 2256, Wichita, Kansas

LIBER 1336 PAGE 368

ATTACHMENT A

1. Legal Description:

That part of the West Half (W 1/2) of the Southwest Quarter (SW 1/4) of Section 34, Town 12 North, Range 17 West, City of Whitehall, described as follows and containing 19 acres, more or less: Commencing at the West Quarter corner of said Section, thence South along the West line of said Section 1082.00 feet for point of beginning, thence South 88°18' East parallel to the East and West Quarter line of said Section 1218.40 feet to a point which is 300.00 feet West of the East line of said West Half (W 1/2) of the Southwest Quarter (SW 1/4), thence South 0°09" East parallel to said East line of the West Half (W 1/2) of the Southwest Quarter (SW 1/4), 894.40 feet to the South line of the North Half (N 1/2) of the Southwest Quarter (SW 1/4) of said Southwest Quarter (SW 1/4), thence North 88°08' West along said South line of the North Half (N 1/2) of the Southwest Quarter (SW 1/4) of the Southwest Quarter (SW 1/4) 203.10 feet to the Northeasterly line of Chesapeake and Ohio Railway Company right of way, thence North 66°12' West along said Northeasterly line 930.10 feet, thence North 25°40' West along said Northeasterly line 383.93 feet to the West line of said Section, thence North along said West line 202.55 feet to point of beginning. The West 50.00 feet thereof to be used for road purposes.

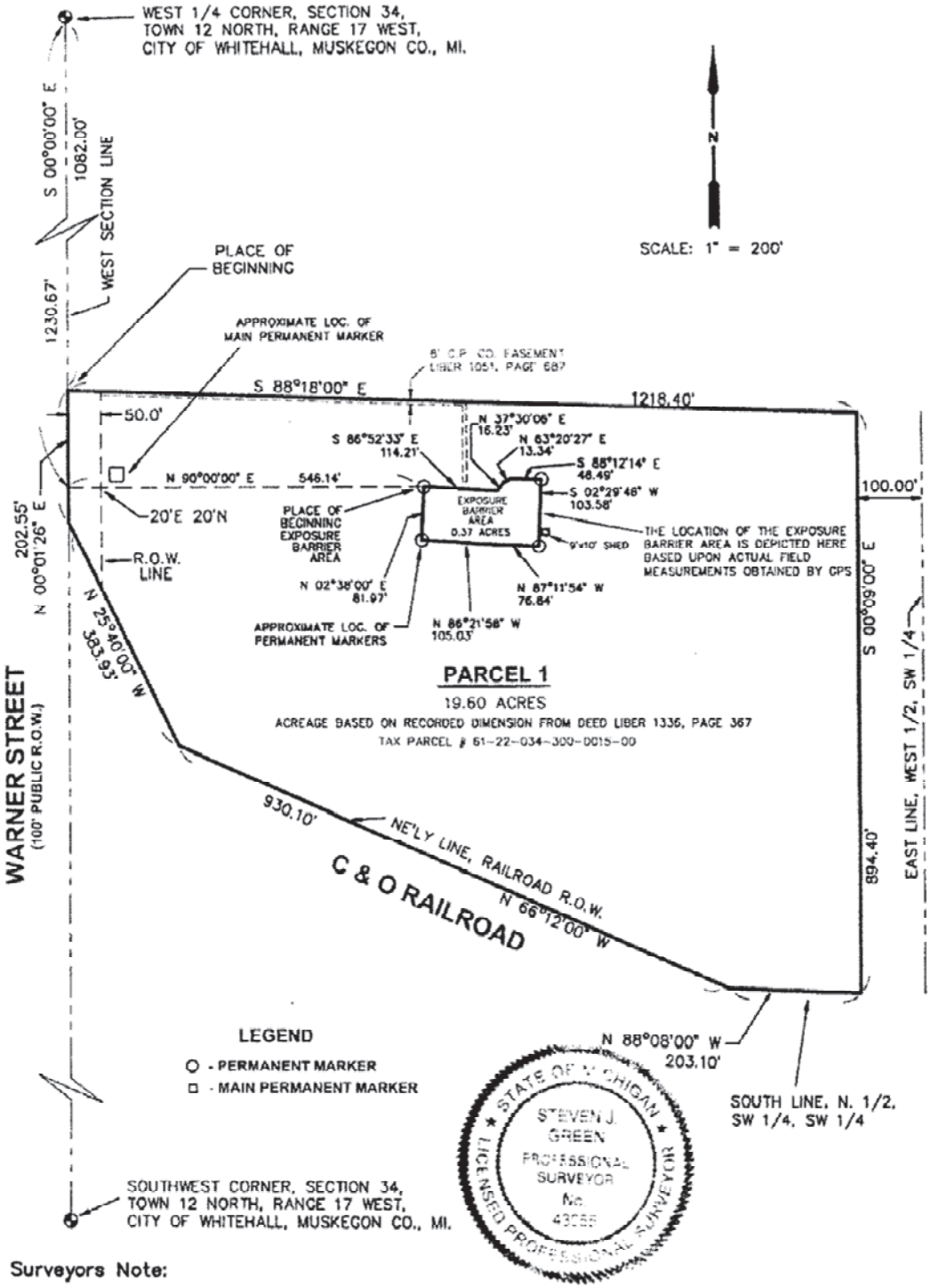
LIBER 1336 PAGE 368

7+4

EXHIBIT 2

LIMITS OF LAND OR RESOURCE USE RESTRICTIONS

PROPERTY DESCRIPTION MAP
SHEET 1 OF 2



SCALE: 1" = 200'

Surveyors Note:

I hereby certify that this Property Description Map was drafted from the description as recorded in Liber 1336, Page 367, of Muskegon County Records, for the Parcel 1 perimeter and actual field measurements obtained by GPS for the Exposure Barrier Area, and the bearings and distances depicted hereon accurately depict the same. The Surveyor did not perform field work, search for boundary irons or set irons, observe or locate any fences, buildings, or other improvements, or review an abstract of title and/or title policy, to determine title or possessory rights. The Exposure Barrier Area survey and description conforms to the requirements of P.A. 132, 1970 as amended.

Steven J. Green 5-06-09

Steven J. Green Professional Surveyor No. 43055

CREATING COMMUNITY
CELEBRATING FIFTY YEARS

Prepared By:
MOORE & BRUGGINK IN
Consulting Engineers
2020 Monroe Avenue N.W.
Grand Rapids, Michigan 49505-6298
Phone: (616) 363-9801 Web: www.mbce.com

M:\06302\2\dwg\06302_PLAN1 PARCEL.dwg, PROP DESC MAP WITH EASE, 5/6/2009 4:05:55 PM, JMR, ACAD 2007

PROPERTY DESCRIPTION

Parcel 1:

That part of the West one-half of the Southwest one-quarter of Section 34, Town 12 North, Range 17 West, City of Whitehall, Muskegon County, Michigan, described as follows: COMMENCING at the West one-quarter corner of said section; thence South along the West line of said section 1082.00 feet for the POINT OF BEGINNING; thence South 88°18' East parallel to the East and West one-quarter line of said section 1218.40 feet to a point which is 100.00 feet West of the East line of said West one-half of the Southwest one-quarter; thence South 00°09' East parallel to said East line of the West one-half of the Southwest one-quarter, 894.40 feet to the South line of the North one-half of the Southwest one-quarter of said Southwest one-quarter; thence North 88°08' West along said South line of the North one-half of the Southwest one-quarter of the Southwest one-quarter, 203.10 feet to the Northeasterly line of Chesapeake and Ohio Railway Company right of way; thence North 66°12' West along said Northeasterly line 930.10 feet; thence North 25°40' West along said Northeasterly line 383.93 feet to the West line of said section; thence North along said West line 202.55 feet to the point of beginning. The West 50.00 feet thereof to be used for road purposes.

Exposure Barrier Area

Part of the West one-half of the Southwest one-quarter of Section 34, Town 12 North, Range 17 West, City of Whitehall, Muskegon County, Michigan, described as: COMMENCING at the West one-quarter corner of said Section 34; thence South 00°00'00" East 1230.67 feet along the West line of said section; thence North 90°00'00" East 546.14 feet perpendicular to said West section line to the TRUE PLACE OF BEGINNING; thence South 86°52'33" East 114.21 feet; thence North 37°30'06" East 16.23 feet; thence North 63°20'27" East 13.34 feet; thence South 88°12'14" East 46.49 feet; thence South 02°29'46" West 103.58 feet; thence North 87°11'54" West 76.84 feet; thence North 86°21'58" West 105.03 feet; thence North 02°38'00" East 81.97 feet to the place of beginning.

16,216 squore feet

STATE OF MICHIGAN
STEVEN J. GREEN
PROFESSIONAL SURVEYOR
No. 49055
LICENSED PROFESSIONAL SURVEYOR

5-06-09

CREATING COMMUNITY

Prepared By:
Consulting Engineers
2020 Monroe Avenue N.W.
Grand Rapids, Michigan 49505-6298
Phone: (616) 363-9801 Web: www.mbce.com

M:\06307\2\dwg\06307-2 PLANT PARCEL.dwg, DESCRIPTION PAGE, 5/6/2009 4:53:48 PM, JMR, ACAD 2007

EXHIBIT 3

DESCRIPTION OF ALLOWABLE USES

The following uses are allowed on the Property:

1. Any activities authorized as part of the remedial action in the RAP.

2. Any industrial uses consistent with the City of Whitehall MC-1 District – Limited Indus Commercial zoning code designation, but only if such uses are made in accordance witl terms of this Restrictive Covenant. The living quarters of a watchman or caretaker shall located on the Property.

ARTICLE XVIII
MC-1 DISTRICT - LIMITED INDUSTRIAL COMMERCIAL

15-18-1 PURPOSE

This Ordinance provides opportunity to place selective commercial uses City's Industrial Districts. It is the purpose of the MC-1 District to provide controlled expansion of those opportunities to specific geographic loc Accordingly, certain personal, professional, and service operations hav added to the range of uses identified in the M1 District under the provisions MC-1 District. Creation of this unique district is considered desirable over expanding the range of uses permitted under other zone districts.

In pursuit of the above, the MC-1 District recognizes the advantag beneficial relationships that may accrue from the integration of commercial uses with industrial uses; offers a suitable location for commercial uses which may be inappropriate for placement in one of the core commercial areas; and, offers additional flexibility in the us development of land.

15-18-2 USES PERMITTED BY RIGHT

In an MC-1 Limited Industrial Commercial District, no building or land sl used and no building erected except for one or more of the following sp land uses, unless otherwise provided for in this Ordinance.

(A) Uses permitted by right in the M1 District.
(B) Printing and copy services.
(C) Office of a professional engineer, surveyor, geologist, architect, pl or similar professional.
(D) Offices of a manufacturer's and/or sales representative.
(E) Packaging, mailing, and delivery services.
(F) Retail and wholesale of office supplies, drafting equipment, con equipment, and similar supplies and equipment.

15-18-3 PERMITTED ACCESSORY USES

(A) Permitted accessory uses as provided for in the M1 District.

15-18-4 USES PERMITTED BY SPECIAL USE PERMIT

(A) Uses permitted by special use permit as provided for in the M1 Distri
(B) Fitness clubs and health spas.
(C) Sexually oriented businesses.

15-18-5 SITE DEVELOPMENT STANDARDS

All uses and structures shall comply with the SITE DEVELOP STANDARDS OF THE M1 District [Refer also to Section 15-20- additional site development standards for Sexually Oriented Businesses.]

ARTICLE XIII
M1 DISTRICT - LIMITED INDUSTRIAL

15-13-1 PURPOSE

The purpose of the M1 District is to encourage and facilitate the developn research, warehouse, and light industrial activities in a setting conducive to health, economic stability and growth, protection from blight, deteriorati nonindustrial encroachment, and efficient traffic movement, including employee and truck traffic. The above mentioned enterprises w characterized by the absence of objectionable external effects and the pote of attractive industrial architecture.

Regulations contained in this District are designed to promote the developn industrial areas and industrial or research parks which will be compatible wi another and with adjacent or surrounding districts. The regulations cor herein are intended to prohibit residential or commercial uses as incompatible with the primary permitted uses, as well as being adeq provided for in other districts.

15-13-2 USES PERMITTED BY RIGHT

In an M1 Limited Industrial District, no building or land shall be used a building erected except for one or more of the following specified uses, otherwise provided in this Ordinance.

(A) Non-manufacturing research and development establishment su laboratories; offices and facilities for research, both basic and ap conducted by or for any individual, organization, or concern; prod of prototyping products, limited to the scale necessary fo investigation of the merits of the product.

(B) The sale at wholesale or warehousing of automotive equipment; dry and apparel; groceries and related products; raw farm products livestock; electrical goods; hardware; plumbing; heating equipme supplies; machinery; tobacco and tobacco products; beer, win distilled alcoholic beverages; paper and paper products; furnitur home furnishings; any commodity the manufacture of which is per in this district; storage or transfer buildings; commercial laundr cleaning establishments; and frozen food lockers.

(C) Industrial establishments such as:

(1) The assembly, fabrication, compounding, packaging, manufa or treatment of such articles as food products, candy, cosmetics and toiletries, musical instruments, toys, nov electrical instruments and appliances, radios and phonog

pottery and figurines or other similar ceramic products usi previously pulverized clay.

(2) The assembly, fabrication, compounding, packaging, manuf or treatment of products from previously prepared materia as bone, canvas, cellophane, cloth, cork, felt, fibre, glass, l paper, plastic, precious or semiprecious metals or stones metal ferrous or nonferrous metals, shell textiles, wax, wire (excluding saw and planing mills), yarn and paint.

(3) Tool and die shops, metal working machine shops involvi use of grinding or cutting tools, such as manufacturing tool jigs and fixtures, publishing, printing, or forming of box, and cardboard products.

(D) Retail sales typically incidental to contractors establishments require a workshop and retail outlet or showroom as accessory use as:

(1) Plumbing and electrical contractors.
(2) Building and material suppliers and wholesalers such as l yards and other similar uses.
(3) Carpenter shops including door, sash, or trim manufacturing.
(4) Jobbing and repair machine shops.
(5) Commercial garage, bump shops, or automobile repair garag
(6) Plastic products forming and molding.
(7) Printing and publishing.
(8) Trade, training, technical, and industrial facilities.
(9) Air conditioning and heating dealers including incidental metal work.
(10) Furniture reupholstering and refinishing establishments.
(11) Sign painting establishments.
(12) Establishments producing and selling monuments, cut stone, and similar products.
(13) Other uses similar to and compatible with the above uses.

(E) Communication facilities with buildings, public utility buil telephone exchange buildings, electric transformer stations substations, gas regulator stations, communication and relay station outdoor storage.

(F) Credit Union which has as its primary purpose the providing of fin services to the employees and their families of an M1 or M2 I Industrial Business located in the City of Whitehall.

15-13-3 PERMITTED ACCESSORY USES

The following are permitted accessory uses.

(A) Any use customarily incidental to the permitted principal use.

(B) Living quarters of a watchman or caretaker employed on the premis

(C) Dispensaries and clinics on the premises of and clearly incidental business, trade, or industry.

(D) Restaurant or cafeteria facilities for employees.

(E) Signs subject to the regulations established in Article XXIII.

(F) Off street parking as required by Article XXII.

15-13-4 USES PERMITTED BY SPECIAL USE PERMIT

The following uses of land and structures may be permitted in this district application for and the issuance of a Special Use Permit as provided for in . XXIV.

(A) Planned research or industrial parks.

(B) Commercial television and radio towers and public utility microwa television transmitting towers and other attendant facilities.

(C) The exterior storage of semi-trucks, semi-trailers, mobile homes, ca buses, and recreational vehicles.

(D) Public buildings and services.

15-13-5 SITE DEVELOPMENT STANDARDS

The following standards shall apply to all uses and structures in the M1 Dist

(A) No structure or use shall be established on any parcel providing les 12,000 square feet of lot area.

(B) The minimum lot width shall be 100 feet.

(C) Yard and Setback requirements
(1) The required front yard setback shall not be less than 50 feet.
(2) The required side and rear yard setbacks shall not be less th feet except. In the case of a corner lot, the side yard shall less than the setback required for the front yard.
(3) No structure shall be located less than 50 feet from any resi boundary line.

(D) The maximum height shall be 30 feet as measured from the a finished grade at the front setback line, unless each required yard s is increased by one foot for every foot of height above 30 feet.

(E) Other requirements

(1) Unless specifically mentioned, all activities in this district s carried on in completely enclosed buildings.

(2) Storage of finished or unfinished materials, or any equipn machinery necessary to the operation, is permitted, but all areas shall be effectively screened by solid, uniformly fi wall or fence with solid entrance and exit gates. Said wall o shall in no case be lower than the enclosed storage.

(3) Landscaping shall be maintained in all required yar accordance with plans approved by the Planning Commissi part of site plan review.

(4) Lighting shall be accomplished in a manner that no illumi source is visible beyond the property lines of the lot upon the use is located, and such that no illumination shall ad affect the welfare of an adjacent property.

(5) Refuse containers shall be enclosed on all sides by an obs masonry wall or tight-board wooden fence of adequate he obscure such containers and any refuse materials from view. case shall such wall or fence be less than six feet in height.

(6) Air conditioning units, heating, oil storage, or similar str shall be screened as approved by the Planning Commission.

15-13-6 PERFORMANCE STANDARDS

It shall be unlawful to carry on or permit to be carried on any activity or op or use of any land, building, or equipment that produces irritants to the s perceptions greater than the measures herein established which are determined to be the maximum permissible hazards to humans or human a Such measures may be supplemented by other measures which are determined to be the maximum permissible hazards to humans or to activity.

(A) Noise - The intensity level of sounds shall not exceed the foll decibel levels when adjacent to the following types of uses as me from any common lot line:

In Decibels (dba)	Adjacent Use
55	Residential Dwellings
65	Commercial
70	Industrial and Other

The sound levels shall be measured with a type of audio output approved by the Bureau of Standards. Objectionable noises d intermittence, beat, frequency, or shrillness, shall be muffled so as become a nuisance to adjacent uses.

(B) Vibration - All machinery shall be so mounted and operated as to p transmission of ground vibration exceeding a displacement of .003 inch, as measured at the property line.

(C) Odor - The emission of noxious, odorous matter in such quantities a readily detectable at any point along lot lines when diluted in the a one volume of odorous air to four or more volumes of clean air c produce a public nuisance or hazard beyond lot lines is prohibited.

(D) Gases - The escape or emission of any gas which is injuri destructive or explosive shall be unlawful and may be summarily to be abated.

(E) Glare and Heat - Any operation producing intense glare or heat s performed within an enclosure so as to completely obscure and shiel operation from direct view from any point along the lot line, except the period of construction of the facilities to be used and occupied.

(F) Light - exterior lighting shall be so installed that the surface of the of light shall not be visible from any bedroom window, and shall arranged as far as practical to reflect light away from any residenti and in no case shall more than one foot candle power of light cros line 5 feet above the ground in a residential district.

(G) Electromagnetic Radiation - applicable rules and regulations Federal Communications Commission in regard to propagati electromagnetic radiation are hereby made a part of this Ordinance.

(H) Smoke - It shall be unlawful to discharge into the atmosphere fro single source of emission whatsoever any air contaminator for a pe periods aggregating more than 4 minutes in any one-half hour which

(1) As dark or darker in shade as that designated as Number 2 Ringelmann Chart. The Ringelmann Chart, as published United States Bureau of Mines, which is hereby made a part Ordinance, shall be the standard. However, the Umbr readings of smoke densities may be used when correlated w Ringelmann Chart. A Ringelmann Chart shall be on file office of the Building Inspector.

(2) Of such opacity as to obscure an observer=s view to a degree to or greater than the smoke described in (1) above, except the emission consists only of water vapor.

(I) Drifted and Blown Material - the drifting or airborne transmission t beyond the lot line of dust, particles, or debris from any open stoc shall be unlawful and may be summarily caused to be abated.

(J) Radioactive Material - radioactive materials shall not be emitted to quantities established as safe by the U. S. Bureau of Standa amended from time to time.

(K) Sewage Wastes - No industrial sewage wastes shall be discharg sewers that will cause chemical reaction, either directly or indirectl the materials of construction to impair the strength or durability of structures, cause mechanical action that will destroy or damage the structures, cause restriction of the hydraulic capacity of sewer stru cause placing of unusual demands on the sewage treatment equipn process, cause limitation of the effectiveness of the sewage tre process, cause danger to public health and safety, or cause obn conditions inimical to the public interest. Industrial sewage disc shall meet all applicable State and Federal requirements.

Restrictive Covenant - Mill Pond Creek Property

DECLARATION OF RESTRICTIVE COVENANT

MDEQ Reference No.: RC-RRD-2

This Declaration of Restrictive Covenant ("Restrictive Covenant") completely supersedes the De of Restrictions and Covenants recorded at liber 2078, page 597 (MDEQ Reference No. RC-ERD Muskegon County Register of Deeds, and liber 2078, page 600 (MDEQ Reference No. RC-ERD Muskegon County Register of Deeds, and has been recorded with the Muskegon County Regist Deeds for the purpose of protecting public health, safety, and welfare, and the environment by p or restricting activities that could result in unacceptable exposure to environmental contaminatio at the property located in the Township of Fruitland, County of Muskegon, and legally described 1 attached hereto ("Property"). The Property is associated with the Muskegon Chemical Compa Site ID No. 61000029, for which a remedial action plan is being conducted. The remedial action being implemented to address environmental contamination is fully described in the Remedial A for the Muskegon Chemical Company NPL Site ("RAP"), dated June 1997 and submitted by Koc Chemical Company. The Michigan Department of Environmental Quality ("MDEQ") approved th pursuant to Part 201, Environmental Remediation, of the Natural Resources and Environmental Act, 1994 PA 451, as amended ("NREPA"), MCL 324.20101 et seq. The RAP was then incorpo a Consent Decree that was entered by the United States District Court for the Western District o on November 25, 1997. The RAP and the Consent Decree were amended by order of that cour December 11, 2000. On January 6, 2010, the MDEQ approved the second amendment to the F submitted by Flint Hills Resources, LP ("FHR"), entitled "Remedial Action Plan Amendment, Mus Chemical Company NPL Site," dated May 8, 2009. Pursuant to the terms of the Consent Decre second RAP amendment was incorporated into and made an enforceable part of the Consent D upon its approval by the MDEQ. The RAP and RAP amendments are together hereinafter refer the "RAP."

The RAP required the recording of this Restrictive Covenant with the Muskegon County Registe to: 1) restrict unacceptable exposures to hazardous substances located on the Property; 2) ass the use of Property is consistent with the exposure assumptions utilized in the development of cl criteria pursuant to Section 20120a(1)(f) of Part 201 of the NREPA and the exposure control me relied upon in the RAP; and 3) to prevent damage or disturbance of any element of the response constructed on the Property. The restrictions contained in this Restrictive Covenant are based u information available to the MDEQ at the time the RAP was approved by the MDEQ. Failure of t response activities to achieve and maintain the criteria, exposure controls, and requirements sp the RAP; future changes in the environmental condition of the Property or changes in the cleanu developed under Section 20120a(1)(f) of Part 201 of the NREPA; the discovery of environmenta conditions at the Property that were not accounted for in the RAP; or use of the Property in a ma inconsistent with the restrictions described herein, may result in this Restrictive Covenant not be protective of public health, safety, and welfare, and the environment.

Exhibit 1 provides a survey of the Property. Exhibit 2 depicts the portion of the Property that is s the land use or resource use restrictions specified herein.

Summary of Response Activities

Hazardous substances, including 1,2 dichloroethane, bis (2-chloroethyl) ether (Chlorex), and trigl dichloride were discovered in groundwater on the Property. Prior to recording of this Restrictive C response activities have been undertaken to remove or treat in-place some of the contamination. However, hazardous substances remain present in groundwater at levels that require controls to unacceptable exposures.

Definitions

"MDEQ" means the Michigan Department of Environmental Quality, its successor entities, a persons or entities acting on its behalf.

"Owner" means at any given time the then current title holder of the Property or any portion there

All other terms used in this document which are defined in Part 3, Definitions, of the NREPA; Par the NREPA; or the Part 201 Administrative Rules ("Part 201 Rules"), 1990 AACS R 299.5101 et s have the same meaning in this document as in Parts 3 and 201 of the NREPA and the Part 201 F of the date of filing of this Restrictive Covenant.

NOW THEREFORE,

Declaration of Land Use or Resource Use Restrictions

Pursuant to the Consent Decree, FHR, as Owner of the Property at the time this Restrictive Cove recorded, hereby declares and covenants that the Property shall be subject to the following restri and conditions:

1. The Owner shall prohibit activities within the area of the Property located north of the of Mill Pond Creek, as depicted in Exhibit 2 ("Restricted Area"), that may result in exposures to ha substances in groundwater above levels established in the RAP. The following activities are proh the Restricted Area:

   A. Any construction of wells or other devices to extract groundwater for consumptio irrigation, or any other use, except for wells and devices that are part of an MDEQ-approved response activity.
   B. Any use of existing wells or other devices to extract groundwater for consumptio irrigation, or any other use, except as authorized as part of an MDEQ-approved r activity.

2. The Owner shall prohibit activities in the Restricted Area that may interfere with any e of the RAP, including the performance of operation and maintenance activities, monitoring, or oth measures necessary to ensure the effectiveness and integrity of the remedial action in the RAP. prohibited activities include:

   A. Any activities that would interfere with access to the monitoring wells identified in RAP.
   B. Any activities that would interfere with contingency measures identified in the RA

3. Access. The Owner shall grant to the MDEQ and its designated representatives the r enter the Restricted Area at reasonable times for the purpose of determining and monitoring com with the RAP, including the right to take samples, inspect the operation of the response activities inspect any records relating thereto, and to perform any actions necessary to maintain compliance Part 201 and the RAP.

4. Conveyance of Property Interest. The Owner shall provide notice to the MDEQ of the intent to transfer any interest in the Property at least fourteen (14) business days prior to consum the conveyance. A conveyance of title, easement, or other interest in the Property shall not be consummated by the Owner without adequate and complete provision for compliance with the te conditions of this Restrictive Covenant and the applicable provisions of Section 20116 of the NRI notice required to be made to the MDEQ under this Paragraph shall be made to: Director, MDE(P.O. Box 30473, Lansing, Michigan 48909-7973; and shall include a statement that the notice is made pursuant to the requirements of this Restrictive Covenant, MDEQ Reference Number RC-I 09-017. A copy of this Restrictive Covenant shall be provided to all future owners, heirs, successor lessees, easement holders, assigns, and transferees by the person transferring the interest.

5. Term and Enforcement of Restrictive Covenant. This Restrictive Covenant shall run Property and shall be binding on the Owner; future owners; and all current and future successors easement holders, their assigns, and their authorized agents, employees, or persons acting unde direction and control. This Restrictive Covenant may only be modified or rescinded with the writt approval of the MDEQ.

The State of Michigan, through the MDEQ, and FHR, as Owner of the Property, may enf restrictions set forth in this Restrictive Covenant by legal action in a court of competent jurisdictic

6. Severability. If any provision of this Restrictive Covenant is held to be invalid by any c competent jurisdiction, the invalidity of such provision shall not affect the validity of any other pro hereof, and all such other provisions shall continue unimpaired and in full force and effect.

7. Authority to Execute Restrictive Covenant. The undersigned person executing this R Covenant is the Owner, or has the express written permission of the Owner, and represents and that he or she is duly authorized and has been empowered to execute and deliver this Restrictive Covenant.

IN WITNESS WHEREOF, Flint Hills Resources, LP, as Owner of the Property, has caused Restrictive Covenant, RC-RRD-201-09-017, to be executed on this 18th day of January, 2010.

FLINT HILLS RESOURCES, LP
a Delaware limited partnership
By: FHR/GP, LLC, its General Partner

By: ______________________
Signature

Name: Phil Gaarder
Print or Type Name

Its: VP Operations
Title

STATE OF Kansas
COUNTY OF Sedgwick

The foregoing instrument was acknowledged before me this 18th day of January, 2010, by Phil Gaarder, VP-Oper. of FHR/GP, LLC, General Partner of Flint Hills Resources, LP, limited partnership.

____
Notary Public

NOTARY PUBLIC
STATE OF KANSAS
My Appt. Exp. 1-4-2012

____
Acting in Sedgwick County, Kansas

My Commission Expires: 1-4-2012

THIS DOCUMENT PREPARED BY
AND WHEN RECORDED RETURN TO: REI Folx

H. Kirk Meadows
HONIGMAN MILLER SCHWARTZ AND COHN LLP
222 N. Washington Square
Suite 400
Lansing, Michigan 48933-1800
(517) 377-0739

EXHIBIT 1

LEGAL DESCRIPTION AND SURVEY OF PROPERTY

PROPERTY DESCRIPTION MAP

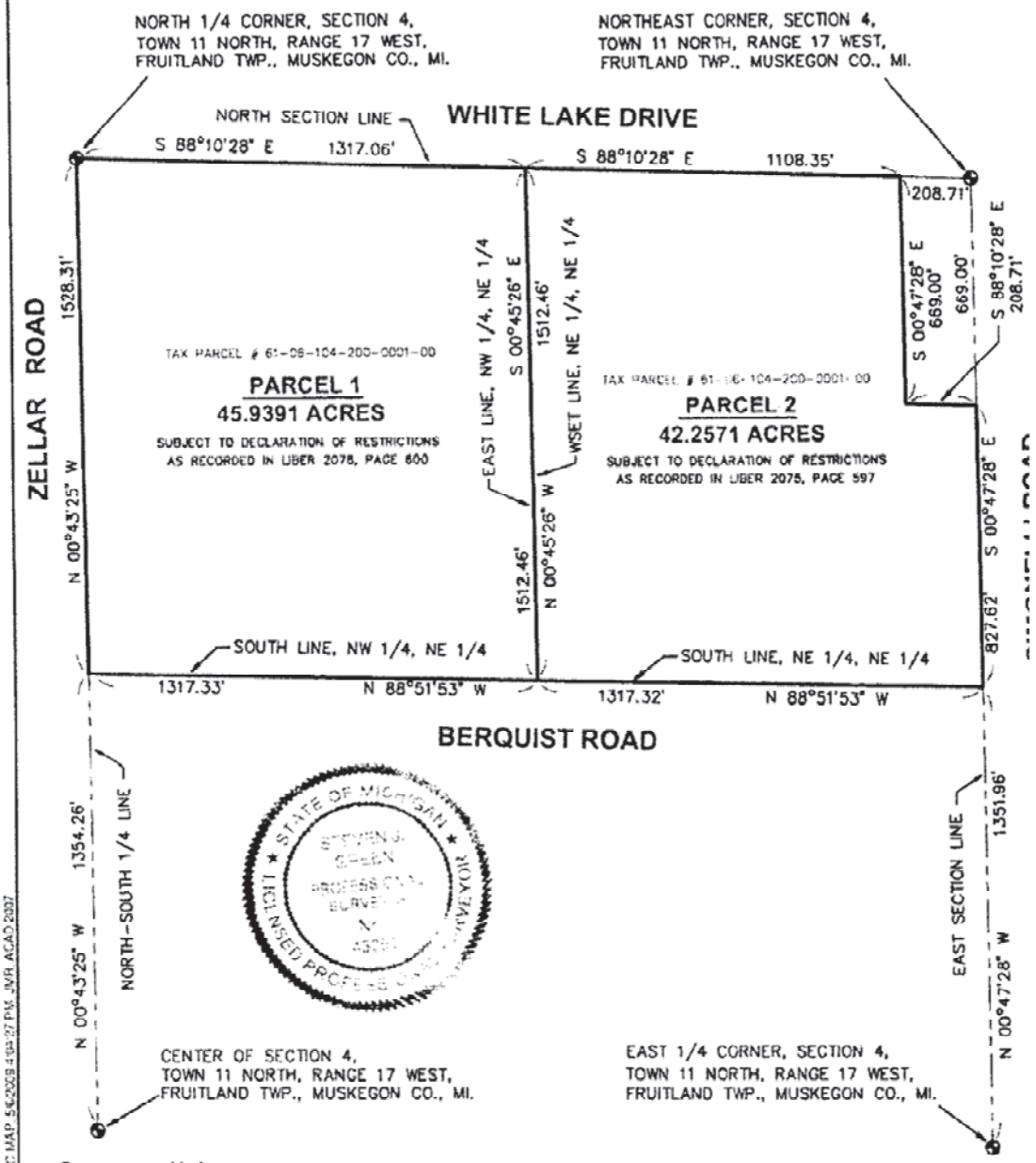
PROPERTY DESCRIPTION

Parcel 1:

The Northwest fractional one-quarter of the Northeast fractional one-quarter of Section 4, Town 11 North, Range 17 West, Township of Fruitland, Muskegon County, Michigan.

Parcel 2:

The Northeast one-quarter of the Northeast fractional one-quarter of Section 4, Town 11 North, Range 17 West, Township of Fruitland, Muskegon County, Michigan, EXCEPT the East 208.71 feet of the North 669 feet of the Northeast one-quarter of the Northeast fractional one-quarter of said Section 4.



Surveyors Note:

I hereby certify that this Property Description Map was drafted from the description as recorded in Liber 1572, Page 27, of Muskegon County Records, for the perimeter of Parcel 1, and Liber 1698, Page 479, of Muskegon County Records, for the perimeter of Parcel 2 and the bearings and distances depicted hereon accurately illustrate the same. The Surveyor did not perform field work, search for boundary irons or set irons, observe or locate any fences, buildings or other improvements, or review an abstract of title and/or title policy, to determine title or possessory rights.

5-06-09

Steven J. Green Professional Surveyor No. 43055

CREATING COMMUNITY CELEBRATING FIFTY YEARS

Prepared By:
MOORE & BRUGGINK INC
Consulting Engineers
2020 Monroe Avenue N.W.
Grand Rapids, Michigan 49505-6298
Phone: (616) 363-9801 Web: www.mbce.com

M:\063072.dwg\063072 MILL POND.dwg PROP DESC MAP 5/6/2009 4:04:27 PM JVH ACAD 2007

AFFIX REAL ESTATE TRANSFER TAX STAMP AFTER RECORDING

LIBER 1572 PAGE 27

STATE OF MICHIGAN
COUNTY OF MUSKEGON

WARRANTY DEED

TITLE OFFICE

STATUTORY FORM—1967

Dated this day of:

MAY 30, 1991

This Indenture,

KNOW ALL MEN BY THESE PRESENTS THAT:

HERBERT D. LONGNORTH AND HAI P. LONGNORTH, HUSBAND AND WIFE
86 STON STREET
HALTHAM, MA 02154

Convey(s) and Warrant(s) To:

KOCH CHEMICAL COMPANY, A DIVISION OF KOCH REFINING COMPANY, A DELAWARE CORPOR
4111 EAST 37TH STREET NORTH
WICHITA, KS 67201

for the sum of

SEE REAL ESTATE TRANSFER VALUATION AFFIDAVIT ATTACHED

the following described premises situated in

THE TOWNSHIP OF FRUITLAND, COUNTY OF MUSKEGON AND STATE OF MICHIGAN TO WIT:

THE NORTHWEST FRACTIONAL 1/4 OF THE NORTHEAST FRACTIONAL 1/4 OF SECTION 4, T
NORTH, RANGE 17 WEST.

P.P. 061/06-004-004-00(FL-49)

SUBJECT TO EASEMENTS, RESERVATIONS AND RESTRICTIONS OF RECORD, IF ANY.

TITLE OFFICE

RECORDERS
ARCHIVE INFORMATION
IRREGULAR ORIGINAL

5336432
L-3834 P-959
01/22/2010 01:32P
Mark Fairchild, Muskegon Co ROD 044 Page: 7 of 10

Witnesses:

Signed and Sealed

HERBERT D. LONGNORTH

HAI P. LONGNORTH

STATE OF MICHIGAN COUNTY OF
MASSACHUSETTS

The foregoing instrument was acknowledged before me

ON MAY 30, 1991 BY HERBERT D. LONGNORTH
AND HAI P. LONGNORTH, HUSBAND AND WIFE

Notary Public

COLLEEN A. DEE
NOTARY PUBLIC, MASS.
MY COMMISSION EXPIRES

Muskegon, Mich. 6-19 19 91

"I hereby certify that there are no tax liens or tax titles held by the state or any individual against the within description, and all taxes on same are paid for five years previous to the date of this [illegible]"

5336432
L-3834 P-959
01/22/2010 01:32P
Page: 8 of 10
Mark Fairchild, Muskegon Co ROD 044

Title Officer: Order:

LIBER 1698 PAGE 479

Rev 107.80

WARRANTY DEED

The Grantors, HOWARD W. BRANDT and wife, RUTH A. BRANDT, whose address is 1500 N.E. 103 Street, Miami Shores, Florida, 33138, convey and *warrant to KOCH CHEMICAL COMPANY, a division of Koch Refining Company, a Delaware corporation, whose address is P.O. Box 2256 Wichita, Kansas, 67201, the following-described premises situated in the Township of Fruitland, County of Muskegon, and State of Michigan:

The Northeast quarter of the Northeast fractional quarter of Section 4, Town 11 North, Range 17 West, except the East 208.71 feet of the North 669 feet of the Northeast quarter of the Northeast fractional quarter of said Section 4.

for the sum of NINETY-EIGHT THOUSAND DOLLARS ($98,000.00) and other valuable consideration subject to easements and building and use restrictions of record.

*Grantors make no warranties, either express or implied, regarding the condition of the property herein conveyed; subject property is granted and conveyed "as is".

Dated this 22nd day of May, 1993.

RECORDERS ARCHIVE INFORMATION IRREGULAR ORIGINAL

Signed in the presence of:

Kenneth R. Lampe — Howard W. Brandt

Rebecca I. DeYoung

Daniel W. Brandt — Ruth A. Brandt

Francis J. Jimenez

STATE OF MICHIGAN
COUNTY OF MUSKEGON
RECEIVED FOR RECORD
1993 JUN 10 AM 10:07
Carrie Carter
REGISTER OF DEEDS

STATE OF MICHIGAN)
) ss
COUNTY OF OTTAWA)

The foregoing instrument was acknowledged before me this 17th day of May, 1993 by Howard W. Brandt.

Muskegon, Mich. June 09 1993
"I hereby certify that there are no tax liens or titles held by the state or any individual against the within description, and all taxes on same are paid for five years previous to the date of this instrument, as appears by the records in my office."
No. 63035

Rebecca I. DeYoung
Notary Public, Ottawa County, Michigan
My Commission Expires: 12-02-96

STATE OF MICHIGAN REAL ESTATE TRANSFER TAX
Dept. of Treasury 107.80

STATE OF FLORIDA)
) ss
COUNTY OF Dade)

The foregoing instrument was acknowledged before me this 22 day of May, 1993 by Ruth A. Brandt.

Mary A. Gault
Notary Public, Dade County, Florida
My Commission Expires:

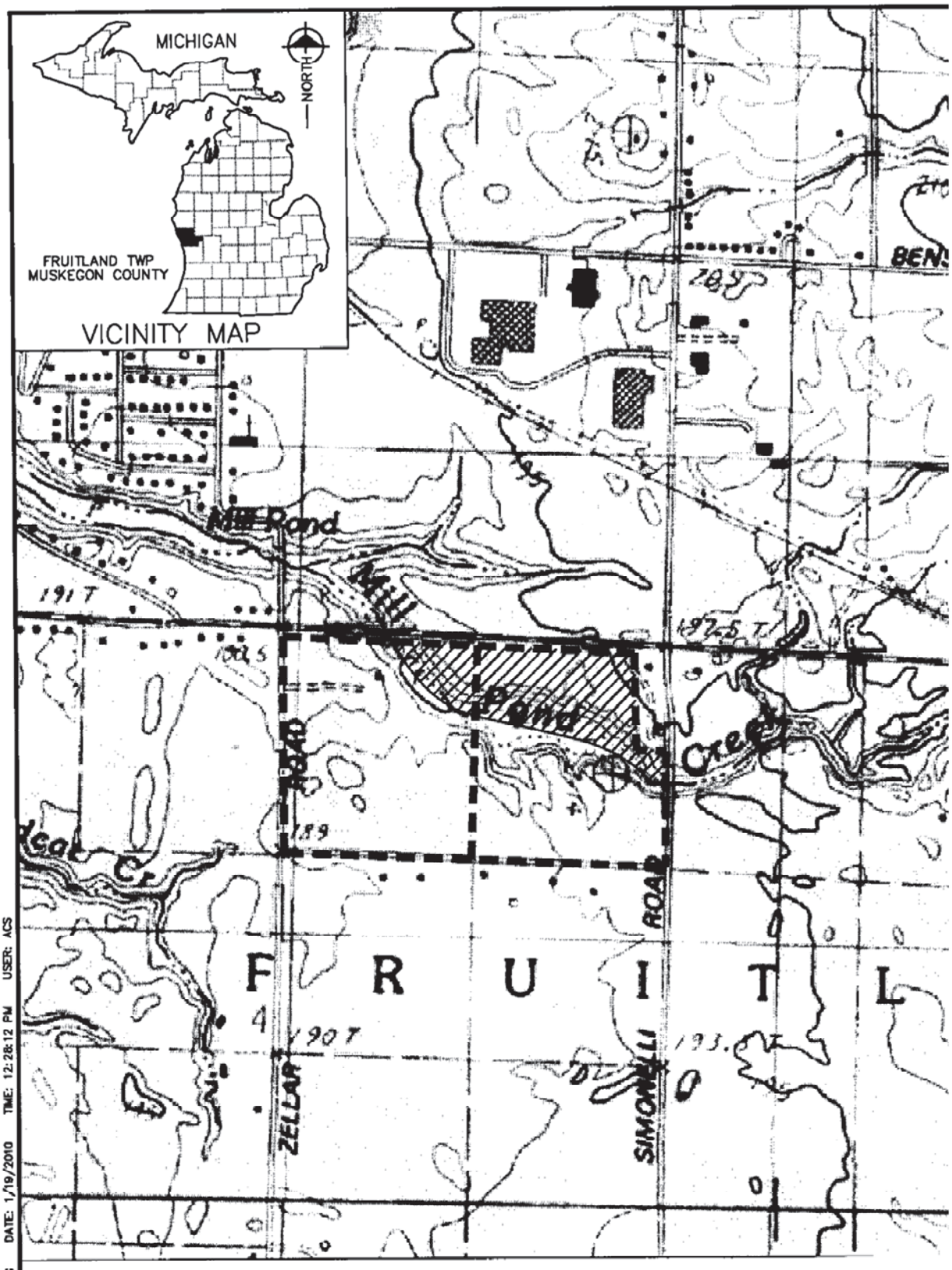
OFFICIAL NOTARY SEAL
MARY A GAULT
NOTARY PUBLIC STATE OF FLORIDA
COMMISSION NO. CC
MY COMMISSION EXP. MAY 24,1994

PREPARED BY:
Kenneth R. Lampe
Attorney at Law
509 Franklin Avenue
Grand Haven, MI 49417

06/104 200 0002 00

EXHIBIT 2

RESTRICTED AREA



LEGEND

RESTRICTED AREA

PROPERTY BOUNDARY

CENTERLINE OF MILL POND CREEK

Scale: 1" = 1000'

0 500 1000

REFERENCE:
DALTON, MONTAGUE, MICHILLINDA AND FLOWER CREEK
QUADRANGLES 7.5 MINUTE SERIES
DATED: 1983

Terrain Navigator Pro v. 8.0, (c)2006, Maptech Inc.

Mark Fairchild, Muskegon Co ROD

PROPERTY WIT
RESTRICTIVE COVENAN

PLOT INFO: N:\056050\CD\Z0C0505605Q.DWG DATE: 1/19/2010 TIME: 12:28:12 PM USER: ACS

N:\056050\RASTER\TOPOS_STATEPLANNAD83\DALTON056050\RASTER\TOPOS_STATEPLANNAD83\MONTAGUE.TIF
N:\056050\RASTER\TOPOS_STATEPLANNAD83\FLOWER CREEK.TIF

Muskegon County Sanitary Regulations

SANITARY REGULATIONS

MUSKEGON COUNTY

Enforcing Agency:
Muskegon County Health Department Environmental Health Division
209 E. Apple Ave., Suite C173
Muskegon, MI 49442
(231) 724-6208

Effective April 26, 2005 As Amended
Effective October 14, 1984 As Amended
April 26, 1994 (Chapter III, Board Resolution, HR-94/04-49)
September 14, 1999 (Chapter III, Board Resolution, HR-99/09-61)

TABLE OF CONTENTS

MUSKEGON COUNTY SANITATION REGULATIONS

CHAPTER I
PURPOSE, ADMINISTRATION. AND GENERAL DEFINITIONS

Section A Purpose

The broad objective of these regulations is to provide a means for safeguarding the environment necessary for the health and welfare of the consumer and all residents of Muskegon County.

Section B Authority, Jurisdiction, and Administration

Authority - By virtue of the power vested in the Board of Health of Muskegon County under the authority of Act 368 of the Public Acts of 1978, as amended, there are hereby provided regulations affecting the public health, safety, and welfare relating to sewage disposal and garbage disposal within the County of Muskegon, State of Michigan, and to provide penalties for the violations of such regulations.

Jurisdiction- The Muskegon County Health Department shall have jurisdiction throughout Muskegon County, including all cities, villages and townships, in the administration and enforcement of the regulations, including all amendments hereafter adopted unless otherwise specifically stated.

Nothing herein contained shall be construed to restrict or abrogate the authority of any municipality in Muskegon County to adopt more restrictive ordinances, or to enforce existing ordinances relating to these regulations, control or issuance of licenses, or the renewal or revocation thereof, or to charge and collect a fee therefore, provided that whenever inspection relating to health or sanitation is required, no such municipality shall issue or renew such license without first having obtained a written statement from the Muskegon County Health Department indicating compliance with the requirements of these regulations.

Enforcement - All premises affected by the requirements of these regulations shall be subject to inspection by the health officer, and the health officer may collect such samples for laboratory examination as he deems necessary for the enforcement of these regulations.

Right of Entry and Inspection- No persons shall refuse to permit the health officer to inspect any promises nor shall any person molest or resist the health officer in the discharge of his duty, and the protection of the public health. In the event entry is refused, the department shall be authorized to procure a search warrant pursuant to Sections 2241 through 2246 of the State Health Code.

Fees - All fees collected by the Health Officer shall be receipted for and be deposited with the Treasurer of Muskegon County to the credit of the Muskegon County Health Department.

Penalty - Criminal - Any person who shall fail to comply with any provision herein shall be deemed guilty of a misdemeanor and, on conviction hereof, shall be punished by a fine of not more than One Hundred ($100.00) Dollars or by imprisonment in the County Jail of not more than ninety (90) days or both such fine and imprisonment in the discretion of the Court. Each twenty-four hours that said owner shall knowingly permit said violation of these regulations shall be deemed an additional offense.

Interference with Notices - No person shall remove, mutilate, or conceal any notice or placard posted by the health officer except by permission of the Health Officer.

Validity - If any section, subsection, clause, or phrase of these regulations is, for any reason, adjudged unconstitutional or invalid, it is hereby provided that the remaining portions of these regulations shall not be affected thereby.

Other Laws and Regulations -These regulations are supplemental to the rules and regulations duly enacted by the Michigan Department of Environmental Quality and to laws of the State of Michigan relating to public health which shall supersede all local ordinances heretofore enacted inconsistent therewith and these regulations.

Notification -Notification of the adoption of all regulations promulgated by the Board of Heafth, under authority of Act 368 of the PA of 1978, as amended, and approved by the Board of Commissioners of Muskegon County shall be published in a newspaper circulated in the County within 30 days after such action, indicating where copies of such regulations can be obtained.

Effective Date - These regulations or amendments thereto shall become effective on the 30th day after the date of publication.

Section C General Definitions

Words and Terms

When consistent with the context, words used in the present tense include the future, words used in the singular number include the plural and words in the plural include the singular number. The word 'shall' is always mandatory and not merely directional. Words and terms not defined herein shall be interpreted in the manner of their common usage.

The following words and terms used in these regulations, unless otherwise expressly stated, shall have the following meaning:

“Board of Health” shall mean the Board of Health of Muskegon County comprised of its Health Committee.

“Health Department’ shall mean the Muskegon County Health Department

“Health Officer" shall mean the Director or the Acting Director of the Muskegon County Health Department and/or his authorized representative

“Municipality” shall mean any incorporated city, village or township within the County of Muskegon.

“Habitable Building” shall mean any structure where persons reside, are employed, or congregate.

“Premise” shall mean any tract of land containing a habitable building.

“Person” shall mean an individual, or a firm, partnership, company, corporation, trustee, association, or any public or private entity.

“Dwelling” shall mean any house, building, structure, tent, shelter, trailer, or vehicle, or portion hereof, which is occupied in whole or in part as a home residence, living or sleeping place of one or more human beings, either permanently or transiently.

CHAPTER II
SEWAGE DISPOSAL

Scope: These regulations relate to sewage disposal systems and apply to all lots and premises used for residential purposes.

Section A General Definitions

Words and Terms

The following words and terms used in this chapter, unless otherwise expressly stated, shall have the following meaning:

"Sewage" shall mean the liquid wastes from all habitable buildings, and shall include human excreta and wastes from sink, lavatory, bathtub, shower, laundry, and any other water-carried wastes of organic or inorganic nature excluding roof, footing and storm drainage, either singly or in any combination thereof. Clear water waste from water-cooled machinery and brine wastes from water softeners shall also be excluded.

"Block trench absorption system" shall mean an underground enclosure connected to the outlet of a septic tank constructed of concrete block, brick, or precast concrete units laid within open joists so as to allow the septic tank effluent or overflow to be absorbed directly into the surrounding soil. Covers shall be reinforced and easily removable or provided with portholes for cleaning and inspection purposes.

"Sewers hall mean a conduit pipe for carry off sewage.

"Absorption field" shall mean a system for distributing septic tank overflow or effluent below the ground surface by means of a series of branch lines of drain tile laid with open joints or other approved pipe so as to allow the overflow or effluent to be absorbed by the surrounding soil.

"Sewage disposal system" shall mean the method of disposing of sewage by means of a sewer line connected to a septic tank and one or more of the following: block trench, seepage bed, tile field or any other similar device or devices approved by the Health Officer.

"Septic tank" shall mean a watertight tank or receptacle of sufficient size used for the purpose of receiving wastes from flush toilets, sinks, lavatories, bathtubs, showers, laundry drains, basement floor drains, or other similar waste lines, and intended to provide for the separation of substantial portions of the suspended solids in such wastes and for the partial destruction by bacterial action of the solids so separated.

"Flush toilet" shall mean a type of closet or plumbing receptacle containing a portion of water which receives human excreta and so designed as by means of a flush of water to discharge the contents of the receptacle to an outlet connection.

"Other toilet devices" shall mean privies, septic toilets, composting toilets, chemical toilets, and other such devices used for the disposal of human excreta.

“Dosing tank” is a watertight tank or receptacle used for the purpose of retaining the overflow or effluent from a septic tank, pending its automatic discharge to a selected point.

“Automatic siphon” is a mechanical device which will automatically cause a liquid entering a receptacle to be retained until a predetermined high-water level has been attained after which it is automatically released from the receptacle until a second predetermined level has been reached, at which time the flow from such receptacle ceases until the high-water level has again been attained.

“Mean seasonal high water” shall mean the average of the seasonal high groundwater levels over a period of the ten years last past.

“Percolation test” is measuring the rate by which water drops in a presaturated test hole. The rate expresses the soil’s ability to transmit water in all directions simultaneously and is usually expressed in inches per hour.

“Public sanitary sewer system” means a sanitary sewer or a combined sanitary and storm sewer used or intended for use by the public for the collection and transportation of sanitary sewage for treatment or disposal and owned or operated by a governmental agency or a private corporation, association, partnership or individual.

“Permit shall mean a document issued by the Muskegon County Health Department authorizing the construction and operation of a sewage disposal system for an individual structure or group of structures according to plans and specifications as approved by the Health Department.

“Fill sand” shall mean clean sand free of clay, silt, black dirt, and vegetation.

“Structure in which sanitary sewage originates” means a building in which toilet, kitchen, laundry, bathing or other facilities which generate water-carried sanitary sewage, are used or are available for use for household, commercial, industrial or other purposes.

“Available sanitary sewer” shall mean a public sanitary sewer system located in a right-of-way, easement, highway, street or public way which crosses, adjoins or abuts upon the property and passing not more than 200 feet at the nearest point from a structure in which sanitary sewage originates.

“Health Officer” means the Public Health Officer of Muskegon County Health Department or any other employee of the Department designated or authorized by the Public Health Officer to perform services or functions pursuant to the provisions of these regulations.

Section B Approved Type Sewage Disposal System on All Premises

Disposal Facilities Required Prior to Occupancy

It shall be unlawful for any person to occupy, or permit to be occupied, any premise which is not equipped with adequate facilities for the disposal in premise which is not equipped with adequate facilities for the disposal in a sanitary manner of human excreta and sewage. Such facilities shall be constructed in accordance with the provisions of these regulations. All privies and other toilet devices shall be constructed and maintained in accordance with the regulations adopted by the State Council of Health, June 6, 1940, as last revised on July 20, 1946, entitled "A Regulation Pertaining to the Construction and Maintenance of Outhouses and to Safeguard the Public Health by Preventing the Spread of Disease and the Existence of Sources of Contamination" in accordance with Act No. 273, Public Acts of 1939.

No Liquid Wastes to Ground Surfaces

Under no condition may the sewage from any existing or hereafter constructed premise, facility, travel trailer, camper, motor travel home or any waterborne craft be deposited upon the surface of the ground, into roadside ditches, water courses, ponds, lakes, or streams or into any closed drain other than a sanitary sewer.

Section C Privies Prohibited Where a Municipal Sewerage System is Provided

No privy shall hereafter be constructed on, or moved to, any premise where the service of a publicly operated sewerage system is available, or if not available at the time of construction, then within 18 months after the same becomes available. Such systems shall be deemed available whenever a public sewer is located in a right-of-way, easement, street, highway or public right-of-way which crosses, adjoins or abuts upon the property and passes not more than 200 feet from a structure in which sanitary sewage originates, provided that the owner and operator of said public sewer will permit such connection. All privies on premises connected to the publicly operated sewerage system shall be abandoned in such a manner as to prevent any nuisance or menace to public health.

Section D Connection Required to a Municipal Sewerage System

All flush toilets, lavatories, bathtubs, showers, and laundry drains hereafter constructed on a premise shall be connected with a publicly operated sewerage system when such system is available. Such systems shall be deemed available whenever a public sewer is located in a right-of-way, easement, street, highway or public right-of-way which crosses, adjoins or abuts upon the property and passes not more than 200 feet at the nearest point from a structure in which sanitary sewage originates, provided that the owner and operator of said public sewer will permit such connection. In the absence of an available public sewerage system, connection shall be made to a sewage disposal system constructed in accordance with the provisions of these regulations. Footing drainage, roof water, and any other waste water not defined as sewage shall not be connected to or discharged into the septic tank system, the absorption field, or into a publicly operated sewage system. When any existing sewage disposal facility, serving any premise where a b=publicly operated sewerage system is available as above set forth, is found in violation or any provision of these regulations, or of any other applicable health law, ordinance, or regulation, the owner shall correct the violation by proper connection to said publicly operated sewerage system. Such connection shall be made within a time limitation, as specified herein. The Health Officer shall send a written notice to the property owner pursuant to the State Health code.

Within a period of 18 months after a public sanitary sewerage system becomes available as above set forth, all premises shall connect to the public sanitary sewer system.

Section E Separate Systems

Unless specifically approved by the Health Officer, each on-site disposal system shall serve only one and two-family dwellings.

Section F Public or Private Drain

Whenever the Health Officer shall determine that improperly treated sewage is flowing or emanating from the outlet of any public or private drain, he shall notify in writing persons owning, leasing, or residing in such premises from which such sewage originates, to connect such sewage flow to publicly operated sewage systems, if available, or in the absence thereof, to comply with the provisions of this Ordinance.

The notice to the owner, lessees, or residents of such properties shall inform said persons of such unlawful discharge of improperly treated sewage into such drain and shall specify the maximum period of time within which such unlawful discharge shall be terminated, which shall not be less than 30 days, except where there is an immediate hazard to public health, safety and welfare by the continued improper drainage.

If, after the expiration of the minimum period of time specified in the notice, such

unlawful discharge continues, the Health Officer may plug or cause to be plugged, the outlet or outlets to the drain through which the sewage is being conveyed. In instances where the sewage disposal system of the premises is incapable of satisfactory operation without such discharge of improperly treated sewage to the public drain, or, where the Health Officer is unable to plug the flow of sewage, the Health Officer shall institute all necessary and proper legal remedies to abate the nuisance and threat to public health, safety and welfare, which shall include restraining orders, temporary and permanent injunctions and summary proceedings to vacate the premises until such time as the sources of pollution have been eliminated.

Section G Type and Location of Private Sewer Lines

Any buried sewer or pipe used to conduct untreated sewage from a dwelling or habitable building shall be constructed of service weight or heavier cast iron soil pipe with leaded and caulked joints tested for water tightness, or PVC Schedule 40 pipe or other acceptable material approved by the Health Officer. No buried sewer line shall be located less than ten (10) feet from a water suction line, well casing, spring structure, or other drinking water source. Where such pipes or sewers are located inside or beneath a habitable building, or within five (5) feet outside the inner face of such building, they shall be constructed of such materials as specified in this section.

Section H Condemnation of Existing Installations

The Health Officer may condemn any existing sewage disposal system where the effluent therefrom is exposed to the surface of the ground or permitted to drain onto the surface of the ground or into any lake, river, storm sewer, or stream, or where the seepage of effluent therefrom may endanger a public or private water supply or where a public nuisance is created by any such system improperly constructed or maintained. An individual sewage disposal system so condemned shall be repaired, rebuilt, or replaced by a system constructed according to the provisions of these regulations within a period of time specified by the Health Officer. This becomes the responsibility of the owner of record for such repairs so ordered.

Section I Permit for Sewage Disposal System

From and after the effective date of these regulations, it shall be unlawful for any person to construct, repair, or extend any sewage disposal system within Muskegon County unless he has a permit issued by the Health Officer. Failure to construct according to specifications herein shall be deemed a violation of these regulations for which the installer of the system may be held liable.

Section J Application and fees for a Sewage Disposal Permit

Permit Required

A permit to construct a sewage disposal system shall be in writing and shall be signed by the applicant.

Information Required on Application

The person making application for a permit (thereinafter called the applicant) shall, on forms to be provided by the Health Officer of the Muskegon County Health Department, provide the following information:

Legal description and/or address of property where sewage disposal system is to be installed.

a. The name and address of the owner and applicant.
b. Date.
c. Proposed use of the lot if other than for a single family residence shall be indicated.
d. The water table level on the date of the application and the elevation of the mean seasonal high groundwater table where the same is within six (6) feet of the finished ground surface.
e. The Health Officer may require soil percolation rates in minutes per inch as determined by the standard percolation test procedures as outlined in the Manual of Septic Tank Practice, U.S. Public Health Service.

Fee to Accompany Application

A fee shall be charged for each permit issued for the installation of a sewage disposal system as defined herein. This fee shall be payable at the time of filing the application for permit by the owner to the Muskegon County Health Department to be deposited with the Muskegon County Treasurer. Such fee shall be established by the Muskegon County Board of Health.

Variances

These regulations provide minimum standards to be used in the design and construction of all subsurface sewage disposal systems. However, special circumstances, limitations, dimensions, or features may exist creating a physical impossibility for compliance. Such circumstances or limitations may justify a variance from a portion of these regulations. Such variances may be granted in writing by the Muskegon County Health Officer if the variance will not create the potential for a public health hazard or nuisance condition, and if the variance will provide suitable treatment of the sewage.

Validity

A sewage disposal permit shall remain valid for a period of two years from date of issuance unless an extension is requested from, and approved by, the Health Officer.

A sewage disposal permit shall not be transferable as to permit holder or property location.

Section K Criteria for Building Site Acceptance

Drainage and Soil Conditions

No permit shall be issued where percolation tests indicate the stabilized percolation rate exceeds 45 minutes per inch.* All percolation tests shall be conducted at the proposed depth of the absorption field. A permit shall not be issued when the building site is subject to ponding or flooding in the areas proposed for the absorption field or where flooding of the area has occurred more than once within the preceding ten (10) years or if the proposed sewage disposal system cannot be built to comply with construction requirements set forth in these regulations. Percolation tests shall be made in the general area to be used for subsurface disposal systems. Health Department personnel shall not be required to run percolation tests. The person making the percolation tests shall furnish a certified statement as to the results of such tests. The person making the test shall be a licensed professional engineer or registered sanitarian in the State of Michigan. If fill sand is used to comply with these regulations, it must be of an approved type.

Grading of seepage field areas shall be so designed and executed with respect to elevation and slope that surface drainage is off the area and away from all nearby wells.

*Soils with a percolation rate of more than 45 min/inch are unsuitable for subsurface absorption and site modification approved by the Health Officer must be pursued.

Protection of Sewage Disposal Systems

After a seepage system has been approved, the area shall not be disturbed in any way unless alterations are specified in the permit. To prevent compaction, the seepage field area shall be protected against all vehicular traffic. Paving should not occur over a seepage system. No permanent structure shall be built over any portion of a sewage disposal system.

Sewage Disposal Systems in Close Proximity with Lakes, Lagoons, Rivers, or Similar Bodies of Water

No permit shall be issued within 400 feet of a lake, lagoon, river, or similar body of water where the seasonal mean high water table is less than 48 inches below the bottom of the drainage system, unless site modifications as set forth in Section M of these regulations are approved by the Health Officer.

Health Officer May Reject Application

The Health Officer shall have the right to reject an application under the following conditions:

- Where publicly operated sewage system is available.
- Where the septic tank would be inaccessible for cleaning or inspection purposes.
- Where the property served is too small for proper isolation from existing water wells, the premise water well, surface waters, or has insufficient drainage area.
- Where percolation rate exceeds 45 min/inch and site modification plans have not been approved by the Health Officer.

Appeal Board

Any applicant who has been denied a permit to install a sewage disposal system may request a hearing from the Appeal Board. The appeal Board shall consist of the Muskegon County Board of Health and the township supervisor in whose township the permit was denied. A request for a hearing shall be submitted in writing to the Muskegon County Health Department not later than 30 days after the date of the permit denial.

Section L Existing Septic Tanks

When repairs are made to an existing sewage disposal facility, existing septic tanks which are part of such facility, and which do not meet the standards contained in these regulations, may remain in service without modification. This provision shall apply only if the Health Officer determines that such existing septic tanks are capable of performing their intended function in an acceptable manner, and that no dangers to human health and safety, nuisances, or degradation of the natural environment will result from their continued usage.

Section M Elevated Seepage Beds and Perimeter Fill Sand

Site modifications such as cutting, grading, or filling, may be permitted in some cases for the purpose of overcoming soil permeability or high groundwater limitations of natural soils. When elevated seepage beds are used, the perimeter fill sand must extend from the final finished grade and extend in all directions from the seepage bed in a 4:1 slope.

Section N Specific Requirements for a Sewage Disposal System

Construction and Location

Any or all of the following requirements which are applicable shall be compiled within the location and construction of a sewage disposal system:

Inspection of Construction

An authorized representative of the Health Officer shall inspect and

approve the completed facility before backfilling may be started.

1. Size of Septic Tank
To serve the plumbing fixtures and appliances commonly used in a single-family residence:

Number of Bedrooms	Minimum Liquid Capacity
1 or 2	800 gal.
3 or 4	1,000 gal.
5 or more	1,250 gal.

Note: Each additional bedroom requires 250 gallons of additional septic tank capacity. The above septic tank capacities are to be used only with a single-family residence. Larger septic tanks may be required for public and semi-public facilities. Consult the Muskegon County Health Department regarding the capacity of such septic tanks. Two septic tanks will also be required if an ejector pump is used to pump all of the raw sewage from a lower elevation to a higher elevation.

Note: In tight soils of loam or clay, or a combination of sandy loam or sandy clay, or where a garbage disposal unit will be used, two septic tanks in series shall be required.

3. Specifications for Septic Tank Construction

a
1. A rectangular tank should be 2½ times longer than its width A minimum of 4 horizontal feet shall be provided between inlet and outlet.
2. Install a 4-inch concrete floor throughout which supports side walls.
3. All concrete block walls must be constructed with the use of mortar.
4. Inside walls must be sealed with brushed mortar or a block sealing tar compound or equivalent.
5. The sections of a precast concrete tank shall be sealed with a watertight compound at time of installation.
6. All septic tanks must be equipped with an outlet device consisting of a sanitary tee or vented ell or a precast baffle.
7. Inlets and outlets to be properly sealed 360 degrees around pipe.
8. The outlet device must extend downward to approximately 40% of the liquid depth.
9. The tank shall be provided with a minimum liquid depth of 30 inches; 48 inches is preferred.
10. An air space equivalent to 12-15% of the liquid depth shall be provided.
11. Provide reinforced prefabricated covers or reinforced concrete

slabs.

12. Two manholes are strongly recommended in the top of a septic tank. As a minimum, one shall be provided at one end of a septic tank and an inspection opening installed at the opposite end. The manhole shall have a dimension of at least 18 inches.
13. The vertical distance between the bottom of the inlet pipe shall be at least two (2) inches higher than the bottom of the outlet pipe.
14. When the top of a tank is more than 20 inches below finished grade, manhole risers must extend to grade, or approximately 8 inches below finished grade.

b Abandoned septic tanks shall be emptied of their contents and filled with earth or rock.

c Any tank used as a pump chamber and installed within the groundwater or below the mean seasonal high groundwater elevation shall have all seams double-sealed so as to provide a leak-proof receptacle

d When sewage must be pumped from a lower elevation to a higher elevation, the pump unit must be of a design to meet the purpose for which it is used.

4. Isolation Distances - Minimum safe distances in feet

From	Cast Iron Soil Pipe*	Other	Septic Tank	Absorption Field
Well	10	50	50	50
Property	2	5	10	5
Basement Wall	(1)	(1)	10	10
Water Lines	10	10	10	10
Bank or Drop-off	5	10	10	15
Lake or Stream	10	25	75	75

*Pipe materials and type of joints as set forth in Michigan Department of Public Health Policy Letter No. 36-3, issued July 19, 1966, and Michigan Department of Licensing and Regulation, Plumbing Board Letter No. 68-1, September 20, 1968, can be substituted for cast iron soil pipe and leaded joints.

5. Absorption Area for Disposal Field, Seepage Bed, or Block Trench Based on Percolation Rate - Minimum required trench bottom area per bedroom.

Stabilized Percolation Rate (Average time in minutes for water to fall one inch)	Single Family Residence Number of Bedrooms			
Minutes/Inch	1	2	3-4	Each Additional
Subsurface Absorption Bed - Minimum Absorption Area Requirements (square feet)				
0-5	300	400	540	100
6-10	350	450	600	150
11-15	400	540	650	200
16-30	540	650	750	250
31-45	650	750	1000	300
over 45*				
Subsurface Absorption Trenches - Minimum Absorption Area Requirement (square ft.)				
0-5	300	350	400	75
6-10	325	375	450	90
11-15	375	450	550	100
16-30	450	550	700	150
31-45*	550	650	900	200
Block Trenches or Precast Units - Length of Trench (feet)				
0-5	45	45	45	15
6-10	50	55	60	15
11-15	60	75	90	15
over 15	Not suitable			

*Soils with a percolation rate of more than 45 minutes/inch are unsuitable for subsurface absorption, and site modification approved by the Health Officer must be pursued.

6. Construction Details of Tile fields or Seepage Beds

Items	Unit	Maximum	Minimum
Number of lateral trenches	–	–	2
Length of trenches	feet	100	–
Width of trenches	inches	36	18
Separation between trench side walls	feet	–	3
Depth of tile lines (top) below finish grade	inches	26	8
Distance between distribution lines in seepage beds	feet	3	3
Slope of tile lines	in./100 ft	4	level preferred
Depth of stone			
Under tile	inches	–	6
Over tile	inches	–	2
Size of stone	inches	1-1½	⅜
Depth of backfill over stone	inches	24	6
Depth to mean seasonal high groundwater below stone	inches	–	30
Depth to mean seasonal high groundwater below stone within 400 feet of surface bodies of water	inches	–	48
Amount of gap between tile in disposal trenches	inches	½	¼

Tarpaper strips 5" X 8" shall be placed over the gap between sections of tile and so placed as to cover the top half of tile.

Other methods of protecting the gap between tile can be approved.

Straw or equivalent shall be placed between the stone and the backfill material.

7. Construction Details of a Block Trench Absorption System

Outside dimensions: Length: 33 blocks (standard concrete blocks)
Width: 2 ½ blocks (standard concrete blocks)

	Maximum	Minimum
Depth of stone	*	16 inches
Width of stone	–	8 inches
Size of stone	3 inches	6A
Slope of block trench	1 inch/10 feet	level preferred
Depth to mean seasonal high groundwater below trench bottom	–	30 inches
Depth to mean seasonal high groundwater below trench within 400 feet of surface bodies of water	–	48 inches

Straw or equivalent shall be placed between stone and backfill material.

Tarpaper or equivalent may be used to cover gaps between covers.

Bottom of inlet pipe into block trench shall be a minimum of 16 inches above bottom of trench.

Connections between block trenches shall be made using elbows or tees and shall be made near the downstream end of the failed trench.

*Stone must cover all side openings.

CHAPTER III
REGULATIONS GOVERNING WATER SUPPLIES

Section 1.0 Purpose

The purpose of this Ordinance is to establish an enforcement mechanism for the control and regulation of water supplied to the consumer and residents of Muskegon County.

The purpose of this Ordinance is to provide a means for safe-guarding the environment in order to protect the health and welfare of the consumer and all residents of Muskegon County through the regulation of water supply facilities.

Section 2.0 Authority

This Ordinance is adopted pursuant to the authority vested in the County, by and through its board of commissioners, under Section 46.11 of the Michigan Compiled Laws and pursuant to authority vested in said Board, and its Department of Health, through Sections 333.2435 and 2441 of the Michigan Compiled Laws, being Sections 2435 and 2441 of Act 368 of the Public Acts of 1978, State of Michigan, as amended.

Section 3.0 Scope

This Ordinance shall apply to all suppliers or suppliers of water, all water supply facilities either existent or which may be hereafter constructed except for Type I public water supplies, as defined by Michigan's Safe Drinking Water Act, Act 399 of the Public Acts of 1976, and Administrative Rules, promulgated thereunder, as amended.

This Ordinance shall furthermore apply to all persons constructing a well or installing a pump as defined under Part 127 of Act 368 of the Public Acts of 1978, and Administrative rules, promulgated thereunder, as amended.

Section 4.0 Definitions

Section 4.1 - General Incorporation by Reference

Except as may be otherwise specifically defined hereunder, the terms used in this Ordinance shall convey the definitions as set forth under Part 127 of Public Act 368 of 1978, as amended, and Administrative Rules of the Department of Public Health, as promulgated thereunder, as amended, and under Act 399 of the Public Acts of 1976, and Administrative rules promulgated thereunder, as amended.

Section 4.2 "Water Supply"

For purposes of this Ordinance, "water supply" shall mean a system of pipes and structures through which water is obtained, including, but not limited to, the source of the water, such as wells, surface water intakes, or hauled water storage tanks, and pumping and treatment equipment, storage tanks, pipes and appurtenances, or a combination thereof, used or intended to furnish water for domestic or consumer use.

Section 5.0 Incorporation of Other Regulations

The following State of Michigan Codes and regulations are hereby incorporated by reference into this Ordinance:

- The "Safe Drinking Water Act", Act 399 of the Public Acts of 1976, being Sections 325.1001 through 325.1023 of the Michigan compiled Laws, and the Administrative Rules promulgated pursuant to that Act, as amended.

- Part 127 of Act 368 of the Public Acts of 1978, of Michigan's Public Health Code, being Section 333.12701 through 333.12722 of the Michigan Compiled Laws, and the Administrative Rules promulgated pursuant to that Act, as amended.

Section 6.0 Water Supply Requirements

It shall be unlawful for any person to occupy, or permit to be occupied, any building which is not provided with a safe and adequate water supply.

It shall furthermore be unlawful for any person to supply water in violation of any provision of the laws and regulations set forth in Section 5.0 of this Ordinance.

Section 7.0 Water Supply Construction Permit

Section 7.1 - Requirement of a Permit

No person shall begin construction of a new water supply, or make significant change to an existing water supply, without first obtaining a water supply construction permit from the Muskegon County Health Department. Significant change to existing water supply would include, by way of illustration, but not by way of limitation, replacing the well casing, removing a well casing from the ground, changing aquifers or sources of water, changing screen elevation, deepening or plugging back a bedrock well, changing the pump type, installing a liner pipe, or significantly increasing the capacity of the water supply.

A water supply which has not been in use for more than one year shall not be put back into operation unless it can be shown to be in substantial compliance with this Code.

Provided, however, this Section shall not apply either to a water supply excluded under Section 12703 or Part 127 of Act 368, the same being MCL 333.12703, or to a water supply that is to be used to provide water for plants, livestock, or other agricultural processes, and will not be used to supply water to habitable structures or for human consumption provided that the well and water supply are not physically connected to any habitable structure.

Section 7.2 - Permit Procedure

Section 7.2.1 - Application for Permit

An application for a Water supply Construction Permit shall be made on forms provided by the Health Department. A completed application shall include all information as may be deemed necessary by the Health Department, including at a minimum:

- Signature of the property owner or their authorized representative;
- Information regarding proposed location of water supply facility, relationship of same to buildings, property lines, know, suspected or potential sources of contamination;
- Information regarding property restrictions or limitations.

Section 7.2.2 - Issuance or Denial of Permit

The Health Officer shall issue a Water supply Construction Permit when the information provided indicates that the requirements of this code and/or applicable State statues have been or will be met, and that the quality of the groundwater will not be degraded. The Health Officer may propose limitations or conditions which the Health Officer deems necessary to protect the public health, or groundwater supply.

The Health Officer may deny an application for a Water supply Construction Permit when incomplete or false information has been supplied by the applicant, or when the Health Officer determines that the requirements of the Ordinance and/or applicable State statutes have not or cannot be met. The denial shall be forwarded to the applicant in writing or in person.

The Health Officer shall deny issuing a Water Supply Construction Permit for well installation in areas defined by the Michigan Department of Environmental Quality (MDEQ) as “Facilities” under Part 201, sites of environmental contamination and/or Part 213, Leaking Underground Storage Tank (LUST) facilities. No well permit variance shall be given without written approval from MDEQ.

Section 7.3 Effect of Issuing Construction Permit

The issuance of a Construction Permit shall serve as authorization to the permittee to construct the proposed water supply in accordance with the application and any conditions or limitations imposed in the Permit. Such authorization shall not, however, relieve permittee of any obligation or limitation that may otherwise be imposed under any other applicable law, nor shall issuance of a construction Permit be deemed in any way to authorize permittee to use the water supply except for testing purposes.

Section 8.0 Approval to use Water Supply

Section 8.1 Unlawful Use of Water Supply

No person shall use, or permit use, of a water supply subject to the permit requirements of this Ordinance except for testing purposes, unless and until the construction and installation of same has been approved by the Health Officer.

Section 8.2 Issuance of Use Permit

The Health Officer shall, upon determination that the water supply has been constructed and installed in accordance with Construction Permit requirements, conditions and limitations, issue a Use Permit. Such Use Permit may be issued conditionally pending receipt by Health Officer of a completed “Water Well and Pump Record” prepared by the well driller and/or pump installer, as applicable.

The Health Officer may elect to perform an onsite inspection prior to issuance of Use Permit.

Provided, however, Health Officer shall not issue a Use Permit until Health Officer has received copies of the results of the analysis of water samples indicating that raw water quality meets minimum public health standards. Water sample analysis shall include coliform bacteria and any other parameter deemed necessary by the Health Officer. Analysis of water samples shall be performed by laboratories certified by the Michigan Department of Environmental Quality. All water samples shall be collected in accordance with protocol established by Health Department.

Section 9 Deviations

The Health Officer may issue a deviation from the requirements set forth herein, or incorporated herein by reference, provided such deviation does not result in a violation of State Law, if the spirit of intent of such requirements and laws are observed and the public health, safety and welfare are assured.

Section 10.0 Application and Approval Fee

A fee to be determined by the Health Department shall be paid by any person for each water supply facility subject to the permit and approval requirements of this Ordinance. Such fee shall be paid on date of application for permit which shall be non-refundable. No permit shall be issued prior to satisfaction of the fee payment requirement.

Section 11.0 Enforcement

The Health Officer and subordinates shall be authorized to administer and enforce this Ordinance and to pursue legal action as may be necessary and appropriate, to assure compliance with same.

Section 12.0 Penalties

Any person who shall fail to comply with the provisions set forth herein shall be deemed guilty of a misdemeanor and may be punished by a fine of not more than $200 or imprisonment in the County Jail for not more than 90 days or both, in the discretion of the Court.

Section 13.0 Incorporation into Muskegon County Sanitary Regulations Amendment and Repeal

Section 13.1 Incorporation

This Ordinance, in its entirety, shall be incorporated upon adoption into that Ordinance and Regulatory document entitled *"Muskegon County Sanitary Regulations"*, effective October 14, 1984, constituting chapter III, entitled *"Water Supply"*.

Section 13.2 Amendment

By adoption of same, the Ordinance entitled "Muskegon County Sanitary Regulations, Effective October 14, 1984", is amended.

Section 13.3 Repeal

Chapter III of the "Muskegon County Sanitary Regulations, Effective October 14, 1984", in previous form, is hereby repealed.

Section 14.0 Savings Clause

Should any part or provision of this amendatory Ordinance be deemed of no force and effect, then any part or provision not so determined inform shall remain in full force and effect.

Section 15.0 Notification

At least (30) days prior to any modification, lapse or revocation of Chapter III, Regulations Governing Water Supplies, the Health Department shall notify the Michigan Department of Environmental Quality (MDEQ) or a successor agency to the MDEQ.

Section 16.0 Effective Date

These regulations shall become effective thirty (30) days after the date of publication.

Adopted this 14th day of September, 1999.

[Chapter III, Notice of Adoption, published September 30, 1999, effective October 29, 1999].

CHAPTER IV
GARBAGE, RUBBISH AND TRASH

Section A General Definitions

Words and Terms

The following words and terms used in this chapter, unless otherwise expressly stated, shall have the following meaning:

"Garbage" shall mean rejected food wastes including waste accumulation of animal, fruit, or vegetable matter used or intended for food or that attend the preparation, use, cooking, dealing in or storing of meat, fish, fowl, fruit, or vegetable.

"Rubbish" shall mean tin cans, bottles, paper cartons, rags, discarded clothing, discarded utensils, discarded containers, sweeping, glass, crockery, nails, tine, wire, light bulbs, signs, advertising matter, and such other material as are normally discarded from a household. This does not include discarded household furniture and appliances or building wastes.

"Trash" shall include such items of discard which are not normally associated with residential usage; also, discarded household appliances, dismantled vehicles or their parts; discarded or dismantled machinery or tools and such, other items that shall constitute a health or safety hazard or menace to persons residing in the neighborhood.

Section B Garbage and Rubbish Storage

- No person, firm or corporation shall store garbage or rubbish on any premises unless such materials be completely contained within watertight containers, having a capacity of not less than ten (10) gallons, nor more than thirty-four (34) gallons with sides tapered to an enlarged opening and equipped with handles and a tightly fitting cover, except that plastic garbage and rubbish bags shall not be stored outside awaiting collection by a refuse service for a period exceeding twelve (12) hours. Putrescible wastes shall not be stored more than sever (7) days.

- The owner of every multiple dwelling, and in the case of private and two-family dwellings, shall keep clean and in place, proper watertight containers having a capacity of not less than ten (10) gallons, nor more than thirty-four (34) gallons with sides tapered to an enlarged opening and equipped with handles and a tightly fitting cover. Putrescible wastes shall not be stored more than seven (7) days.

- Containers used for the storage of garbage or rubbish shall be maintained in a clean and sanitary condition, and shall be tightly covered except at such times as material is bing placed within or removed from containers.

APPENDIX F

TABLES

Table 6

Groundwater Monitoring Requirements
Muskegon Chemical Company
Whitehall, Michigan

Monitoring Purpose	Monitoring Well Location	Current Monitoring Frequency	Static Water Level	VOCs	TGDC	Chlorex
Compliance Wells	FP-1	Biennial (October 2021, 2023, ...)	X	X	X	X
	P-2		X	X	X	X
	P-5		X	X	X	X
	P-6		X	X	X	X
	P-9		X	X	X	X
Natural Attenuation Wells	KCC-5S	Biennial (October 2021, 2023, ...)	X	X	X	X
	MCC-3SR		X	X	X	X
	MCC-16		X	X	X	X
	MCC-21R		X	X	X	X
	MCC-24R		X	X	X	X
	MCC-36R		X	X	X	X
	MCC-30RS		X	X	X	X
	OW-4		X	X	X	X
Hydraulic Monitoring Wells	KCC-30	5-Year (October 2020, 2025, ...)	X			
	KCC-31		X			
	KCC-15S		X			
	KCC-15D		X			
	KCC-17S		X			
	KCC-17I		X			
	SW-1		X			
	KCC-33		X			
	KCC-37		X			
	MCC-3I		X			
	MCC-3D		X			
	MCC-14		X			
	MCC-9		X			
	MCC-11		X			
	MWJ1-1		X			
	MCC-8B		X			
	MCC-23		X			
	MCC-22		X			
	MCC-21R		X			
	EXT-1		X			
	KCC-6		X			
	MCC-18		X			
	MCC-25D		X			
	MWX3-2		X			
	P-1		X			
	P-8		X			

Notes:
1. VOCs - Chlorobenzene, 1,2-dichloroethane, cis-1,2-dichloroethene, trans-1,2-dichloroethene, tetrachloroethene, trichloroethene, vinyl chloride.
2. TGDC = bis(2-chloroethoxy)ethane.
3. Chlorex = bix(2-chloroethyl)ether.

Table 7
October 2013 - 2021 Groundwater Data Summary
Natural Attenuation Wells
Muskegon Chemical Company
Whitehall, Michigan

Monitoring Location	Date	Volatile Organic Compounds							Semivolatile Organic Compounds	
		Chlorobenzene	1,2-dichloroethane	cis-1,2-dichloroethene	trans-1,2-dichloroethene	Total [illegible]	Trichloroethene	Vinyl chloride	TGDC	Chlorex
Tier II Remedial Goal		100	5	70	100	[illegible]	5	2	5	2
KCC-5S	10/9/13	**1.7**	< 1.0	**21**	1.3	**140**	**8.7**	< 1.0	0.072	0.031
	10/6/14	0.47	< 1.0	**8.7**	< 1.0	**53**	**6.6**	< 1.0	0.14	< 1.0
	10/6/15	< 1.0	0.22	**1.2**	< 1.0	**33**	**2.4**	< 1.0	0.12	< 1.0
	10/3/17	< 1.0	< 1.0	**10.1**	< 1.0	**9.0**	**6.5**	< 1.0	0.096	<0.95
	10/9/19	< 1.0	< 1.0	0.75	< 1.0	**7.8**	< 1.0	< 1.0	< 4.9	<0.97
	10/12/21	< 1.0	< 1.0	**11**	< 1.0	**31**	**1.2**	< 1.0	< 5.0	< 1.4
MCC-3SR	10/9/13	< 1.0	< 1.0	< 1.0	< 1.0	**2.4**	< 1.0	< 1.0	0.04	< 1.0
	10/6/14	< 1.0	< 1.0	**5.3**	< 1.0	**14**	0.9	< 1.0	0.13	0.031
	10/6/15	< 1.0	< 1.0	0.26	< 1.0	**15**	< 1.0	< 1.0	0.051	< 1.0
	10/3/17	< 1.0	< 1.0	< 1.0	< 1.0	**20.3**	< 1.0	< 1.0	< 4.8	< 0.96
	10/9/19	< 1.0	< 1.0	**4.6**	< 1.0	**20.4**	< 1.0	**1.9**	< 4.9	< 0.97
	10/12/21	< 1.0	< 1.0	**4.7**	< 1.0	**19**	< 1.0	< 1.0	< 5.0	< 1.4
MCC-16	10/11/13	**120**	< 1.0	**1.8**	< 1.0	< 1.0	< 1.0	**1.4**	**3,400**	**370**
	10/6/14	**93**	0.27	**1.6**	< 1.0	< 1.0	< 1.0	**1.0**	**3,300**	**360**
	10/6/15	**95**	0.3	**1.4**	< 1.0	< 1.0	0.26	0.72	**3,100**	**360**
	10/3/17	**71.9**	< 1.0	**1.1**	< 1.0	< 1.0	< 1.0	0.39	**2,620**	**304**
	10/9/19	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**6.6**	1.2
	10/12/21	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.4
MCC-21R	10/9/13	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.27	< 1.0	**100**	**4.4**
	10/6/14	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**73**	**3.7**
	10/6/15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.24	< 1.0	**100**	**4**
	10/3/17	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**212**	**11.4**
	10/9/19	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**133**	**4.9**
	10/11/21	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**160**	**9.0**
MCC-24R	10/9/13	**22**	**1.5**	0.34	< 1.0	< 1.0	< 1.0	< 1.0	**260**	**29**
	10/6/14	**9.9**	0.6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**41**	**7.4**
	10/6/15	**4.2**	0.23	0.24	< 1.0	< 1.0	0.37	< 1.0	**26**	**3.3**
	10/3/17	**7.9**	**1.4**	0.28	< 1.0	< 1.0	< 1.0	< 1.0	**86.3**	**11.2**
	10/9/19	**37.0**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**293**	**38.8**
	10/11/21	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.3
MCC-30RS	10/8/13	< 1.0	< 1.0	0.26	< 1.0	<1	< 1.0	< 1.0	< 5.0	< 1.0
	10/6/14	< 1.0	< 1.0	< 1.0	< 1.0	<1	< 1.0	< 1.0	< 5.0	< 1.0
	10/5/15	< 1.0	< 1.0	< 1.0	< 1.0	<1	< 1.0	< 1.0	< 5.0	< 1.0
	10/3/17	< 1.0	< 1.0	< 1.0	< 1.0	0.26	< 1.0	< 1.0	<4.8	<0.95
	10/9/19	< 1.0	< 1.0	< 1.0	< 1.0	<1	< 1.0	< 1.0	< 5.0	< 1.0
	10/11/21	< 1.0	< 1.0	< 1.0	< 1.0	<1	< 1.0	< 1.0	< 5.0	< 1.3
MCC-36R	10/9/13	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.0
	10/6/14	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.04	< 1.0
	10/5/15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.0
	10/3/17	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<4.8	<0.95
	10/9/19	≤ 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<4.9	<0.97
	10/11/21	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.3
OW-4	10/11/13	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.071	< 1.0
	10/6/14	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.052	< 1.0
	10/5/15	< 1.0	0.67	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.8	0.15
	10/3/17	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<4.8	<0.95
	10/9/19	< 10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 5.3	<1.1
	10/13/21	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.4

Notes: 1. All units are micrograms per liter (ug/L)
2. TGDC = bis(2-chloroethoxy)ethane
3. Chlorex = bis(2-chloroethyl)ether
4. Bold value indicates laboratory detection greater than laboratory reporting limit.
5. Highlighted value indicates laboratory detection greater than Tier II remedial goal.

Table B

October 2013 - 2021 Groundwater Data Summary
Natural Attenuation Wells
Muskegon Chemical Company
Whitehall, Michigan

Monitoring Location	Date	Volatile Organic Compounds							Semivolatile Organic Compounds	
		Chloroethane	1,2-Dichloroethane	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Trichloroethene	Tetrachloroethene	Vinyl chloride	TGDC	Chlorex
Tier II Remedial Goal		160	5	70	100	5	5	2	5	2
KCC-5S	10/9/13	**1.7**	< 1.0	**21**	1.3	**140**	**0.7**	< 1.0	0.072	0.031
	10/6/14	0.47	< 1.0	**8.7**	< 1.0	**53**	**0.8**	< 1.0	0.14	< 1.0
	10/6/15	< 1.0	0.22	**1.2**	< 1.0	**33**	**2.4**	< 1.0	0.12	< 1.0
	10/3/17	< 1.0	< 1.0	**10.1**	< 1.0	**9.0**	**6.5**	< 1.0	0.096	<0.95
	10/9/19	< 1.0	< 1.0	0.75	< 1.0	**7.8**	< 1.0	< 1.0	< 4.9	<0.97
	10/12/21	< 1.0	< 1.0	**11**	< 1.0	**31**	**1.2**	< 1.0	< 5.0	< 1.4
MCC-3SR	10/9/13	< 1.0	< 1.0	< 1.0	< 1.0	**2.4**	< 1.0	< 1.0	0.04	< 1.0
	10/6/14	< 1.0	< 1.0	**5.3**	< 1.0	**14**	0.9	< 1.0	0.13	0.031
	10/6/15	< 1.0	< 1.0	0.26	< 1.0	**15**	< 1.0	< 1.0	0.051	< 1.0
	10/3/17	< 1.0	< 1.0	< 1.0	< 1.0	**30.3**	< 1.0	< 1.0	< 4.8	< 0.96
	10/9/19	< 1.0	< 1.0	**4.6**	< 1.0	**20.4**	< 1.0	**1.9**	< 4.9	< 0.97
	10/12/21	< 1.0	< 1.0	**4.7**	< 1.0	**19**	< 1.0	< 1.0	< 5.0	< 1.4
MCC-16	10/11/13	**120**	< 1.0	**1.8**	< 1.0	< 1.0	< 1.0	**1.4**	**3,490**	**370**
	10/6/14	**93**	0.27	**1.6**	< 1.0	< 1.0	< 1.0	**1.0**	**3,390**	**360**
	10/6/15	**95**	0.3	**1.4**	< 1.0	< 1.0	0.26	0.72	**3,190**	**360**
	10/3/17	**71.9**	< 1.0	**1.1**	< 1.0	< 1.0	< 1.0	0.39	**2,620**	**304**
	10/9/19	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**5.6**	**1.2**
	10/12/21	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.4
MCC-21R	10/9/13	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.27	< 1.0	**100**	**4.4**
	10/6/14	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**73**	**3.7**
	10/6/15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.24	< 1.0	**106**	**4**
	10/3/17	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**212**	**11.4**
	10/9/19	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**133**	**4.9**
	10/11/21	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**150**	**8.0**
MCC-24R	10/9/13	**22**	**1.5**	0.34	< 1.0	< 1.0	< 1.0	< 1.0	**268**	**29**
	10/6/14	**9.9**	0.6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**41**	**7.4**
	10/6/15	**4.2**	0.23	0.24	< 1.0	< 1.0	0.37	< 1.0	**26**	**3.3**
	10/3/17	**7.9**	**1.4**	0.28	< 1.0	< 1.0	< 1.0	< 1.0	**88.3**	**11.2**
	10/9/19	**37.0**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**253**	**38.8**
	10/11/21	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.3
MCC-30RS	10/6/13	< 1.0	< 1.0	0.28	< 1.0	<1	< 1.0	< 1.0	< 5.0	< 1.0
	10/6/14	< 1.0	< 1.0	< 1.0	< 1.0	<1	< 1.0	< 1.0	< 5.0	< 1.0
	10/6/15	< 1.0	< 1.0	< 1.0	< 1.0	<1	< 1.0	< 1.0	< 5.0	< 1.0
	10/3/17	< 1.0	< 1.0	< 1.0	< 1.0	0.28	< 1.0	< 1.0	<4.8	<0.96
	10/9/19	< 1.0	< 1.0	< 1.0	< 1.0	<1	< 1.0	< 1.0	< 5.0	< 1.0
	10/11/21	< 1.0	< 1.0	< 1.0	< 1.0	<1	< 1.0	< 1.0	< 5.0	< 1.3
MCC-36R	10/9/13	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.0
	10/6/14	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.04	< 1.0
	10/5/15	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.0
	10/3/17	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<4.8	<0.95
	10/9/19	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<4.9	<0.97
	10/11/21	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.3
OW-4	10/11/13	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.071	< 1.0
	10/6/14	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.052	< 1.0
	10/5/15	< 1.0	0.67	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.8	0.15
	10/3/17	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<4.8	<0.95
	10/9/19	< 10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 5.3	<1.1
	10/13/21	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.4

Notes: 1. All units are micrograms per liter (ug/L)
2. TGDC = bis(2-chloroethoxy)ethane
3. Chlorex = bis(2-chloroethyl)ether
4. Bold value indicates laboratory detection greater than laboratory reporting limit.
5. Highlighted value indicates laboratory detection greater than Tier II remedial goal.

Table 9

October 2015 - 2021 Groundwater Elevation Summary
Muskegon Chemical Company
Whitehall, Michigan

Monitoring Location	TOC Elevation (ft amsl)	October 2016 Static Water Elevation (ft amsl)	October 2017 Static Water Elevation (ft amsl)	October 2019 Static Water Elevation (ft amsl)	October 2021 Static Water Elevation (ft amsl)
FP-1	605.52	603.15	602.90	603.10	603.09
KCC-5S	660.92	627.76	627.50	628.61	626.88
MCC-3SR	651.22	627.46	627.14	628.40	626.55
MCC-16	649.73	625.41	625.06	626.38	624.52
MCC-21R	650.98	624.37	623.94	625.30	623.51
MCC-24R	640.38	619.52	619.14	620.38	618.92
MCC-30RS	636.00	610.35	610.09	610.86	609.96
MCC-36R	642.48	617.81	617.45	618.59	617.25
OW-4	635.38	606.64	606.48	607.16	606.37
P-2	632.13	607.14	605.19	605.64	605.10
P-5	629.92	607.14	607.01	607.46	607.03
P-6	632.76	606.70	606.58	607.06	606.55
P-9	634.87	607.02	606.92	607.31	606.86

Notes:

1. TOC = Top of casing
2. ft amsl = feet above mean sea level.

TABLE 10

PART 201

GENERIC GROUNDWATER SURFACE WATER INTERFACE (GSI) CRITERIA

AND

SOIL CRITERIA PROTECTIVE OF GSI*

Criteria may change as toxicity and chemical-specific parameter values are updated. New GSI values have not been generated for all compounds listed in Part 201 Operational Memoranda #8 (Revision 4) and #14 (Revision 2). GSI values for compounds not listed below will be made available as they are developed. All units are presented in parts per billion (ug/L or ug/Kg).

CHEMICAL	CAS#	GSI Criteria	20X GSI Criteria	GSI SWP Criteria
Acenaphthene	83329	19	380	4,300
Acetic acid	64197	IP	IP	IP
Acetone	67641	1,700	34000	2,900
Acrylonitrile	107131	4.9	98	8.7
Ammonia	7664417	50 {C}	1,000	ID
Arsenic	7440382	150	3000	70,000
Barium	7440393	200 {C}	3,800	1.3E+5
Benzene	71432	200	4,000	740
Benzidine	92875	ID	ID	ID
Benzo(b)fluoranthene	205992	ID	NLL	NLL
Benzo(a)pyrene	50328	ID	NLL	NLL
Beryllium	7440417	10 {A}	200	1.3E+5
bis(2-Ethylhexyl)phthalate	117817	IP	NLL	NLL
Boron	7440428	1,400	28,000	ID
Bromoform	75252	ID	ID	ID
Bromomethane	74839	IP	IP	IP
Cadmium	7440439	3.6 {A,B}	72	4,300
Carbon tetrachloride	56235	45	900	350
Chlordane	57749	IP	NLL	NLL
Chlorobenzene	108907	47	940	410
Chloroethane	75003	ID	ID	ID
Chloroform	67663	170	3,400	520
Chloromethane	74873	ID	ID	ID
2-Chlorophenol	95578	22	440	130
Chromium (III)	16065831	120 {A}	2,400	1.0E+9
Chromium (VI)	18540299	11 {B}	220	3,300
Chrysene	218019	ID	NLL	NLL
Copper	7440508	25 {A,B,C}	300	4.0E+6
Cyanide	57125	20 {C}	100	ID
4-4'-DDT	50293	0.02 {C}	NLL	NLL
Dibenzo(a,h)anthracene	53703	ID	NLL	NLL
1,2-Dichlorobenzene	95501	16	320	340
1,3-Dichlorobenzene	541731	38	760	1,100
1,4-Dichlorobenzene	106467	13	260	280
3,3'-Dichlorobenzidine	91941	20 {C}	400	500
1,1-Dichloroethane	75343	IP	IP	IP
1,2-Dichloroethane	107062	360	7,200	820
1,1-Dichloroethylene	75354	65	1,300	270
cis-1,2-Dichloroethylene	156592	ID	ID	ID
trans-1,2-Dichloroethylene	156605	ID	ID	ID

PART 201
GENERIC GROUNDWATER SURFACE WATER INTERFACE (GSI) CRITERIA
AND
SOIL CRITERIA PROTECTIVE OF GSI*

CHEMICAL	CAS#	GSI Criteria	20X GSI Criteria	GSI SWP Criteria
2,4-Dichlorophenol	120832	19	380	680
1,2-Dichloropropane	78875	290	5,800	930
Dieldrin	60571	0.02 {C}	NLL	NLL
Diethyl ether	60297	ID	ID	ID
N,N-Dimethylacetamide	127195	4,100	82000	ID
2,4-Dimethylphenol	105679	12	240	100
Dimethylsulfoxide	67685	IP	IP	IP
Endrin	72208	IP	NLL	NLL
Ethylbenzene	100414	18	360	240
Hexachlorobenzene (C-66)	118741	ID	0.006	0.53
Hexachlorobutadiene (C-46)	87683	ID	ID	ID
Hexachloroethane	67721	6.7	130	1,800
Indeno(1,2,3-cd)pyrene	193395	ID	NLL	NLL
Isopropyl benzene	98828	ID	ID	ID
Lead	7439921	19 {A,B}	380	ID
Lindane	58899	IP	IP	IP
Mercury (Inorganic)	7439976	0.2 {C}	0.026	170
Methyl-tert-butyl ether (MTBE)	1634044	730	15000	1,500
Methylene chloride	75092	940	19,000	2,000
Molybdenum	7439987	800	16,000	ID
Naphthalene	91203	13	260	850
Nickel	7440020	85 {A}	1,700	88,000
Pentachlorophenol	87865	2.8 {A}	22	7,400
Phenanthrene	85018	5.0 {C}	48	2,300
Phenol	108952	IP	IP	IP
Polychlorinated biphenyls (PCBs)	1336363	IP	NLL	NLL
Propionic acid	79094	ID	ID	ID
n-Propylbenzene	103651	ID	ID	ID
Selenium	7782492	5	100	400
Silver	7440224	0.5 {C}	1.1	67
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746016	1.0E-5 {C}	NLL	NLL
1,1,2,2-Tetrachloroethane	79345	78	1,600	370
Tetrachloroethylene	127184	45	900	320
Thallium	7440280	3.7	74	4,200
Toluene	108883	140	2,800	1,100
Toxaphene	8001352	1.0 {C}	0.0014	860
Tributylamine	102829	ID	ID	ID
1,1,1-Trichloroethane	71556	200	4,000	1,100
1,1,2-Trichloroethane	79005	330	6,600	1,100
Trichloroethylene	79016	200	4,000	1,400
2,4,6-Trichlorophenol	88062	5.0 {C}	88	700
1,2,4-Trimethylbenzene	95636	ID	ID	ID
1,3,5-Trimethylbenzene	108678	ID	ID	ID
Vinyl chloride	75014	15	300	42
Xylenes	1330207	35	700	450

PART 201
GENERIC GROUNDWATER SURFACE WATER INTERFACE (GSI) CRITERIA
AND
SOIL CRITERIA PROTECTIVE OF GSI*

CHEMICAL	CAS#	GSI Criteria	20X GSI Criteria	GSI SWP Criteria
Zinc	7440666	190 {A,B}	3,800	1.9E+5

{A} GSI value is water hardness or pH dependent. Contact an ERD toxicologist for details.
{B} Background, as defined in Rule 299.5701(c), may be substituted if higher than the cleanup criteria.
{C} Calculated criterion is below the analytical method detection limit (MDL), therefore, the criterion defaults to the MDL.
ID = *Insufficient data* for calculation.
IP = Development of generic GSI value *in process* but not yet complete. This notation is equivalent to "NLS" as used in the August 18, 1997 addendum to Operational Memoranda #8 and #14, and the Rule 57 Water Quality Values table presented on the Surface Water Quality Division's Internet homepage.
NLL = Chemical is *not likely to leach* under most soil conditions.

* The higher of the soil 20X GSI value or the soil GSI SWP value may be used to ensure that groundwater concentrations do not exceed the GSI value. The GSI SWP values presented here replace those listed in the Generic Soil/Water Partitioning Criteria: Technical Support Document (TSD), dated January 17, 1997. Please consult the TSD for further guidance on the development

Table 1
PFAS Analytical Results
Muskegon Chemical Company Site
Whitehall, MI

Parameter	CAS	Units	Drinking Water Criteria	GSI Criteria	Reporting Limit	KCC-5S	KCC-22S	KCC-34	KCC-35	KCC-38	MCC-3SR
						10/24/18	10/23/18	10/24/18	10/24/18	10/24/18	10/23/18
Perfluoroalkyl Carboxylates/Carboxylic Acids (PFCA)											
Perfluorobutanoic acid (**PFBA**)	375-22-4	ng/L	--	--	1.7	**5.5**	1.0 J	ND	0.37 J	ND	0.30 J
Perfluoropentanoic acid (**PFPeA**)	2706-90-3	ng/L	--	--	1.7	**2.0**	ND	ND	ND	ND	ND
Perfluorohexanoic acid (**PFHxA**)	307-24-4	ng/L	--	--	1.7	**2.5**	ND	ND	ND	ND	ND
Perfluoroheptanoic acid (**PFHpA**)	375-85-9	ng/L	--	--	1.7	1.3 J	ND	ND	ND	ND	ND
Perfluorooctanoic acid (**PFOA**)	335-67-1	ng/L	**70**	**12,000**	1.7	**7.2**	**11**	**18**	ND	1.1 J	**3.0**
Perfluorononanoic acid (**PFNA**)	375-95-1	ng/L	--	--	1.7	0.92 J	ND	ND	ND	ND	ND
Perfluorodecanoic acid (**PFDA**)	335-76-2	ng/L	--	--	1.7	ND	ND	ND	ND	ND	ND
Perfluoroundecanoic acid (**PFUnA**)	2058-94-8	ng/L	--	--	1.7	ND	ND	ND	ND	ND	ND
Perfluorododecanoic acid (**PFDoA**)	307-55-1	ng/L	--	--	1.7	ND	ND	ND	ND	ND	ND
Perfluorotridecanoic Acid (**PFTriA**)	72629-94-8	ng/L	--	--	1.7	ND	ND	ND	ND	ND	ND
Perfluorotetradecanoic acid (**PFTeA**)	376-06-7	ng/L	--	--	1.7	ND	ND	ND	ND	ND	ND
Perfluoroalkyl Sulfonates/Sulfonic Acids											
Perfluorobutane sulfonic acid (**PFBS**)	375-73-5	ng/L	--	--	1.7	0.48 J	0.30 J	ND	ND	0.45 J	ND
Perfluoropentane sulfonic acid (**PFPeS**)	2706-91-4	ng/L	--	--	1.7	0.28 J	ND	ND	ND	ND	ND
Perfluorohexane sulfonic acid (**PFHxS**)	355-46-4	ng/L	--	--	1.7	**4.4** B	0.23 J,B	0.33 J,B	0.28 J,B	0.48 J,B	0.24 J,B
Perfluoroheptane sulfonic acid (**PFHpS**)	375-92-8	ng/L	--	--	1.7	ND	ND	ND	ND	ND	ND
Perfluorooctane sulfonic acid (**PFOS**)	1763-23-1	ng/L	**70**	**12**	1.7	**4.5**	ND	ND	ND	ND	ND
Perfluorononane sulfonic acid (**PFNS**)	474511-07-4	ng/L	--	--	1.7	ND	ND	ND	ND	ND	ND
Perfluorodecane sulfonic acid (**PFDS**)	335-77-3	ng/L	--	--	1.7	ND	ND	ND	ND	ND	ND
Perfluoroalkyl Sulfonates/Sulfonic Acids (PFSA)											
4:2 Fluorotelomer sulfonic acid (**4:2 FTSA**)	757124-72-4	ng/L	--	--	17	ND	ND	ND	ND	ND	ND
6:2 Fluorotelomer sulfonic acid (**6:2 FTSA**)	27619-97-2	ng/L	--	--	17	ND	ND	ND	ND	ND	ND
8:2 Fluorotelomer sulfonic acid (**8:2 FTS**)	39108-34-4	ng/L	--	--	17	ND	ND	ND	ND	ND	ND
Fluorotelomer Sulfonates/Sulfonic Acids (FTSA)											
N-methyl perfluorooctane sulfonamidoacetic acid (**N-MeFOSAA**)	2355-31-9	ng/L	--	--	17	ND	ND	ND	ND	ND	ND
N-ethyl perfluorooctane sulfonamidoacetic acid (**N-EtFOSAA**)	2991-50-6	ng/L	--	--	17	ND	ND	ND	ND	ND	ND
Perfluoroalkane Sulfonamides/Sufonamidoacetic Acids (FASA)											
Perfluorooctane sulfonamide (**FOSA**)	754-91-6	ng/L	--	--	1.7	ND	ND	ND	ND	ND	ND
Total PFOA and PFOS		ng/L	**70**	--	--	**11.7**	**11.0**	**18.0**	**ND**	**1.1**	**3.0**
Total PFAS		ng/L	--	--	--	**29.1**	**12.5**	**18.3**	**0.7**	**2.0**	**3.5**

Notes:
1. PFAS laboratory analysis was completed using Modified USEPA Method 537.
2. ng/L = nanogram per liter
3. ND = not detected
4. Shading indicates a detection at or above the generic Part 201 Cleanup Criteria.
5. Generic Drinking Water Cleanup Criteria is 70 nanograms per liter (ng/L) for PFOA, PFOS, and the combined concentrations of PFOA and PFOS, effective January 10, 2018.
6. Generic Groundwater to Surface Water Interface (GSI) Cleanup Criteria is 12,000 ng/L for PFOA and 12 ng/L for PFOS for Great Lakes and their connecting waters.
7. J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
8. B = Compound was found in the method blank and sample.

APPENDIX G

LETTER REGARDING PFAS INVESTIGATION

RICK SNYDER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

C. HEIDI GRETHER
DIRECTOR

August 7, 2018

Mr. Sid Johnson

Process & Systems Manager
Koch Remediation & Environmental Services, LLC
4111 E 37TH ST N
WICHITA, KS 67220

Dear Mr. Johnson:

SUBJECT: Muskegon Chemical Company Superfund Site, Whitehall, Michigan – Michigan Department of Environmental Quality (MDEQ) Request for PFAS Sampling in Groundwater

The MDEQ-Remediation and Redevelopment Division-Super Fund (MDEQ-RRD-SF) has identified the Muskegon Chemical Company Superfund Site, Whitehall, Michigan as a potential source for possible release of perfluoroalkyl and polyfluoroalkyl substances (PFAS) and is recommending collecting groundwater samples for PFAS analysis.

Attachment A contains a memo outlining the screening process used to identify the potential for PFAS during previous industrial activity at this location.

It is recommended the modified Method 537, isotope dilution be utilized for analysis of the groundwater samples from monitoring wells. Attachment B includes the list of compounds to include in the PFAS analysis.

The Part 201 values are below:

Perfluorooctanoic acid (PFOA) + Perfluorooctane sulfonic acid (PFOS):
Residential Drinking Water: 0.07 micrograms per liter (µg/L) = 70 parts per trillion (ppt)
Nonresidential Drinking Water: 0.07 µg/L = 70 ppt
Groundwater Surface Water Interface (PFOS only): 0.012 µg/L = 12 ppt

The Rule 57 water quality values are below:

PFOA:
Human noncancer value (HNV) drinking water source: 0.42 µg/L = 420 ppt
HNV non-drinking source: 12 µg/L = 12,000 ppt
Wildlife Value (WV): NA
Human cancer value (HCV) drinking water source: NA
HCV non-drinking source: NA
Final Chronic Value (FCV): 880 µg/L = 880,000 ppt
Aquatic Maximum Value (AMV): 7,700 µg/L = 7,700,000 ppt
Final Acute Value (FAV): 15,000 µg/L = 15,000,000 ppt

PFOS:

HNV drinking water source: 0.011 µg/L = 11 ppt
HNV non-drinking source: 0.012 µg/L = 12 ppt
WV: NA
HCV drinking water source: NA
HCV non-drinking water source: NA
FCV: 140 µg/L = 140,000 ppt
AMV: 780 µg/L = 780,000 ppt
FAV: 1,600 µg/L = 1,600,000 ppt

Rule 323.1057 (Toxic Substances) Part 4, Water Quality Standards, gives procedures for calculating water quality values to protect humans, wildlife, and aquatic life. These values apply to all surface waters in Michigan unless site-specific values have been derived.

The use of Rule 57 water quality values is to assess point source discharges and venting groundwater described in the Part 8 Rules titled "Water Quality-Based Effluent Limits for Toxic Substances". The identification of a value as "drink" or "non-drink" refers to whether or not the receiving water for the chemical discharge is protected as a source of drinking water (See R323.1100 – Designated uses, of the Water Quality Standards).

It is recommended the following twenty-seven monitoring wells be sampled:

KCC-5S	MCC-3I	MCC-24R	MCC-29	MCC-32D	P-6
KCC-5D	MCC-3D	MCC-25S	MCC-30RS	MCC-36R	P-9
KCC-35	MCC-16	MCC-25I	MCC30RD	P-1	
KCC-38	MCC-14	MCC-25D	MCC-32S	P-2	
MCC-3SR	MCC-21R	MCC-26	MCC-32I	P-4	

If you have any questions about the Muskegon Chemical Company Superfund Site, please contact me at the telephone number or email address listed below.

Sincerely,

Nic Dawson
Project Manager
Site Assessment and Site Management Unit
Superfund Section
Remediation and Redevelopment Division
dawsonn1@michigan.gov
517-284-5084

cc: Mrs. Sheri Bianchin, USEPA
Mr. David Kline, MDEQ
Mr. Robert Franks, MDEQ
Mr. John Bradley, MDEQ
Mr. Joe Walczak, MDEQ