FOURTH FIVE-YEAR REVIEW REPORT FOR K&L AVENUE LANDFILL SUPERFUND SITE KALAMAZOO COUNTY, MICHIGAN

Prepared by

U.S. Environmental Protection Agency
Region 5
CHICAGO, ILLINOIS

3/20/2025

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
CREU	Contingent Remedial Alternatives Evaluation Update (report)
CSM	Conceptual Site Model
DWC	Drinking Water Criteria (Michigan Part 201 Drinking Water Criteria)
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EISB	Enhanced In-Situ Bioremediation
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
FHR	Fish Hatchery Road in Van Buren County
GPM	Gallons per Minute
GRZ	Groundwater Restricted Use Zone
GSI	Groundwater-Surface Water Interface
ICs	Institutional Controls
ICIAP	Institutional Control Implementation and Assurance Plan
KCBC	Kalamazoo County Board of Commissioners
KCHCS	Kalamazoo County Health and Community Services
KLA Group	K&L Avenue Landfill Potentially Responsible Party Group
LFG	Landfill Gas
LTS	Long-term Stewardship
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDEQ	Michigan Department of Environmental Quality
MNA	Monitored Natural Attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	Non-detect
ng/L	Nanogram per Liter
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
P&T	Pump and Treat
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated biphenyl
PFAS	Per-and Polyfluoralkyl Substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid

PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
Site	K&L Avenue Landfill Superfund Site
SVOC	Semi-volatile Organic Compound
TBA	Tert-butyl alcohol
TBC	To be considered
THF	Tetrahydrofuran
µg/L	Micrograms per Liter
UU/UE	Unlimited Use and Unrestricted Exposure
VBC	Van Buren County
VOC	Volatile Organic Compound

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 in accordance with EPA policy.

This is the fourth FYR for the K&L Avenue Landfill Superfund Site (a.k.a. West K&L Superfund Site) (Site). The triggering action for this statutory review is the completion date of the previous FYR, dated April 3, 2020. This FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of one operable unit (OU1), which will be addressed in this FYR. OU1 addresses the landfill and contaminated groundwater.

Alyssa Graveline and Anthony McGlown, EPA Remedial Project Managers (RPMs) led the K&L Avenue Landfill Superfund Site FYR. Participants included Walelign Wagaw, Senior Project Manager and Nate Zielinski, Geologist of the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The Potentially Responsible Parties (PRPs) (herein referred to as the "KLA Group[1]") were notified of the initiation of the five-year review. The review began on April 8, 2024.

Site Background

Physical Characteristics:

The K&L Avenue Landfill Superfund Site is located in Kalamazoo County and Van Buren County, Michigan, approximately three miles west of the City of Kalamazoo. The former landfill portion of the Site, located in Oshtemo Township, Kalamazoo County, is approximately 87 acres and is bordered to the south by West KL Avenue (See Appendix B, Figure B1).

[1] The KLA Group consists of Pharmacia & Upjohn Company (formerly known as The Upjohn Company), Kalamazoo County, Charter Township of Oshtemo, and the City of Kalamazoo.

Land and Resource Use:

The area surrounding the Site includes a mixture of farms, rural, residential, and undeveloped property. The closest residents to the landfill are immediately to the southeast and southwest of the landfill. Bonnie Castle Lake is located adjacent to the northeast corner of the landfill and Dustin Lake is located one mile west of the Site. Springwood Lake (also called Mud Lake) is located within two miles of the Site. The landfill sits above shallow and deep groundwater aquifers, separated by a thick layer of clay-rich glacial till. Both aquifers supply drinking water for Kalamazoo County. The shallow aquifer flows westerly and northwesterly toward Dustin Lake and Springwood Lake, respectively.

The landfill property is zoned industrial and since the landfill has been capped, a restrictive covenant on the landfill property prohibits residential, commercial and industrial uses and other uses incompatible with the remedy. Bonnie Castle Lake, Dustin Lake and Springwood Lakes are used for recreational purposes such as fishing, boating, and swimming. Marsh habitat is present around Bonnie Castle Lake, Dustin Lake, and several small intermittent ponds surrounding the landfill.

History of Contamination:

The Site operated as a small, 20-acre private dump from about 1955 until 1960 when Oshtemo Township acquired the initial parcel of property for use as a sanitary landfill. Throughout the 1960s, the Township operated the landfill as a municipal landfill. In 1968, Kalamazoo County entered into an agreement with Oshtemo Township to use the municipal landfill as a county-wide landfill. Kalamazoo County acquired additional acreage adjacent to the landfill to create the present 87-acre landfill site. From approximately 1968 to 1974, the landfill accepted industrial, commercial and municipal waste. An estimated 5 million cubic yards of refuse, including some bulk liquids and drummed chemical wastes were disposed of in the landfill. The landfill was in operation until 1979 when the State of Michigan ordered the landfill to close due to the detection of volatile organic compounds (VOCs) in the residential drinking water supply wells downgradient of the Site.

The State of Michigan also ordered Kalamazoo County to provide an alternate water source to affected residents and to install an impermeable cover over the landfill. In response, Kalamazoo County installed a new water main and provided municipal water service connections to 36 homes along West KL Avenue and South 4th Street by 1980. Kalamazoo County also replaced eleven private residential wells with new wells. The new wells were installed into the deeper uncontaminated aquifer. In 1980, the landfill was capped by Kalamazoo County with a two-foot-thick layer of soil and clay.

The Site was added to the National Priorities List (NPL) on September 8, 1983.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: K&L Avenue Landfill Superfund Site		
EPA ID: MID980506463		
Region: 5	**State:** MI	**City/County:** Kalamazoo/Kalamazoo County
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Alyssa Graveline and Anthony McGlown		
Author affiliation: EPA Region 5		
Review period: 7/8/2024 - 12/4/2024		
Date of site inspection: 10/8/2024		
Type of review: Statutory		
Review number: 4		
Triggering action date: 4/3/2020		
Due date *(five years after triggering action date)*: 4/3/2025		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

From 1986-1988, the EPA conducted a fund-lead remedial investigation/feasibility study (RI/FS) to investigate the nature and extent of contamination at the landfill and in the groundwater and to evaluate potential remedial options. The RI/FS found that the groundwater contained VOCs and semi-volatile organic compounds (SVOCs) (EPA, 1989). Hazardous substances or pollutants and contaminants that have been released from the landfill are the contaminants of concern (COCs) at this Site (at the time the initial RI was completed in 1988) and include:

Soil: Polychlorinated biphenyls (PCBs), acetone, benzoic acid, bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, dibenzofuran, 1,4-dichlorobenzene, diethylphthalate, ethylbenzene, 2-hexatone, 4-methylphenol, polycyclic aromatic hydrocarbons (PAHs), pentachlorophenol, toluene, and xylene.

Groundwater: acetone, barium, benzene, benzoic acid, 2-butanone, cadmium, chromium, chloroethane, 1,1-dichloroethane, 1,2-dichloroethane, trans-1,2-dichloroethylene, ethylbenzene, 2-hexatone, iron, lead, 4-methyl-2-pentanone, nickel, 4-methylphenol, phenol, toluene, vinyl chloride, xylene, manganese, and zinc.

Sediment: PAHs, di-n-butyl phthalate, methylene chloride and 4-methylphenol.

Air: acetone, benzene, bromomethane, 2-butanone, carbon disulfide, carbon tetrachloride, chloroform, 1,1-dichloroethane, trans-1,2-dichloroethylene, ethylbenzene, methylene chloride, tetrachloroethylene, toluene, 1,1,1-trichlorethane, trichloroethylene, vinyl acetate and xylene.

After the initial RI, the EPA identified further COCs in groundwater, including: tetrahydrofuran (THF), tert-butyl alcohol (TBA), cis-1,2-dichloroethylene and 1,4-dioxane.

Contaminant Exposures:

The RI also found that a groundwater plume (area of contaminated groundwater) emanated from the landfill and extended to the west and northwest approximately 1/3 mile downgradient of the Site. A baseline human health risk assessment was performed in 1989 to evaluate health risks posed by exposure to landfill related contaminants. Actual or potential human exposure to contaminants posed by drinking the groundwater is the primary contributor to human health risks due to concentrations that exceed the EPA's risk management criteria (i.e., excess lifetime carcinogenic risk exceeds the risk range of 10^{-4} to 10^{-6} and/or non-carcinogenic hazards exceed a hazard index quotient of 1) under reasonable exposure scenarios. At the time the risk assessment was performed, potential carcinogenic risks were high for exposures to benzene, vinyl chloride and dichloroethane in the Site groundwater, as these compounds exceeded Safe Drinking Water Act maximum contaminant levels (MCLs), maximum contaminant level goals (MCLGs) above zero, or other protective levels. Lead, cadmium and zinc concentrations found during the RI were high, resulting in a hazard index greater than 1 for Site groundwater. Risks associated with all other exposure pathways (inhalation of volatiles from landfill in outdoor air, direct contact with uncapped landfill surface soils and direct contact with sediments in Bonnie Castle and Dustin Lakes) did not exceed the EPA's risk management criteria.

The RI found no unacceptable risks to actual or potential ecological receptors due to exposure to uncapped landfill surface soil or to sediments of Bonnie Castle and Dustin Lakes.

Response Actions

The EPA issued a Record of Decision (ROD) for the Site on September 28, 1990, two ROD Amendments for the Site on February 27, 2003 and September 12, 2005, followed by an Explanation of Significant Differences (ESD) on June 23, 2014 and a second ESD on August 25, 2021. The remedial action objectives (RAOs) for the Site developed in the initial ROD were to:

1) reduce and control potential risks to human health posed by exposure to contaminated groundwater and landfill waste; and

2) to restore contaminated groundwater to State cleanup standards or Federal drinking water standards, whichever is more stringent.

First Record of Decision (ROD):

The remedy components of the 1990 ROD include:

- Installation of a perimeter fence to protect the integrity of the landfill cap and restrict public access to the Site;

- Construction of a multi-layer hazardous waste landfill cap to prevent exposure to the landfill waste and to reduce the amount of contamination reaching the groundwater;

- Installation of a passive landfill gas venting system;

- Pump and treat for contaminated groundwater until Michigan Act 307-Type B groundwater cleanup standards or federal drinking water MCLs and MCLGs above zero, are met (this requirement was superseded by the 2005 ROD Amendment);

- Continued long-term groundwater monitoring;

- Proper abandonment of residential drinking water wells that were replaced by Kalamazoo County in the 1980s; and

- Implementation of deed restrictions to prohibit future development of the landfill and prohibit potable use of groundwater wells at the landfill and at homes within the area bounded by the landfill to the east, 4th Street to the west, to the north by Almena Avenue, and to the south by West KL Avenue. See Appendix B, Figure B2 for location of the area subject to deed restrictions under the 1990 ROD. Additional deed restrictions were also required to restrict the shallow aquifer from being used as a drinking water source.

First ROD Amendment:

In October 1998, sampling by the Kalamazoo County detected groundwater contamination in several residential drinking water wells in the Springwood Hills subdivision located approximately one-mile downgradient of the landfill. In response, the State temporarily provided several homes in the subdivision with bottled water. The KLA Group also voluntarily agreed to pay to extend the City's water mains and provide municipal water service connections to all homes within the subdivision. The KLA Group began sampling additional residential wells along West KL Avenue and along 2nd Street on a

routine basis, resulting in a number of additional contaminated residential wells being connected to city water. The KLA Group also performed a limited groundwater investigation in this area to determine the extent of this previously unknown contamination. Due to the findings of groundwater contamination in the Springwood Hills subdivision and in subsequent samples collected along West KL Avenue and 2nd Street, the EPA amended the 1990 ROD in 2003.

On February 27, 2003, the EPA issued the first amendment to the 1990 ROD. The 2003 ROD Amendment modified the remedy by requiring:

- Supplying municipal water to all homes within the newly created "2003 Municipal Water Supply Area" (See Appendix B3) and abandoning private drinking water wells at each property (unless used for non-potable uses) supplied with city water to prevent exposure to contaminated groundwater;

- Implementation of institutional controls (ICs) such as a county ordinance to prohibit installation of new drinking water wells within the 2003 Municipal Water Supply Area;

- Replacement of the Michigan Act 307 Type B groundwater cleanup standards in the 1990 ROD with the residential groundwater cleanup standards established under Part 201 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended; and

- Established TBA and THF as Site COCs.

<u>Second ROD Amendment:</u>

In early 2004, 1,4-dioxane was detected in both monitoring and residential wells above drinking water criteria. The detection of this compound at the downgradient edge of the area established in the 2003 ROD Amendment necessitated an expansion of the 2003 Municipal Water Supply Area. In addition, based on the results of pre-design studies conducted from 1992 to 2002, the KLA Group submitted a Focused Feasibility Study proposing Monitoring Natural Attenuation (MNA) as an amended groundwater remedy. The proposed amended remedy would rely upon a landfill cap for source control and natural attenuation of the groundwater plume in lieu of active pump and treat.

The EPA issued a Second Amendment to the ROD on September 12, 2005. Michigan Department of Environmental Quality (MDEQ, renamed to EGLE in 2019) did not agree with the selection of MNA as the groundwater remedy, and therefore did not concur with the 2005 ROD Amendment. The 2005 ROD Amendment modified the remedy by requiring:

- The landfill cap design was modified to require a geosynthetic clay layer/flexible membrane liner, and the 12-inch drainage layer with a geocomposite drainage layer. Gas venting and perimeter monitoring was incorporated into the cap design. The amended cap design also

reduced the two-foot thick layer of clean fill to eighteen inches, and slightly reduced the landfill slope requirements;

- Required the supply of municipal water to all private well users within an expanded area called the "2005 expanded Municipal Water Supply Area" (See Appendix B, Figure B4). This also included the abandonment of private drinking water wells at each property supplied with city water unless used for non-potable uses;

- Required implementation of a county groundwater ordinance on private drinking water wells within the 2005 Municipal Water Supply Area. The county ordinance prohibits the installation of new drinking water wells but allows existing water wells to be retained if they are used solely for irrigation or other non-potable uses and if approved by Kalamazoo County and the MDEQ (now EGLE). Additionally, the groundwater ordinance includes a 1,000 foot buffer zone around the contaminated groundwater plume ensuring a safe drinking water supply while the final remedy is implemented;

- Replaced the active pump and treat groundwater remedy, selected by the 1990 ROD, with MNA as the remedy for groundwater downgradient of the landfill and provided for implementation of contingency cleanup technologies (e.g., sulfate addition, ozone injection, or localized groundwater extraction with above ground treatment) if MNA proved ineffective in remediating the groundwater plume within a reasonable timeframe. The 2005 ROD Amendment also required a complete evaluation of the effectiveness of the source control and an evaluation of the effectiveness of MNA every five years after initiation of construction of the landfill cap; and

- Established groundwater cleanup levels for 1,4-dioxane (85 micrograms per liter or µg/L) and cis-1,2-dichloroethylene (70 µg/L) based on MI Part 201 Generic Residential Cleanup standards.

<u>2014 Explanation of Significant Differences:</u>
On June 23, 2014, the EPA issued an ESD allowing potable groundwater use for nineteen existing residential wells in Chadds Ford Way[2] and within the entire Municipal Water Supply Area (see Appendix B, Figure B5), provided that the following criteria are met:

1. The property extracts groundwater only from an uncontaminated aquifer;

2. Such extraction well, groundwater extraction and related activities do not threaten or adversely impact the movement of contaminants from the contaminated aquifer; and

[2] Since issuance of the 2014 ESD, the KLA Group has continued to sample Chadds Ford Way residential wells annually. As of Spring 2024, no site-related contaminants have been detected in any of the Chadds Ford Way residential wells.

3. Any groundwater extraction and potable use of any groundwater from the contaminated aquifer is prohibited in accordance with the ROD Amendment, unless an exemption for irrigation and/or non-potable use is granted by the MDEQ (now EGLE) and Kalamazoo County.

2021 Explanation of Significant Differences:

In 2017, MDEQ (now EGLE) promulgated a final rule, lowering the Drinking Water Criterion (DWC) for 1,4-dioxane from 85 µg/L to 7.2 µg/L. The adoption of the lowered 1,4-dioxane cleanup level resulted in a larger footprint of the 1,4-dioxane plume that is above cleanup standards. In particular, concentrations of 1,4-dioxane above 7.2 µg/L extended into a portion of Van Buren County. Due to the revised DWC for 1,4-dioxane, and the increased plume footprint, the EPA issued a second ESD for the Site on August 25, 2021. The 2021 ESD:

- Selects 7.2 µg/L EGLE Part 201 DWC for 1,4-dioxane as the Site's 1,4-dioxane groundwater cleanup standard, noting that this concentration falls approximately at the midpoint within the EPA's acceptable risk range of 0.35 µg/L (equating to a risk of 10^{-6}) and 35 µg/L (equating to a risk of 10^{-4}).

- Provides alternate water supplies to properties within the proposed Van Buren County groundwater restricted zone. Alternate water supplies may include installing a "properly located" replacement supply well, extending the Kalamazoo County municipal water supply, or another method approved by EPA in consultation with EGLE;

- Prohibits the installation of drinking water wells at certain depths within areas of contaminated groundwater above drinking water criteria, but allows potable groundwater use within the proposed Van Buren County groundwater restricted zone, provided data and other records indicate that:

    - Groundwater in the proposed area is extracted only from an uncontaminated aquifer;

    - The extraction well, groundwater extraction and related activities will not cause the movement of contaminants from a contaminated aquifer; and

    - Any groundwater extraction and potable use of any groundwater from a contaminated aquifer is prohibited in accordance with the ROD as amended.

The established groundwater cleanup levels for the Site as of the 2021 ESD are as follows:

Table 1: **Groundwater Cleanup Levels**

Chemical	Cleanup Standard (µg/L)
Acetone	730
Barium	2,000

Benzene	5.0
2-Butanone	13,000
Cadmium	5.0
Chromium (total)	100
1,1-Dichloroethane	880
1,2-Dichloroethane	5.0
Cis-1,2-dichloroethylene	70
1,4-dioxane	7.2
Trans-1,2-dichloroethylene	100
Ethylbenzene	74
Iron	2,000
Lead	4.0
4-Methyl-2-pentanone	1,800
Nickel	100
Phenol	4,400
Tetrahydrofuran	95
1-butyl alcohol	3,900
Trichloroethylene	5.0
Toluene	790
Vinyl chloride	2.0
Xylenes	280

Hydrogeologic Assessment – 22nd Street, Fish Hatchery Road and Sunset Drive, Van Buren County:

To support the 2021 ESD, the KLA Group submitted a Technical Memorandum: *Hydrogeologic Assessment – 22nd Street, Fish Hatchery Road and Sunset Drive Area, Van Buren County* on April 9, 2020 and a revised technical memorandum based on EPA and EGLE comments on July 31, 2020 (Golder, 2020f). This technical memorandum summarized hydrogeologic investigation activities conducted over the prior 10 years, including profile borings and new monitoring wells, to delineate the spatial distribution of 1,4-dioxane between 22nd Street and Fish Hatchery Road. The Technical Memorandum concluded that 1,4-dioxane contamination in the area is confined to an approximately 50-foot-thick sand layer between 675 and 725 feet above mean seal level, and that the hydrogeologic conditions are suitable for installation of replacement drinking water wells either below or above the zone of contamination.

Status of Remedy Implementation

A list of remedy implementation activities since the 2020 FYR is in Appendix F. Activities are also discussed in detail in the KLA Group's Annual Progress Reports, listed in Appendix A.

In 2006, the KLA Group capped the landfill with a multi-layer, hazardous waste impermeable cover and installed a passive landfill gas collection system, perimeter fence, stormwater management, access

roads and signage. In 2008, the passive gas venting system was converted to an active landfill gas management (extraction) system with an enclosed flare, to control methane gas migration and remove VOC mass from the landfill.

The groundwater MNA remedy has been implemented since 2007. The following discussion provides a brief summary of the groundwater remedy implementation status during this FYR period. These topics are discussed in more detail in the institutional control and data review sections below.

In November 2020, the KLA Group completed and submitted the third MNA evaluation report (following MNA evaluations in 2010 and 2015). As with the two previous reports submitted in 2010 and 2015, EPA's review of the evaluation found that MNA is not working for 1,4-dioxane based on empirical evidence that the leading edge of the 1,4-dioxane plume is continuing to expand, and that cleanup goals for 1,4-dioxane are not likely to be achieved in a reasonable timeframe.

Based on EPA's 2020 FYR finding that MNA was not working, the KLA Group submitted a new Contingent Remedial Alternatives Evaluation Update Report (CREU Report) in December 2020 (Golder, 2020g). The KLA Group's CREU Report evaluated two contingent remedial alternatives: enhanced in situ bioremediation and localized groundwater extraction with above ground treatment. The modeling results presented with the CREU Report indicate that an active remediation system that intercepts the downgradient portion of the plume, such as a linear transect of groundwater extraction wells, may be effective at preventing further 1,4-dioxane plume expansion into Van Buren County (Appendix B, Figure 11 and Figure 12).

Additionally, the KLA Group conducted a hydrogeologic investigation in August 2023 to assess groundwater quality in the area west and downgradient of Fish Hatchery Road near Campbell Creek. The investigation, which consisted of borehole drilling and vertical aquifer sampling for 1,4-dioxane followed by installation of a new monitoring well, determined that the leading edge of the 1,4-dioxane plume remains upgradient of Campbell Creek, in the vicinity of Fish Hatchery Road.

The current Kalamazoo County Groundwater Restricted Zone (GRZ) went into effect in March 2016. A GRZ for Van Buren County went into effect in February 2025. Efforts by the KLA Group to expand the Kalamazoo County GRZ in accordance with the 2021 ESD are ongoing, but the expanded GRZ is expected to be in place by mid-2025.

Within the current Kalamazoo County GRZ, water supply replacements and well abandonment efforts are nearly complete, and the KLA Group provides bottled water to one resident who continues to decline municipal water. The KLA Group continues to work with Kalamazoo County to plug and abandon that homeowner's water supply well and five other non-potable wells located within the current GRZ. One additional residential property has been proposed for removal from the GRZ as explained further below.

Within the proposed expanded Kalamazoo County GRZ, 88 properties have been hooked up to municipal water and 48 of these properties have had their wells properly plugged and abandoned, with the rest continuing to use wells for non-potable purposes (e.g., irrigation). Seventeen residential wells remain on properties where owners have declined connection to municipal water. Of these wells, 15 have been sampled for 1,4-dioxane and the KLA Group is supplying bottled drinking water to only one residence that has sampling results that exceeded the Part 201 DWC of 7.2 µg/L. Three additional residential wells and two irrigation wells within the proposed expanded GRZ have been proposed for exemption, as explained in the ICs section below.

In Van Buren County, the KLA Group voluntarily installed replacement wells at 16 homes prior to implementation of the Van Buren County GRZ, of which only one well had 1,4-dioxane above 7.2 µg/L prior to being replaced (9.2 µg/L in 2016 and replaced the same year). The majority of these wells were replaced at the homeowner's request even though their well water was non-detect or well below 7.2 µg/L 1,4-dioxane.

Institutional Controls

ICs are non-engineered instruments, such as administrative and legal controls, that help to minimize the potential for exposure to contamination and that protect the integrity of the remedy. ICs are required to assure long-term protectiveness for any areas which do not allow for UU/UE. ICs are also required to maintain the integrity of the remedy.

Table 3: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Site Soil - K&L Avenue Landfill Property - Constructed landfill cap	Yes	Yes	Parcels identified in Appendix B, Figure B2	Protect integrity of landfill cap and prevent exposure to the underlying landfill waste. Prohibit residential, commercial or industrial uses.	Restrictive Covenant, recorded at vol 15325 (liber 1720 page 1118) at Kalamazoo County recorder's office on April 19, 1994.
Site Soil - K&L Avenue Landfill Property - Areas of soil treated to industrial cleanup standards	Yes	Yes	Parcels identified in Appendix B, Figure B2	Prevent exposure to on-site contamination by limiting land use within the landfill property area and specifically prohibiting residential, commercial, and industrial uses.	Restrictive Covenant, recorded at vol 15325 (liber 1720 page 1118) at Kalamazoo County recorder's office on April 19, 1994.

On-Site Groundwater - K&L Avenue Landfill Property	Yes	Yes	Parcels identified in Appendix B, Figure B2	Prohibit groundwater use until cleanup standards are achieved.	Restrictive Covenant, recorded at vol 15325 (liber 1720 page 1118) at Kalamazoo County recorder's office on April 19, 1994.
Off-Site Groundwater – Kalamazoo County	Yes	Yes	Groundwater Restricted Zone (GRZ) shown in Appendix B, Figure B5	Prohibit drinking water well installation within the GRZ (areas of contaminated groundwater and 1,000-foot buffer zone). Prohibit groundwater use until cleanup standards are achieved.	Kalamazoo County Groundwater Ordinance approved January 19, 2016; effective under Sanitary Code on March 9, 2016
Off-Site Groundwater – Kalamazoo County	Yes	Yes	Planned Expanded GRZ shown in Appendix B, Figure B5	Prohibit drinking water well installation within the GRZ (areas of contaminated groundwater and 1,000-foot buffer zone). Prohibit groundwater use until cleanup standards are achieved.	(Planned 2025) Amend GRZ to include additional impacted properties above 7.2 µg/L 1,4-dioxane and within 1,000-foot buffer zone.
Off-Site Groundwater – Van Buren County	Yes	Yes	GRZ shown in Appendix B, Figure B5	Prohibit installation and use of drinking water wells at certain depths within the GRZ (areas of contaminated groundwater and 1,000-foot buffer zone).	Amendment to Van Buren Cass District Health Department Environmental Health Code to establish a GRZ effective February 28, 2025.

Status of Access Restrictions and ICs:

The land use ICs appear to be adequate to prevent unacceptable exposure and risk associated with the landfill. The current and planned groundwater ICs appear to be adequate to prohibit potable groundwater use within the current GRZ, until Site groundwater cleanup standards are achieved. An update on the Kalamazoo County GRZ and Van Buren County GRZ is provided below.

Kalamazoo County Groundwater Restricted Zone Update:

In September 2020, the KLA Group submitted an initial proposed expansion of the Kalamazoo County GRZ boundary due to exceedances of the revised 1,4-dioxane DWC for groundwater. Additional revisions to the proposed GRZ have been submitted from 2021-2024. The additional revisions are discussed further below and include: (1) a conditional exemption for two irrigation wells at the Ridgeview Golf Course; (2) an exemption for three existing wells on Van Kal Street; (3) removal of three properties located on West KL Avenue, west of 4th Street, from the existing GRZ; and (4) extension of the proposed GRZ boundary for three parcels located along West J Avenue. The most recent revision to the proposed Kalamazoo County GRZ was approved by the EPA and EGLE on October 4, 2024. The KLA Group submitted the most recent supplemental application to extend the GRZ along West J Avenue to Kalamazoo County on November 5, 2024, and review by the County is ongoing. If approved, the expanded GRZ for Kalamazoo County is anticipated to be in place by the spring of 2025.

Van Buren County Groundwater Restricted Zone Update:

The KLA Group submitted an initial draft water well restriction ordinance to address ICs in Van Buren County to the EPA and EGLE in December 2021. Various revisions to the proposed ordinance were made from 2022-2024 based on comments from the EPA, EGLE and the Van Buren Cass District Health Department. The ordinance went into effect on February 28, 2025.

Current Compliance:

Even though all required ICs have not been implemented, there are currently no known land or groundwater uses at the Site which would be considered inconsistent with the IC objectives identified in the Site decision documents.

Kalamazoo County – Well Abandonment/Municipal Water Connections within current GRZ:

Two homeowners within the current Kalamazoo County GRZ have private groundwater supply wells connected to their homes and continue to decline the KLA Group's offer of free connections to the municipal water supply. One homeowner uses bottled water for drinking water (supplied by the KLA Group). The KLA Group continues to work with Kalamazoo County to have the well plugged and abandoned and to connect the home to municipal water. The other homeowner continues to use their well for drinking water; however, their well has shown no evidence of Site impacts (no contaminant detections historically) and has been proposed for removal from the amended GRZ with the EPA and EGLE approval. As part of the proposal to remove this well from the amended GRZ, an older well on the property was abandoned in 2024 and the remaining potable well will be required to be sampled annually.

Five private wells located within the current Kalamazoo County GRZ and not connected to homes have been retained by their owners for irrigation or other non-potable use. These well owners have sought

exemptions for agricultural or irrigation purposes and all requests have been denied by EGLE and the County except for two along West KL Avenue. The KLA Group continues to work with Kalamazoo County to have the non-exempted wells plugged and abandoned. See Appendix B, Figure B9 for municipal connection status within the Kalamazoo County GRZ as of December 2023.

Kalamazoo County – Well Abandonment/Municipal Water Connections outside of current GRZ:

In anticipation of the expansion of the current GRZ, the KLA Group has proactively provided free municipal water connections to Kalamazoo County residents within the planned GRZ expansion area since 2016, and voluntarily extended municipal water mains in 2016 and 2023. Eighty-eight properties within the proposed expanded GRZ have been hooked up to municipal water. Of the 88 properties, 48 have had their wells properly plugged and abandoned. Forty-two wells within the proposed expanded GRZ continue to be used for non-potable purposes (e.g., irrigation).

Seventeen residential wells remain within the proposed expanded Kalamazoo County GRZ on properties where owners have declined connection to municipal water. Of these wells, 15 have been sampled for 1,4-dioxane and only one has had a detection exceeding the Part 201 DWC of 7.2 µg/L (see Hydrogeologic Assessment - West J Avenue). The KLA Group is supplying this residence with bottled drinking water until the property is connected to municipal water. Three additional residential wells within the expanded GRZ have been proposed for exemption (see Hydrogeologic Assessment - Van Kal Street Area). Two irrigation wells currently remain on the Ridgeview Golf Course and an exemption for these wells has been proposed as part of the expanded GRZ (see Hydrogeologic Assessment and Focused Risk Evaluation – Ridgeview Golf Course). See Appendix B, Figure B9 for municipal connection status within the planned expanded Kalamazoo County GRZ as of December 2023.

Hydrogeologic Assessment – Van Kal Street Area:

A technical memorandum entitled *Hydrogeologic Assessment – Van Kal Street Area* was submitted to the EPA on August 21, 2023 to document the rationale for a proposed exemption to the expanded Kalamazoo County GRZ for four properties located within the expanded GRZ along Van Kal Street, north of West J Avenue, where municipal water is not available (see Appendix B, Figure B5). Three of the properties have existing residential wells and one property is vacant/undeveloped. The technical memorandum concluded that 1,4-dioxane impacts are vertically confined and that the existing residential wells along Van Kal Street are screened above or below the zone of 1,4-dioxane contamination. These wells will be subject to continued annual monitoring. The EPA, in consultation with EGLE, approved a revision to the proposed expanded GRZ incorporating the proposed Val Kal Street exemptions on October 19, 2023.

Hydrogeologic Assessment and Focused Risk Evaluation – Ridgeview Golf Course:

The KLA Group completed a technical memorandum entitled *Hydrogeological Assessment – Ridgeview Golf Course* on April 17, 2023. The technical memorandum documented the drilling of an exploratory

aquifer profile boring in February-March 2023 that was unable to confirm the viability of installing a deeper replacement irrigation well at the Ridgeview Golf Course. The KLA Group subsequently completed a focused risk evaluation that calculated site-specific risk-based human health screening levels and estimated risk associated with potential golf course worker exposure to 1,4-dioxane in groundwater through non-potable use (e.g. irrigation, cart washing, etc.). The updated risk assessment showed no unacceptable risk for the golf course worker exposure scenario based on maximum concentrations detected in the irrigation wells. The memorandum was approved by EGLE on May 15, 2023 and by the EPA on June 27, 2023. The agencies approved subsequent Kalamazoo County GRZ boundary map revisions in 2023 and 2024 exempting the golf course irrigation wells.

Hydrogeologic Assessment - West J Avenue:

Spring 2024 sampling of one residential well located on West J Avenue that had previously denied access reported concentrations of 1,4-dioxane above the Part 201 DWC. The KLA Group is supplying this residence with bottled drinking water until the property is connected to municipal water. The well is located within and near the northern edge of the proposed expansion of the Kalamazoo County GRZ previously submitted to Kalamazoo County in March 2024. To determine the need for GRZ boundary revisions in this area, the KLA Group conducted an investigation consisting of two vertical aquifer profile borings and installation of a new permanent monitoring well in October-November 2024. Following EPA and EGLE approval, the KLA Group submitted a supplemental application on November 5, 2024, extending the northern GRZ boundary in the vicinity of the sampled well.

Van Buren County – Replacement Wells:

Van Buren County residents use their private water supply wells for drinking water as municipal water is not currently available. The KLA Group samples approximately 60 residential wells annually in Van Buren County, with a subset sampled semi-annually. Of the 63 Van Buren County residential wells sampled in May 2024, all homes were non-detect (ND) for Site contaminants except two along Fish Hatchery Road, with the highest 1,4-dioxane concentration of 2.4 µg/L, which is below the 7.2 µg/L DWC.

The KLA Group voluntarily installed replacement wells at 16 homes in Van Buren County (VBC) prior to implementation of the VBC GRZ, and only one well had 1,4-dioxane above 7.2 µg/L prior to being replaced (9.2 µg/L in 2016 and replaced the same year). The majority of these wells were replaced at the homeowner's request even though their well water was non-detect or well below 7.2 µg/L 1,4-dioxane. See Appendix B, Figure B9 for location of VBC replacement wells.

IC Follow up Actions Needed:

The following measures must be taken to ensure protectiveness of the remedy in the long-term: (1) expand the current GRZ in Kalamazoo County to include properties affected by the change in 1,4-dioxane criterion (in progress), (2) complete all remaining municipal water connections, private well

abandonments, and well replacements (including the provision of bottled water as needed until replacement drinking water supply is provided), and (3) review the 2018 Updated Institutional Control Implementation and Assurance Plan (ICIAP) to ensure that it is consistent with the 2021 ESD and revise to include all Long-term stewardship (LTS) components as outlined in the 2012 ICIAP Guidance.

Long Term Stewardship:

Long-term protectiveness requires restricting land use and groundwater use to ensure that the remedy continues to function as intended. Long-term stewardship ensures that the ICs are maintained, monitored, and enforced. The KLA Group submitted an updated ICIAP on August 31, 2018 ("2018 Updated ICIAP") which includes ICs for impacted VBC properties and ICs for the planned GRZ expansion area in Kalamazoo County. The 2018 Updated ICIAP incorporates the following LTS procedures: (1) monitoring activities and schedules; (2) identifying the parties responsible for performing each task; (3) reporting requirements; and (4) planning for any potential IC issues that may arise during the reporting period.

The 2018 Updated ICIAP needs to be revised to include all LTS components (i.e., implementing, monitoring, maintaining, and enforcing effective ICs) as outlined in the ICIAP guidance. The ICIAP also needs to be reviewed and revised to ensure that ICs for Van Buren County are sufficient, based on the 2021 ESD. The EPA will continue to work with the KLA Group to revise the ICIAP after both GRZs are finalized.

Systems Operations/Operation & Maintenance

The KLA Group performs Operation and Maintenance (O&M) activities in accordance with the Landfill Cap O&M Plan, dated June 11, 2007. O&M at the Site consists of quarterly inspections of the landfill cap cover system, landfill gas (LFG) extraction wells, perimeter gas monitoring probes, access roads, signage, Site security fence, storm water management system and perimeter roads. Quarterly Landfill Cap Inspection Summary Reports and perimeter gas probe data are included in the Semi-Annual Progress Reports listed in Appendix A.

The KLA Group performs routine monitoring of the LFG collection system. Thirty-five active LFG extraction wells are sampled monthly for methane, oxygen, carbon dioxide and nitrogen. Routine maintenance (checking flare system and operations, greasing blower, cleaning flare system, removing liquid ports on flare blowers) of the landfill gas blower/flare system is performed monthly. Twenty-three perimeter LFG monitoring probes are sampled quarterly. The quarterly inspection in March 2024 indicated that several LFG extraction well sample ports needed replacement due to wear and these were replaced in April 2024.

Since remedy implementation, approximately 7,000 pounds of VOCs have been removed by the landfill gas system. See Appendix C, Figure C8 for the estimated mass of VOCs removed by the gas collection system and flare through spring 2024. A summary of the gas collection system O&M including

analytical results for VOCs in extracted gas, VOC extraction rates and mass removal estimates, and analytical results of gas condensate are included in the Semi-Annual Progress Reports listed in Appendix A.

Groundwater Monitoring:

The remedial action (RA) monitoring well network consists of approximately 71 monitoring wells that are designed to monitor the performance of the MNA groundwater remedy. The full monitoring network is sampled annually and approximately 45 of the 71 monitoring wells are sampled semi-annually. The RA monitoring well network consist of three groups of wells: Source Area wells (wells near or adjacent to landfill), Downgradient Plume wells (within main plume area), and Sentinel wells (at downgradient edge of the groundwater plume). The full monitoring network is sampled annually for VOCs, select natural attenuation parameters (i.e., methane, dissolved oxygen, etc.), and target parameters (1,4-dioxane, THF, TBA and benzene). Approximately 45 wells sampled semi-annually are tested only for target parameters, with a subset also tested for VOCs. The KLA Group voluntarily sampled six monitoring wells for PFAS in Fall 2019 and has since expanded each year to include additional wells from Spring 2020 (10 monitoring wells sampled) through Spring 2024 (39 monitoring wells sampled).

The KLA Group continues to conduct semi-annual and annual residential well monitoring in accordance with the Revised 2011 Residential Monitoring Plan (approved by the EPA on March 30, 2011), as amended (Golder, 2010). Approximately 140-145 residential wells, in Kalamazoo and Van Buren Counties, are sampled annually, biennially, or non-routine. See Appendix B, Figure B6 for residential monitoring locations. Residential well sampling data is contained in the Annual Residential Monitoring Reports (2019-2024) listed in Appendix A.

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 4: Protectiveness Determinations/Statements from the 2020 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1/Sitewide	Short-term Protective	The remedy for the K&L Avenue Landfill Superfund Site currently protects human health and the environment because the remedy prevents direct contact with landfilled waste and eliminates risks to public health associated with potable groundwater use by connecting homes that exceed groundwater cleanup criteria to the Kalamazoo County water supply, or by providing an alternate water supply (i.e., new replacement wells) at impacted homes in VBC, or by providing bottled water. A Kalamazoo County groundwater ordinance is also in effect to prevent potable groundwater use and the installation of new potable wells. However, in order for the remedy to be

		protective in the long-term, the following actions need to be taken to ensure protectiveness: issue a decision document to change the 1,4-dioxane DWC to 7.2 µg/L and to include ICs and alternate water supplies for affected homes in VBC; submit a Contingent Remedial Alternatives Evaluation Report that fully evaluates potential contingent remedies (including EISB) against the nine NCP criteria, to achieve groundwater RAOs and prevent further migration of the 1,4-dioxane plume into VBC; issue a decision document to incorporate the selected contingent remedy; implement the selected contingent remedy; submit an amended GRZ application to Kalamazoo County that includes the additional Kalamazoo County properties affected by the change in 1,4-dioxane DWC (plus buffer); pursue a groundwater ordinance with VBC or place deed restrictions on affected VBC properties; and revise the ICIAP to incorporate all LTS components.

Table 5: Status of Recommendations from the 2020 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1/ Sitewide	The ROD, as amended, does not include the new 1,4-dioxane DWC and does not include ICs or alternate water supplies for affected properties in VBC.	Issue a decision document to change the 1,4-dioxane DWC to 7.2 µg/L and to include ICs and alternate water supplies for affected homes in VBC.	Completed	The 2021 ESD updated the 1,4-dioxane DWC to 7.2 µg/L, and also addressed new groundwater ICs for the GRZ extension in Kalamazoo County and into Van Buren County.	8/25/2021
		Continue providing municipal water connections (Kalamazoo County), alternate water supplies (VBC), and in the interim, offer bottled water to residents with 1,4-dioxane in their well water at or above 7.2 µg/L until the home is connected to municipal water or an alternate water supply provided.	Addressed in Next FYR	As of December 2024, the KLA Group has connected 88 Kalamazoo County properties, outside the current GRZ, to municipal water due to the change in the Michigan 1,4-dioxane DWC. The KLA Group also drilled new replacement wells for 16 VBC residences. The KLA Group continues to offer bottled water to affected residents until the home is provided an alternate water supply.	
1/ Sitewide	MNA is not working for 1,4-dioxane as the leading edge of the plume continues to expand (based on the	Submit a Contingent Remedial Alternatives Evaluation Report that fully evaluates potential contingent	Completed	The KLA Group submitted the *Third 5-Year Review on MNA Performance Monitoring* on November 25, 2020, and *the CREU*	12/22/2020

	former ROD 85 µg/L 1,4-dioxane standard) and groundwater cleanup goals will not likely be met without additional treatment of the plume, and is less likely to be met considering the 1,4-dioxane DWC changed to 7.2 µg/L.	remedies (including EISB) against nine NCP criteria to achieve groundwater RAOs and prevent the further migration of the 1,4-dioxane contaminant plume into VBC.		*Report* on December 22, 2020.	
		Issue a decision document to incorporate the selected contingent remedy to achieve groundwater RAOs and prevent further migration of the 1,4-dioxane contaminant plume into VBC.	Addressed in Next FYR	The EPA anticipates issuing a ROD Amendment following the completion of a supplemental RI/FS for PFAS.	
		Implement the selected contingent remedy to achieve groundwater RAOs and prevent further migration of the 1,4-dioxane contaminant plume into VBC.	Addressed in Next FYR	The EPA anticipates that a contingent remedy will be implemented after the ROD is amended and the Remedial Design phase of the remedy is completed and approved.	
1/ Sitewide	ICs are not in place for Kalamazoo County properties (outside the current GRZ) that are affected by the lowered 1,4-dioxane DWC (plus buffer).	Submit amended GRZ application to Kalamazoo County that includes the additional Kalamazoo County properties affected by the change in the 1,4-dioxane DWC (plus buffer).	Addressed in Next FYR	The KLA Group has submitted several application revisions to amend the Kalamazoo County GRZ during this FYR period, with the most recent proposed changes approved by the EPA in October 2024. Kalamazoo County is reviewing the latest amended application submitted in November 2024. Pending county approval, an expanded Kalamazoo County GRZ is expected to go into effect in mid-2025.	
1/ Sitewide	ICs are not in place for VBC properties	Pursue a groundwater ordinance with VBC or, if not possible, place	Completed	An amendment to the Van Buren Cass District Health Department	2/28/2025

	affected by the change in the 1,4-dioxane DWC.	deed restrictions on VBC properties affected by the change in the 1,4-dioxane DWC.		Environmental Health Code to establish a GRZ became effective on February 28, 2025.	
1/Sitewide	The ICIAP needs to be revised to include all LTS components as outlined in the ICIAP guidance.	Revise ICIAP to incorporate all LTS components.	Addressed in Next FYR	A revised ICIAP was not submitted during this FYR period due to ongoing revisions to the proposed GRZs for Kalamazoo County and Van Buren County. The EPA will continue to work with the KLA Group to revise the ICIAP after both GRZs are finalized.	

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was made available on the EPA's public website and was published in the Kalamazoo Gazette on August 25, 2024, stating that there was a FYR and inviting the public to submit any comments to the EPA. The results of the review and the report will be made available at the Site information repository located at the Kalamazoo Public Library, Oshtemo Branch, 7265 West Main Street, Kalamazoo, Michigan 49009, and on the EPA's website at: https://www.epa.gov/superfund/kl-avenue-landfill.

Data Review

Overview

As of this fourth FYR, the primary COCs remaining above DWC in Site groundwater are 1,4-dioxane, benzene, and tetrahydrofuran (THF). Tert-butyl alcohol (TBA) also continues to be detected in Site groundwater but has not been observed at or above its DWC, 3,900 µg/L, since before 2010 (2020 FYR). This compound is currently still monitored at source area wells (P-46, P-48, P-49, P-50, P-51, P-52, P-53, P-55, and TW-4) during the ongoing semi-annual sampling events (Golder 2022a, 2022b).

The current Part 201 DWC for the remaining COCs at the Site are:

- 1,4-dioxane, 7.2 µg/L
- THF, 95 µg/L
- Benzene, 5 µg/L

The Site has also observed PFAS compounds, Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS), present above their MCLs of 4 ng/L in the area of contaminated groundwater. See Appendix C, Figures C1-C6, for Site COC and PFAS plume maps. Each contaminant and respective groundwater plume will be further evaluated below.

As of 2024, approximately 71 monitoring wells are a part of the Site monitoring network that are sampled at least annually, approximately 45 of the 71 monitoring wells are sampled semi-annually. The 71 monitoring wells were sampled for target COCs and water quality parameters during the most recent annual sampling event in the spring of 2024. Thirty-nine Site wells between the landfill and West Main Street were also sampled for PFAS. Forty-five of the 71 monitoring wells sampled during spring 2024 event contained more than one COC concentration exceeding their respective groundwater cleanup levels. A list of the Site monitoring wells and monitoring frequency is provided below in **Table 6.**

From 2015 through 2024, groundwater trends have been evaluated using sampling data collected from select monitoring wells chosen for variable Site and contaminant representation. Contaminant concentration trends for selected wells can be found in Appendix D, D1-D3 (Golder 2020a-e, 2021a-g, 2022a-f, Pfizer 2020a-d, 2021a, WSP 2023, 2024a-b).

Contaminated groundwater at the Site contains several COCs with a plume thickness generally ranging from 50-90 feet below ground surface (bgs) adjacent to the landfill to approximately 100-200 feet bgs between 4th St. and 1st St. based on aquifer profiling. In the downgradient areas of Van Kal Avenue/22nd Street and Fish Hatchery Road, the plume varies in thickness generally between 10 and 30 feet bgs as the primary flow path becomes spatially limited by overlying and underlying aquitard units.

Table 6: Site Monitoring Well Network

Source Area Wells	**Downgradient Plume Wells**	**Sentinel Wells**
11 wells: M-8[1], MW-13[1], P-46[2], P-48[2], P-49[2], P-50[2], P-51[2], P-52[2], P-53[2], P-55[2], and TW-4[2]	40 wells: MW-1[1], MW-12[1], P-19[1], P-20[1], P-21[1], P-24[1], P-25[1], P-27[1], P-28[1], P-29[1], P-30[1], P-31[1], P-35[2], P-36[2], P-37[2], P-38[1], P-39[1], P-40[1], P-41[2], P-44[2], P-56[2], P-57[2], P-58[1], P-61[2], P-63[2], P-65[2], P-66[2], P-67[2], P-68[2], P-69[2], P-70[2], P-71[2], P-72[2], P-73[2], P-74[2], P-75[2], P-77[2], P-80[2], P-89[2], and P-10711[2]	20 wells: MW-15[1], P-32[1], P-33[1], P-34[1], P-42[2], P-43[2], P-45[1], P-54[2], P-59[1], P-60[1], P-62[1], P-64[2], P-76[2], P-78[2], P-79[2], P- 85[2], P-86[2], P-87[2], P-88[2], P-90[1]*

-*RA monitoring well network as of October 2024. P90 is newly installed and was not included in the 2024 report.

-Superscript numbers next to wells described frequency of sampling, where [1] means once a year, and [2] means twice a year.

Benzene

During this review period, benzene was not detected in any wells downgradient of Dustin Lake. The farthest extent of the benzene plume has decreased since 2011 (Appendix C1 and C6). In spring 2024, benzene concentrations in Site monitoring wells ranged from non-detect to a maximum of 340 µg/L in TW-4. Notably, significant reductions were observed in the core of the benzene plume (adjacent to 4th St.) at some monitoring wells compared to 2023, including MW-12 (88 µg/L to 48 µg/L), P-27 (92 µg/L to 49 µg/L,) and P-31 (86 µg/L to 64 µg/L) (WSP, 2024b). Other monitoring wells in the benzene plume core, such as P-30, MW-1, and P-21, have not demonstrated obvious trends during this review period.

The Third FYR (EPA, 2020) included a trend analysis for source area monitoring wells P-49 & P-53 using data from 2010-2019. While both wells had a high variation in COC concentrations, P-53 showed a decreasing trend for benzene and P-49 showed an increasing trend. During this FYR period, benzene concentrations in P-49 generally increased until fall of 2021 and have decreased since then. Well P-53 also continued to observe generally decreasing benzene concentrations, but as noted in previous FYRs, both wells demonstrate a wide variability of concentrations. Continued benzene monitoring is recommended.

THF

Tetrahydrofuran (THF) has been below its Part 201 DWC of 95 µg/L since 2022, with the exception of well MW-13 which observed 100 µg/L THF in 2022 (WSP, 2022b, 2024b). Other wells which observed THF exceedances during this review period include P-48 and P-49. Source area wells P-49 and P-53 showed an overall decreasing trend from 2014 to 2023, see Appendix D1. Future monitoring is recommended to ensure THF concentrations continue to decrease across the Site.

1,4-Dioxane

Monitoring wells with 1,4-dioxane concentrations exceeding the DWC are located within the source area, downgradient plume area, and in sentinel wells. In spring 2024, twenty-four of the 40 monitoring wells in the downgradient plume area (P-10711, P-36, P-37, P-41, P-44, P-56, P-57, P-58, P-61, P-63, P-65, P-66, P-67, P-68, P-69, P-70, P-71, P-72, P-73, P-74, P-77, and P-80) and eight of the eleven monitoring wells in the source area immediately adjacent to the landfill (P-46, P-48, P-49, P-51, P-52, P-53, P-55 and TW-4) contained 1,4-dioxane concentrations exceeding the DWC of 7.2 µg/L. During this FYR period, source area and downgradient monitoring well concentrations ranged from non-detect to a maximum of 290 µg/L in P-61.

Two (P-78, and P-79) of the twenty sentinel wells sampled in Spring 2024 contained 1,4-dioxane concentrations exceeding the DWC of 7.2 µg/L. During this FYR period, sentinel well concentrations ranged from non-detect to a maximum of 15 µg/L in P-78 (See Appendix E).

Residential Data- 1,4-dioxane

Sampling for 1-4, dioxane across the Site includes semi-annual sampling of residential wells located in and adjacent to the known 7.2 µg/L 1,4-dioxane plume boundary. Most recent spring 2024 sampling

included sampling 141 residential wells at 139 private properties (WSP, 2024a). Other residential well samples could not be collected due to water being turned off, no access to an outdoor spigot, or access not being granted from the property owners. This is comparable for the rest of the review period, where between 123-146 residential samples were collected during the spring events (Golder 2020b, 2021a, 2022f, and WSP 2023a, 2024a).

For the spring 1,4-dioxane residential sampling events from 2020-2024, there were a total of three samples that exceeded 7.2 µg/L (one in 2021 where the residential well was subsequently quickly replaced, and two in 2024 which are now in the replacement process). Most residential well sample results during this FYR period were non-detect, but low level 1,4-dioxane detections (below 7.2 µg/L) occurred in approximately 8% to 12% of the samples collected during each event.

As demonstrated in **Table 7** below, sampling results from downgradient residential wells (Van Buren County; Appendix B, Figure 7) provide additional evidence of 1,4-dioxane plume migration during this FYR period. Homes along Fish Hatchery Road and 22nd Street that were once non-detect have had low level detections with subsequent concentration increases until well replacement. As further discussed below in the *Downgradient & Sentinel Plume* subsection, plume movement is expected to occur and may continue until a remedy is in place that would prevent future plume movement.

Table 7: Increasing Concentrations of 1,4-dioxane Results in Downgradient Residential Wells

Location (RH= Resident Home)	Spring 2018	Spring 2019	Spring 2020	Spring 2021	Spring 2022	Spring 2023	Spring 2024
RH-A	-	-	ND	ND	ND	-	1.1
RH-B	ND	1.4	1.5	2.1	2	2.1	2.4
RH-C	ND	1.2	1.2	2.1	-	ND (replaced)	ND
RH-D	ND	1.4	1.5	-	3.3	3.9	ND (replaced)
RH-E	-	-	-	-	-	2.4	ND (replaced)
RH-F	ND	ND	ND	1.6	3.7	-	ND (replaced)

*The (-) means sampling did not take place at that time and location. ND means no 1,4-dioxane detected.

Prior to the implementation of the Van Buren County GRZ, the KLA Group voluntarily installed 16 replacement wells in the affected groundwater zones. The deeper aquifer (~65-110 feet bgs in Van Buren County) has not been impacted and is not expected to be impacted due to a clay aquitard (10-50 feet thick) confining the lower unit. Residents with wells found to have 1,4-dioxane above cleanup criteria that are awaiting new well installation are provided bottled water. The KLA group has also voluntarily replaced wells in the VBC area of concern upon homeowner request without evidence of 1,4-dioxane impacts. Currently, there is one home in VBC awaiting new well installation due to a Spring 2023 detection of 1,4-dioxane at less than half of the 7.2 µg/L DWC.

Source Area Wells- 1,4-dioxane

Well P-49 showed a decreasing trend from 2010 to 2019 (EPA, 2020); that trend continued during the last five years with the most recent data observing the lowest concentrations for that well at 72 µg/L, see Appendix D1 and E. Although this source area well continues to show a decreasing trend, it is still 10 times the groundwater cleanup level, and the decreasing trend may be expected as the core of the plume continues to dilute and migrate downgradient (WSP,2024b).

Well P-53 showed a decreasing trend from 2010 to 2019 (EPA, 2020); that trend mostly continues with the well only observing 1,4-dioxane concentrations above 7.2 µg/L twice since 2019, see Appendix D1. The two exceedances were in fall of 2020 (14 µg/L) and most recently spring of 2024 (21 µg/L) (WSP, 2024b). Historically, this well has occasionally observed elevated concentrations and continued monitoring is recommended. As discussed above, decreasing concentration trends near the source area align with the conceptual Site model (CSM) which depicts the core of the 1,4-dioxane plume to be moving further downgradient over time (from the east to the northwest of Dustin Lake), see Appendix C4.

Downgradient & Sentinel Plume - 1,4-dioxane

Downgradient wells adjacent to 22nd St. used previously for 1,4-dioxane trend analysis include wells P-70, 71, and 77. In the previous FYR, these three wells were found to have an increasing 1,4-dioxane trend. Continuing the 2016 data to 2024, all three still show an overall increasing trend, with concentrations in these wells appearing to stabilize or decrease slightly beginning in 2022 and 2023 (see Appendix D2).

The farthest downgradient portion of the 1,4-dioxane plume exceeding the cleanup level of 7.2 µg/L is located within VBC, between Van Kal Street and Fish Hatchery Road, approximately 3 miles downgradient of the landfill. The leading edge of the 1,4-dioxane plume exceeding the cleanup level is in the vicinity of P-78 and P-79, located along Fish Hatchery Road.

During this review period, monitoring well P-78 saw 1,4-dioxane concentrations ranging from 8.1 to 15 µg/L and an overall increasing trend since 2016. In well P-79, 1,4-dioxane concentrations ranged from 7.3 to 14 µg/L with an increasing trend since 2016, see Appendix D2 (Pfizer 2020d, EPA 2020, WSP 2024b). Both P-78 and P-79 are classified as sentinel wells and were originally installed in 2016 downgradient of the plume to monitor migration. Well P-78 first exceeded the cleanup level of 7.2 µg/L in 2017, followed by P-79 in 2018. Sentinel wells observing contamination and increasing contamination is evidence of plume migration. Until a new remedy is in place that would prevent plume movement, plume migration is expected to continue under the current MNA remedy.

In August 2023, new sentinel monitoring well P-90 was installed approximately ½ mile downgradient of P-78 and P-79 (see Appendix B, Figure B8). During drilling, groundwater samples were collected approximately every 5 feet from 3 feet to 60 feet below ground surface. Sampling was terminated after

artesian conditions were observed in a sand unit at the 55-to-60-foot depth interval, with head measured between 1 and 2 feet above ground surface. 1,4-dioxane was not detected in groundwater samples from the boring nor from newly installed monitoring well P-90, indicating that the fringe of the 1,4-dioxane plume remains upgradient, in the vicinity of Fish Hatchery Road.

Northwest of Fish Hatchery Road is a large wetland area (see Appendix B10). Hydrogeologic data suggests that the 1,4-dioxane contaminated aquifer discharges to Campbell Creek and the local wetland (Golder 2019b, 2020f). The 1,4-dioxane plume has not yet migrated to Campbell Creek, however it is past Fish Hatchery Road where the wetland area begins. The highest concentrations at the P-78 and P-79 wells during this review period were 14-15 µg/L respectively. These concentrations are one or more orders of magnitude below Michigan's groundwater-surface water interface (GSI) criterion for 1,4-dioxane of 280 µg/L and Rule 57 surface water quality value for aquatic life (chronic) value of 22,000 µg/L. This could indicate that even if direct discharge to the wetland is occurring, 1,4-dioxane concentrations within the groundwater plume are not high enough to create an unacceptable risk.

PFAS

At this time, per- and polyfluoroalkyl substances ("PFAS") compounds have not been selected as COCs in a decision document for this Site. Initial PFAS groundwater sampling occurred at the Site in 2019 and 2020, which led to the addition of PFAS as an annual sampling parameter in 2021. PFAS monitoring currently occurs at 39 monitoring wells with analysis for 28 different PFAS compounds. Select residential drinking water and irrigation wells along KL Avenue and Almena Drive as well as an exploratory borehole at the Ridgeview Golf Course have also been sampled for PFAS to supplement the annual monitoring. Trend graphs, created for select wells, are further discussed per location subsection below (see Appendix D1-D3).

Groundwater- PFAS

Spring 2024 sampling detected PFAS in Site groundwater at concentrations up to 33 ng/L for perfluorooctanesulfonic acid (PFOS) and up to 100 ng/L for perfluorooctanoic acid (PFOA); see Appendix C3. No other PFAS compounds have been detected above MCLs. Currently, all areas of the PFAS contamination above the PFOS and PFOA MCLs of 4 ng/L are within the current Kalamazoo County GRZ. As described above, two private wells remain within the current Kalamazoo County GRZ at residences that have not agreed to connect to municipal water; these wells have been sampled for PFAS and all detections have been below MCLs since the first well was sampled in 2022. Results for all other private wells sampled for PFAS as well as the exploratory boring at the Ridgeview Golf Course were also below MCLs. Therefore, there is no current evidence of an unacceptable Site-related human health exposure to PFAS through groundwater. The KLA Group has proposed to sample additional wells for PFAS around the current known plume boundary, with an emphasis on monitoring wells and private wells located in the downgradient portion of the known PFAS plume.

Source Area Wells- PFAS

Monitoring wells east of Dustin Lake with the highest concentrations of PFOA during this review period are P-28 with 160 ng/L and P-30 with 150 ng/L (both observed in 2021). Concentrations have ranged from 89-160 ng/L at these wells with no obvious trends emerging, see Appendix E. Source area monitoring wells with the highest concentrations of PFOS in the last five years were P-48 with 43 ng/L and P-49 39 ng/L (both in 2022). Concentrations ranged from 21-43 ng/L at these wells. These wells are directly adjacent to the Site landfill. The spatial distribution of PFAS within the plume is similar to that of 1,4-dioxane and other groundwater contaminants released from the landfill, with relatively higher concentrations of both 1,4-dioxane and PFAS detected in monitoring wells at the western landfill margin, immediately upgradient of Dustin Lake, and downgradient of Dustin Lake near 2nd Street (Appendix C3, Appendix E).

PFAS trend graphs for source area wells P-49 and P-53, evaluating PFOA and PFOS compounds, were created using the annual data collected since 2021, see Appendix D3. For well P-49 the PFOA concentrations appear to be decreasing over time, but more data should be collected to confirm this potential trend. No other potential trend is yet apparent for PFOA and PFOS at these wells.

PFAS trend graphs for source area wells close to Dustin Lake with the highest PFAS concentrations were also created for P-28, P-29, and P-30. However, PFAS trends have not been observed yet, except in well P-29 which may have increasing PFOA concentrations, see Appendix D1 and D3. Further monitoring is needed to confirm potential trends.

Downgradient, Side Gradient, and Sentinel Plume Wells- PFAS

PFOA has been detected as far downgradient as well monitoring well P-10711, near the south end of Wickford Drive and the boundary between Kalamazoo County and Van Buren County. Concentrations of PFOA at this well have ranged from <1.6 ng/L to 2.6 ng/L in 2024 and may be observing an increasing trend, see Appendix E. As currently depicted, the leading edge of the PFAS plume is located between monitoring well P-10711 and monitoring well P-66, which has also observed a potentially increasing trend with PFOA concentrations ranging from 2.7 ng/L to 5.8 ng/L (Appendix C3, E, D3). Further monitoring is needed to ensure the PFAS plume is not migrating farther downgradient. Planned investigation work includes sampling additional downgradient wells to ensure that the downgradient edge of the PFAS plume is delineated. Additional side gradient wells, including additional residential wells, are also planned to be included in future sampling.

Delineation may also be needed southwest of the landfill. Currently, the PFAS contour map (Appendix C3) interprets the 4 ng/L contour line to not extend much beyond the monitoring wells P-52 and MW-1, which had PFOS concentrations at 6.7 and 1.8 ng/L, respectively, and PFOA concentrations at 15 and 8.5 ng/L (spring 2024). The nearest residential well tested south of MW-1 was non-detect for PFOS (<1.7 ng/L) and PFOA was detected at 1.4 ng/L (below MCLs, spring 2024). The groundwater flow has consistently traveled almost directly west in the source area, and no southern flow component has

been observed. However, further sampling including additional residential wells may be needed to ensure the current contour map (Appendix C3) is accurate and residential wells are not impacted above MCLs.

PFAS trend graphs for side gradient wells P-58 and MW-1, evaluating PFOA and PFOS compounds, were created using the annual data collected since 2020 (data included in Appendix E). No obvious potential trend is yet apparent for PFOA and PFOS at these wells. During spring 2024, P-58 and MW-1 did not detect PFOS, but detected PFOA at 2 and 8.5 ng/L, respectively. PFAS trends for downgradient wells P-10711, P-63, and P-66 were also created using the annual data collected since 2020, See Appendix D3. A decreasing trend thus far is observed for PFOA in well P-63, and a potential increasing trend for PFOA in well P-66. During spring 2024 wells P-10711, P-63, and P-66 did not detect PFOS, but detected PFOA at 2.6, 8.8, and 5.8ng/L, respectively (Appendix E). Further monitoring will aid in evaluating any long-term trends.

Continued monitoring and investigation of PFAS in groundwater across the Site is needed. Additional PFAS investigation will determine if the PFAS present in groundwater is attributable to the landfill, and if it should be identified as a COC for the Site. Any future selected remedy for the Site will likely need to consider PFAS. Additional groundwater investigation will be completed as part of a supplemental RI/FS for PFAS, with investigation activities expected to begin by summer 2025.

Surface Water - PFAS

Surface water and sediment at the site have not been sampled for PFAS. The three largest lakes located within or near the plume, Bonnie Castle Lake, Dustin Lake, and Springwood Lake (also known as Mud Lake), are surrounded by residential and commercial property, and the lakes were known in the past to be used for recreational purposes such as fishing, boating, and swimming (EPA, 1988). Recent community member accounts have confirmed that limited recreational activities such as boating and kayaking are still occurring. The Remedial Investigation ("RI") described Dustin Lake and Springwood Lake as interacting, and likely mixing, with shallow groundwater.

Dustin Lake is located near the core of the landfill-impacted groundwater contaminant plume. Three shallow monitoring wells (P-20, P-29, and P-25) located east, adjacent to and hydraulically upgradient of Dustin Lake have had detections of PFAS during the last five years (Appendix C7). PFOA was detected at maximum concentrations of 3.8 ng/L in P-20, 61 ng/L in P-29, and 11 ng/L in P-25, with PFOS concentrations ranging from non-detect to a maximum of 1.5 ng/L (in P-29). These concentrations are below EGLE's human health GSI criteria for PFAS (170 ng/L for PFOA and 12 ng/L for PFOS).

Bonnie Castle Lake is perched above the static water table but is located immediately adjacent to the northeast corner of the landfill. There have been historical observations of discharge into the lake from landfill seeps and surface runoff prior to installation of the current landfill cap. The 1989 RI did not

identify sediment or surface water impacts resulting in unacceptable risk from surface runoff or seeps from the landfill surface to Bonnie Castle Lake; however, the 1989 RI sampling did not include PFAS.

Prior investigations of Dustin Lake and Bonnie Castle Lake did not identify impacts to surface water and sediment resulting in unacceptable exposure risks and did not conclusively identify impacts to these media from the landfill. However, due to the nature of PFAS in the environment and rapidly evolving technical and regulatory guidance, a supplemental RI should be performed with sufficient data collection to assess human health and ecological exposure risks for PFAS in surface water and sediment.

Groundwater Trends, Model Discussion, MNA Remedy, & Overall Conclusions

Groundwater Trends

As presented in **Table 8**, substantial source-mass and plume-mass reductions of benzene, THF and 1,4-dioxane have been observed since 2002 at the Site (Pfizer, 2020d); see Appendix C9 for calculations. However, increasing trends have been observed in downgradient locations for 1,4-dioxane, as discussed above. Graphs depicting select wells trends over time are located in Appendix D1-D3. Such is evidence that plume migration is not under control.

Table 8: Percent Reductions of COCs Since Remedy Implementation

Compound	Percent Reduction (kg) Near Source Mass (<200 µg/L)	Percent Reduction (kg) Total Plume Mass (<20 µg/L)
Benzene (2002-2020)	91%	80%
THF (2002-2020)	>99%	98%
1,4-dioxane (2004-2020)	90%	64%

(Source: 2020 MNA Evaluation [Pfizer, 2020d], completed by KLA Group consultant)

Data Review Conclusions:

The KLA Group submitted the Groundwater Performance Monitoring Report: *Third 5-Year Evaluation of Monitored Natural Attenuation* on November 24, 2020 (Pfizer, 2020d). Unlike the two previous MNA reports completed in 2010 and 2015, the 2020 MNA Report evaluated the performance of the MNA remedy based on the 2017 revised Michigan Part 201 DWC for 1,4-dioxane (lowered from 85 µg/L to 7.2 µg/L). Despite this DWC change and evidence of increasing trends and plume migration, the KLA Group's 2020 MNA Report concludes that the selected remedy (MNA with source control) is effective. While there are currently no known unacceptable exposures, the EPA and EGLE continue to find that the MNA remedy is not functioning as intended.

Similar to the last two FYRs, groundwater monitoring data continue to show increasing trends of 1,4-dioxane in multiple downgradient plume area monitoring wells and sentinel wells. Residential monitoring results also showed increasing 1,4-dioxane concentrations (although still below 7.2 µg/L) in

multiple residential drinking water wells in Van Buren County prior to well replacements during this FYR period. These data present clear evidence of continued expansion of the 1,4-dioxane plume. In addition, the updated 2019 groundwater model results provided with the 2020 MNA Report predict that disconnected residual portions of the 1,4-dioxane plume would remain above 10 µg/L for more than 50 years, which is above the current groundwater cleanup goal of 7.2 µg/L.

In summary, the groundwater monitoring data has demonstrated that MNA is not effective at reducing 1,4-dioxane concentrations in the groundwater at a reasonable rate, and that in fact the 1,4-dioxane plume appears to be expanding. The viability of MNA is further challenged by the presence of PFAS contamination in the groundwater. Plume expansion and increasing concentrations are clear indicators that MNA is not effective as a groundwater remedy. The next Groundwater Performance Monitoring Report, Fourth 5-Year Evaluation of MNA remedy is due in December 2025.

Site Inspection

The inspection of the Site was conducted on 10/8/2024. In attendance were EPA RPMs Alyssa Graveline and Anthony McGlown, EGLE Project Manager Walelign Wagaw, EGLE geologist Nate Zielinski, and several representatives from the KLA Group. The purpose of the inspection was to assess the protectiveness of the remedy. The Site inspection included a visual evaluation of the landfill property and inspection of the security fence, landfill cap, flare system and selected landfill gas extraction and groundwater monitoring wells. Access to the landfill is restricted by a fence. The landfill appears to be well-maintained, and fencing appears to be in good condition.

The EPA RPMs made the following key observations/findings during the inspection:

- The landfill cap appeared to be in good condition;
- Groundwater monitoring wells, landfill gas extraction wells, and landfill perimeter fencing appeared to be in good condition and were locked;
- Appropriate signage was in place and readable;
- Survey markers for the cap monuments were readily visible; and
- No evidence of vandalism or trespassing was observed.

There were no changes to land use observed, no unauthorized use of the landfill property and underlying groundwater, and no other issues were noted during the Site inspection. The completed Site Inspection Photos and Checklist are included in Appendix G and Appendix H.

V. TECHNICAL ASSESSMENT

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

No. The remedy is not fully functioning as intended in the ROD, but currently no unacceptable Site risk is observed.

Question A Summary:

Remedial Action Performance

In the previous two FYRs, the EPA determined that MNA was not working as the leading edge of the 1,4-dioxane plume (at the 85 µg/L concentration) continued to expand and that cleanup goals would not likely be met in a reasonable timeframe without additional treatment of the plume. The 2021 ESD reduced the 1,4-dioxane groundwater cleanup standard 7.2 µg/L, making it is even less likely that cleanup goals will be met within a reasonable timeframe using MNA. There are no known exposures with unacceptable risk to contaminated groundwater as all residents with potable wells above the 1,4-dioxane DWC of 7.2 µg/L are connected to municipal water (Kalamazoo County), received a replacement well in a clean aquifer (Van Buren County), or are being provided with bottled water pending replacement of their water supply.

The landfill cap component of the remedy is performing as expected and containment is effective at preventing exposure to landfill related contaminants. The landfill cover prevents exposure via direct contact to waste materials. The perimeter security fence and posted warning signs restrict public access to the Site thereby reducing the potential exposure to landfill waste.

Per the 2005 ROD Amendment which required contingency cleanup technologies if MNA proved ineffective in remediating the groundwater plume, and subsequent EPA FYR conclusions that MNA was not effective for 1,4-dioxane, the KLA Group submitted the CREU Report. The EPA's 2020 FYR recommended an evaluation of the potential contingent remedies against nine NCP criteria to achieve groundwater RAOs and prevent further migration of the 1,4-dioxane contaminant plume into Van Buren County. The 2020 CREU Report updates previous analyses of contingent remedy options evaluated in the 2015 CREU Report, taking into account new data, the reduction of the 1,4-dioxane standard in 2017, and the results of bench scale and field pilot testing of EISB conducted from 2016 through 2018.

The 2020 CREU Report focuses on 1,4-dioxane but considers benzene and PFAS in the context of assessing remedial technologies. THF is not considered as it is no longer found in the downgradient groundwater plume at concentrations above Michigan Part 201 DWC. The 2020 CREU Report retains two technologies for detailed evaluation: (1) localized groundwater extraction and above ground treatment (pump-and-treat) and (2) EISB. The effectiveness of the contingent remedial alternatives evaluated in the 2020 CREU Report rely heavily on a numerical groundwater modeling presented in Appendix A of the Revised Groundwater Modeling Report, dated December 2020. The EPA, EGLE, and KLA group have been collaborating to review and improve the numerical model for future remedial evaluation use. Currently the EPA is reviewing the most recent model updates. Once the EPA concurs on the model and its parameters, the model may be used to support the future RI/FS and remedial decisions.

Implementation of Institutional Controls and Other Measures

The ICs (deed restrictions) on the landfill property are in place and are preventing direct contact and exposure to landfill wastes, restrict groundwater use, and current/future land use of the landfill property. The Site inspection found that there are no unauthorized uses of the landfill property or underlying groundwater. The current Kalamazoo County GRZ is effective at preventing potable groundwater use as all homes within the GRZ are connected to municipal water, except two, as previously discussed.

Pursuant to the ROD, as amended, and the 2021 ESD, the KLA Group is in the process of expanding the GRZ for Kalamazoo County to address properties affected by the change in 1,4-dioxane DWC. A GRZ for Van Buren County went into effect on February 28, 2025. The Site's ICIAP will be revised to include all LTS components.

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

Question B Summary:

No, but currently no unacceptable Site risk is observed. As discussed in detail below, PFAS have been detected comingled with the Site's contaminated groundwater. However, the known and reasonably anticipated extent of PFAS in groundwater above MCLs is located within the existing GRZ boundaries, and there is no known current potable use of groundwater within the current GRZs. Although no sediment or surface water sampling for PFAS has occurred to date, previous investigations of these media documented in the 1989 RI did not conclusively identify significant impacts from the landfill and no unacceptable risk to human or ecological receptors was identified.

Changes in Standards and TBCs

On April 10, 2024, the EPA issued MCLs for six PFAS contaminants, including PFOA, PFOS, PFNA, HFPO-DA (Gen-X), PFHxS, and PFBS.

Landfills can be a source of PFAS if waste containing PFAS was deposited in the landfill. The site landfill accepted various wastes including both municipal and industrial wastes over its years of operation. PFOA and PFOS have been detected above MCLs in site groundwater since 2019 and the distribution of PFAS in groundwater is similar to that of other site COCs, but less dispersed than 1,4-dioxane. Further investigation is needed to fully delineate the PFAS plume, followed by a feasibility study to determine if a groundwater remedy change is needed to address PFAS.

The presence of PFAS in groundwater does not affect the short-term protectiveness of the remedy because the known and reasonably anticipated extent of PFAS in groundwater above MCLs is located within the existing Kalamazoo County GRZ boundary, and there is no known current potable use of

groundwater within the current GRZ. Furthermore, a new GRZ for Van Buren County has been implemented as of February 2025 and an expanded Kalamazoo County GRZ boundary is expected to be in place by spring 2025.

Changes in Exposure Pathways

Land use and expected land use in the area around the site remains unchanged. There are no observed changes to physical site conditions that could affect the protectiveness of the remedy.

The upper portion of the shallow aquifer is in communication with downgradient surface water bodies located within the areal extent of the plume (Springwood Lake and Dustin Lake). Hydraulically upgradient, Bonnie Castle Lake is perched above the static water table and is located directly adjacent to the northeast corner of the landfill. In February 1976, MDNR personnel identified 15 locations where leachate seeps from the landfill were flowing into Bonnie Castle Lake and adjacent small ponds. The 1989 RI also describes evidence of surface water runoff, erosional gullying, and leachate flow/seeps prior to installation of the current landfill cap in 2006. Surface water and sediment were previously investigated for site COCs during the 1989 RI, which did not identify evidence of impacts from the landfill resulting in unacceptable ecological risk or human health risks associated with recreational use of the lakes (e.g., boating, swimming, fishing). The lakes are surrounded by private property and still used for recreational purposes by surrounding private landowners.

Although current information does not indicate a change in the protectiveness of the remedy, a supplemental RI/FS for PFAS should include sufficient data collection to complete human health and ecological exposure risk assessments if PFAS are detected in surface water and/or sediment.

Expected Progress Towards Meeting RAOs

As discussed above, EPA has determined that the current MNA remedy is not working to restore the groundwater to the cleanup levels, as the leading edge of the 1,4-dioxane plume continues to expand and cleanup goals will not likely be met in a reasonable timeframe without additional treatment of the plume. Additional RAOs for PFAS may be needed depending on the outcome of the supplemental RI/FS.

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

No additional information has come to light that would call into question the protectiveness of the remedy. Additionally, there have been no newly identified natural disasters or weather events that have adversely impacted 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:

Issue #1				
OU(s): OU1/Sitewide	**Issue Category: Remedy Performance**			
	Issue: PFAS has been documented in the Site groundwater contaminant plume since 2019 and appears to be distributed similarly to other groundwater COCs sourced from the landfill. The current groundwater MNA remedy does not address PFAS and the extent of PFAS in groundwater may require additional investigation. Other Site media (e.g., surface water, sediment) have not been investigated for PFAS.			
	Recommendation: Complete a supplemental RI/FS inclusive of a human health and ecological risk assessment for PFAS. Determine if PFAS should be added as a Site COC.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	5/10/2026
Issue #2				
OU(s): OU1/Sitewide	**Issue Category: Remedy Performance**			
	Issue: The current MNA groundwater remedy is not working for 1,4-dioxane as the leading edge of the plume continues to expand and groundwater cleanup goals will not likely be met without additional treatment of the plume. An alternative groundwater remedy may also be needed to address PFAS.			
	Recommendation: Identify and evaluate groundwater remedial alternatives to achieve groundwater RAOs and prevent further migration of the 1,4-dioxane contaminant plume. If it is determined that PFAS will need to be addressed as part of the new or modified groundwater remedy, the alternatives evaluation should also consider PFAS. EPA may then issue a decision document to incorporate the selected new or modified groundwater remedy.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	12/31/2026

Issue #3				
OU(s): OU1/Sitewide	**Issue Category: Institutional Controls**			
	Issue: ICs are not in place for Kalamazoo County properties (outside the current GRZ) that are affected by the lowered 1,4-dioxane DWC (plus buffer).			
	Recommendation: Amend the Kalamazoo County GRZ to include the additional Kalamazoo County properties affected by the change in the 1,4-dioxane DWC (plus buffer).			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	12/31/2025

Issue #4				
OU(s): OU1/Sitewide	**Issue Category: Institutional Controls**			
	Issue: The ICIAP needs to be revised to include all LTS components as outlined in the ICIAP guidance and updated to include ICs required in the 2021 ESD.			
	Recommendation: Revise the ICIAP to incorporate all LTS components and ICs required in the 2021 ESD.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	12/31/2025

VII. PROTECTIVENESS STATEMENT

OU1 and Sitewide Protectiveness Statement(s)
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedy for the K&L Avenue Landfill Superfund Site currently protects human health and the environment because the remedy prevents direct contact with landfilled waste and eliminates unacceptable risks to public health associated with potable groundwater use by connecting homes that exceed groundwater cleanup criteria to the Kalamazoo County water supply, or by providing replacement wells at impacted homes in Van Buren County, or by providing bottled water. Groundwater ordinances are in effect for Kalamazoo County and Van Buren County to prevent potable use of contaminated groundwater. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: • Complete a supplemental RI/FS inclusive of a human health and ecological risk assessment for PFAS. Determine if PFAS should be added as a Site COC; • Identify and evaluate groundwater remedial alternatives to achieve groundwater RAOs and prevent further migration of the 1,4-dioxane contaminant plume. If it is determined that PFAS will need to be addressed as part of the new or modified groundwater remedy, the alternatives evaluation should also consider PFAS. EPA may then issue a decision document to incorporate the selected new or modified groundwater remedy; • Amend the Kalamazoo County GRZ to include the additional Kalamazoo County properties affected by the change in the 1,4-dioxane DWC (plus buffer); and • Revise the ICIAP to incorporate all LTS components and ICs required in the 2021 ESD.

VIII. NEXT REVIEW

The next FYR report for the K&L Avenue Landfill Superfund Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

The following documents were reviewed for the Five-Year Review:

EPA 1989. *Remedial Investigation (RI)*. SEMS ID: 166231

EPA 1990. *Record of Decision (ROD*). September 28. SEMS ID: 152353

EPA 2005. *Second ROD Amendmen*t. September 12. SEMS ID: 238865

EPA 2014. *Second Five Year Review (FYR) Report*. May 9. SEMS ID: 959080

EPA 2015. *Institutional Control Implementation and Assurance (ICIAP) Plan.* May 28. SEMS ID: 486609

EPA 2015. *Contingent Remedial Alternatives Evaluation Update and Preliminary Evaluation of Monitored Natural Attenuation (MNA) Report*. June 11. SEMS ID: 486610

EPA 2016. *Revised ICIAP*. March 14. SEMS ID: 516648

EPA 2017. *Second FYR Report Addendum.* April 26. SEMS ID: 509000

EPA 2018. *Updated ICIAP*. August 31.

EPA 2020. *Third Five Year Review (FYR) Report*. April 3. SEMS ID: 955553

EPA 2021. *Explanation of Significant Differences (ESD)*. SEMS ID: 968657

EPA 2024. *Letter Re: Approval of Revised Hydrogeologic Work Plan - WJ Avenue*. SEMS ID: 2006407

Golder 2010. *Groundwater Performance Monitoring Report, Initial 5-Year Evaluation Of Monitored Natural Attenuation Ra Activities (& Residential Monitoring Plan).* SEMS ID: 395568

Golder 2015. *Groundwater Performance Monitoring Report, Second 5-Year Evaluation of MNA and fall 2015 Semi- Annual Remedial Action (RA) Groundwater Monitoring Data Summary Report (DSR),* December 30. SEMS ID: 486610

Golder 2016. *Work Plan for Supplemental Hydrogeological Investigations, Residential Monitoring and Bench Scale Studies on Treatment of 1,4-Diethylene Dioxide via Bio stimulation*. March 14. SEMS ID: 976593

Golder 2016. *Bench Scale Studies Work Plan on Treatment of 1,4-Dietheylene Dioxide (DD) via Bio stimulation*. March 14. SEMS ID: 976593

Golder 2018. Semi Annual Groundwater Monitoring Summary Report, Fall 2018. November 11. SEMS ID: 590045

Golder 2019a. *2018 Municipal Water Connections and Well Closures Report*. February 22. SEMS ID: 2002385

Golder 2019b. *Groundwater Modeling Report*. June 10. SEMS ID: 2002384

Golder 2019c. Residential Monitoring Data Summary Report, Fall 2019 Semi-Annal Sampling. Dec 10. SEMS ID: 976592

Golder 2020a. *2020 Annual Report*. June 1. SEMS ID: 590046

Golder 2020b. *Annual Spring Residential Monitoring Report*. June 5. SEMS ID: 976594

Golder 2020c. *July 2020 PFAS Groundwater Sampling Summary Report*. September 8. SEMS ID: 976606

Golder 2020d. *Semi- Annual Fall Residential Monitoring Report*. Nov 18. SEMS ID: 2003151

Golder 2020e. *Semi-Annual RD/RA Groundwater Monitoring Report (Fall 2020)*. Nov 18. SEMS ID: 2003150

Golder 2020f. *Technical Memorandum, Revised Hydrogeologic Assessment.* July 31. SEMS ID: 590391

Golder 2020g. *Contingent Remedial Alternatives Evaluation Update*. December. SEMS ID: 590053

Golder 2021a. *Residential Monitoring Data Summary Report – Spring 2021 Annual Sampling*. SEMS ID: 976595

Golder 2021b. *Semi Annual Progress Report for January Through June 2021*. SEMS ID: 590054

Golder 2021c. *Data Summary Report - 2021 Annual RA - Groundwater Monitoring*. SEMS ID: 2006091

Golder 2021d. *Fall 2021 Remedial Action (RA) Semi-annual Groundwater Monitoring - Data Summary Report, West KL Avenue Landfill, Kalamazoo, Michigan.* SEMS ID: 2003927

Golder 2021e. *Residential Monitoring Data Summary Report – Fall 2021 Semi-annual Sampling West Kl Landfill Site, Kalamazoo, Michigan*. SEMS ID: 2003926

Golder 2021f. *Annual Report For 2021 Remedial Design / Remedial Action Activities*. SEMS ID: 590059

Golder 2021g. *Semi-annual Report for July to December 2021 - Rd/Ra Activities*. SEMS ID: 2004075

Golder 2022a. *Semi-annual Progress Report for January Through June 2022, Rd/Ra Activities.* SEMS ID: 976785

Golder 2022b. *Groundwater Modeling Interim Report.* SEMS ID: 979066

Golder 2022c. *Annual Report For 2022 Remedial Design/Remedial Action (Rd/Ra) Activities.* SEMS ID: 979059

Golder 2022d. *Spring 2022 Remedial Action (Ra) Annual Groundwater Monitoring - Data Summary Report - West Kl Avenue Landfill, Kalamazoo, Michigan*. SEMS ID: 2006093

Golder 2022e. *Fall 2022 Remedial Action (Ra) Semi-annual Groundwater Monitoring Data Summary Report, West Kl Landfill Site, Kalamazoo, Michigan*. SEMS ID: 979058

Golder 2022f. *Residential Monitoring Data Summary Report – Fall 2022 Semi-annual Sampling West Kl Landfill Site, Kalamazoo, Michigan*. SEMS ID: 978958

Pfizer 2020a. *Semi-Annual RD/RA Progress Report (July through Dec 2019*). January 28. SEMS ID: 590047

Pfizer 2020b. *Spring Groundwater Sampling for PFAS, 2020*. June 18. SEMS ID: 590050Pfizer 2020c. *Semi-Annual RD/RA Progress Report (January through June 2020)*. July 28. SEMS ID: 590049

Pfizer 2020d. *Third 5 Year Review of MNA Remedy Performance*. Nov 25. SEMS ID: 590052

Pfizer 2021a. *Semi Annual Report for July to December 2020 RD/RA Activities.* SEMS ID: 590048

WSP 2022a. *Residential Monitoring Data Summary Report – Fall 2022 Semi-annual Sampling West Kl Landfill Site, Kalamazoo, Michigan.* SEMS ID: 984883

WSP 2023a. *Residential Monitoring Data Summary Report - Spring 2023 Annual Sampling West Kl Landfill Site, Kalamazoo, Michigan*. SEMS ID: 2006095

WSP 2023b. *Data Summary Report - Spring 2023 Annual Ra Groundwater Monitoring*. SEMS ID: 2006094

WSP 2024a. *Residential Monitoring Data Summary Report - Spring 2024 Annual Sampling West Kl Landfill Site, Kalamazoo, Michigan*. SEMS ID: 2006427

WSP 2024b. *Data Summary Report - Spring 2024 Annual Ra Groundwater Monitoring*. SEMS ID: 2006426

APPENDIX B – Additional Site Information

B1. Site Location Map

B2. Area Subject to Deed Restrictions under 1990 ROD

B3. 2003 Municipal Water Supply Area

B4. 2005 Municipal Water Supply Area

B5. GRZ & Proposed Expanded GRZ (Kalamazoo County) and Proposed GRZ (Van Buren County)

B6. Spring 2024 Residential Well Sample Location Map

B7. Map of Downgradient Residential Wells with Increasing 1,4-Dioaxne Trends

B8. Groundwater Monitoring Well & Aquifer Profile Boring Location Map

B9. Municipal Water Connection & Residential Supply Well Replacement Map (2023)

B10. Area Wetland Map

B11. December 2020 Model Simulated EISB At Skyview Drive

B12. December 2020 Model Simulated Pump-and-treat At Skyview Drive

FIGURE B1 – Site Location Map

FIGURE 1 -SITE LOCATION MAP

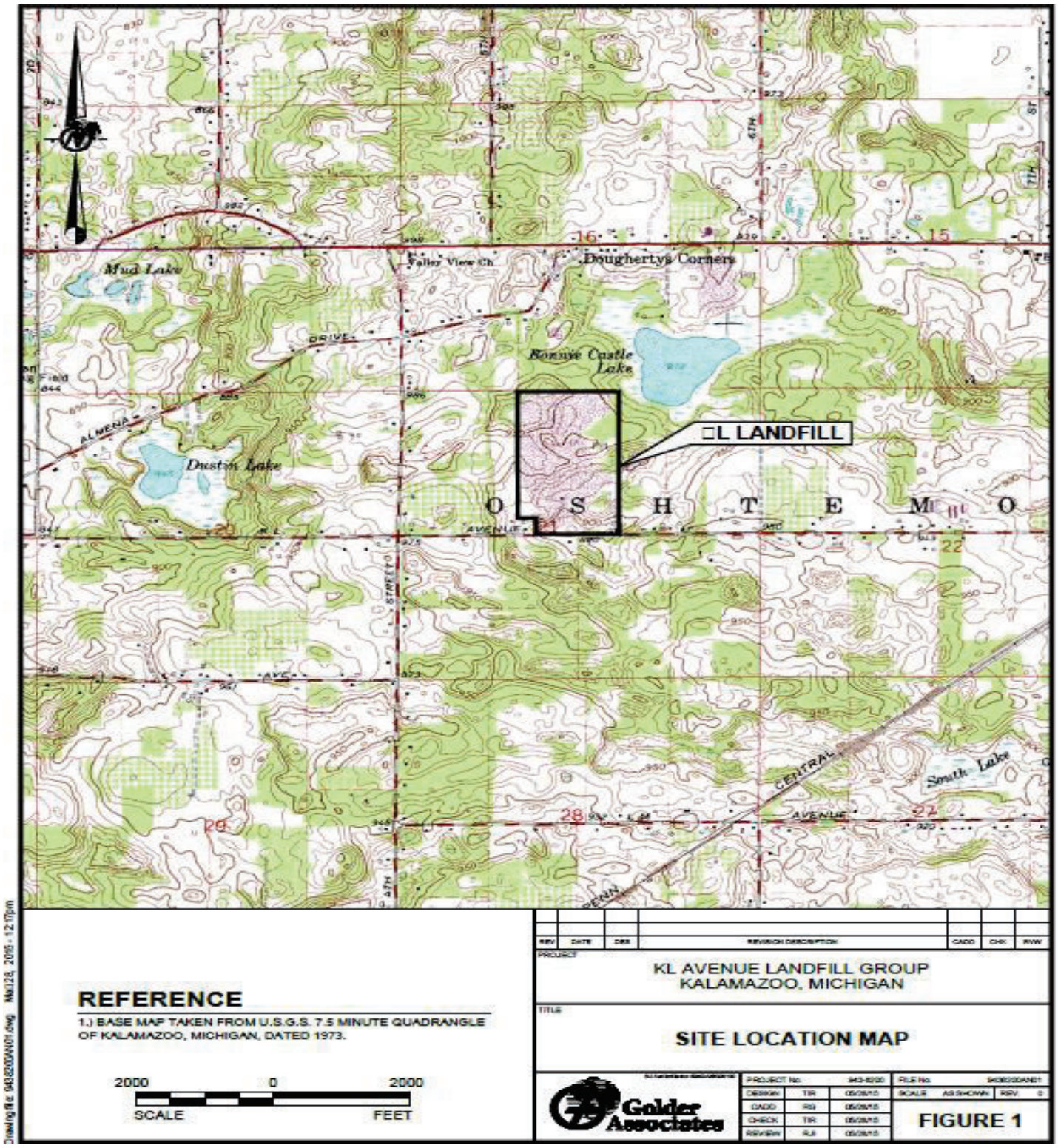


FIGURE 2
AREA SUBJECT TO DEED RESTRICTIONS UNDER 1990 ROD

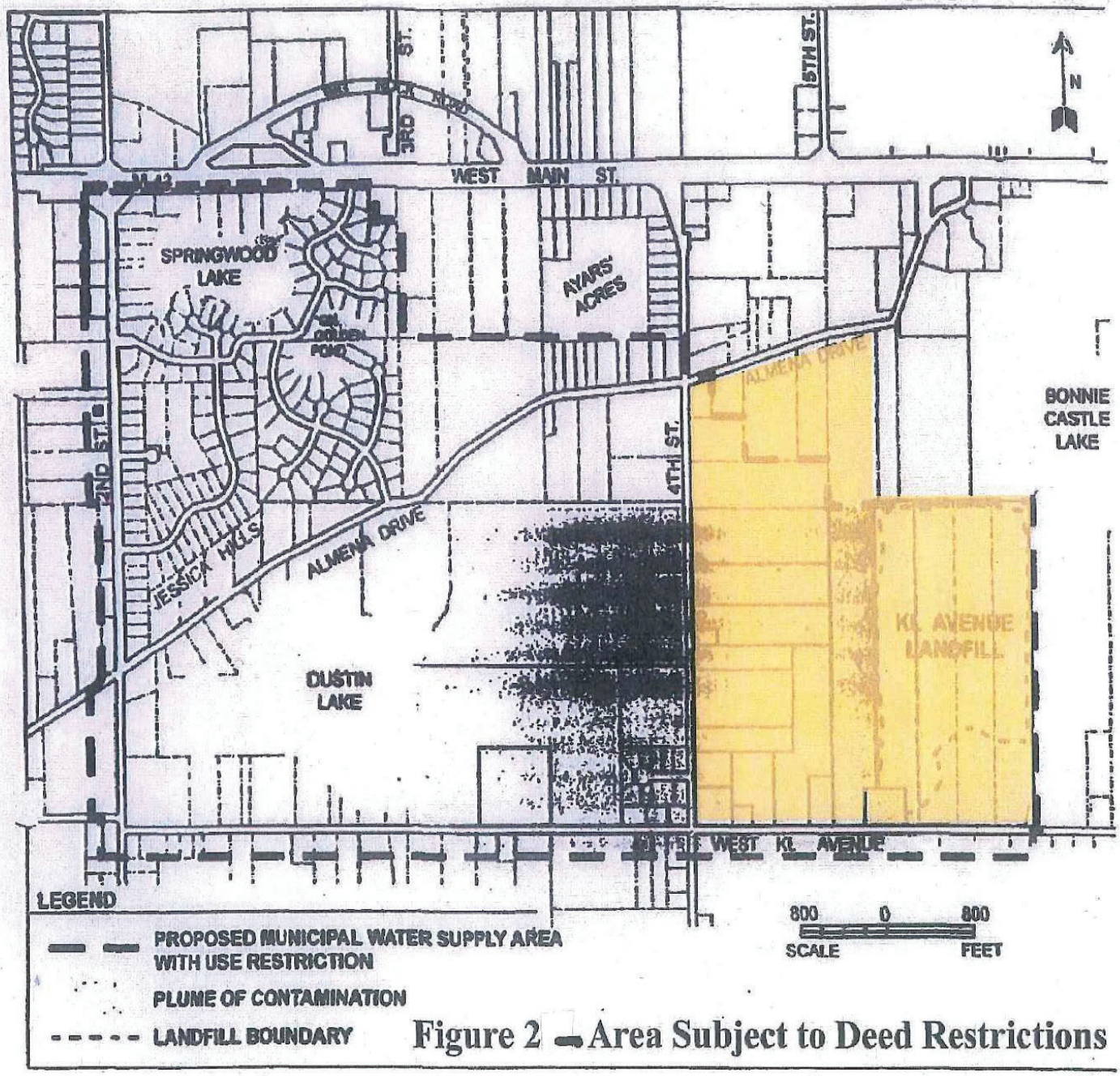


Figure 2 – Area Subject to Deed Restrictions

FIGURE B2 – Area Subject to Deed Restrictions Under 1990 ROD

[redacted] – DECLARATION OF RESTRICTIVE COVENANT AND ENVIRONMENTAL EASEMENT

May 2015 9438200.14

Legal Description of Landfill Parcels
West KL Avenue Landfill, Kalamazoo, MI

Legal Description of the West KL Avenue Landfill parcels (per Oshtemo Township Tax Records):

Property Number:	3905-21-180-020
Legal Description:	SEC 21-2-12 COM AT PT 42 R 1.5 FT E OF SW COR OF E1/2 NW1/4 TH RUNNING E 7 R TH N 160 R TH W 22 R 11.5 FT TH S 140 R TH E 16 R 11.5 FT TH S 20 R TO BEG * (H 21-7)
Property Number:	3905-21-180-030
Legal Description:	SEC 21-2-12 COM AT PT 49 R 1.5 FT E OF SW COR E1/2 NW1/4 TH E 21 R 11.5 FT TH N 160 R TH W 21 R 11.5 FT TH S 160 R TO BEG * (H 21-6)
Property Number:	3905-21-255-010
Legal Description:	SEC 21-2-12 COM AT PT 70 R 13 FT E OF SW COR E1/2 NW1/4 TH E 22 R 11.5 FT TH RUNNING N 160 R TH W 22 R 11.5 FT TH S 160 R TO BEG * (H-21-3)
Property Number:	3905-21-255-020
Legal Description:	SEC 21-2-12 BEG AT PT ON E&W1/4 LI SEC 21 13 RODS & 8 FT E OF C1/4 POST THEREOF TH E ALG SD E&W1/4 LI 23 RODS TH N 160 RODS TH W 23 RODS TH S 160 RODS TO BEG EXC BEG AT PT ON E&W1/4 LI SEC 21 36 R & 8 FT E OF C1/4 POST THEREOF TH N 280.5 FT TH W 37 FT TH SWLY 295.33 FT TO A PT ON SD E&W1/4 LI 123.75 FT W OF BEG TH E 123.75 FT TO BEG * (H 21-8-1)

DECLARATION OF DEED RESTRICTIONS

THIS DECLARATION, made effective the 19th day of April, 1994, by the COUNTY OF KALAMAZOO, a governmental entity, and the CHARTER TOWNSHIP OF OSHTEMO, a governmental entity, hereinafter collectively referred to as "Declarants."

LIBER 1720 PG 1190 15325

WHEREAS, Declarants are the owners of certain property in the Township of Oshtemo, County of Kalamazoo, State of Michigan, which is more particularly described in Exhibit "A" attached hereto and referred to herein as "property," and;

WHEREAS, Declarants, as parties to a Consent Decree entered on November 18, 1992 and filed in the Kalamazoo County Register of Deeds' Office, Liber 1320, Page 118, have agreed to certain deed restrictions on the property described in Exhibit "A."

NOW, THEREFORE, Declarants hereby declare that the property described herein shall be held, sold, and conveyed subject to the following restrictions, covenants, and conditions, which are necessary to effectuate remedial action for the property and to protect the public health or welfare or the environment, and which shall run with the property and be binding on all parties having any right, title, or interest in the property or any part thereof, their heirs, successors, legal representatives, and assigns, and shall inure to the benefit of each owner thereof.

1. There shall be no interference by any person with construction, operation, maintenance, and monitoring of all components of and structures and improvements resulting from or related to the response actions implemented pursuant to the aforementioned Consent Decree;

2. There shall be no extraction of the groundwater underlying the facility and adjacent properties for any purpose unless prior written approval from the U.S. EPA is obtained;

3. There shall be no residential, commercial, nor industrial use of the facility including, but not limited to, construction of any residences, buildings, or structures other than for the purpose of implementing, monitoring, and maintaining the remedial action required by the aforementioned Consent Decree unless approved in writing by the U.S. EPA;

4. There shall be no construction, installation, nor use of any buildings, wells, pipes, roads, ditches, or any other structures on the facility that may affect the physical integrity or operation and maintenance of the landfill cap; groundwater, surface water, and landfill gas monitoring systems; and the groundwater extraction and treatment systems, unless such construction, installation, or use is approved in advance in writing by the U.S. EPA.

The aforementioned restrictions are contained in Chapter 3 Paragraph 9 of the previously mentioned Consent Decree.

LIBER 1720 PG 1192

IN WITNESS WHEREOF, the undersigned, being the Declarants herein, have executed this instrument effective on the date set forth above.

WITNESSED:

Shirley J. Grigsby

Nancy Donovan

COUNTY OF KALAMAZOO

By: Richard D. Kleiman
Richard D. Kleiman, Chairman
Board of Commissioners

By: James O. Youngs
James O. Youngs
Clerk/Register

STATE OF MICHIGAN)
) SS.
COUNTY OF KALAMAZOO)

On April 19, 1994, before me, a Notary Public in and for said County, personally appeared Richard D. Kleiman and James O. Youngs, to me known to be the same persons described in and who executed the within instrument, who acknowledged the same to be their free act and deed.

Nancy C. Donovan
Notary Public, Nancy C. Donovan
Kalamazoo County, Michigan
My Commission Expires Sept. 30, 1996

3

WITNESSED:

LIBER 1720 PG 1193

Laura Kuhn
Laura Kuhn

Deborah Everett
Deborah Everett

CHARTER TOWNSHIP OF OSHTEMO

By: Ronald Fleckenstein
Ronald Fleckenstein
Township Supervisor

By: Elaine Branch
Elaine Branch
Township Clerk

STATE OF MICHIGAN)
)ss.
COUNTY OF KALAMAZOO)

The foregoing instrument was acknowledged before me this 14th day of April, 1994, by Ronald Fleckenstein and Elaine Branch, the Supervisor and Clerk respectively, of Oshtemo Charter Township, a Michigan municipal corporation, on behalf of the Township by authority of the Oshtemo Charter Township Board of Trustees.

Wendy R. Fleckenstein
Notary Public, Wendy R. Fleckenstein
Kalamazoo County, Michigan
My Commission Expires: [illegible]

This document was prepared by Steven E. Burnham, P43358)
KALAMAZOO COUNTY BOARD OF COMMISSIONERS
201 West Kalamazoo Avenue
Kalamazoo, Michigan 49007
(616) 384-8111

EXHIBIT A

LIBER 1720 PG 1194

PARCELS OWNED BY THE COUNTY OF KALAMAZOO:

Land situated in the Township of Oshtemo, County of Kalamazoo, State of Michigan, more particularly described as:

1. Commencing at a point 13 rods 8 feet East of the Southwest corner of the West half of the Northeast quarter of said Section 21, thence East 23 rods, thence North 160 rods, thence West 23 rods, thence South 160 rods to the place of beginning. Excepting commencing at a point 13 rods 8 feet East of the Southwest corner of the West half of the Northeast quarter of Section 21, thence East 23 rods for the place of beginning of the property hereinafter described, thence North 280 feet 6 inches, thence West 37 feet, thence Southwesterly 295 feet 4 inches to a point 123 feet 9 inches West of the place of beginning, thence East 123 feet 9 inches to the place of beginning.

2. Commencing 49 rods 1½ feet East of the Southwest corner of the East half of the Northwest quarter of Section 21, Town 2 South, Range 12 West, thence East 21 rods, 11½ feet, thence North 160 rods to the North line of said section, thence West 21 rods 11½ feet, thence South 160 rods to the [illegible] beginning.

Also commencing at a point 42 rods 1½ feet East of the Southwest corner of the East half of the Northwest quarter of Section 21, Town 2 South, Range 12 West, thence East 7 rods, thence North 160 rods, thence West 22 rods 11½ feet, thence South 160 rods, thence East 15 rods 11½ feet, thence South 0 rods to beginning.

PARCEL OWNED BY THE CHARTER TOWNSHIP OF OSHTEMO:

Land situated in the Township of Oshtemo, County of Kalamazoo, State of Michigan, more particularly described as:

1. Commencing on the East and West one quarter line of Section 21, Township 2 South, Range 12 West, 70 rods 13 feet East of the Southwest corner of the East one-half of the Northwest one-quarter of said Section 21; thence East 22 rods 11½ feet; thence North 160 rods to the North line of said Section; thence West along said North line 22 rods 11½ feet; thence South 160 rods to the place of beginning.

D [illegible] SB EXHIBITA SO

2006-028901
Page 1 of 7
06/29/2006 12:48P
CHICAGO TITLE REST-Kalamazoo ROD

DECLARATION OF RESTRICTIVE COVENANT

This Declaration of Restrictive Covenant ("Restrictive Covenant") has been recorded with the Kalamazoo County Register of Deeds for the purpose of protecting public health, safety, and welfare, and the environment by prohibiting or restricting activities that could result in unacceptable exposure to environmental contamination present at the property located in Oshtemo Township, Kalamazoo County, Michigan and legally described in Exhibit 1 attached hereto ("Property"). The Property is adjacent to the West KL Avenue Landfill for which remedial action is being conducted pursuant to a Record of Decision ("ROD") issued by the U.S. EPA. The remedial action that is being implemented to address environmental contamination is described in the ROD issued on September 20, 1990, and subsequently amended by U.S. EPA on February 27, 2003, and September 12, 2005. The West KL Avenue Landfill Group is implementing the remedial action pursuant to a Consent Decree entered into with the U.S. EPA in Civil Action No. 1:92-CV-859, United States District Court for the Western District of Michigan.

This Restrictive Covenant is recorded to 1) restrict unacceptable exposures to hazardous substances located in the groundwater on the Property; 2) assure that the use of the Property is consistent with the implementation of the remedial action for the West KL Avenue Landfill and does not result in unacceptable exposures; and 3) to prevent damage or disturbance of any monitoring wells located on the Property or stormwater control structures constructed on the Property during the remedial action.

Exhibit 2 provides a survey of the Property that is subject to the land use or resource use restrictions specified herein.

Summary of Response Activities

The Property is immediately to the west of the West KL Avenue Landfill. As described further in the ROD, the West KL Avenue Landfill is the source of groundwater contamination, and the plume of groundwater contamination flows beneath the Property. The groundwater contamination includes a variety of chemical constituents, and several of these constituents exceed the applicable drinking water criteria. In order to address this contamination, the municipal water supply was extended to the Property area and beyond, and the amended ROD requires the implementation of an Ordinance to prohibit the use of groundwater.

In addition, several groundwater and gas vapor monitoring wells are located on the Property. These wells are used to periodically monitor the status of the groundwater contamination and landfill gas vapors as required by the ROD. The Property will also contain stormwater control structures constructed as part of the remedial action for the West KL Avenue Landfill.

Commercial CTIC Commercial

Definitions

"U.S. EPA" means the United States Environmental Protection Agency, its successor entities, and those persons or entities acting on its behalf.

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

NOW THEREFORE,

Declaration of Land Use or Resource Use Restrictions

Charter Township of Oshtemo, as Owner of the Property, hereby declares and covenants that the Property shall be subject to the following restrictions and conditions:

1. The Owner shall prohibit all uses of the Property unless the West KL Avenue Landfill Group provides written approval for such use. The West KL Avenue Landfill Group includes Pharmacia Corporation, Kalamazoo County, the City of Kalamazoo, and Oshtemo Township. The primary contact for the Group is William Gierke, 908-901-8830.

2. The Owner shall prohibit activities on the Property designated in Exhibit 2 as follows:

A. Any excavation or other intrusive activity that could affect the integrity of the cap constructed at the West KL Avenue Landfill or any aspect of the remediation for the Landfill.

B. Any construction of wells or other devices to extract groundwater for consumption, irrigation, or any other use, except for wells and devices that are part of the remedial action for the West KL Avenue Landfill pursuant to the ROD.

3. The Owner shall prohibit activities on the Property that may interfere with any element of the remedial action for the West KL Avenue Landfill, including the stormwater control structures, monitoring wells, the performance of operation and maintenance activities, monitoring, or other measures necessary to ensure the effectiveness and integrity of the remedial action for the West KL Avenue Landfill.

4. The Owner shall prohibit all residential, commercial, and industrial use of the Property. The only permitted use shall be as a park for recreational purposes, but only after written approval from the West KL Avenue Landfill Group.

5. The Owner shall prohibit the construction of any structures or buildings on the Property except for slab on grade construction with no subgrade basement.

6. Access. The Owner shall grant to the West KL Avenue Landfill Group and U.S. EPA, and their designated representatives, the right to enter the Property at reasonable times for the purpose of determining and monitoring compliance with the ROD, including the right to take samples, maintain and install monitoring wells or treatment system wells, and inspect the operation of the response activities, or take other actions required to maintain the Group's compliance with the Consent Decree.

7. Notice. The Owner shall provide notice to the West KL Avenue Landfill Group of the Owner's intent to transfer any interest in the Property at least fourteen (14) business days prior to consummating 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 terms and conditions of this Restrictive Covenant. The notice required to be made under this Paragraph shall be made to: William Gierke, 100 Route 206 North, MS 611, Peapack, NJ 07977, and shall include a statement that the notice is being made pursuant to the requirements of this Restrictive Covenant. A copy of this Restrictive Covenant shall be provided to all future owners, heirs, successors, lessees, easement holders, assigns, and transferees by the person transferring the interest.

8. Term and Enforcement of Restrictive Covenant. This Restrictive Covenant shall run with the Property and shall be binding on the Owner; future owners; and all current and future successors, lessees, easement holders, their assigns, and their authorized agents, employees or persons acting under their direction and control. This Restrictive Covenant may only be modified or rescinded with the written approval of the West KL Avenue Landfill Group.

The West KL Avenue Landfill Group and Pharmacia Corporation and its successors and assigns may enforce the restrictions set forth in this Restrictive Covenant by legal action in a court of competent jurisdiction.

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

10. Authority to Execute Restrictive Covenant. The undersigned person executing this Restrictive Covenant is the Owner and represents and certifies that he or she is duly authorized and has been empowered to execute and deliver this Restrictive Covenant.

IN WITNESS WHEREOF, the Charter Township of Oshtemo has caused this Restrictive Covenant to be executed on this 15th day of June, 2006.

CHARTER TOWNSHIP OF OSHTEMO

By: _____
Signature

Name: _____

Its: _____
Title

STATE OF MICHIGAN)
) ss.
COUNTY OF KALAMAZOO)

The foregoing instrument was acknowledged before me in Kalamazoo County, Michigan, on June 15, 2006 by John VanSyke, as Supervisor of the Charter Township of Oshtemo, a Michigan municipal corporation, on behalf of the Township.

Notary Public, State of Michigan,
County of Allegan
My commission expires: March 12, 2008
Acting in the County of Kalamazoo

PREPARED BY AND RETURN TO:
Mark D. Sevald, Attorney
WARNER NORCROSS & JUDD LLP
111 Lyon Street, NW, Suite 900
Grand Rapids, Michigan 49503-2487
Telephone: (616) 752-2755

032131.111671 GR1274385-4

Return To
MAIL TO:
Chicago Title of Michigan
Commercial Division
941 West Milham Road
Portage, MI 49024

2006-028901
Page: 4 of 7
06/29/2006 12:46P
CHICAGO TITLE
REGT-Kalamazoo ROD

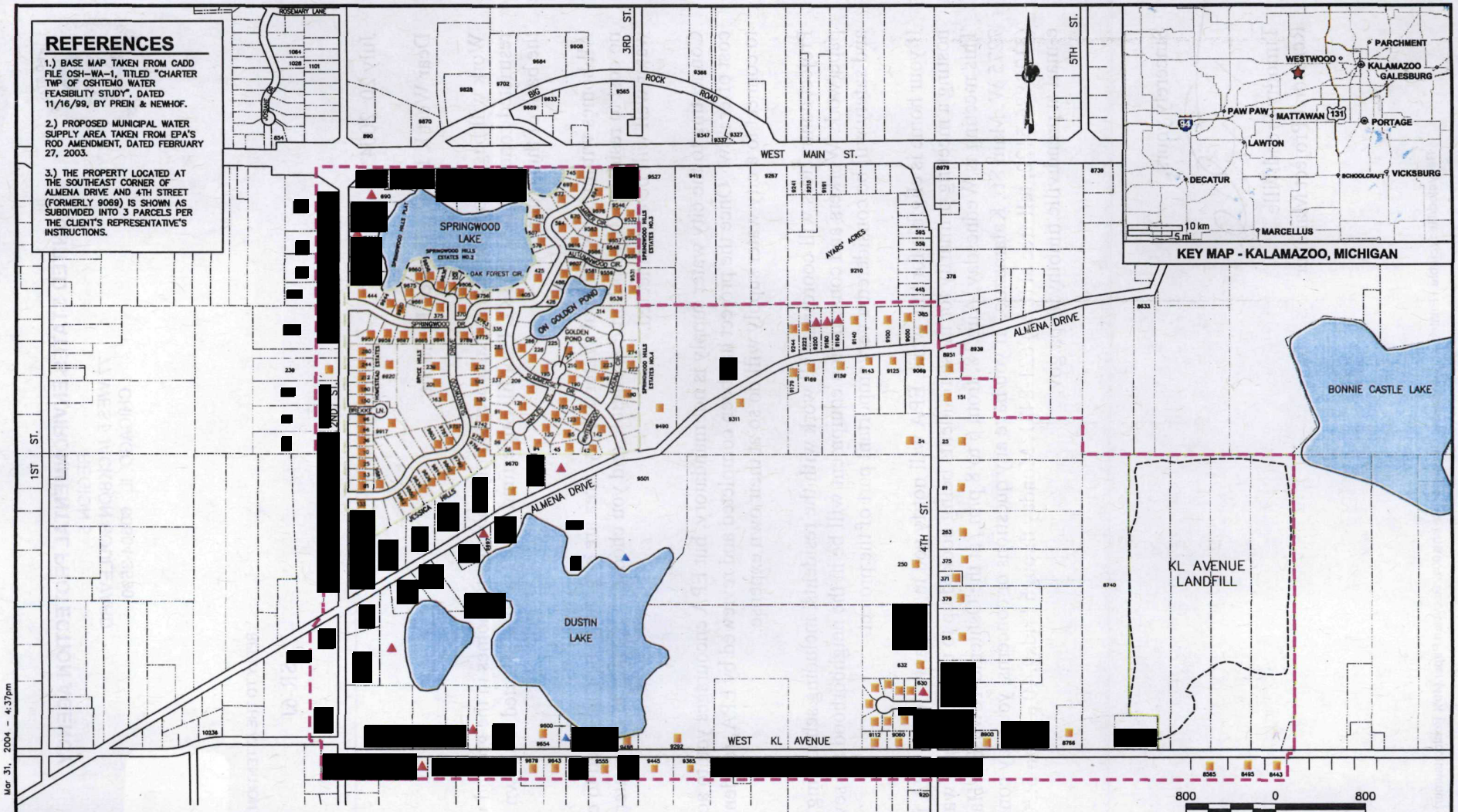
FIGURE B3 – 2003 Municipal Water Supply Area

REFERENCES

1.) BASE MAP TAKEN FROM CADD FILE OSH-WA-1, TITLED "CHARTER TWP OF OSHTEMO WATER FEASIBILITY STUDY", DATED 11/16/99, BY PREIN & NEWHOF.

2.) PROPOSED MUNICIPAL WATER SUPPLY AREA TAKEN FROM EPA'S ROD AMENDMENT, DATED FEBRUARY 27, 2003.

3.) THE PROPERTY LOCATED AT THE SOUTHEAST CORNER OF ALMENA DRIVE AND 4TH STREET (FORMERLY 9069) IS SHOWN AS SUBDIVIDED INTO 3 PARCELS PER THE CLIENT'S REPRESENTATIVE'S INSTRUCTIONS.



LEGEND

- MUNICIPAL WATER SUPPLY AREA
- SPRINGWOOD HILLS MUNICIPAL WATER HOOKUPS: 2001
- LANDFILL BOUNDARY
- ON MUNICIPAL WATER SUPPLY
- ON-SITE WELLS
- VACANT / UNDEVELOPED
- SEASONAL RESIDENCE

Golder Associates
Philadelphia USA

FILE No.	9438200R002
PROJECT No.	943-8200
REV.	0
SCALE	AS SHOWN
DATE	03/31/04
DESIGN	RJI
CADD	MJS
CHECK	
REVIEW	

TITLE

RESIDENTIAL WELL / MUNICIPAL WATER SERVICE

KL AVENUE LANDFILL

FIGURE 1

Drawing file: 9438200R002.dwg Mar 31, 2004 - 4:37pm

FIGURE B4 – 2005 Municipal Water Supply Area

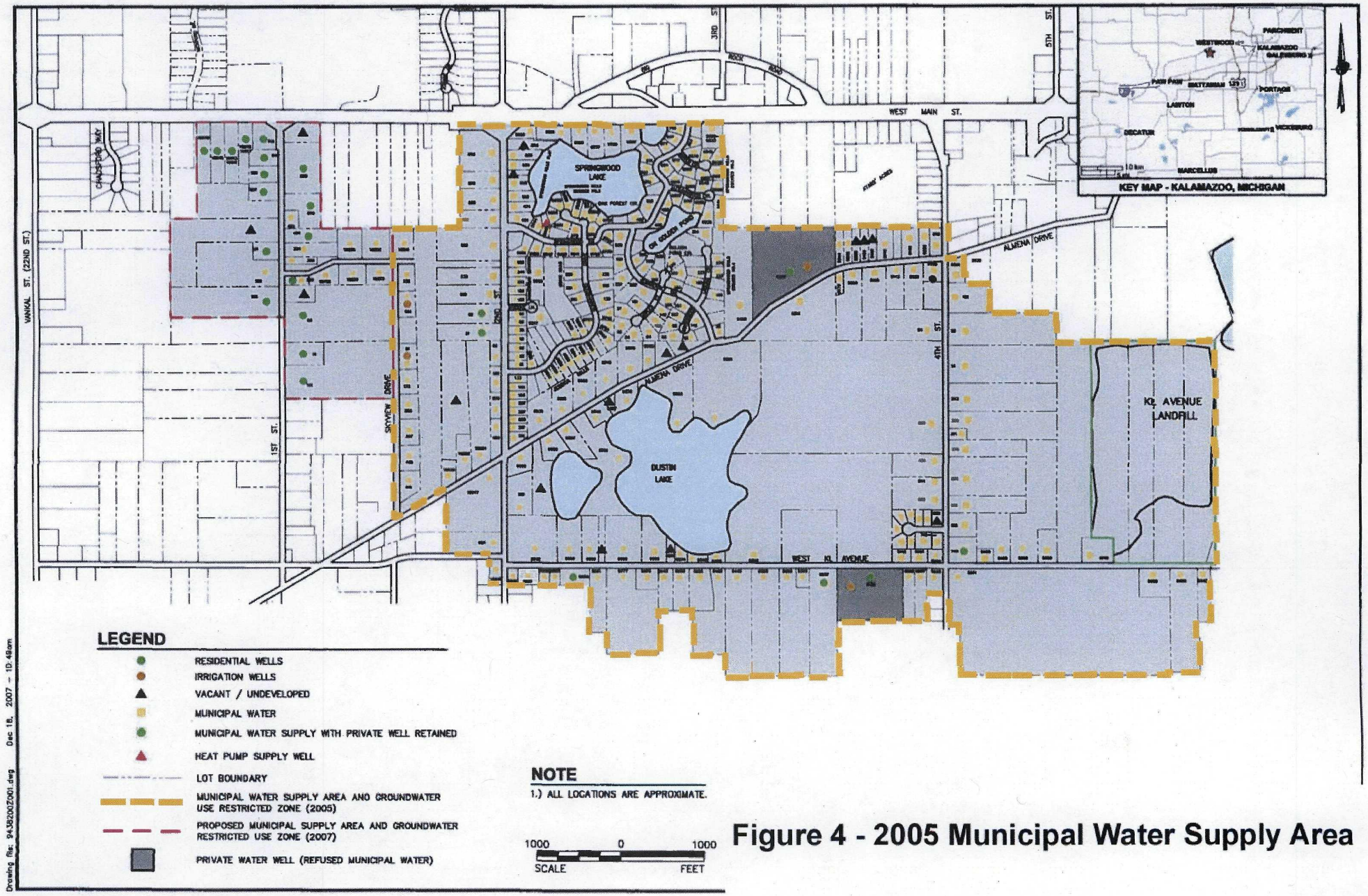
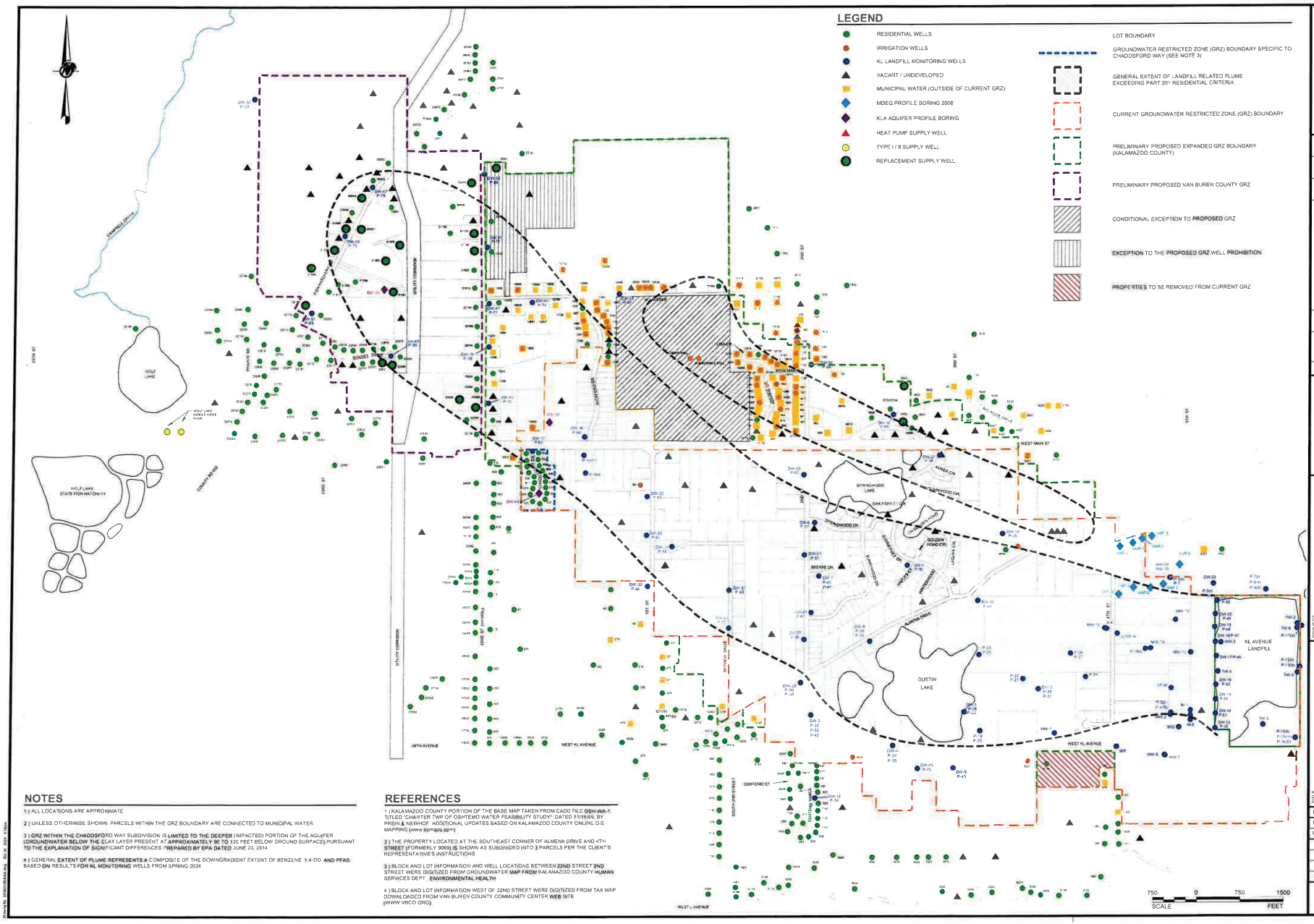


Figure 4 - 2005 Municipal Water Supply Area

FIGURE B5 – GRZ and Proposed Expanded GRZ (Kalamazoo County) and Proposed GRZ (Van Buren County)



NOTES

1.) ALL LOCATIONS ARE APPROXIMATE

2.) UNLESS OTHERWISE SHOWN, PARCELS WITHIN THE GRZ BOUNDARY ARE CONNECTED TO MUNICIPAL WATER

3.) GRZ WITHIN THE CHADDSFORD WAY SUBDIVISION IS LIMITED TO THE DEEPER (IMPACTED) PORTION OF THE AQUIFER (GROUNDWATER BELOW THE CLAY LAYER PRESENT AT APPROXIMATELY 90 TO 120 FEET BELOW GROUND SURFACE) PURSUANT TO THE EXPLANATION OF SIGNIFICANT DIFFERENCES PREPARED BY EPA DATED JUNE 23, 2014

4.) GENERAL EXTENT OF PLUME REPRESENTS A COMPOSITE OF THE DOWNGRADIENT EXTENT OF BENZENE 1,4-DD AND PFAS BASED ON RESULTS FOR KL MONITORING WELLS FROM SPRING 2024

REFERENCES

1.) KALAMAZOO COUNTY PORTION OF THE BASE MAP TAKEN FROM CADD FILE DSH-WA-1, TITLED "CHARTER TWP OF OSHTEMO WATER FEASIBILITY STUDY", DATED 11/16/99, BY PRein & NEWHOF. ADDITIONAL UPDATES BASED ON KALAMAZOO COUNTY ONLINE GIS MAPPING (www.kcmaps.com)

2.) THE PROPERTY LOCATED AT THE SOUTHEAST CORNER OF ALMENA DRIVE AND 4TH STREET (FORMERLY 9069) IS SHOWN AS SUBDIVIDED INTO 3 PARCELS PER THE CLIENT'S REPRESENTATIVE'S INSTRUCTIONS

3.) BLOCK AND LOT INFORMATION AND WELL LOCATIONS BETWEEN 22ND STREET 2ND STREET WERE DIGITIZED FROM GROUNDWATER MAP FROM KALAMAZOO COUNTY HUMAN SERVICES DEPT., ENVIRONMENTAL HEALTH

4.) BLOCK AND LOT INFORMATION WEST OF 22ND STREET WERE DIGITIZED FROM TAX MAP DOWNLOADED FROM VAN BUREN COUNTY COMMUNITY CENTER WEB SITE (WWW.VBCO.ORG).

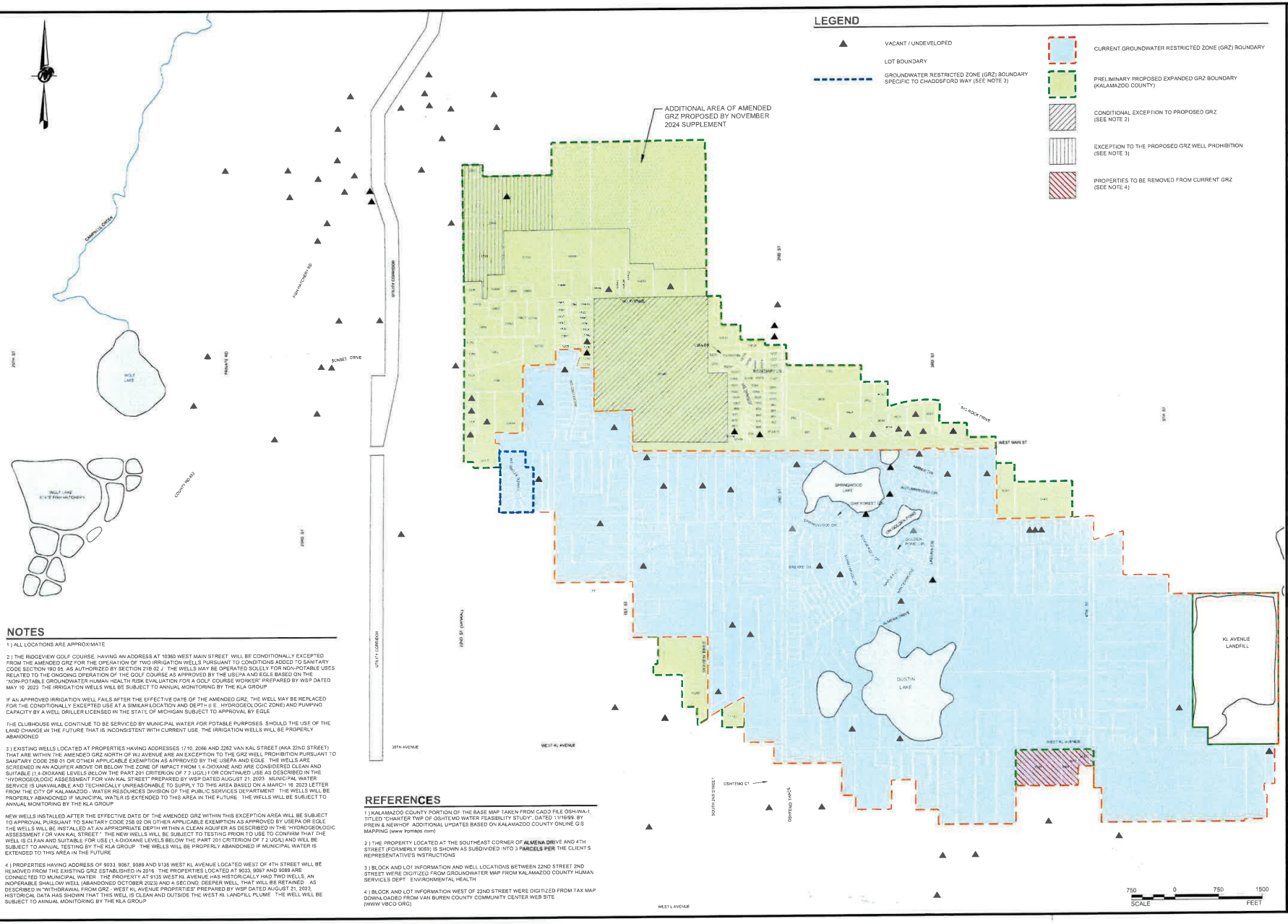
REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT: KL AVENUE LANDFILL GROUP
KALAMAZOO, MICHIGAN

TITLE: LOCATIONS OF GROUNDWATER MONITORING WELLS AND GENERAL EXTENT OF THE PLUME ABOVE PART 201 DRINKING WATER CRITERIA

PROJECT No.	3140S041.001	
FILE No.	BU08A	
REV. 0	SCALE	AS SHOWN
DESIGN	RJI	2024-10-30
CADD	RG	2024-10-30
CHECK	MS	2024-10-30
REVIEW	RJI	2024-10-30

FIGURE 2



NOTES

1) ALL LOCATIONS ARE APPROXIMATE

2) THE RIDGEVIEW GOLF COURSE, HAVING AN ADDRESS AT 10360 WEST MAIN STREET WILL BE CONDITIONALLY EXCEPTED FROM THE AMENDED GRZ FOR THE OPERATION OF TWO IRRIGATION WELLS PURSUANT TO CONDITIONS ADDED TO SANITARY CODE SECTION 180 05 AS AUTHORIZED BY SECTION 218 02 J THE WELLS MAY BE OPERATED SOLELY FOR NON-POTABLE USES RELATED TO THE ONGOING OPERATION OF THE GOLF COURSE AS APPROVED BY THE USEPA AND EGLE BASED ON THE "NON-POTABLE GROUNDWATER HUMAN HEALTH RISK EVALUATION FOR A GOLF COURSE WORKER" PREPARED BY WSP DATED MAY 10 2023 THE IRRIGATION WELLS WILL BE SUBJECT TO ANNUAL MONITORING BY THE KLA GROUP

IF AN APPROVED IRRIGATION WELL FAILS AFTER THE EFFECTIVE DATE OF THE AMENDED GRZ, THE WELL MAY BE REPLACED FOR THE CONDITIONALLY EXCEPTED USE AT A SIMILAR LOCATION AND DEPTH (I E , HYDROGEOLOGIC ZONE) AND PUMPING CAPACITY BY A WELL DRILLER LICENSED IN THE STATE OF MICHIGAN SUBJECT TO APPROVAL BY EGLE

THE CLUBHOUSE WILL CONTINUE TO BE SERVICED BY MUNICIPAL WATER FOR POTABLE PURPOSES SHOULD THE USE OF THE LAND CHANGE IN THE FUTURE THAT IS INCONSISTENT WITH CURRENT USE, THE IRRIGATION WELLS WILL BE PROPERLY ABANDONED

3) EXISTING WELLS LOCATED AT PROPERTIES HAVING ADDRESSES 1710, 2066 AND 2262 VAN KAL STREET (AKA 22ND STREET) THAT ARE WITHIN THE AMENDED GRZ NORTH OF WJ AVENUE ARE AN EXCEPTION TO THE GRZ WELL PROHIBITION PURSUANT TO SANITARY CODE 258 01 OR OTHER APPLICABLE EXEMPTION AS APPROVED BY THE USEPA AND EGLE THE WELLS ARE SCREENED IN AN AQUIFER ABOVE OR BELOW THE ZONE OF IMPACT FROM 1,4-DIOXANE AND ARE CONSIDERED CLEAN AND SUITABLE (1,4-DIOXANE LEVELS BELOW THE PART 201 CRITERION OF 7 2 UG/L) FOR CONTINUED USE AS DESCRIBED IN THE "HYDROGEOLOGIC ASSESSMENT FOR VAN KAL STREET" PREPARED BY WSP DATED AUGUST 21, 2023 MUNICIPAL WATER SERVICE IS UNAVAILABLE AND TECHNICALLY UNREASONABLE TO SUPPLY TO THIS AREA BASED ON A MARCH 16 2023 LETTER FROM THE CITY OF KALAMAZOO - WATER RESOURCES DIVISION OF THE PUBLIC SERVICES DEPARTMENT THE WELLS WILL BE PROPERLY ABANDONED IF MUNICIPAL WATER IS EXTENDED TO THIS AREA IN THE FUTURE. THE WELLS WILL BE SUBJECT TO ANNUAL MONITORING BY THE KLA GROUP

NEW WELLS INSTALLED AFTER THE EFFECTIVE DATE OF THE AMENDED GRZ WITHIN THIS EXCEPTION AREA WILL BE SUBJECT TO APPROVAL PURSUANT TO SANITARY CODE 258 02 OR OTHER APPLICABLE EXEMPTION AS APPROVED BY USEPA OR EGLE THE WELLS WILL BE INSTALLED AT AN APPROPRIATE DEPTH WITHIN A CLEAN AQUIFER AS DESCRIBED IN THE "HYDROGEOLOGIC ASSESSMENT FOR VAN KAL STREET " THE NEW WELLS WILL BE SUBJECT TO TESTING PRIOR TO USE TO CONFIRM THAT THE WELL IS CLEAN AND SUITABLE FOR USE (1,4-DIOXANE LEVELS BELOW THE PART 201 CRITERION OF 7 2 UG/L) AND WILL BE SUBJECT TO ANNUAL TESTING BY THE KLA GROUP THE WELLS WILL BE PROPERLY ABANDONED IF MUNICIPAL WATER IS EXTENDED TO THIS AREA IN THE FUTURE

4) PROPERTIES HAVING ADDRESS OF 9033, 9067, 9089 AND 9135 WEST KL AVENUE LOCATED WEST OF 4TH STREET WILL BE REMOVED FROM THE EXISTING GRZ ESTABLISHED IN 2016 THE PROPERTIES LOCATED AT 9033, 9067 AND 9089 ARE CONNECTED TO MUNICIPAL WATER THE PROPERTY AT 9135 WEST KL AVENUE HAS HISTORICALLY HAD TWO WELLS, AN INOPERABLE SHALLOW WELL (ABANDONED OCTOBER 2023) AND A SECOND, DEEPER WELL, THAT WILL BE RETAINED AS DESCRIBED IN "WITHDRAWAL FROM GRZ - WEST KL AVENUE PROPERTIES" PREPARED BY WSP DATED AUGUST 21, 2023, HISTORICAL DATA HAS SHOWN THAT THIS WELL IS CLEAN AND OUTSIDE THE WEST KL LANDFILL PLUME THE WELL WILL BE SUBJECT TO ANNUAL MONITORING BY THE KLA GROUP

REFERENCES

1) KALAMAZOO COUNTY PORTION OF THE BASE MAP TAKEN FROM CADD FILE OSH-WA-1, TITLED "CHARTER TWP OF OSHTEMO WATER FEASIBILITY STUDY", DATED 11/16/99, BY PREIN & NEWHOF ADDITIONAL UPDATES BASED ON KALAMAZOO COUNTY ONLINE GIS MAPPING (www tomtags com)

2) THE PROPERTY LOCATED AT THE SOUTHEAST CORNER OF ALMENA DRIVE AND 4TH STREET (FORMERLY 9089) IS SHOWN AS SUBDIVIDED INTO 3 PARCELS PER THE CLIENT'S REPRESENTATIVE'S INSTRUCTIONS

3) BLOCK AND LOT INFORMATION AND WELL LOCATIONS BETWEEN 22ND STREET 2ND STREET WERE DIGITIZED FROM GROUNDWATER MAP FROM KALAMAZOO COUNTY HUMAN SERVICES DEPT ENVIRONMENTAL HEALTH

4) BLOCK AND LOT INFORMATION WEST OF 22ND STREET WERE DIGITIZED FROM TAX MAP DOWNLOADED FROM VAN BUREN COUNTY COMMUNITY CENTER WEB SITE (WWW VBCO ORG)

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

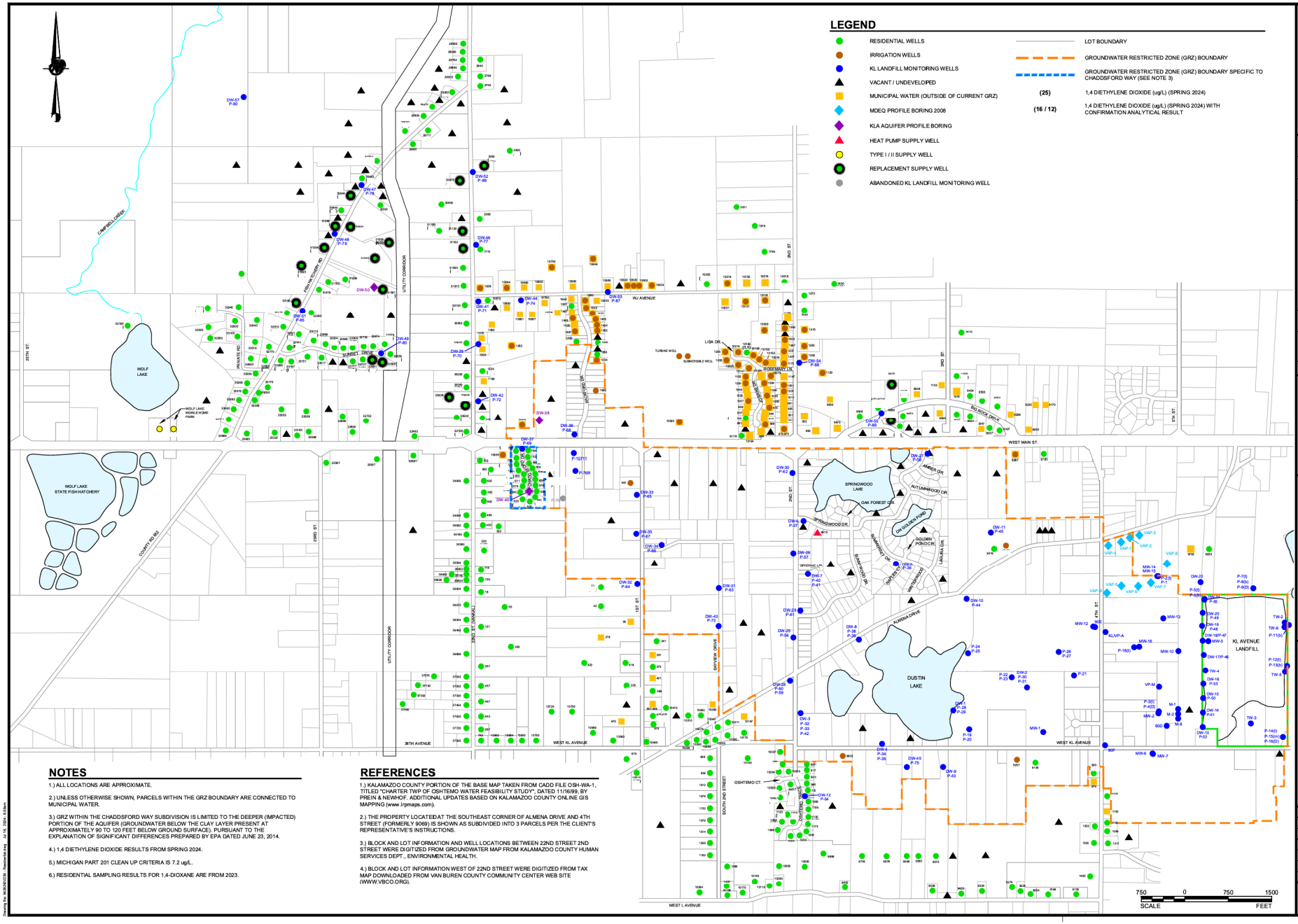
PROJECT
KL AVENUE LANDFILL GROUP
KALAMAZOO, MICHIGAN

TITLE
PROPOSED AMENDMENT TO THE GROUNDWATER RESTRICTED ZONE (2024)

PROJECT No.		31405041.001
FILE No.		BU07A
REV. 0	SCALE	AS SHOWN
DESIGN	TIR	2024-10-30
CADD	RG	2024-10-30
CHECK	MS	2024-10-30
REVIEW	RJI	2024-10-30

FIGURE 3

FIGURE B6 – Spring 2024 Residential Well Sample Location Map



NOTES

1.) ALL LOCATIONS ARE APPROXIMATE.

2.) UNLESS OTHERWISE SHOWN, PARCELS WITHIN THE GRZ BOUNDARY ARE CONNECTED TO MUNICIPAL WATER.

3.) GRZ WITHIN THE CHADDSFORD WAY SUBDIVISION IS LIMITED TO THE DEEPER (IMPACTED) PORTION OF THE AQUIFER (GROUNDWATER BELOW THE CLAY LAYER PRESENT AT APPROXIMATELY 90 TO 120 FEET BELOW GROUND SURFACE). PURSUANT TO THE EXPLANATION OF SIGNIFICANT DIFFERENCES PREPARED BY EPA DATED JUNE 23, 2014.

4.) 1,4 DIETHYLENE DIOXIDE RESULTS FROM SPRING 2024.

5.) MICHIGAN PART 201 CLEAN UP CRITERIA IS 7.2 ug/L.

6.) RESIDENTIAL SAMPLING RESULTS FOR 1,4-DIOXANE ARE FROM 2023.

REFERENCES

1.) KALAMAZOO COUNTY PORTION OF THE BASE MAP TAKEN FROM CADD FILE OSH-WA-1, TITLED "CHARTER TWP OF OSHTEMO WATER FEASIBILITY STUDY", DATED 11/16/99, BY PREIN & NEWHOF. ADDITIONAL UPDATES BASED ON KALAMAZOO COUNTY ONLINE GIS MAPPING (www.lrpmaps.com).

2.) THE PROPERTY LOCATED AT THE SOUTHEAST CORNER OF ALMENA DRIVE AND 4TH STREET (FORMERLY 9069) IS SHOWN AS SUBDIVIDED INTO 3 PARCELS PER THE CLIENT'S REPRESENTATIVE'S INSTRUCTIONS.

3.) BLOCK AND LOT INFORMATION AND WELL LOCATIONS BETWEEN 22ND STREET 2ND STREET WERE DIGITIZED FROM GROUNDWATER MAP FROM KALAMAZOO COUNTY HUMAN SERVICES DEPT., ENVIRONMENTAL HEALTH.

4.) BLOCK AND LOT INFORMATION WEST OF 22ND STREET WERE DIGITIZED FROM TAX MAP DOWNLOADED FROM VAN BUREN COUNTY COMMUNITY CENTER WEB SITE (WWW.VBCO.ORG).

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
KL AVENUE LANDFILL GROUP
KALAMAZOO, MICHIGAN

TITLE
RESIDENTIAL AND KLA MONITORING WELL LOCATION MAP AND 1,4-DD CONCENTRATIONS

PROJECT No.		31405041.001
FILE No.		V239
REV. 0	SCALE	AS SHOWN
DESIGN	MS	2024-07-18
CADD	RG	2024-07-18
CHECK	MLS	2024-07-18
REVIEW	TIR	2024-07-18

FIGURE 1

FIGURE B7 – Map of Downgradient Residential Wells with Increasing 1,4-Dioxane Trends

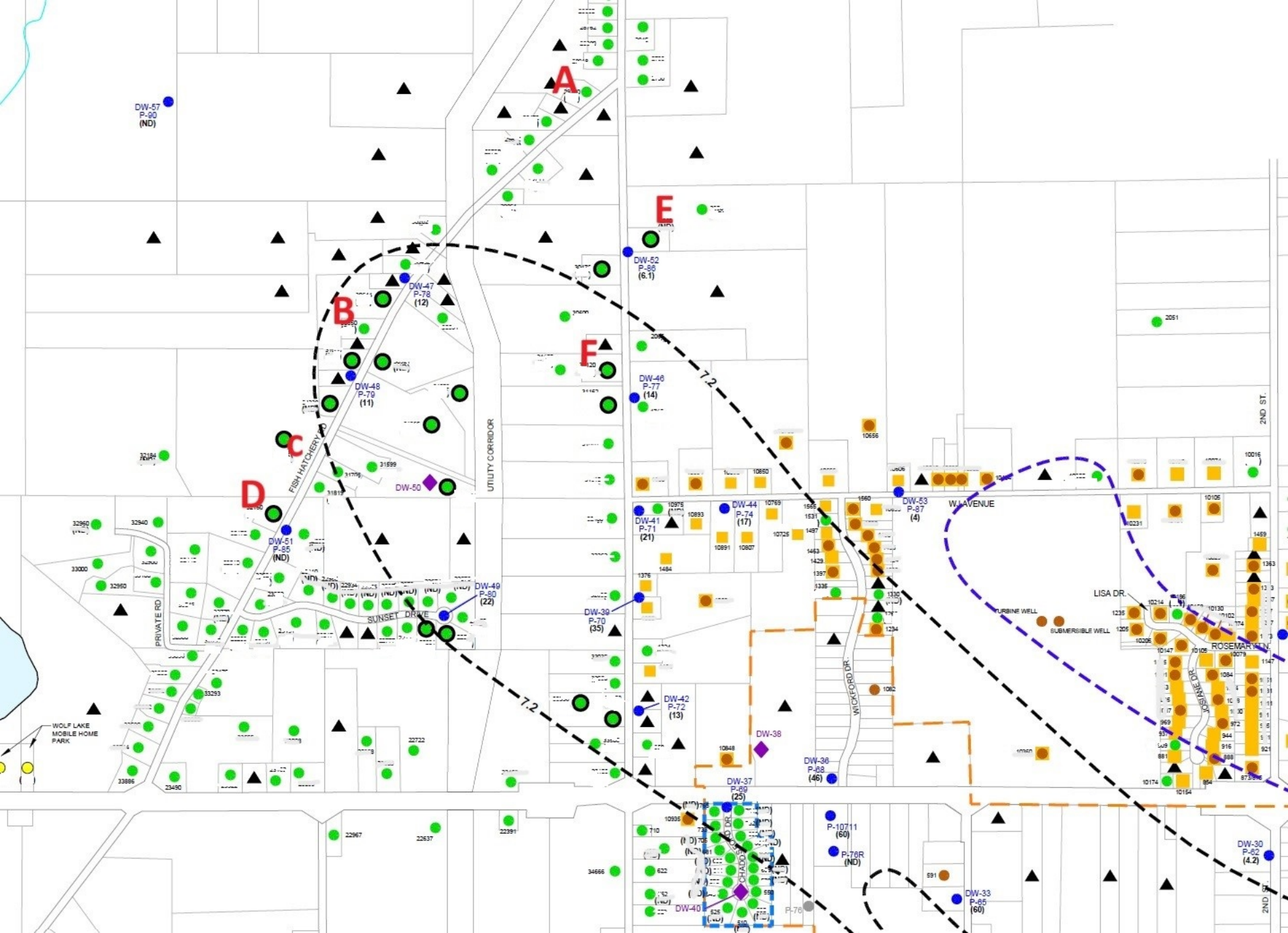
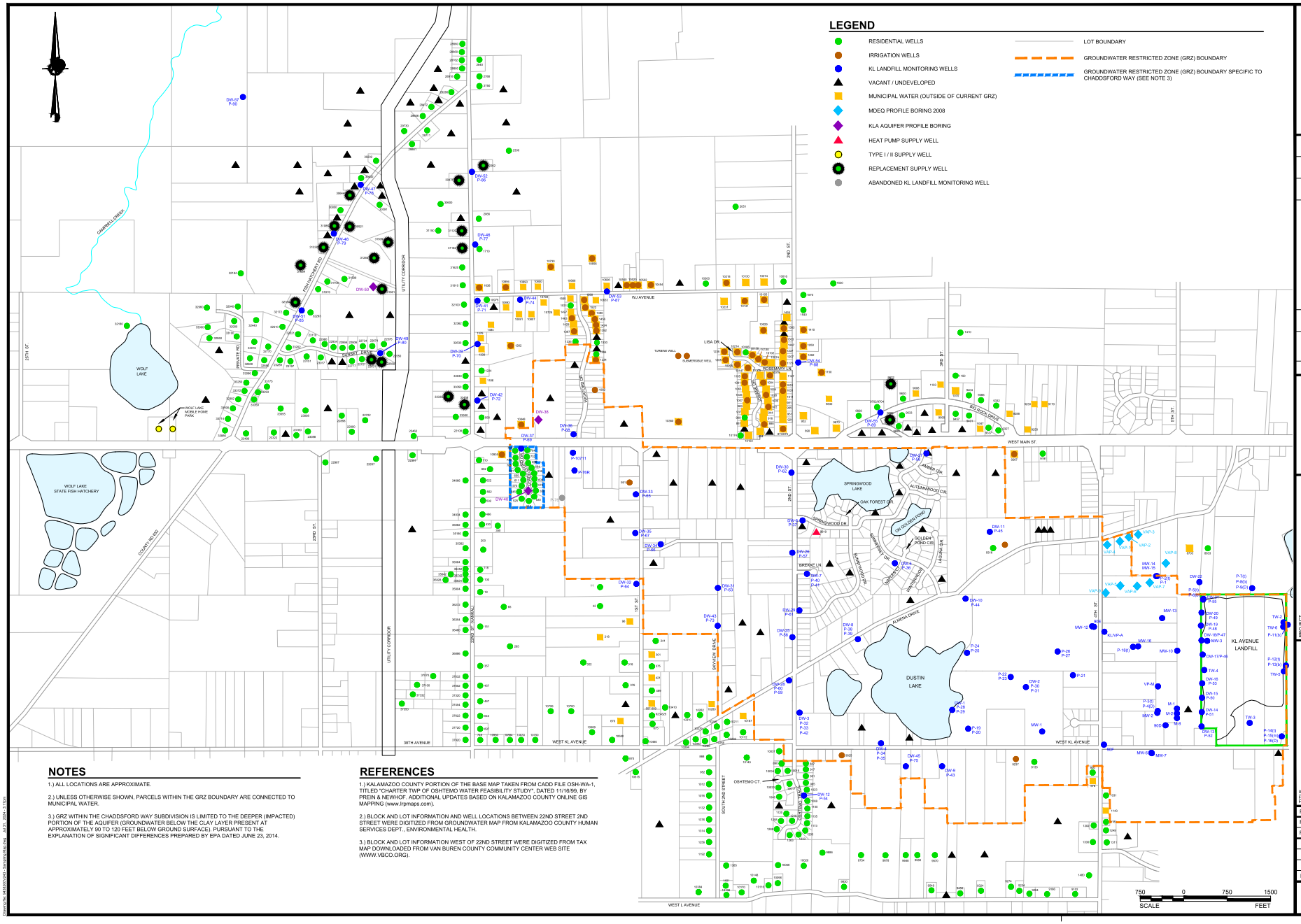

A
B
C
D
E
F
DW-57
P-90
(ND)
DW-47
P-78
(12)
DW-48
P-79
(11)
DW-50
DW-51
P-85
(ND)
DW-49
P-80
(22)
DW-52
P-86
(6.1)
DW-46
P-77
(14)
DW-41
P-71
(21)
DW-44
P-74
(17)
DW-53
P-87
(4)
DW-39
P-70
(35)
DW-42
P-72
(13)
DW-38
DW-36
P-68
(46)
DW-37
P-89
(25)
DW-40
P-10711
(60)
P-76R
(ND)
DW-33
P-85
(60)
DW-30
P-62
(4.2)
7.2
7.2
FISH HATCHERY RD
UTILITY CORRIDOR
PRIVATE RD
SUNSET DRIVE
WOLF LAKE
MOBILE HOME
PARK
W.I AVENUE
2ND ST.
LISA DR.
ROSEMARY LN
JOSINE DR
WICKFORD DR
CHADDOCK DR
TURBINE WELL
SUBMERSIBLE WELL

FIGURE B8 – Groundwater Monitoring Well and Aquifer Profile Boring Location Map



NOTES

1.) ALL LOCATIONS ARE APPROXIMATE.

2.) UNLESS OTHERWISE SHOWN, PARCELS WITHIN THE GRZ BOUNDARY ARE CONNECTED TO MUNICIPAL WATER.

3.) GRZ WITHIN THE CHADDSFORD WAY SUBDIVISION IS LIMITED TO THE DEEPER (IMPACTED) PORTION OF THE AQUIFER (GROUNDWATER BELOW THE CLAY LAYER PRESENT AT APPROXIMATELY 90 TO 120 FEET BELOW GROUND SURFACE). PURSUANT TO THE EXPLANATION OF SIGNIFICANT DIFFERENCES PREPARED BY EPA DATED JUNE 23, 2014.

REFERENCES

1.) KALAMAZOO COUNTY PORTION OF THE BASE MAP TAKEN FROM CADD FILE OSH-WA-1, TITLED "CHARTER TWP OF OSHTEMO WATER FEASIBILITY STUDY", DATED 11/16/99, BY PREIN & NEWHOF. ADDITIONAL UPDATES BASED ON KALAMAZOO COUNTY ONLINE GIS MAPPING (www.lrpmaps.com).

2.) BLOCK AND LOT INFORMATION AND WELL LOCATIONS BETWEEN 22ND STREET 2ND STREET WERE DIGITIZED FROM GROUNDWATER MAP FROM KALAMAZOO COUNTY HUMAN SERVICES DEPT., ENVIRONMENTAL HEALTH.

3.) BLOCK AND LOT INFORMATION WEST OF 22ND STREET WERE DIGITIZED FROM TAX MAP DOWNLOADED FROM VAN BUREN COUNTY COMMUNITY CENTER WEB SITE (WWW.VBCO.ORG).

REV.	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

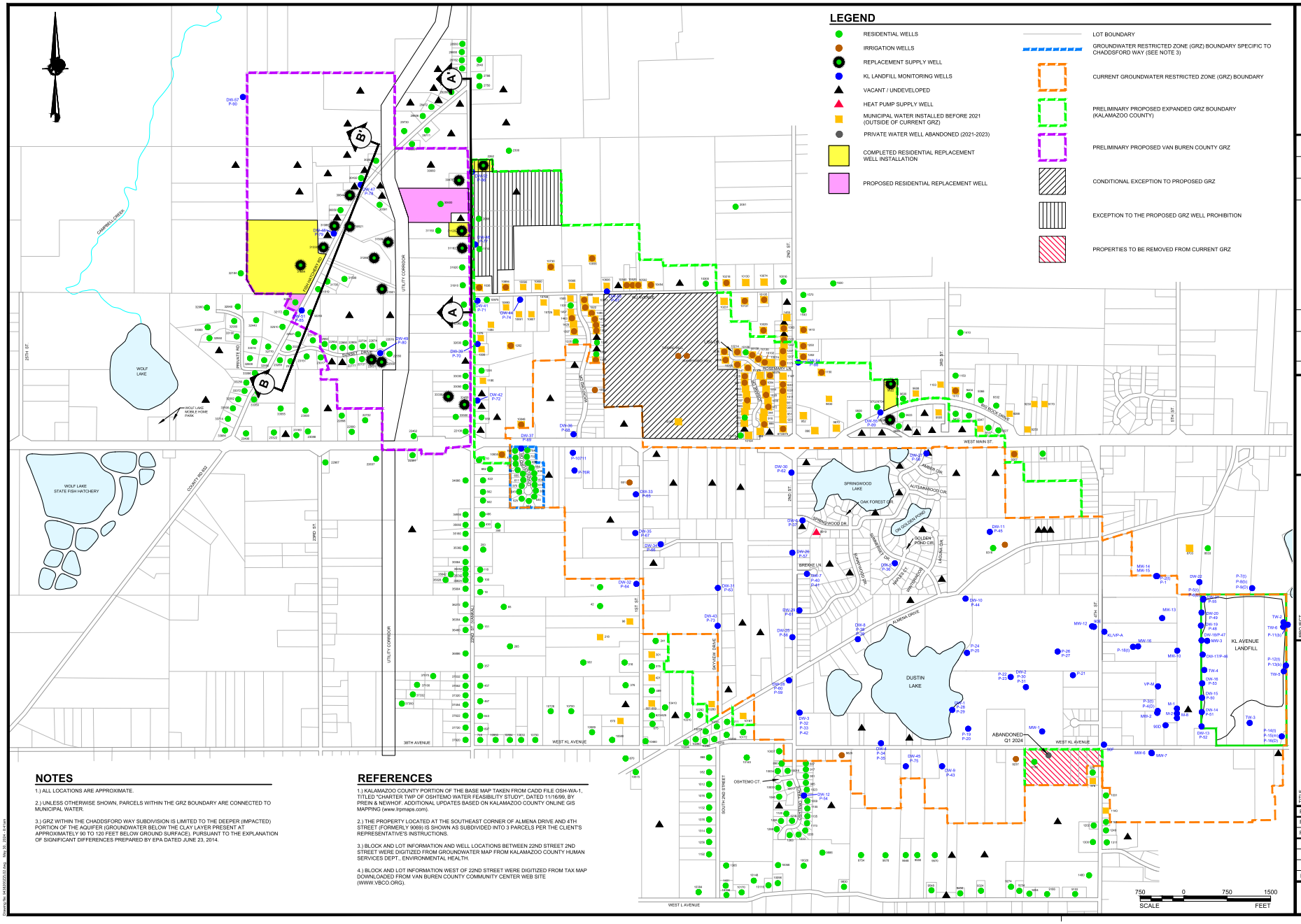
PROJECT: KL AVENUE LANDFILL GROUP
KALAMAZOO, MICHIGAN

TITLE: AQUIFER PROFILE BORING, MONITORING WELL AND SAMPLING LOCATION MAP SPRING 2024

PROJECT No.	31405041.001	
FILE No.	V243	
REV. 0	SCALE	AS SHOWN
DESIGN	TIR	2024-07-31
CADD	RG	2024-07-31
CHECK	TIR	2024-07-31
REVIEW	RJI	2024-07-31

FIGURE 1

FIGURE B9 – Municipal Water Connection and Residential Supply Well Replacement Map (As Of December 2023)



NOTES

1.) ALL LOCATIONS ARE APPROXIMATE.

2.) UNLESS OTHERWISE SHOWN, PARCELS WITHIN THE GRZ BOUNDARY ARE CONNECTED TO MUNICIPAL WATER.

3.) GRZ WITHIN THE CHADDSFORD WAY SUBDIVISION IS LIMITED TO THE DEEPER (IMPACTED) PORTION OF THE AQUIFER (GROUNDWATER BELOW THE CLAY LAYER PRESENT AT APPROXIMATELY 90 TO 120 FEET BELOW GROUND SURFACE). PURSUANT TO THE EXPLANATION OF SIGNIFICANT DIFFERENCES PREPARED BY EPA DATED JUNE 23, 2014.

REFERENCES

1.) KALAMAZOO COUNTY PORTION OF THE BASE MAP TAKEN FROM CADD FILE OSH-WA-1, TITLED "CHARTER TWP OF OSHTEMO WATER FEASIBILITY STUDY", DATED 11/16/66, BY PREIN & NEWHOF. ADDITIONAL UPDATES BASED ON KALAMAZOO COUNTY ONLINE GIS MAPPING (www.fripmaps.com).

2.) THE PROPERTY LOCATED AT THE SOUTHEAST CORNER OF ALMENA DRIVE AND 4TH STREET (FORMERLY 9069) IS SHOWN AS SUBDIVIDED INTO 3 PARCELS PER THE CLIENT'S REPRESENTATIVE'S INSTRUCTIONS.

3.) BLOCK AND LOT INFORMATION AND WELL LOCATIONS BETWEEN 22ND STREET 2ND STREET WERE DIGITIZED FROM GROUNDWATER MAP FROM KALAMAZOO COUNTY HUMAN SERVICES DEPT., ENVIRONMENTAL HEALTH.

4.) BLOCK AND LOT INFORMATION WEST OF 22ND STREET WERE DIGITIZED FROM TAX MAP DOWNLOADED FROM VAN BUREN COUNTY COMMUNITY CENTER WEB SITE (WWW.VBCO.ORG).

REV.	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
KL AVENUE LANDFILL GROUP
KALAMAZOO, MICHIGAN

TITLE
RESIDENTIAL REPLACEMENT WELL LOCATIONS

PROJECT No.	31405041.001		
FILE No.	ZZL02		
REV. 0	SCALE	AS SHOWN	
DESIGN	MS	2024-05-30	
CADD	RG	2024-05-30	
CHECK	MS	2024-05-30	
REVIEW	TIR	2024-05-30	

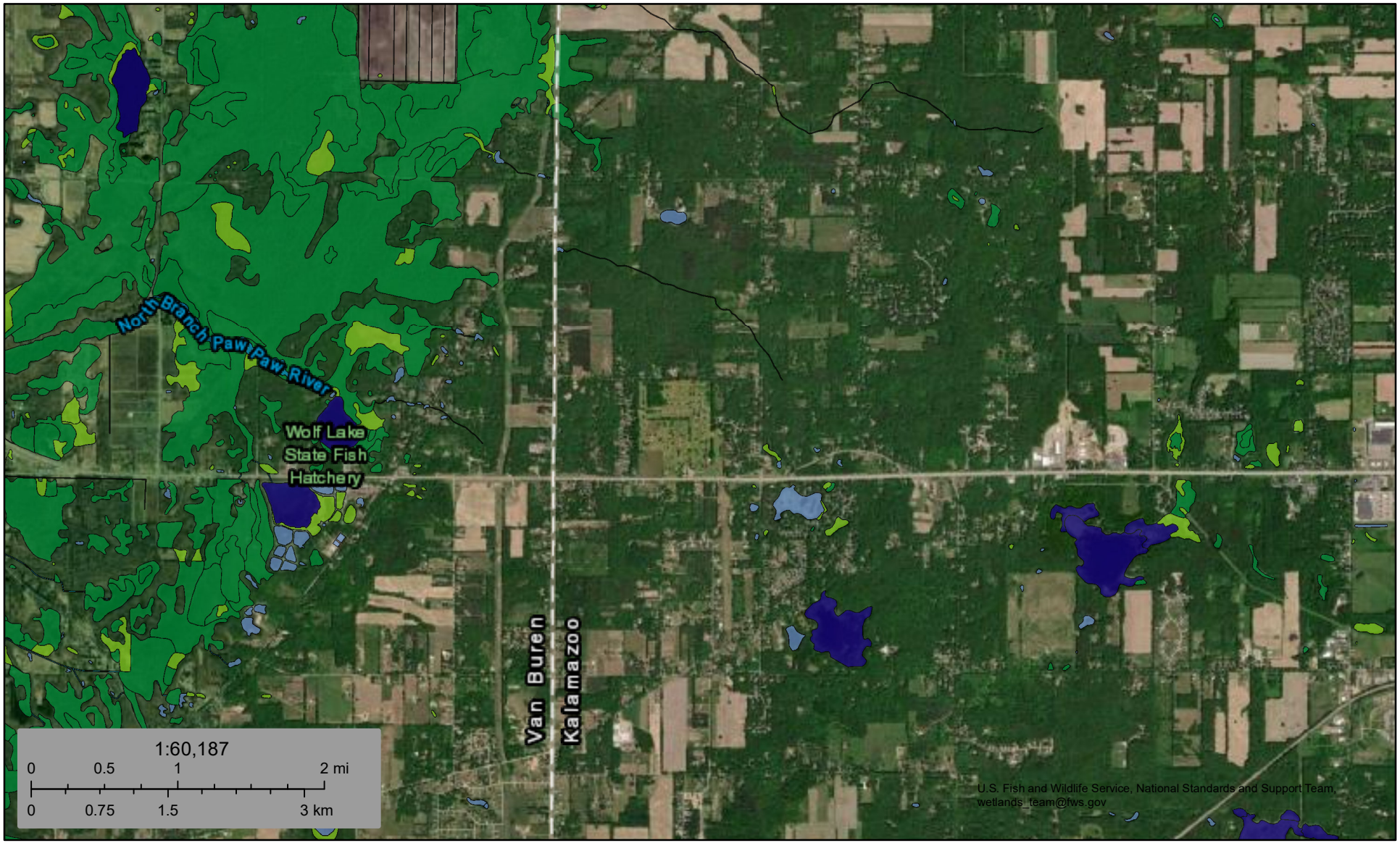
FIGURE 1

FIGURE B10 – Area Wetland Map

U.S. Fish and Wildlife Service

National Wetlands Inventory

K&L Avenue Landfill



December 4, 2024

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

FIGURE B11 – December 2020 Model Simulated EISB At Skyview Drive

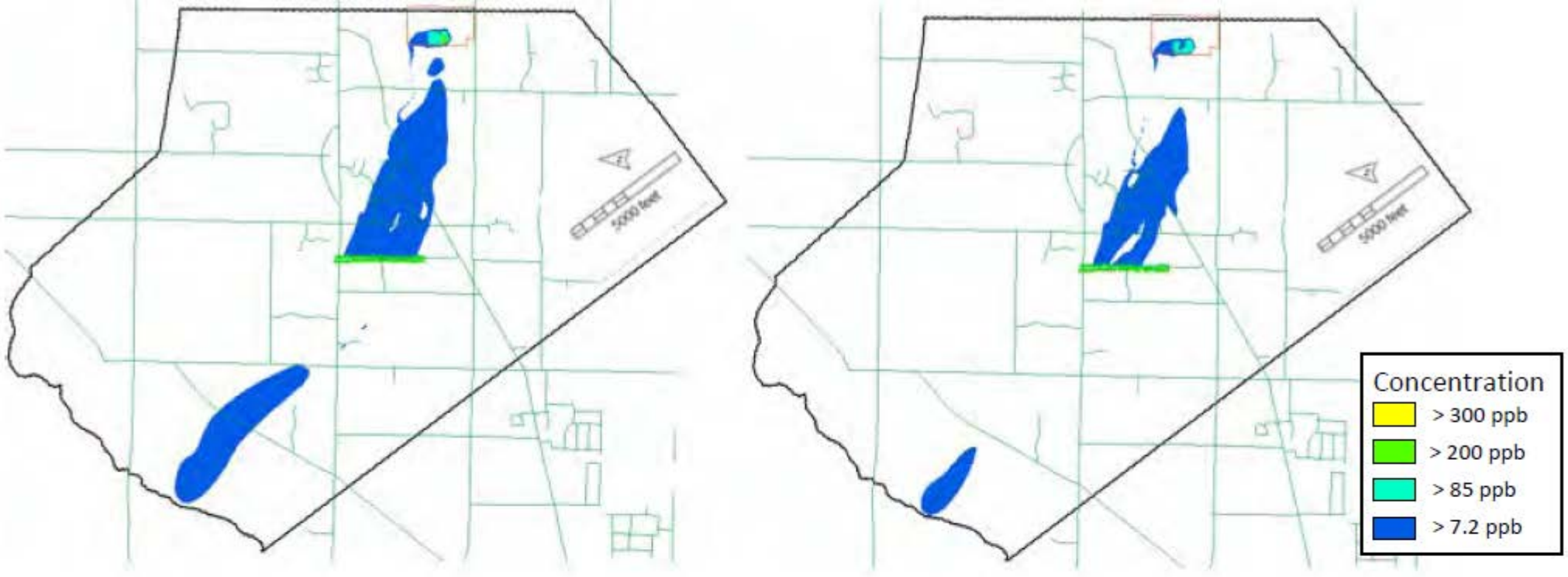


Figure 15a, b – Model Simulated 1,4-DD Results: EISB at Skyview Drive at 20 (2042) and 30 years (2052).

Figure 15c, d – Model Simulated 1,4-DD Results: EISB at Skyview Drive at 40 (2062) and 50 (2072) years.

FIGURE B12 – December 2020 Model Simulated Pump-And-Treat At Skyview Drive

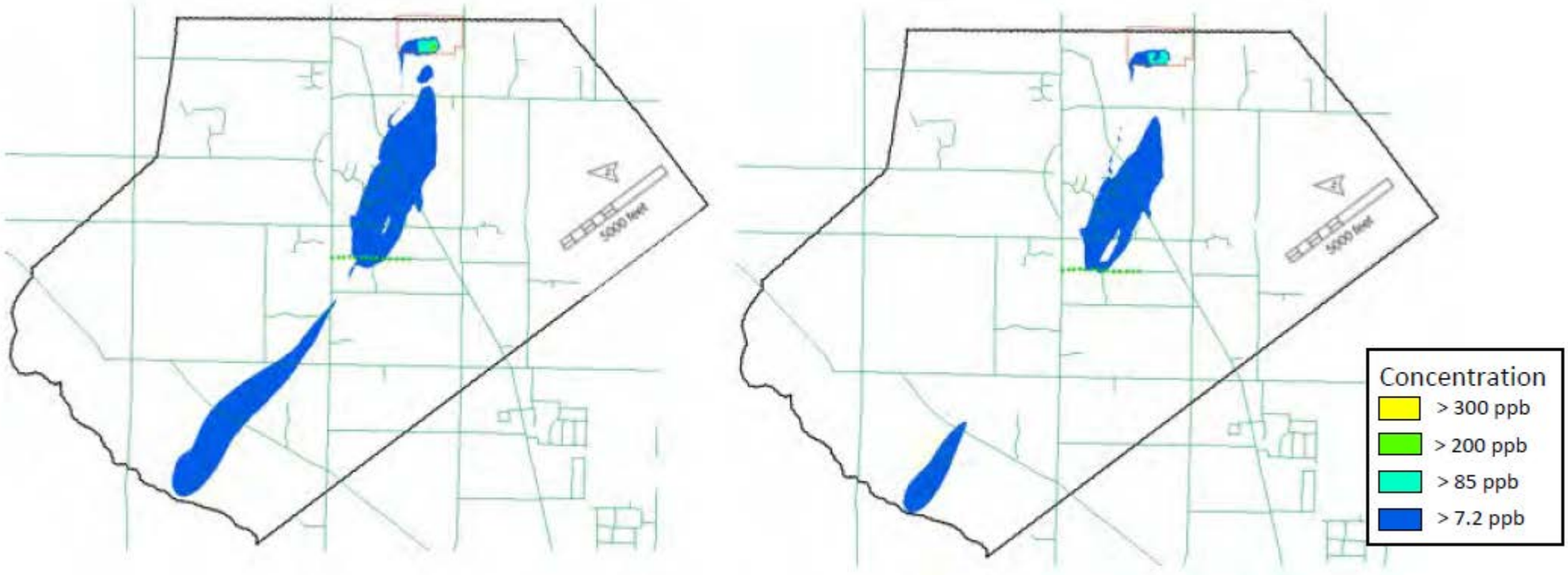
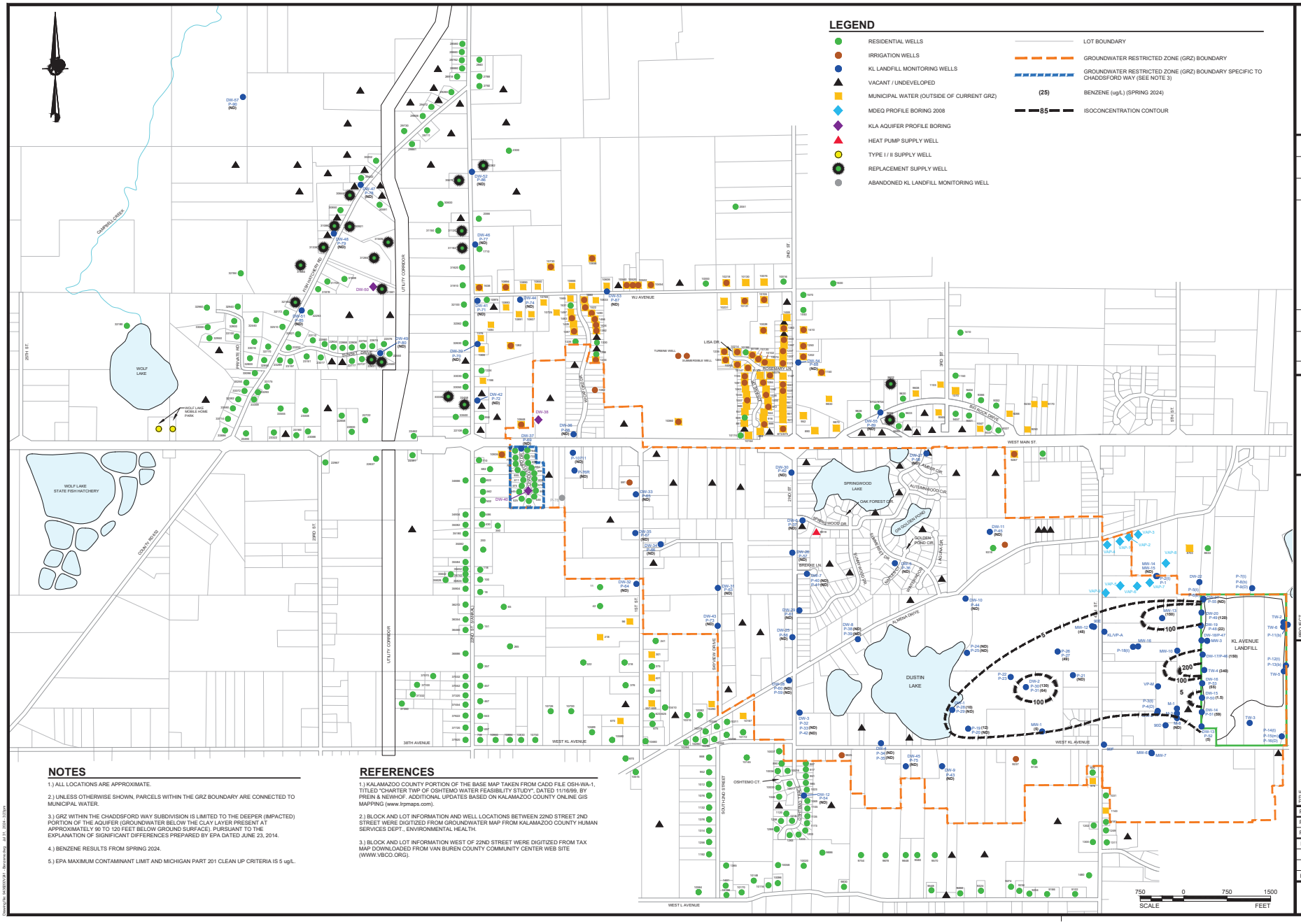


Figure 17a, b – Model Simulated 1,4-DD Results: P&T at Skyview Drive at 20 (2042) and 30 (2052) years.

Figure 17c, d – Model Simulated 1,4-DD Results: P&T at Skyview Drive at 40 (2062) and 50 (2072) years.

APPENDIX C – COCs Plumes, Movement Over Time, & Reduction Calculations

FIGURE C1: Spring 2024 Isoconcentration Map for Benzene



NOTES

1.) ALL LOCATIONS ARE APPROXIMATE.

2.) UNLESS OTHERWISE SHOWN, PARCELS WITHIN THE GRZ BOUNDARY ARE CONNECTED TO MUNICIPAL WATER.

3.) GRZ WITHIN THE CHADDSFORD WAY SUBDIVISION IS LIMITED TO THE DEEPER (IMPACTED) PORTION OF THE AQUIFER (GROUNDWATER BELOW THE CLAY LAYER PRESENT AT APPROXIMATELY 90 TO 120 FEET BELOW GROUND SURFACE). PURSUANT TO THE EXPLANATION OF SIGNIFICANT DIFFERENCES PREPARED BY EPA DATED JUNE 23, 2014.

4.) BENZENE RESULTS FROM SPRING 2024.

5.) EPA MAXIMUM CONTAMINANT LIMIT AND MICHIGAN PART 201 CLEAN UP CRITERIA IS 5 ug/L.

REFERENCES

1.) KALAMAZOO COUNTY PORTION OF THE BASE MAP TAKEN FROM CADD FILE OSH-WA-1, TITLED "CHARTER TWP OF OSHTEMO WATER FEASIBILITY STUDY", DATED 11/16/99, BY PREIN & NEWHOF. ADDITIONAL UPDATES BASED ON KALAMAZOO COUNTY ONLINE GIS MAPPING (www.lrpmaps.com).

2.) BLOCK AND LOT INFORMATION AND WELL LOCATIONS BETWEEN 22ND STREET 2ND STREET WERE DIGITIZED FROM GROUNDWATER MAP FROM KALAMAZOO COUNTY HUMAN SERVICES DEPT., ENVIRONMENTAL HEALTH.

3.) BLOCK AND LOT INFORMATION WEST OF 22ND STREET WERE DIGITIZED FROM TAX MAP DOWNLOADED FROM VAN BUREN COUNTY COMMUNITY CENTER WEB SITE (WWW.VBCO.ORG).

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

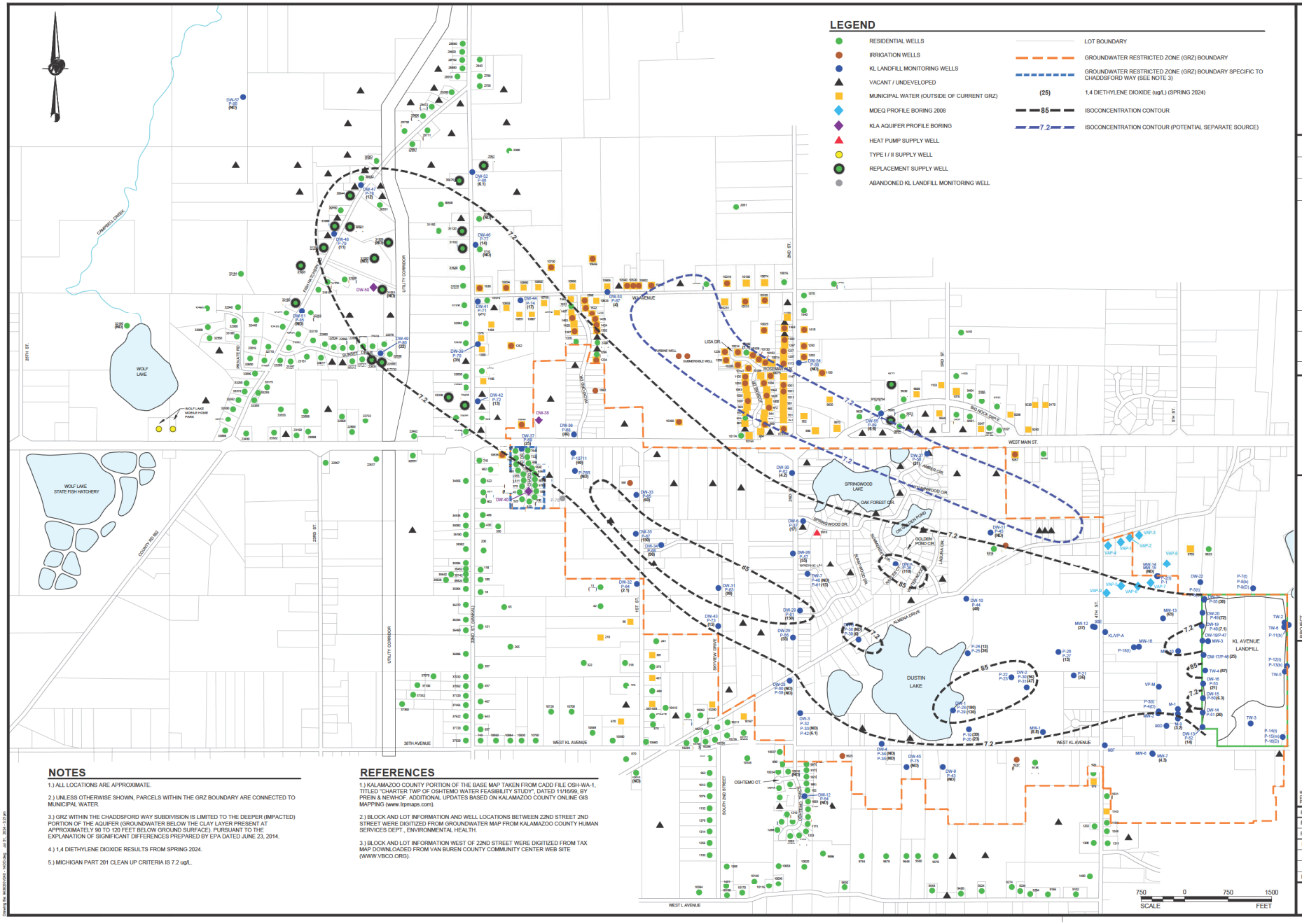
PROJECT
KL AVENUE LANDFILL GROUP
KALAMAZOO, MICHIGAN

TITLE
BENZENE CONCENTRATION MAP SPRING 2024

PROJECT No.	31405041.001	
FILE No.	V241	
REV. 0	SCALE	AS SHOWN
DESIGN	TIR	2024-07-31
CADD	RG	2024-07-31
CHECK	TIR	2024-07-31
REVIEW	RJI	2024-07-31

FIGURE 2

FIGURE C2: Spring 2024 Isoconcentration Map for 1,4-dioxane



NOTES

1.) ALL LOCATIONS ARE APPROXIMATE.

2.) UNLESS OTHERWISE SHOWN, PARCELS WITHIN THE GRZ BOUNDARY ARE CONNECTED TO MUNICIPAL WATER.

3.) GRZ WITHIN THE CHADDSFORD WAY SUBDIVISION IS LIMITED TO THE DEEPER (IMPACTED) PORTION OF THE AQUIFER (GROUNDWATER BELOW THE CLAY LAYER PRESENT AT APPROXIMATELY 90 TO 120 FEET BELOW GROUND SURFACE), PURSUANT TO THE EXPLANATION OF SIGNIFICANT DIFFERENCES PREPARED BY EPA DATED JUNE 23, 2014.

4.) 1,4 DIETHYLENE DIOXIDE RESULTS FROM SPRING 2024.

5.) MICHIGAN PART 201 CLEAN UP CRITERIA IS 7.2 ug/L.

REFERENCES

1.) KALAMAZOO COUNTY PORTION OF THE BASE MAP TAKEN FROM CADD FILE OSH-WA-1, TITLED "CHARTER TWP OF OSHTEMO WATER FEASIBILITY STUDY", DATED 11/16/99, BY PREIN & NEWHOF. ADDITIONAL UPDATES BASED ON KALAMAZOO COUNTY ONLINE GIS MAPPING (www.lrpmaps.com).

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3.) BLOCK AND LOT INFORMATION WEST OF 22ND STREET WERE DIGITIZED FROM TAX MAP DOWNLOADED FROM VAN BUREN COUNTY COMMUNITY CENTER WEB SITE (WWW.VBCO.ORG).

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

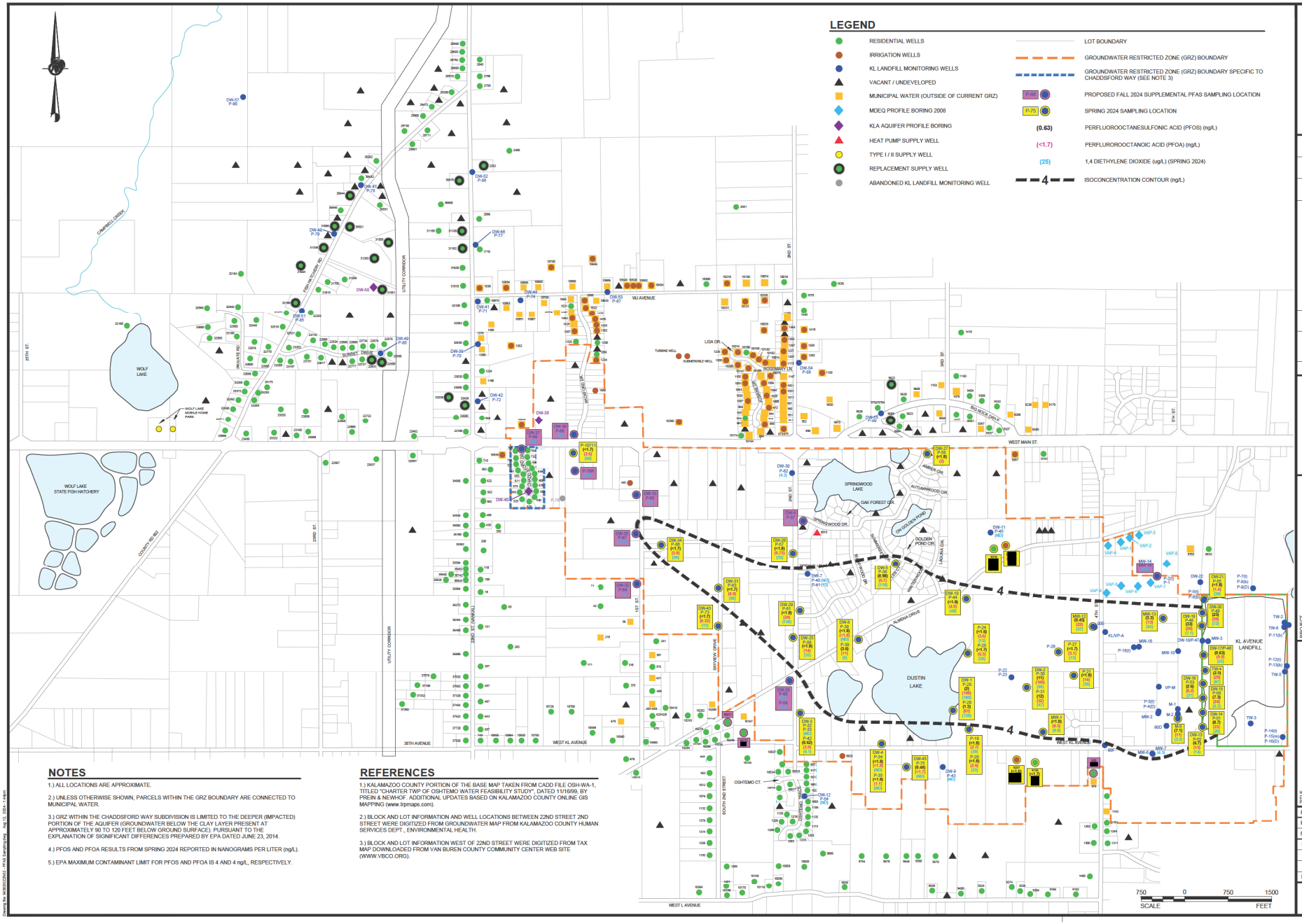
PROJECT: KL AVENUE LANDFILL GROUP
KALAMAZOO, MICHIGAN

TITLE: 1,4 DIETHYLENE DIOXIDE CONCENTRATION MAP SPRING 2024

PROJECT No.		31405041.001	
FILE No.		V240	
REV. 0	SCALE	AS SHOWN	
DESIGN	TIR	2024-07-31	
CADD	RG	2024-07-31	
CHECK	TIR	2024-07-31	
REVIEW	RJI	2024-07-31	

FIGURE 3

FIGURE C3: Spring 2024 Isoconcentration Map for PFAS



NOTES

1.) ALL LOCATIONS ARE APPROXIMATE.

2.) UNLESS OTHERWISE SHOWN, PARCELS WITHIN THE GRZ BOUNDARY ARE CONNECTED TO MUNICIPAL WATER.

3.) GRZ WITHIN THE CHADDSFORD WAY SUBDIVISION IS LIMITED TO THE DEEPER (IMPACTED) PORTION OF THE AQUIFER (GROUNDWATER BELOW THE CLAY LAYER PRESENT AT APPROXIMATELY 90 TO 120 FEET BELOW GROUND SURFACE). PURSUANT TO THE EXPLANATION OF SIGNIFICANT DIFFERENCES PREPARED BY EPA DATED JUNE 23, 2014.

4.) PFOS AND PFOA RESULTS FROM SPRING 2024 REPORTED IN NANOGRAMS PER LITER (ng/L).

5.) EPA MAXIMUM CONTAMINANT LIMIT FOR PFOS AND PFOA IS 4 AND 4 ng/L, RESPECTIVELY.

REFERENCES

1.) KALAMAZOO COUNTY PORTION OF THE BASE MAP TAKEN FROM CADD FILE OSH-WA-1, TITLED "CHARTER TWP OF OSHTEMO WATER FEASIBILITY STUDY", DATED 11/16/99, BY PREIN & NEWHOF. ADDITIONAL UPDATES BASED ON KALAMAZOO COUNTY ONLINE GIS MAPPING (www.lrpmaps.com).

2.) BLOCK AND LOT INFORMATION AND WELL LOCATIONS BETWEEN 22ND STREET 2ND STREET WERE DIGITIZED FROM GROUNDWATER MAP FROM KALAMAZOO COUNTY HUMAN SERVICES DEPT., ENVIRONMENTAL HEALTH.

3.) BLOCK AND LOT INFORMATION WEST OF 22ND STREET WERE DIGITIZED FROM TAX MAP DOWNLOADED FROM VAN BUREN COUNTY COMMUNITY CENTER WEB SITE (WWW.VBCO.ORG).

NO.	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

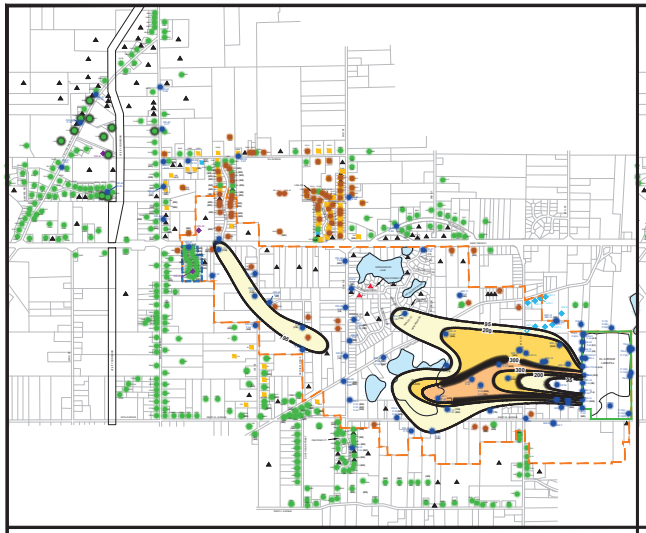
PROJECT: KL AVENUE LANDFILL GROUP
KALAMAZOO, MICHIGAN

TITLE: SUPPLEMENTAL FALL 2024 PFAS SAMPLING LOCATION MAP

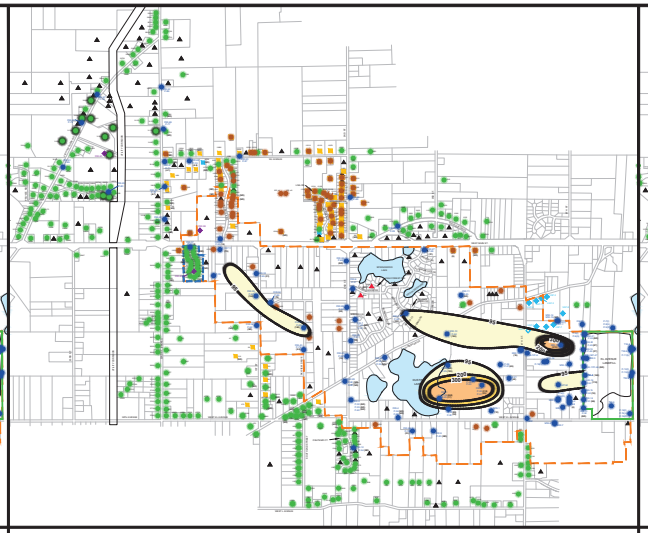
PROJECT No.	31405041.001		
FILE No.		ZZN02	
REV. 0	SCALE	AS SHOWN	
DESIGN	TIR	2024-08-12	
CADD	RG	2024-08-12	
CHECK	TIR	2024-08-12	
REVIEW	RJI	2024-08-12	

FIGURE 1

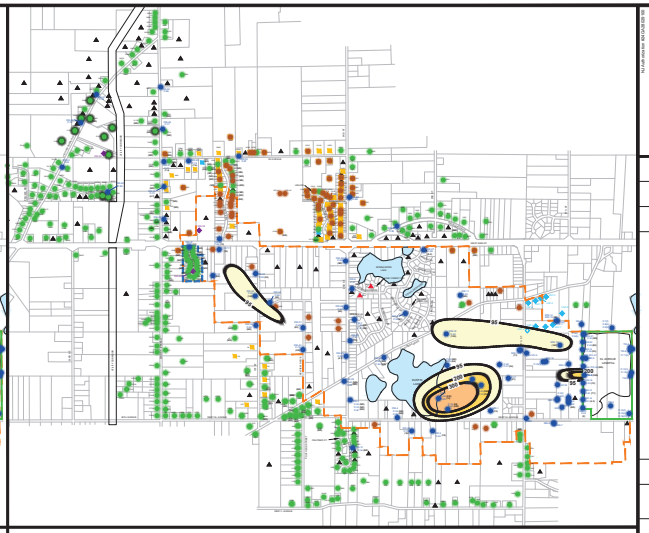
FIGURE C4 & C5: THF & 1,4-Dioxane Distribution Map from 2011-Present



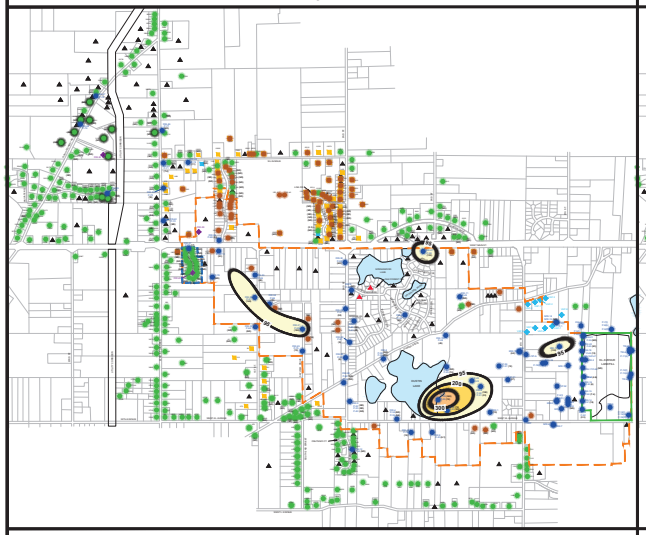
2011



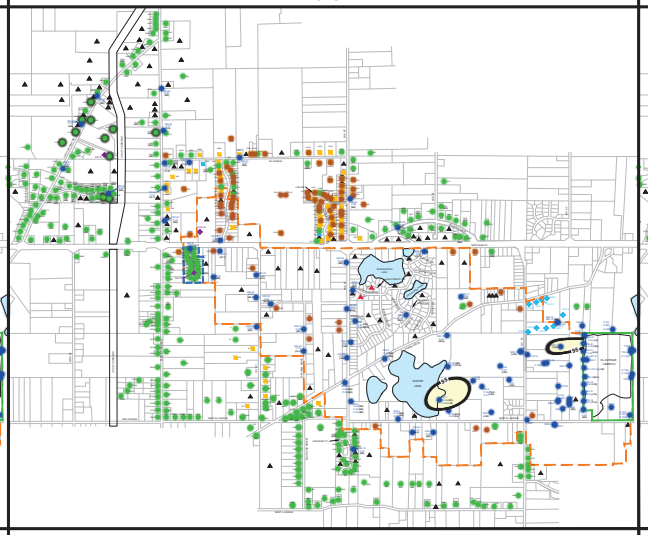
2013



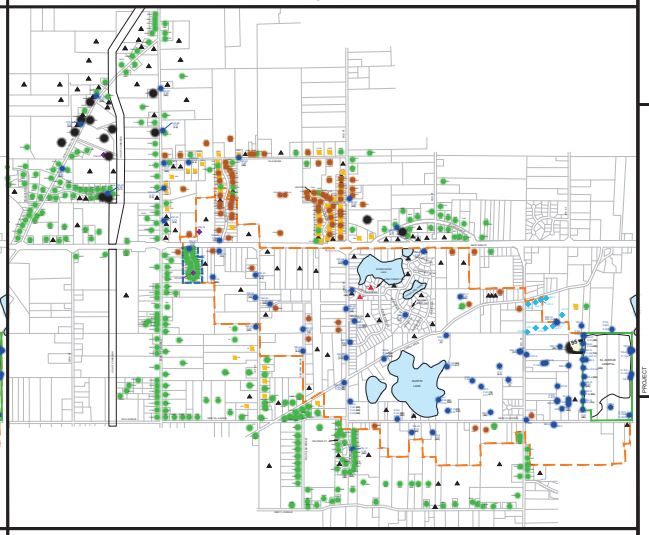
2014



2016



2018



2020

LEGEND

- RESIDENTIAL WELLS
- IRRIGATION WELLS
- KL LANDFILL MONITORING WELLS
- VACANT / UNDEVELOPED
- MUNICIPAL WATER
- MDEQ PROFILE BORING 2008
- KLA PROFILE BORING 2010
- HEAT PUMP SUPPLY WELL

- LOT BOUNDARY
- GROUNDWATER RESTRICTED ZONE (GRZ) BOUNDARY
- GROUNDWATER RESTRICTED ZONE (GRZ) BOUNDARY SPECIFIC TO CHADDSFORD WAY (SEE NOTE 3)
- 95 — ISOCONCENTRATION CONTOUR (TETRAHYDROFURAN)
- (ND) TETRAHYDROFURAN (ug/L)

- 95 - 200 ug/L
- 200 - 300 ug/L
- > 300 ug/L

NOTES

1.) ALL LOCATIONS ARE APPROXIMATE.

2.) UNLESS OTHERWISE SHOWN, PARCELS WITHIN THE GRZ BOUNDARY ARE CONNECTED TO MUNICIPAL WATER.

3.) GRZ WITHIN THE CHADDSFORD WAY SUBDIVISION IS LIMITED TO THE DEEPER (IMPACTED) PORTION OF THE AQUIFER (GROUNDWATER BELOW THE CLAY LAYER PRESENT AT APPROXIMATELY 90 TO 120 FEET BELOW GROUND SURFACE). PURSUANT TO THE EXPLANATION OF SIGNIFICANT DIFFERENCES PREPARED BY EPA DATED JUNE 23, 2104.

4.) TETRAHYDROFURAN RESULTS FOR KL MONITORING WELLS FROM 2011 THROUGH 2020.

5.) TETRAHYDROFURAN REPORTING LIMIT 2 ug/L; PART 201 DRINKING WATER CRITERIA = 95 ug/L.

REFERENCES

1.) KALAMAZOO COUNTY PORTION OF THE BASE MAP TAKEN FROM CADD FILE OSH-WA-1, TITLED "CHARTER TWP OF OSHTEMO WATER FEASIBILITY STUDY", DATED 11/16/99, BY PREIN & NEWHOF. ADDITIONAL UPDATES BASED ON KALAMAZOO COUNTY ONLINE GIS MAPPING (www.bgmaps.com).

2.) THE PROPERTY LOCATED AT THE SOUTHEAST CORNER OF ALMENA DRIVE AND 4TH STREET (FORMERLY 9089) IS SHOWN AS SUBDIVIDED INTO 3 PARCELS PER THE CLIENT'S REPRESENTATIVE'S INSTRUCTIONS.

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4.) BLOCK AND LOT INFORMATION WEST OF 22ND STREET WERE DIGITIZED FROM TAX MAP DOWNLOADED FROM VAN BUREN COUNTY COMMUNITY CENTER WEB SITE (WWW.VBCO.ORG).

1500 0 1500 3000
SCALE FEET

GOLDER

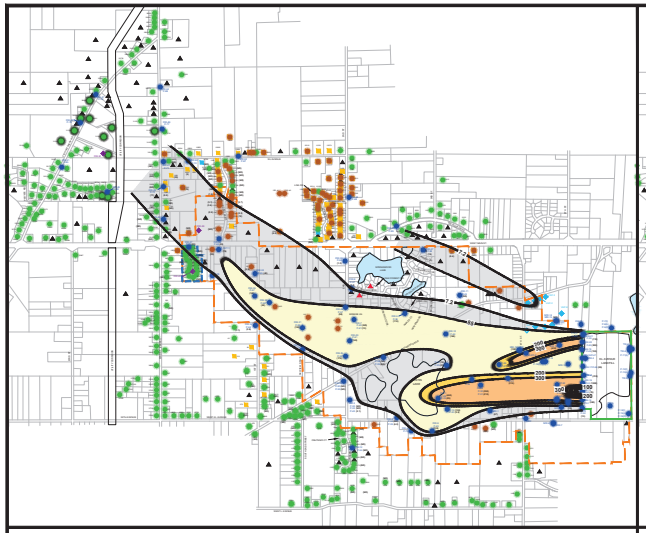
REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK

PROJECT
KL AVENUE LANDFILL GROUP
KALAMAZOO, MICHIGAN

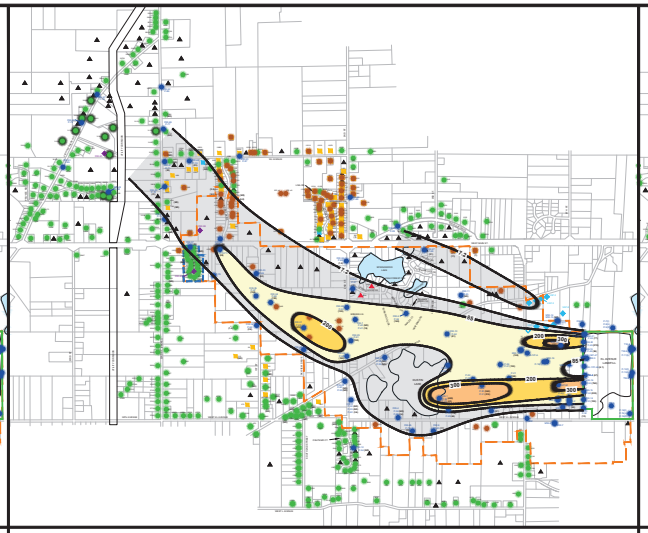
TITLE
TETRAHYDROFURAN DISTRIBUTION 2011 TO 2020

PROJECT No.	943-8200		
FILE No.	943820080G01		
REV.	0	SCALE	AS SHOWN
DESIGN	TIR		11/20/20
CADD	RG		11/20/20
CHECK	TIR		11/20/20
REVIEW	RJI		11/20/20

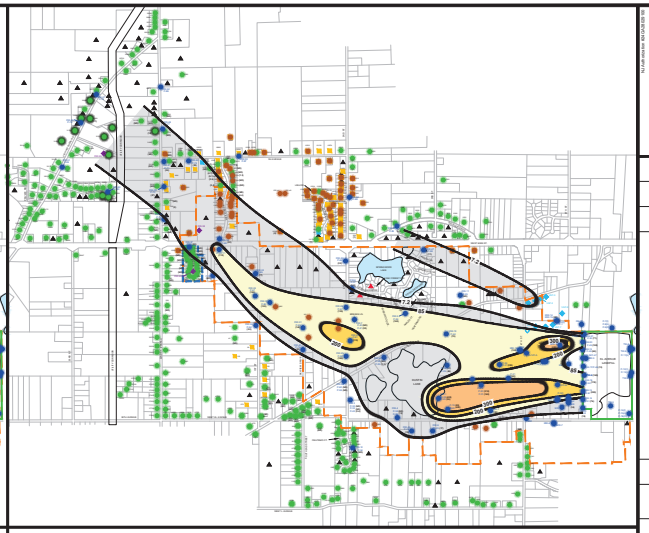
FIGURE 7



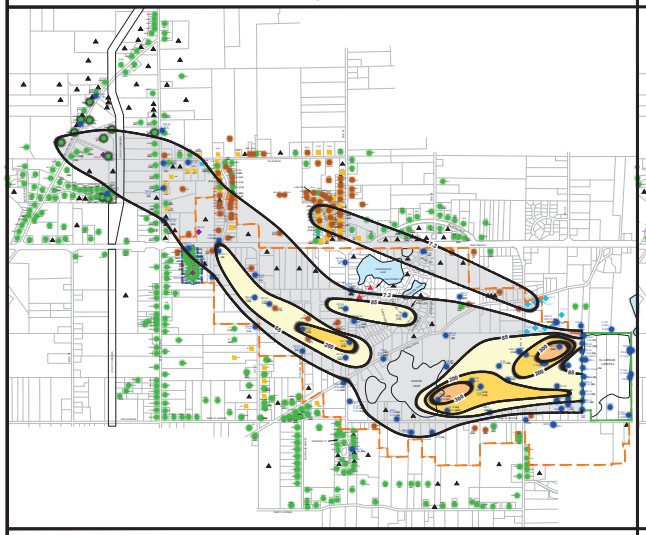
2011



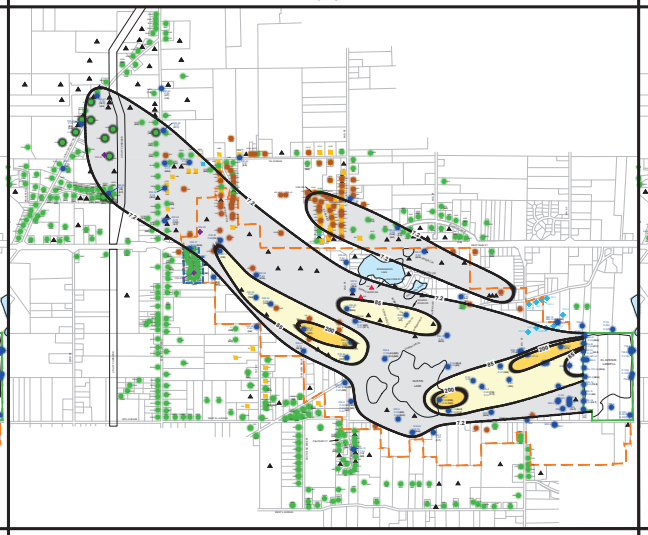
2013



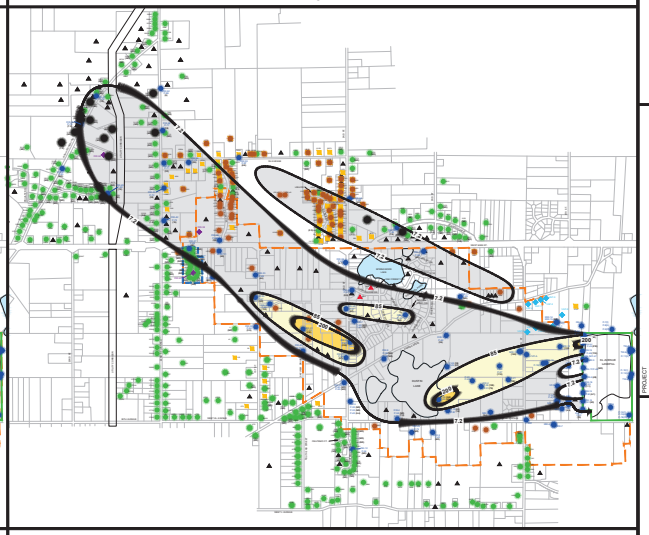
2014



2016



2018



2020

LEGEND

- RESIDENTIAL WELLS
- IRRIGATION WELLS
- KL LANDFILL MONITORING WELLS
- VACANT / UNDEVELOPED
- MUNICIPAL WATER
- MDEQ PROFILE BORING 2008
- KLA PROFILE BORING 2010
- HEAT PUMP SUPPLY WELL

- LOT BOUNDARY
- GROUNDWATER RESTRICTED ZONE (GRZ) BOUNDARY
- GROUNDWATER RESTRICTED ZONE (GRZ) BOUNDARY SPECIFIC TO CHADDSFORD WAY (SEE NOTE 3)
- 85 — ISOCONCENTRATION CONTOUR (1,4 DIETHYLENE DIOXIDE)
- (ND) 1,4 DIETHYLENE DIOXIDE (ug/L)

- 7.2 - 85 ug/L
- 85 - 200 ug/L
- 200 - 300 ug/L
- > 300 ug/L

NOTES

1.) ALL LOCATIONS ARE APPROXIMATE.

2.) UNLESS OTHERWISE SHOWN, PARCELS WITHIN THE GRZ BOUNDARY ARE CONNECTED TO MUNICIPAL WATER.

3.) GRZ WITHIN THE CHADDSFORD WAY SUBDIVISION IS LIMITED TO THE DEEPER (IMPACTED) PORTION OF THE AQUIFER (GROUNDWATER BELOW THE CLAY LAYER PRESENT AT APPROXIMATELY 90 TO 120 FEET BELOW GROUND SURFACE). PURSUANT TO THE EXPLANATION OF SIGNIFICANT DIFFERENCES PREPARED BY EPA DATED JUNE 23, 2104.

4.) 1,4 DIETHYLENE DIOXIDE RESULTS FOR KL MONITORING WELLS FROM 2011 THROUGH 2020.

5.) 1,4-DIETHYLENE DIOXIDE REPORTING LIMIT 1 ug/L; PART 201 DRINKING WATER CRITERIA = 7.2 ug/L.

REFERENCES

1.) KALAMAZOO COUNTY PORTION OF THE BASE MAP TAKEN FROM CADD FILE OSH-WA-1, TITLED "CHARTER TWP OF OSHTEMO WATER FEASIBILITY STUDY", DATED 11/16/99, BY PREIN & NEWHOF. ADDITIONAL UPDATES BASED ON KALAMAZOO COUNTY ONLINE GIS MAPPING (www.bpmaps.com).

2.) THE PROPERTY LOCATED AT THE SOUTHEAST CORNER OF ALMENA DRIVE AND 4TH STREET (FORMERLY 9089) IS SHOWN AS SUBDIVIDED INTO 3 PARCELS PER THE CLIENT'S REPRESENTATIVE'S INSTRUCTIONS.

3.) BLOCK AND LOT INFORMATION AND WELL LOCATIONS BETWEEN 22ND STREET 2ND STREET WERE DIGITIZED FROM GROUNDWATER MAP FROM KALAMAZOO COUNTY HUMAN SERVICES DEPT., ENVIRONMENTAL HEALTH.

4.) BLOCK AND LOT INFORMATION WEST OF 22ND STREET WERE DIGITIZED FROM TAX MAP DOWNLOADED FROM VAN BUREN COUNTY COMMUNITY CENTER WEB SITE (WWW.VBCO.ORG).

1500 0 1500 3000
SCALE FEET

GOLDER

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	APP

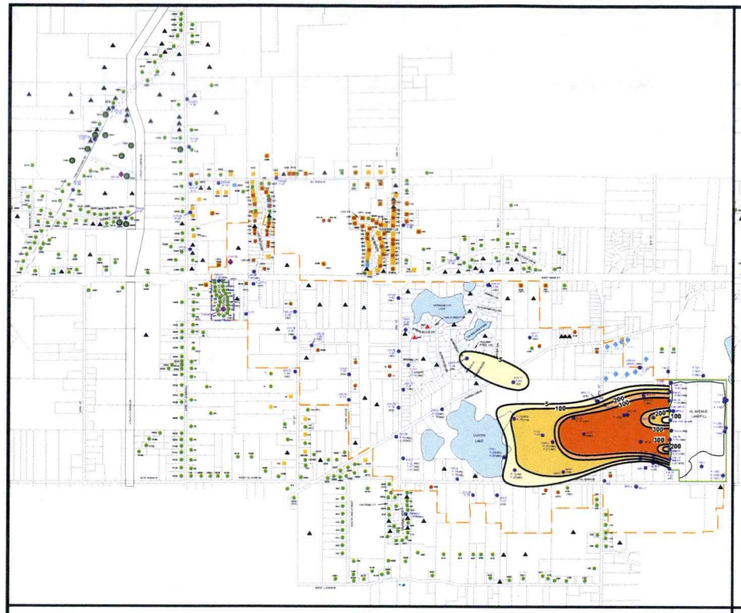
PROJECT
KL AVENUE LANDFILL GROUP
KALAMAZOO, MICHIGAN

TITLE
1,4-DIETHYLENE DIOXIDE DISTRIBUTION 2011 TO 2020

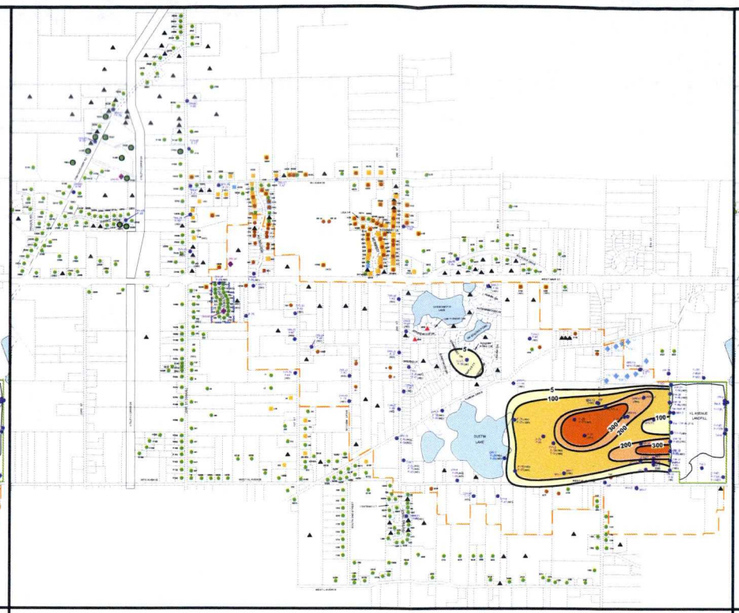
PROJECT No.		943-8200
FILE No.		943820080O2
REV. 0	SCALE	AS SHOWN
DESIGN	TIR	11/20/20
CADD	RG	11/20/20
CHECK	TIR	11/20/20
REVIEW	RJI	11/20/20

FIGURE 8

FIGURE C6: Benzene Distribution Map from 2011-Present



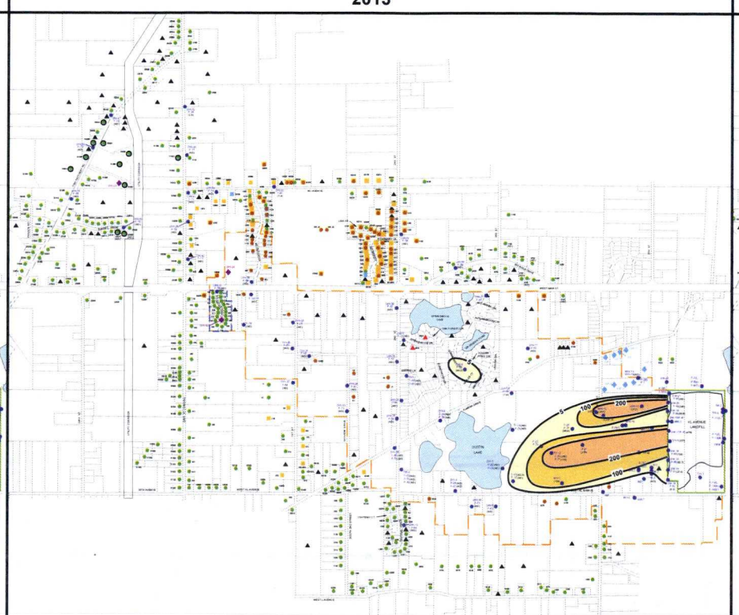
2011



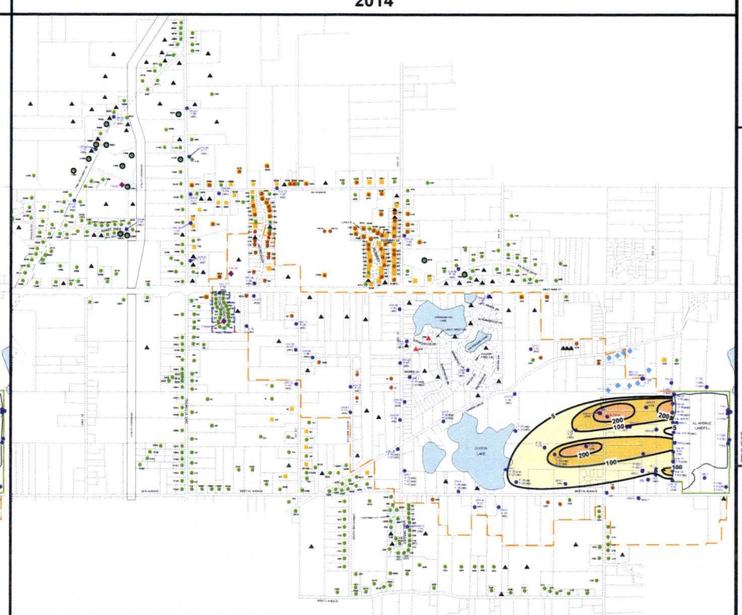
2013

2014

2016



2018



2020

LEGEND

- RESIDENTIAL WELLS
- IRRIGATION WELLS
- KL LANDFILL MONITORING WELLS
- VACANT / UNDEVELOPED
- MUNICIPAL WATER
- MDEQ PROFILE BORING 2008
- KLA PROFILE BORING 2010
- HEAT PUMP SUPPLY WELL

- LOT BOUNDARY
- GROUNDWATER RESTRICTED ZONE (GRZ) BOUNDARY
- GROUNDWATER RESTRICTED ZONE (GRZ) BOUNDARY SPECIFIC TO CHADDSFORD WAY (SEE NOTE 3)
- 100 — ISOCONCENTRATION CONTOUR (BENZENE)
- (ND) BENZENE (ug/L)

- 5 - 100 ug/L
- 100 - 200 ug/L
- 200 - 300 ug/L
- > 300 ug/L

NOTES

1.) ALL LOCATIONS ARE APPROXIMATE.

2.) UNLESS OTHERWISE SHOWN, PARCELS WITHIN THE GRZ BOUNDARY ARE CONNECTED TO MUNICIPAL WATER.

3.) GRZ WITHIN THE CHADDSFORD WAY SUBDIVISION IS LIMITED TO THE DEEPER (IMPACTED) PORTION OF THE AQUIFER (GROUNDWATER BELOW THE CLAY LAYER PRESENT AT APPROXIMATELY 90 TO 120 FEET BELOW GROUND SURFACE). PURSUANT TO THE EXPLANATION OF SIGNIFICANT DIFFERENCES PREPARED BY EPA DATED JUNE 23, 2104.

4.) BENZENE RESULTS FOR KL MONITORING WELLS FROM 2011 THROUGH 2020.

5.) BENZENE REPORTING LIMIT 1 ug/L; PART 201 DRINKING WATER CRITERIA = 5 ug/L.

REFERENCES

1.) KALAMAZOO COUNTY PORTION OF THE BASE MAP TAKEN FROM CADD FILE OSH-WA-1, TITLED "CHARTER TWP OF OSHTEMO WATER FEASIBILITY STUDY", DATED 11/16/99, BY PREIN & NEWHOF. ADDITIONAL UPDATES BASED ON KALAMAZOO COUNTY ONLINE GIS MAPPING (www.lrpmaps.com).

2.) THE PROPERTY LOCATED AT THE SOUTHEAST CORNER OF ALMENA DRIVE AND 4TH STREET (FORMERLY 9069) IS SHOWN AS SUBDIVIDED INTO 3 PARCELS PER THE CLIENTS REPRESENTATIVE'S INSTRUCTIONS.

3.) BLOCK AND LOT INFORMATION AND WELL LOCATIONS BETWEEN 22ND STREET 2ND STREET WERE DIGITIZED FROM GROUNDWATER MAP FROM KALAMAZOO COUNTY HUMAN SERVICES DEPT., ENVIRONMENTAL HEALTH.

4.) BLOCK AND LOT INFORMATION WEST OF 22ND STREET WERE DIGITIZED FROM TAX MAP DOWNLOADED FROM VAN BUREN COUNTY COMMUNITY CENTER WEB SITE (WWW.VBCO.ORG).

1500 0 1500 3000
SCALE FEET

GOLDER

REV	DATE	DES	REVISION DESCRIPTION	CHK	APVD

PROJECT
KL AVENUE LANDFILL GROUP
KALAMAZOO, MICHIGAN

TITLE
BENZENE PLUME DISTRIBUTION 2011 TO 2020

PROJECT No.		943-8200	
FILE No.		9438200BO00	
REV. 0	SCALE	AS SHOWN	
DESIGN	TIR	11/20/20	
CADD	RG	11/20/20	
CHECK	TIR	11/20/20	
REVIEW	RJI	11/20/20	

FIGURE 6

FIGURE C7: Cross-Section of Plume Concentrations Near Dustin Lake

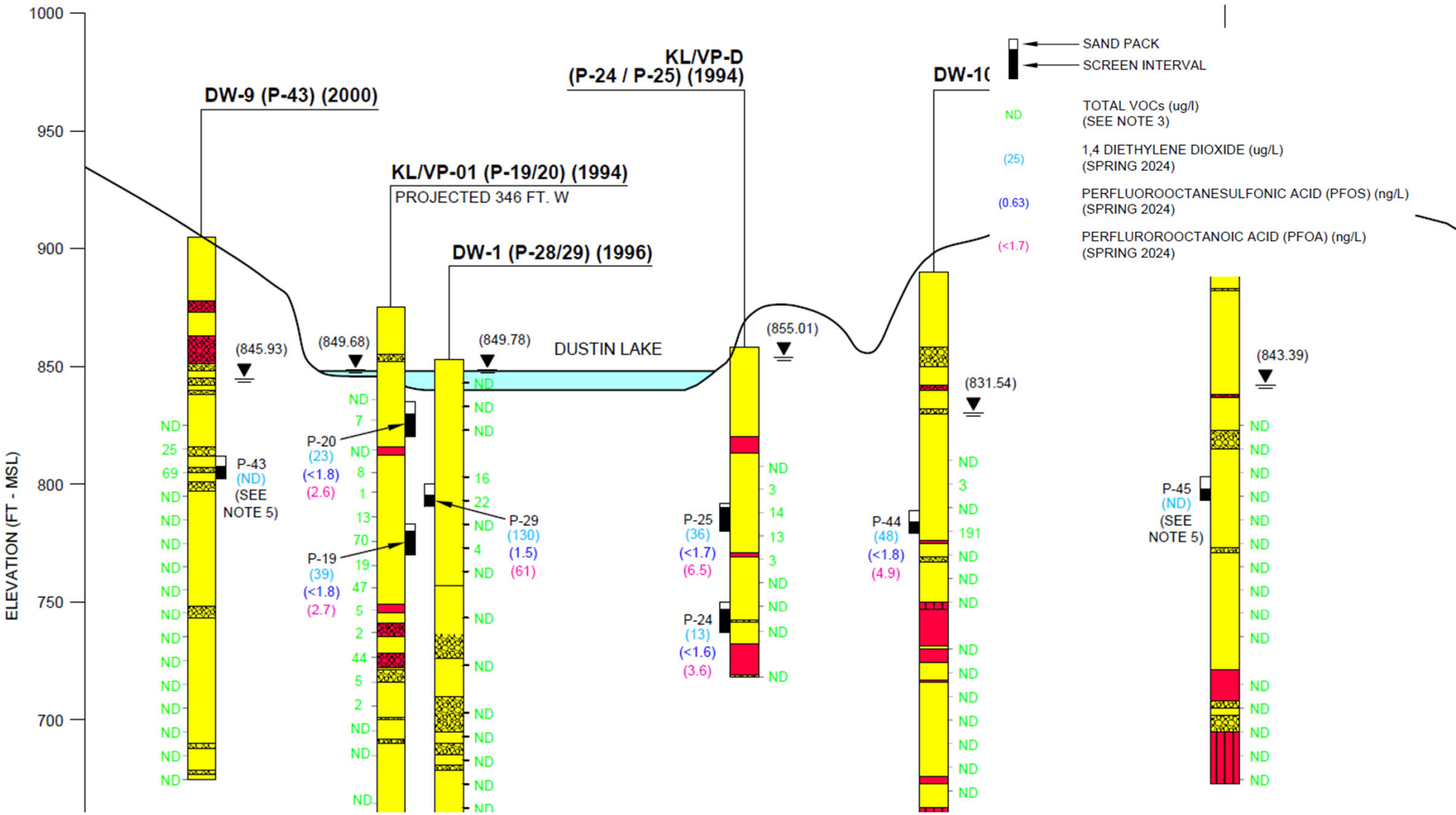

ELEVATION (FT - MSL)
1000
950
900
850
800
750
700
DW-9 (P-43) (2000)
KL/VP-01 (P-19/20) (1994)
PROJECTED 346 FT. W
DW-1 (P-28/29) (1996)
KL/VP-D
(P-24 / P-25) (1994)
DW-1(
DUSTIN LAKE
(845.93)
(849.68)
(849.78)
(855.01)
(831.54)
(843.39)
SAND PACK
SCREEN INTERVAL
TOTAL VOCs (ug/l)
(SEE NOTE 3)
1,4 DIETHYLENE DIOXIDE (ug/L)
(SPRING 2024)
PERFLUOROOCTANESULFONIC ACID (PFOS) (ng/L)
(SPRING 2024)
PERFLUROROOCTANOIC ACID (PFOA) (ng/L)
(SPRING 2024)
P-43
(ND)
(SEE
NOTE 5)
P-20
(23)
(<1.8)
(2.6)
P-19
(39)
(<1.8)
(2.7)
P-29
(130)
(1.5)
(61)
P-25
(36)
(<1.7)
(6.5)
P-24
(13)
(<1.6)
(3.6)
P-44
(48)
(<1.8)
(4.9)
P-45
(ND)
(SEE
NOTE 5)

FIGURE C8: VOC Mass Removed Through Flare

FIGURE 1
Estimated Mass Removed Through Flare
Through April 16, 2024
West KL Avenue Landfill
Oshtemo Township, Kalamazoo County, Michigan

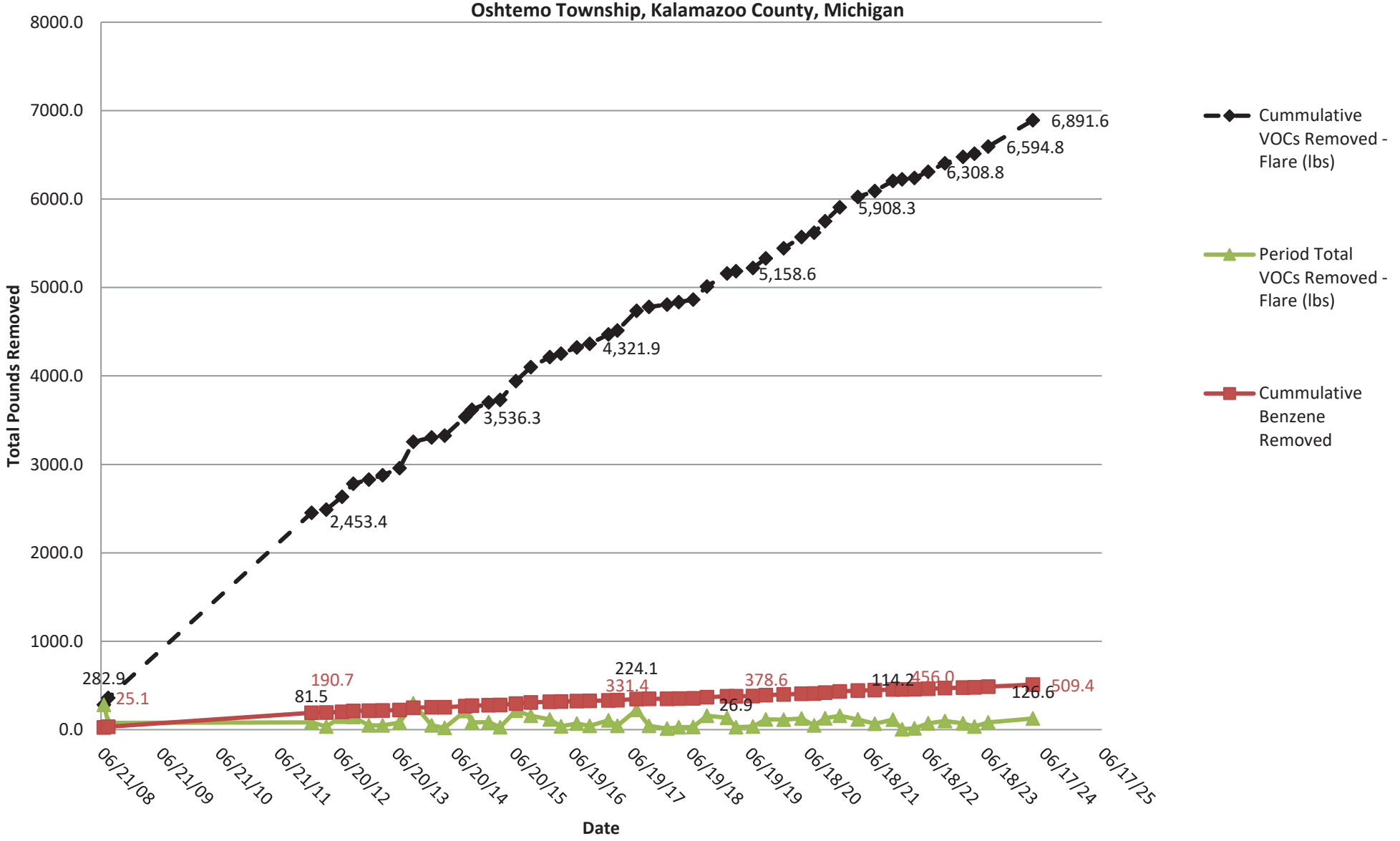


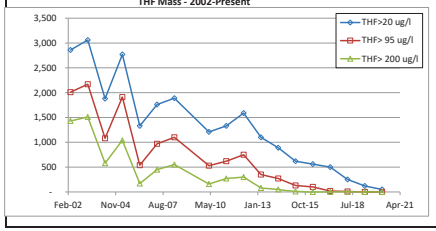
FIGURE C9: Mass Reduction Calculations

TABLE 1 - Dissolved-Phase Mass Estimate Summary - KL Landfill

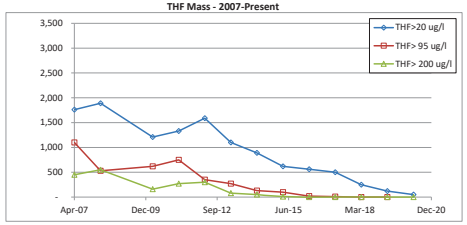
Tetrahydrofuran (THF) Mass Estimates - with 2002 profile control points

	Mass (kg)																		
Iso-Concentration Limit	**Apr-02**	**Apr-03**	**Apr-04**	**Apr-05**	**Apr-06**	**Apr-07**	**Apr-08**	**Apr-10**	**Apr-11**	**Apr-12**	**Apr-13**	**Apr-14**	**Apr-15**	**Apr-16**	**Apr-17**	**Apr-18**	**Apr-19**	**Apr-20**	**% Reduction**
THF>20 ug/l	2,860	3,060	1,880	2,770	1,330	1,760	1,890	1,210	1,330	1,590	1,100	890	620	560	500	250	120	50	98%
THF> 95 ug/l	2,010	2,170	1,080	1,910	540	970	1,100	530	620	750	350	270	130	100	20	10	-	-	100%
THF> 200 ug/l	1,430	1,510	580	1,040	170	450	550	160	270	300	80	50	10	-	-	-	-	-	100%
20 ug/l < THF < 200 ug/l	1,430	1,550	1,300	1,730	1,160	1,310	1,340	1,050	1,060	1,290	1,020	840	610	560	500	250	120	50	97%

THF Mass - 2002-Present



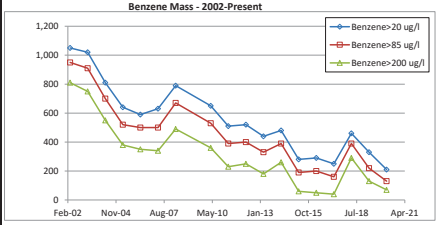
THF Mass - 2007-Present



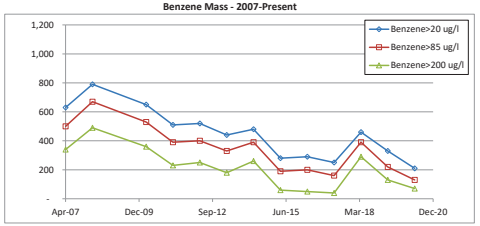
Benzene Mass Estimates - with 2002 profile control points

	Mass (kg)																		
Iso-Concentration Limit	**Apr-02**	**Apr-03**	**Apr-04**	**Apr-05**	**Apr-06**	**Apr-07**	**Apr-08**	**Apr-10**	**Apr-11**	**Apr-12**	**Apr-13**	**Apr-14**	**Apr-15**	**Apr-16**	**Apr-17**	**Apr-18**	**Apr-19**	**Apr-20**	**% Reduction**
Benzene>20 ug/l	1,050	1,020	810	640	590	630	790	650	510	520	440	480	280	290	250	460	330	210	80%
Benzene>85 ug/l	950	910	700	520	500	500	670	530	390	400	330	390	190	200	160	390	220	130	86%
Benzene>200 ug/l	810	750	550	380	350	340	490	360	230	250	180	260	60	50	40	290	130	70	91%
20 ug/l < Benzene < 200 ug/l	240	270	260	260	240	290	300	290	280	270	260	220	220	240	210	170	200	140	42%

Benzene Mass - 2002-Present



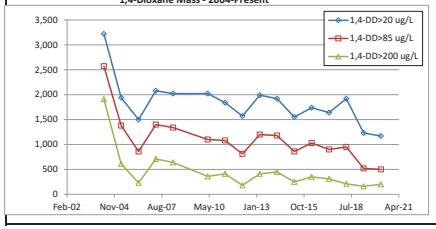
Benzene Mass - 2007-Present



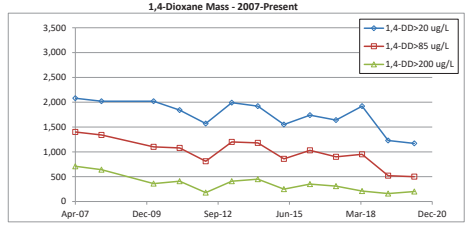
1,4 -Dioxane Mass Estimates - with 2002 profile control points

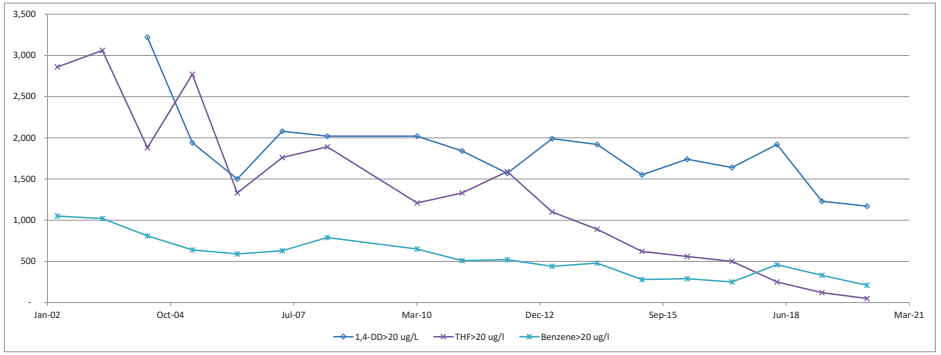
	Mass (kg)																		
Iso-Concentration Limit	**Apr-02**	**Apr-03**	**Apr-04**	**Apr-05**	**Apr-06**	**Apr-07**	**Apr-08**	**Apr-10**	**Apr-11**	**Apr-12**	**Apr-13**	**Apr-14**	**Apr-15**	**Apr-16**	**Apr-17**	**Apr-18**	**Apr-19**	**Apr-20**	**% Reduction**
1,4-DD>7.2 ug/L			3,460	2,090	1,700	2,280	2,210	2,070	2,060	1,790	2,220	2,140	1,770	1,970	1,890	2,230	1,470	1,410	59%
1,4-DD>20 ug/L			3,220	1,940	1,500	2,080	2,020	2,020	1,840	1,570	1,990	1,920	1,550	1,740	1,640	1,920	1,230	1,170	64%
1,4-DD>85 ug/L			2,570	1,380	860	1,400	1,340	1,100	1,080	810	1,200	1,180	860	1,030	900	950	520	500	81%
1,4-DD>200 ug/L			1,910	610	230	710	640	360	410	180	410	450	250	350	310	210	160	200	90%
20 ug/l < 1,4-DD < 200 ug/l			1,310	1,330	1,270	1,370	1,380	1,660	1,430	1,390	1,580	1,470	1,300	1,390	1,330	1,710	1,070	970	26%

1,4-Dioxane Mass - 2004-Present



1,4-Dioxane Mass - 2007-Present





NOTES:

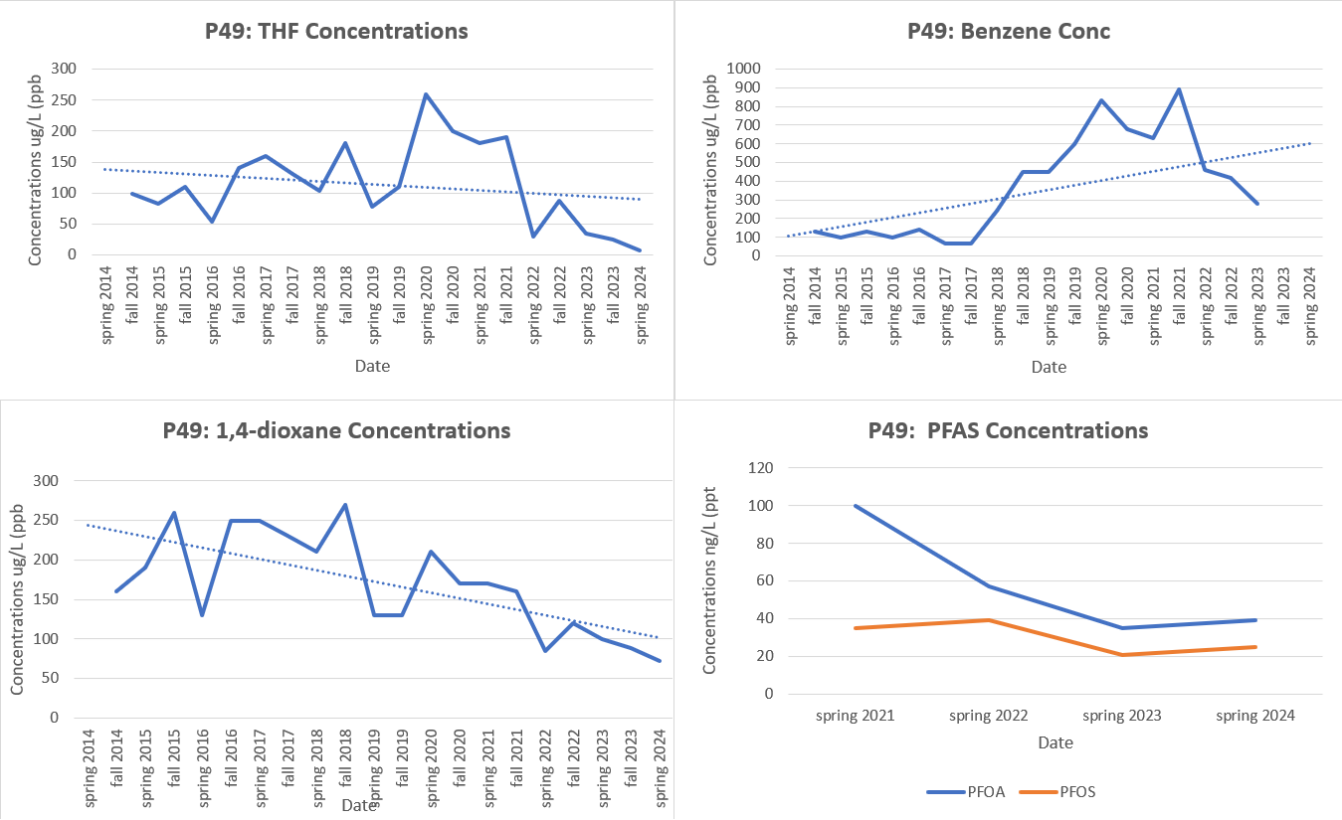
1) Mass estimates are cumulative as the isoconcentration limit decreases. For example, the mass listed for THF>20 ug/l includes the mass listed for THF>200 ug/l.
2) For samples where compounds were not detected above the numerical reporting limit, (a.k.a non-detect or ND samples), the method detection limit (MDL) is posted in EVS with a "<" prefix and EVS used a value equal to 1/10 x MDL for data interpretation.
3) These mass estimates were created using Environmental Visualization System/Mining Visualization System (EVS/MVS) modeling software, version 9.94 by C-Tech Corporation

APPENDIX D – Trend Charts

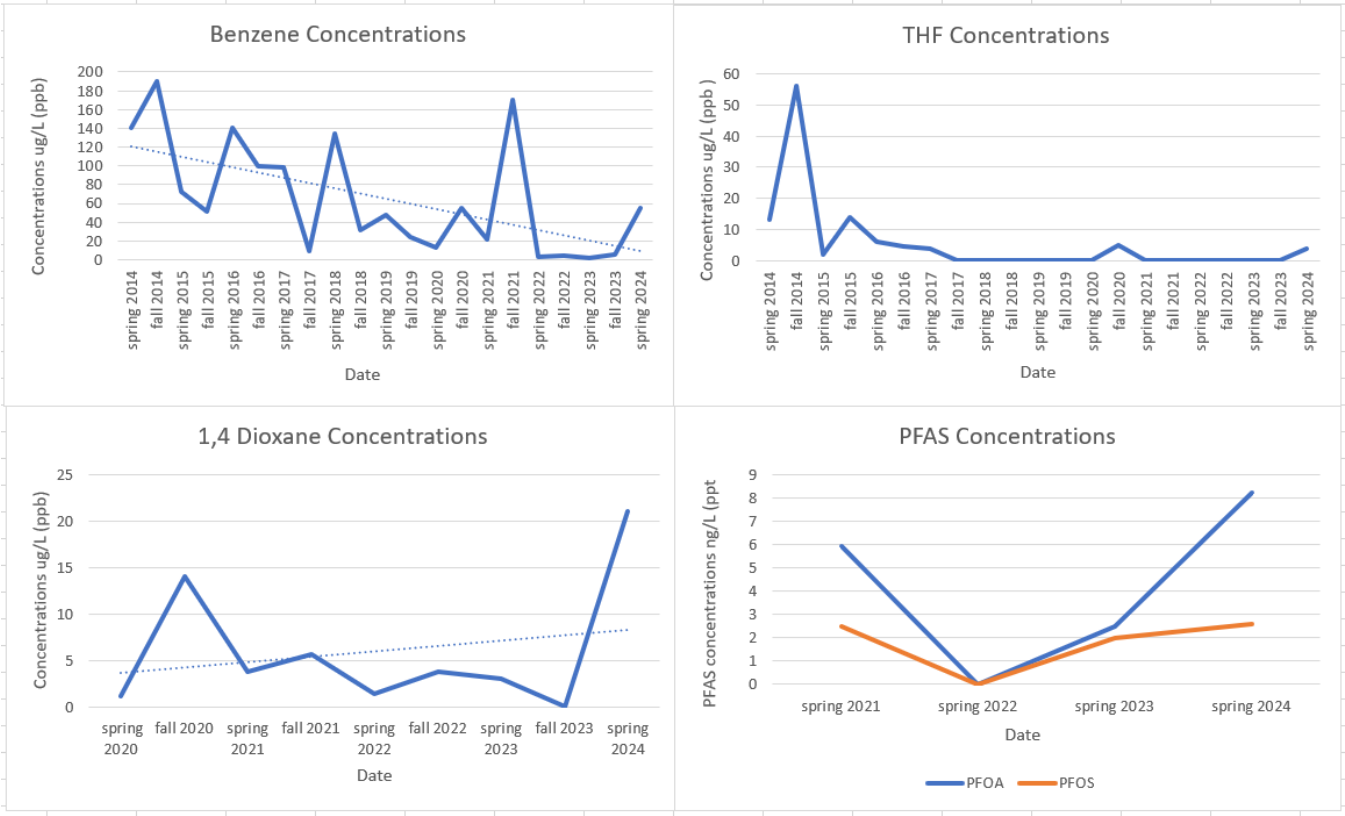
D1: Trend Charts for Source Area Wells P49 & P53; All COCs
D2: Trend Charts for Downgradient 1,4-dioxane Wells
D3: Trend Charts for Select PFAS Plume Wells

FIGURE D1: Trend Charts for Source Area Wells P49 & P53; All COCs

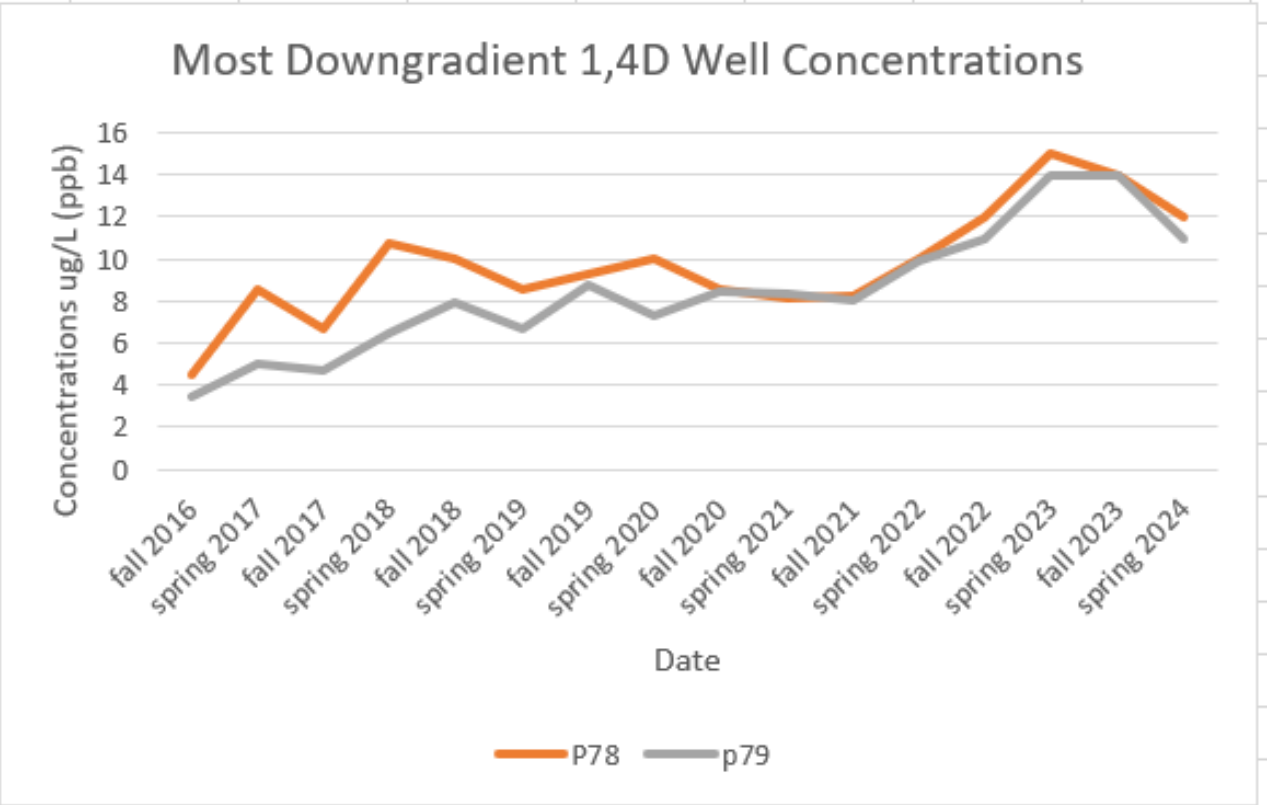
Monitoring Well P49 COCs Over Time



Monitoring Well P53 COCs Over Time



D2: Trend Charts for Downgradient 1,4-dioxane Wells



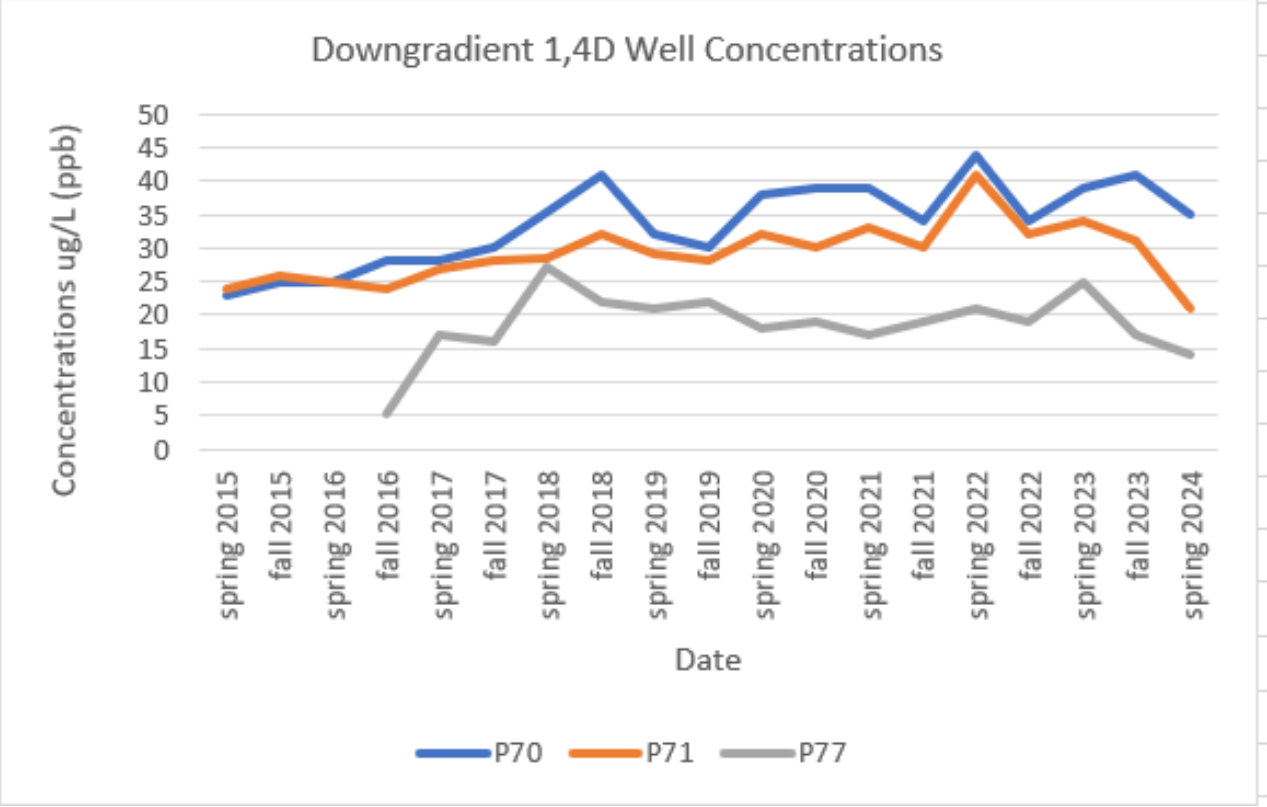
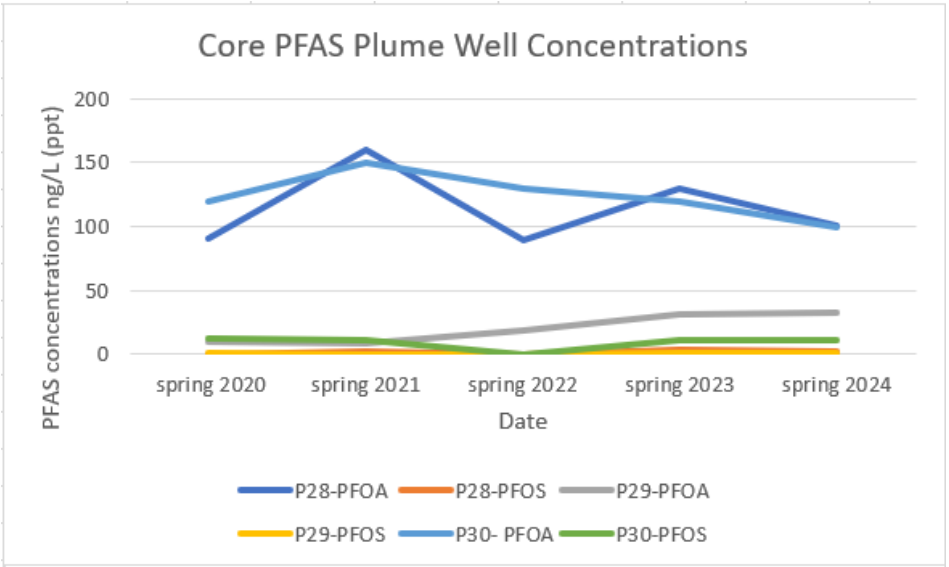
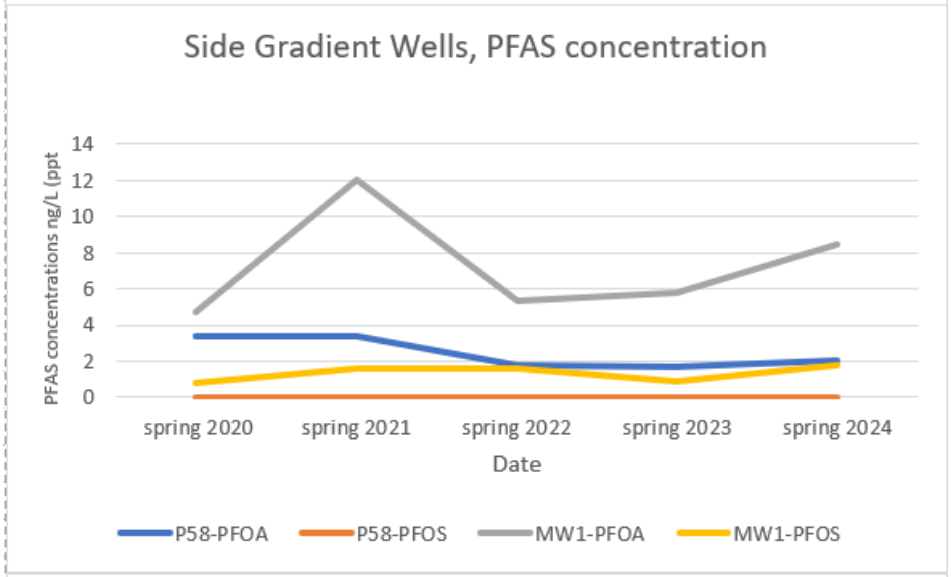
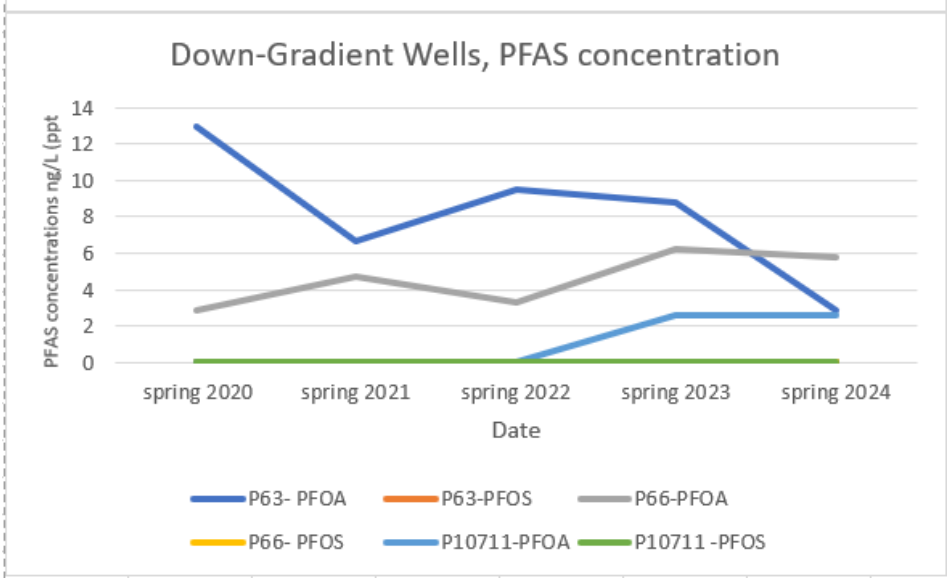


FIGURE D3: Trend Charts for Select PFAS Plume Wells


Core PFAS Plume Well Concentrations
PFAS concentrations ng/L (ppt)
200
150
100
50
0
spring 2020
spring 2021
spring 2022
spring 2023
spring 2024
Date
P28-PFOA
P28-PFOS
P29-PFOA
P29-PFOS
P30- PFOA
P30-PFOS


Side Gradient Wells, PFAS concentration
PFAS concentrations ng/L (ppt
14
12
10
8
6
4
2
0
spring 2020
spring 2021
spring 2022
spring 2023
spring 2024
Date
P58-PFOA
P58-PFOS
MW1-PFOA
MW1-PFOS


Down-Gradient Wells, PFAS concentration
PFAS concentrations ng/L (ppt
14
12
10
8
6
4
2
0
spring 2020
spring 2021
spring 2022
spring 2023
spring 2024
Date
P63- PFOA
P63-PFOS
P66-PFOA
P66- PFOS
P10711-PFOA
P10711 -PFOS

APPENDIX E – 2020-2024 Summary Data Results for COCs & PFAS

Table 1A
SUMMARY OF ANALYTICAL RESULTS - PFAS COMPOUNDS
SPRING 2020 PFAS SAMPLING EVENT
WEST KL LANDFILL

		M-8 4/6/2021 N	M-8 3/30/2022 N	M-8 5/9/2023 N	M-8 5/8/2024 N	MW-1 7/21/2020 N	MW-1 4/6/2021 N	MW-1 3/28/2022 N	MW-1 5/4/2023 N	MW-1 5/3/2024 N	MW-7 2/21/2023 N	MW-7 5/9/2023 N	MW-12 4/5/2021 N	MW-12 3/28/2022 N	MW-12 5/5/2023 N	MW-12 5/6/2024 N
Parameter	**CAS**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	< 3	< 3.0	1.2	0.66	< 2.5	< 2.4	< 2.5	0.72	1.9	<1.7	1	< 2.5	< 2.5	4.1	< 1.7
Perfluoro-1-Octanesulfonate (PFOS)	1763-23-1	6.9	8	8.5	7.1	0.77 J	< 1.6	< 1.6	0.86	< 1.8	1.9	3.4	< 1.7	< 1.7	< 1.7	0.45
Perfluorobutanesulfonic acid (PFBS)	375-73-5	< 2	< 2	0.67	0.85	2.3	2.9	2.9	5.4	2.3	0.75	0.59	2.5	2.3	2.2	1.4
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	< 2	< 2	1.6	1.1	1.4 J	1.8	< 1.6	1.5	2.1	0.81	1.4	3.4	2.1	2.2	3.7
Perfluorohexanoic acid (PFHxA)	307-24-4	4.9	4.2	5.6	3.7	15	18	12	11	4.7	1.3	0.67	31	27	21	20
Perfluoro-n-octanoic acid (PFOA)	335-67-1	18	15	17	11	4.7	12	5.3	5.8	8.5	3.7	5.5	25	12	16	22
Perfluorononanoic acid (PFNA)	375-95-1	< 2	< 2	0.31	0.28	< 1.7	< 1.6	< 1.6	0.21	< 1.8	<1.7	< 1.6	< 1.7	< 1.7	< 1.7	< 1.7

Notes:
All results are in nanograms per liter (ng/L)
Non-detects are reported as less than the method detection limit

N = Normal, FD = Field Duplicate

	MW-13 4/2/2021 N	MW-13 3/28/2022 N	MW-13 (Field Dup) 3/28/2022 FD	MW-13 5/12/2023 N	MW-13 5/3/2024 N	MW-15 7/21/2020 N	P-10711 7/20/2020 N	P-10711 3/31/2021 N	P-10711 3/24/2022 N	P-10711 5/12/2023 N	P-10711 5/2/2024 N	P-10711 (Field Dup) 5/2/2024 FD
Parameter	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hexafluoropropylene oxide dimer acid (GenX)	< 2.5	< 30	< 30	1.4	<1.7	< 2.6	< 2.5	< 2.4	< 2.9	< 1.6	< 1.7	< 1.6
Perfluoro-1-Octanesulfonate (PFOS)	3.3	< 20	*< 20*	3.7	3.3	< 1.7	< 1.6	< 1.6	< 1.9	< 1.6	< 1.7	< 1.6
Perfluorobutanesulfonic acid (PFBS)	3.3	< 20	< 20	2.5	1.0	< 1.7	1.5 J	4.4	< 1.9	2.2	2	2.1
Perfluorohexanesulfonic acid (PFHxS)	2.8	< 20	< 20	4.1	2.1	< 1.7	0.67 J	< 1.6	< 1.9	0.95	0.54	0.63
Perfluorohexanoic acid (PFHxA)	40	37	38	26	6.4	< 1.7	3.8	< 1.6	4.8	15	10	12
Perfluoro-n-octanoic acid (PFOA)	16	< 20	20	21	13	< 1.7	0.78 J	< 1.6	< 1.9	2.6	2.6	2.6
Perfluorononanoic acid (PFNA)	< 1.7	< 20	< 20	< 1.7	<1.7	< 1.7	< 1.6	< 1.6	< 1.9	< 1.6	< 1.7	2.6

	P-19 4/20/2020 N	P-19 4/5/2021 N	P-19 3/29/2022 N	P-19 5/10/2023 N	P-19 5/6/2024 N	P-20 4/20/2020 N	P-20 4/6/2021 N	P-20 3/29/2022 N	P-20 5/10/2023 N	P-20 5/6/2024 N	P-21 4/2/2021 N	P-21 3/28/2022 N	P-21 5/9/2023 N	P-21 5/6/2024 N
Parameter	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hexafluoropropylene oxide dimer acid (GenX)	< 0.41	< 2.9	< 2.5	1.2	0.36	< 0.43	< 2.6	< 2.5	1.1	< 1.8	< 2.5	< 2.8	< 1.6	< 1.8
Perfluoro-1-Octanesulfonate (PFOS)	< 0.41	< 1.9	< 1.6	< 1.7	< 1.8	< 0.43	< 1.8	< 1.7	< 1.7	< 1.8	< 1.7	< 1.8	0.66	< 1.8
Perfluorobutanesulfonic acid (PFBS)	1.3	< 1.9	1.6	1.2	1.5	0.65	< 1.8	2.4	0.85	0.74	3	2.3	1.9	1.6
Perfluorohexanesulfonic acid (PFHxS)	0.48	< 1.9	< 1.6	0.64	0.75	< 0.43	< 1.8	< 1.7	0.41	0.66	3.5	3.5	4.8	2.6
Perfluorohexanoic acid (PFHxA)	9.5	11	13	9.6	7.1	2.1	2.8	20	4.6	4.8	33	38	37	20
Perfluoro-n-octanoic acid (PFOA)	2.4	3.4	3.8	2.9	2.7	0.81	< 1.8	3.8	2.1	2.6	18	17	27	14
Perfluorononanoic acid (PFNA)	< 0.41	< 1.9	< 1.6	< 1.7	< 1.8	< 0.43	< 1.8	< 1.7	< 1.7	< 1.8	< 1.7	< 1.8	0.18	< 1.8

	P-24 4/20/2020 N	P-24 4/5/2021 N	P-24 3/29/2022 N	P-24 5/5/2023 N	P-24 5/6/2024 N	P-25 4/20/2020 N	P-25 4/5/2021 N	P-25 3/29/2022 N	P-25 5/5/2023 N	P-25 5/6/2024 N
Parameter	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hexafluoropropylene oxide dimer acid (GenX)	1	< 2.5	< 2.5	< 1.7	< 1.6	< 0.42	< 2.4	< 2.5	0.92	0.34
Perfluoro-1-Octanesulfonate (PFOS)	< 0.42	< 1.7	< 1.7	< 1.7	< 1.6	< 0.42	< 1.6	< 1.7	< 1.7	< 1.7
Perfluorobutanesulfonic acid (PFBS)	2.2	1.8	< 1.7	0.86	0.56	1.8	2.3	2.1	1.9	1.5
Perfluorohexanesulfonic acid (PFHxS)	1.3	< 1.7	< 1.7	0.72	0.61	0.84	2	1.8	1.8	1.7
Perfluorohexanoic acid (PFHxA)	19	17	11	6.8	5	10	19	14	12	6.3
Perfluoro-n-octanoic acid (PFOA)	8.4	9.5	5.3	3.1	3.6	3.7	11	8.3	6	6.5
Perfluorononanoic acid (PFNA)	< 0.42	< 1.7	< 1.7	< 1.7	< 1.6	< 0.42	< 1.6	< 1.7	< 1.7	< 1.7

GOLDER

Table 1A
SUMMARY OF ANALYTICAL RESULTS - PFAS COMPOUNDS
SPRING 2020 PFAS SAMPLING EVENT
WEST KL LANDFILL

	P-27 4/21/2020 N	P-27 4/5/2021 N	P-27 3/29/2022 N	P-27 (Field Dup) 5/5/2023 FD	P-27 5/5/2023 N	P-27 5/6/2024 N	P-27 (Field Dup) 5/6/2024 FD	P-28 (Field Dup) 4/20/2020 FD	P-28 4/20/2020 N	P-28 4/5/2021 N	P-28 3/29/2022 N	P-28 5/12/2023 N	P-28 5/6/2024 N
Parameter	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hexafluoropropylene oxide dimer acid (GenX)	< 5	< 2.4	< 2.4	< 1.7	3.3	< 1.7	3.3	< 4.9	< 4.9	14	< 30	12	< 1.8
Perfluoro-1-Octanesulfonate (PFOS)	< 5	< 1.6	< 1.6	< 1.7	< 1.7	< 1.7	< 1.7	< 4.9	< 4.9	2.5	< 20	3	2
Perfluorobutanesulfonic acid (PFBS)	< 5	3	3.1	0.68	0.66	0.31	0.3	8	8.2	13	< 20	7.2	7
Perfluorohexanesulfonic acid (PFHxS)	< 5	2.8	3	1.2	1.3	0.99	0.98	9.2	8.7	14	< 20	11	11
Perfluorohexanoic acid (PFHxA)	39	38	38	6.3	6	4.7	2.9	88	87	100	100	110	59
Perfluoro-n-octanoic acid (PFOA)	18	22	17	8.7	8.2	5.1	4.9	91	90	160	89	130	100
Perfluorononanoic acid (PFNA)	< 5	< 1.6	< 1.6	< 1.7	< 1.7	< 1.7	< 1.7	< 4.9	< 4.9	< 1.8	*< 20*	< 1.7	0.18

	P-29 4/20/2020 N	P-29 4/5/2021 N	P-29 3/29/2022 N	P-29 (Field Dup) 5/12/2023 FD	P-29 5/12/2023 N	P-29 5/6/2024 N	P-30 (Field Dup) 4/21/2020 FD	P-30 4/21/2020 N	P-30 (Field Dup) 4/5/2021 FD	P-30 4/5/2021 N	P-30 3/29/2022 N	P-30 (Field Dup) 3/29/2022 FD	P-30 5/15/2023 N	P-30 5/8/2024 N
Parameter	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hexafluoropropylene oxide dimer acid (GenX)	< 0.42	< 3	< 2.6	1.2	< 1.6	< 1.9	< 5	< 4.9	< 30	< 2.4	< 30	< 30	< 1.7	<1.7
Perfluoro-1-Octanesulfonate (PFOS)	0.91	< 2	< 1.7	0.79	0.86	1.5	13	12	< 20	11	< 20	< 20	11	11
Perfluorobutanesulfonic acid (PFBS)	2.1	2.2	3	1.6	3.4	1.5	7.1	7.7	< 20	7.1	< 20	< 20	4.4	1.4
Perfluorohexanesulfonic acid (PFHxS)	1.3	< 2	2.9	3.4	4.1	4.9	12	11	< 20	12	< 20	< 20	10	7.7
Perfluorohexanoic acid (PFHxA)	14	14	28	46	48	60	90	89	95	100	93	100	71	58
Perfluoro-n-octanoic acid (PFOA)	10	8.9	18	31	33	61	110	120	140	150	130	130	120	100
Perfluorononanoic acid (PFNA)	< 0.42	< 2	< 1.7	< 1.8	0.16	< 1.9	< 5	< 4.9	< 20	< 1.6	*< 20*	*< 20*	0.24	0.33

	P-31 4/21/2020 N	P-31 4/5/2021 N	P-31 3/29/2022 N	P-31 5/15/2023 N	P-31 5/8/2024 N	P-32 7/20/2020 N	P-33 7/20/2020 N	P-34 7/21/2020 N	P-34 4/1/2021 N	P-34 3/24/2022 N	P-34 5/4/2023 N	P-34 5/3/2024 N	P-34 (Field Dup) 5/3/2024 FD
Parameter	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hexafluoropropylene oxide dimer acid (GenX)	< 4.9	< 30	< 30	< 1.7	<1.6	< 2.7	< 2.6	< 2.6	< 2.4	< 3.4	< 1.7	< 1.8	< 1.8
Perfluoro-1-Octanesulfonate (PFOS)	19	26	25	14	12	0.96 J	< 1.7	1.5 J	< 1.6	< 2.3	0.63	< 1.8	< 1.8
Perfluorobutanesulfonic acid (PFBS)	5.5	< 20	< 20	1.9	1.6	< 1.8	< 1.7	< 1.7	< 1.6	< 2.3	< 1.7	< 1.8	< 1.8
Perfluorohexanesulfonic acid (PFHxS)	9.7	< 20	< 20	4.7	4.5	< 1.8	< 1.7	< 1.7	< 1.6	< 2.3	< 1.7	< 1.8	< 1.8
Perfluorohexanoic acid (PFHxA)	86	78	57	36	44	< 1.8	< 1.7	< 1.7	< 1.6	< 2.3	< 1.7	< 1.8	< 1.8
Perfluoro-n-octanoic acid (PFOA)	98	98	82	47	52	< 1.8	< 1.7	0.48 J	< 1.6	< 2.3	0.26	< 1.8	< 1.8
Perfluorononanoic acid (PFNA)	< 4.9	< 20	*< 20*	0.28	0.28	< 1.8	< 1.7	< 1.7	< 1.6	< 2.3	< 1.7	< 1.8	< 1.8

	P-35 7/21/2020 N	P-35 4/1/2021 N	P-35 3/24/2022 N	P-35 (Field Dup) 5/4/2023 FD	P-35 5/4/2023 N	P-35 5/2/2024 N	P-36 7/20/2020 N	P-36 4/1/2021 N	P-36 3/24/2022 N	P-36 (Field Dup) 3/23/2022 FD	P-36 5/4/2023 N	P-36 5/2/2024 N
Parameter	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hexafluoropropylene oxide dimer acid (GenX)	< 2.6	< 2.5	< 2.8	< 1.7	< 1.8	< 1.8	< 2.4	< 2.9	< 2.4	< 2.4	< 1.6	< 1.9
Perfluoro-1-Octanesulfonate (PFOS)	0.53 J	< 1.7	< 1.8	< 1.7	< 1.8	< 1.8	3.2	4.1	< 1.6	< 1.6	1.2	0.98
Perfluorobutanesulfonic acid (PFBS)	2.4	2.6	2.7	4	4.3	4	2.4	< 2	< 1.6	1.6	3	2.6
Perfluorohexanesulfonic acid (PFHxS)	0.77 J	< 1.7	< 1.8	1.1	1.1	1.1	1.8	< 2	< 1.6	< 1.6	2.4	1.5
Perfluorohexanoic acid (PFHxA)	3.4	2.3	< 1.8	< 1.7	< 1.8	< 1.8	19	11	12	13	18	19
Perfluoro-n-octanoic acid (PFOA)	11	7.7	1.8	1.5	1.6	1.1	5.4	6.6	4.1	3.2	7.8	6.7
Perfluorononanoic acid (PFNA)	< 1.7	< 1.7	< 1.8	< 1.7	< 1.8	< 1.8	< 1.6	< 2	< 1.6	< 1.6	< 1.6	< 1.9

GOLDER

Table 1A
SUMMARY OF ANALYTICAL RESULTS - PFAS COMPOUNDS
SPRING 2020 PFAS SAMPLING EVENT
WEST KL LANDFILL

	P-38 7/21/2020 N	P-38 4/1/2021 N	P-38 3/28/2022 N	P-38 5/5/2023 N	P-38 5/2/2024 N	P-39 7/21/2020 N	P-39 4/1/2021 N	P-39 3/28/2022 N	P-39 5/5/2023 N	P-39 5/3/2024 N	P-42 7/20/2020 N	P-42 4/1/2021 N	P-42 3/23/2022 N	P-42 5/9/2023 N	P-42 5/2/2024 N
Parameter	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hexafluoropropylene oxide dimer acid (GenX)	< 3.1	< 2.5	< 2.8	< 1.6	< 1.8	< 2.5	< 2.7	< 2.7	< 1.7	< 1.8	< 2.5	< 2.5	< 2.9	0.4	< 1.7
Perfluoro-1-Octanesulfonate (PFOS)	< 2.1	< 1.7	< 1.9	0.44	< 1.8	3.6	3.5	4.6	5.2	3.6	1.6 J	< 1.7	1.9	1.3	0.62
Perfluorobutanesulfonic acid (PFBS)	< 2.1	< 1.7	< 1.9	< 1.6	< 1.8	0.84 J	1.9	2.7	1.5	1.4	0.68 J	< 1.7	< 1.9	1.5	1
Perfluorohexanesulfonic acid (PFHxS)	< 2.1	< 1.7	< 1.9	< 1.6	< 1.8	< 1.7	< 1.8	2.1	0.69	0.45	1.2 J	< 1.7	< 1.9	1.9	1
Perfluorohexanoic acid (PFHxA)	< 2.1	< 1.7	< 1.9	< 1.6	< 1.8	3.1	4.5	7.1	4.8	6.3	3.3	2.9	2.2	3.1	2.4
Perfluoro-n-octanoic acid (PFOA)	< 2.1	< 1.7	< 1.9	< 1.6	< 1.8	6.9	9.4	15	11	11	6.7	7.0	5.5	5.6	3.9
Perfluorononanoic acid (PFNA)	< 2.1	< 1.7	< 1.9	< 1.6	< 1.8	< 1.7	< 1.8	< 1.8	1.3	1.1	< 1.7	< 1.7	< 1.9	< 1.7	< 1.7

	P-44 4/20/2020 N	P-44 4/2/2021 N	P-44 3/24/2022 N	P-44 5/16/2023 N	P-44 5/2/2024 N	P-46 4/6/2021 N	P-46 3/30/2022 N	P-46 5/16/2023 N	P-46 5/8/2024 N	P-48 4/6/2021 N	P-48 3/28/2022 N	P-48 (Field Dup) 5/10/2023 FD	P-48 5/10/2023 N	P-48 5/7/2024 N
Parameter	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hexafluoropropylene oxide dimer acid (GenX)	< 0.43	< 2.5	< 2.5	1.6	< 1.8	< 2.6	< 2.4	< 1.7	<1.8	< 29	< 30	13	8	1.3
Perfluoro-1-Octanesulfonate (PFOS)	0.86	< 1.7	< 1.6	0.42	< 1.8	< 1.7	< 1.6	< 1.7	0.63	35	43	34	36	33
Perfluorobutanesulfonic acid (PFBS)	1.6	1.8	2	2.3	1.6	< 1.7	< 1.6	< 1.7	0.59	< 20	< 20	3.5	< 20	0.92
Perfluorohexanesulfonic acid (PFHxS)	0.44	< 1.7	< 1.6	1.8	0.79	< 1.7	< 1.6	< 1.7	1.1	< 20	< 20	4.1	3.4	2.9
Perfluorohexanoic acid (PFHxA)	11	14	23	23	13	< 1.7	< 1.6	< 1.7	8.6	< 20	< 20	3.5	2.6	4.5
Perfluoro-n-octanoic acid (PFOA)	1.8	2.9	6.7	8.9	4.9	< 1.7	< 1.6	1	9.9	25	29	24	30	26
Perfluorononanoic acid (PFNA)	< 0.43	< 1.7	< 1.6	< 1.7	< 1.8	< 1.7	< 1.6	< 1.7	<1.8	< 20	*< 20*	< 20	< 20	0.34

	P-49 (Field Dup) 4/6/2021 FD	P-49 4/6/2021 N	P-49 3/30/2022 N	P-49 5/10/2023 N	P-49 5/7/2024 N	P-49 (Field Dup) 5/7/2024 FD	P-50 4/6/2021 N	P-50 3/30/2022 N	P-50 5/10/2023 N	P-50 5/8/2024 N	P-51 4/6/2021 N	P-51 3/30/2022 N	P-51 (Field Dup) 5/16/2023 FD	P-51 5/16/2023 N	P-51 5/7/2024 N
Parameter	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hexafluoropropylene oxide dimer acid (GenX)	< 30	< 29	< 2.8	< 20	<1.8	<1.7	2.4	< 2.5	2.4	<1.7	< 29	< 2.6	0.82	< 1.6	<1.8
Perfluoro-1-Octanesulfonate (PFOS)	35	35	39	21	25	18	14	19	13	7.3	51	6.5	5.1	4.6	8.7
Perfluorobutanesulfonic acid (PFBS)	< 20	< 19	3	4.5	1.4	1.2	1.6	2	1.7	1.2	< 20	< 1.7	0.89	0.88	1.4
Perfluorohexanesulfonic acid (PFHxS)	< 20	< 19	11	5.4	4.1	3.7	3.1	6.4	3.7	2.8	< 20	< 1.7	0.37	0.38	2.7
Perfluorohexanoic acid (PFHxA)	37	39	20	18	12	7.2	20	31	21	12	94	< 1.7	1.1	0.4	12
Perfluoro-n-octanoic acid (PFOA)	100	100	57	35	39	30	31	58	37	24	140	3.1	2.2	1.8	23
Perfluorononanoic acid (PFNA)	< 20	< 19	< 1.9	< 20	0.25	0.21	< 1.6	< 1.6	0.39	0.33	< 20	< 1.7	0.28	< 1.6	0.26

	P-52 4/6/2021 N	P-52 3/28/2022 N	P-52 5/10/2023 N	P-52 5/7/2024 N	P-53 4/6/2021 N	P-53 3/30/2022 N	P-53 5/10/2023 N	P-53 5/8/2024 N	P-55 4/6/2021 N	P-55 3/30/2022 N	P-55 5/10/2023 N	P-55 5/7/2024 N
Parameter	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hexafluoropropylene oxide dimer acid (GenX)	< 2.4	5	3.9	<1.7	< 2.4	< 2.5	0.73	<1.7	< 2.6	< 2.9	0.52	<1.8
Perfluoro-1-Octanesulfonate (PFOS)	4.4	6.6	4.8	6.7	2.5	1.6	2	2.6	< 1.7	< 2	< 1.6	<1.8
Perfluorobutanesulfonic acid (PFBS)	< 1.6	< 1.7	1.2	1.3	< 1.6	< 1.6	1.2	0.8	< 1.7	< 2	2	0.47
Perfluorohexanesulfonic acid (PFHxS)	2.5	3.8	2.2	2.6	< 1.6	< 1.6	0.59	1.2	< 1.7	< 2	0.17	<1.8
Perfluorohexanoic acid (PFHxA)	6.5	6.1	4.8	4.4	2.2	< 1.6	0.89	8.2	11	21	12	7.5
Perfluoro-n-octanoic acid (PFOA)	15	19	13	15	5.9	< 1.6	2.5	8.2	< 1.7	< 2	1.1	1.4
Perfluorononanoic acid (PFNA)	< 1.6	< 1.7	0.17	0.23	< 1.6	< 1.6	0.38	0.61	< 1.7	< 2	< 1.6	<1.8

	P-56 7/20/2020 N	P-56 4/1/2021 N	P-56 3/24/2022 N	P-56 5/12/2023 N	P-56 5/2/2024 N	P-57 7/20/2020 N	P-57 3/31/2021 N	P-57 3/23/2022 N	P-57 5/5/2023 N	P-57 5/2/2024 N	P-58 7/20/2020 N	P-58 4/1/2021 N	P-58 3/24/2022 N	P-58 5/4/2023 N	P-58 5/2/2024 N

GOLDER

Table 1A
SUMMARY OF ANALYTICAL RESULTS - PFAS COMPOUNDS
SPRING 2020 PFAS SAMPLING EVENT
WEST KL LANDFILL

Parameter	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Hexafluoropropylene oxide dimer acid (GenX)	< 2.6	< 2.5	< 2.4	0.59	<1.8	< 2.4	< 2.7	< 2.5	< 1.7	< 1.8	< 2.4	< 2.5	< 2.5	< 1.6	< 1.8
Perfluoro-1-Octanesulfonate (PFOS)	< 1.7	< 1.7	< 1.6	< 1.7	<1.8	< 1.6	< 1.8	< 1.7	< 1.7	< 1.8	< 1.6	< 1.7	< 1.7	< 1.6	< 1.8
Perfluorobutanesulfonic acid (PFBS)	2.5	3.4	1.9	1.9	2.6	0.99 J	< 1.8	1.8	1.6	1.3	0.87 J	< 1.7	< 1.7	0.84	0.8
Perfluorohexanesulfonic acid (PFHxS)	1.6 J	2.3	< 1.6	1.8	1.9	< 1.6	< 1.8	< 1.7	0.25	< 1.8	0.77 J	< 1.7	< 1.7	0.32	0.47
Perfluorohexanoic acid (PFHxA)	22	24	17	20	23	6.1	5.1	4.7	6	6.2	5.4	5.1	2.7	2	3.1
Perfluoro-n-octanoic acid (PFOA)	11	15	8.6	13	14	0.67 J	< 1.8	< 1.7	0.48	0.75	3.4	3.4	1.8	1.7	2
Perfluorononanoic acid (PFNA)	< 1.7	< 1.7	< 1.6	< 1.7	<1.8	< 1.6	< 1.8	< 1.7	< 1.7	< 1.8	< 1.6	< 1.7	< 1.7	< 1.6	< 1.8

	P-61 7/21/2020 N	(Field Dup) 7/21/2020 FD	P-61 3/31/2021 N	P-61 3/23/2022 N	P-61 5/5/2023 N	P-61 5/2/2024 N	P-63 7/20/2020 N	P-63 3/31/2021 N	P-63 3/23/2022 N	P-63 5/15/2023 N	P-63 5/2/2024 N
Parameter	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Hexafluoropropylene oxide dimer acid (GenX)	0.59 J	1.7 J	< 2.5	< 2.5	0.7	<1.8	< 2.6	< 2.5	< 2.5	1.8	< 1.7
Perfluoro-1-Octanesulfonate (PFOS)	< 1.7	< 1.7	< 1.7	< 1.7	< 1.6	<1.8	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7
Perfluorobutanesulfonic acid (PFBS)	5.3	4.9	8.8	3.2	3.5	6.4	3.9	5.3	1.9	2.7	2.4
Perfluorohexanesulfonic acid (PFHxS)	2	2	3.1	2	2	2.7	1.8	< 1.7	< 1.7	1.3	1.1
Perfluorohexanoic acid (PFHxA)	43	41	49	34	31	42	29	31	19	22	16
Perfluoro-n-octanoic acid (PFOA)	18	16	27	15	19	24	11	13	6.7	9.5	8.8
Perfluorononanoic acid (PFNA)	< 1.7	0.42 J	< 1.7	< 1.7	0.16	0.46	< 1.8	< 1.7	< 1.7	0.18	< 1.7

	P-66 7/20/2020 N	(Field Dup) 7/20/2020 FD	P-66 3/31/2021 N	P-66 3/23/2022 N	P-66 5/15/2023 N	P-66 5/2/2024 N	P-73 4/1/2021 N	P-73 3/23/2022 N	P-73 (Field Dup) 5/9/2023 FD	P-73 5/9/2023 N	P-73 5/2/2024 N
Parameter	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Hexafluoropropylene oxide dimer acid (GenX)	0.59 J	0.60 J	< 2.5	< 2.5	1.8	< 1.7	< 2.4	< 2.4	< 1.7	< 1.7	< 1.7
Perfluoro-1-Octanesulfonate (PFOS)	< 1.7	< 1.7	< 1.6	< 1.6	< 1.6	< 1.7	< 1.6	< 1.6	< 1.7	< 1.7	< 1.7
Perfluorobutanesulfonic acid (PFBS)	1.8	1.7	3	< 1.6	2.3	2.3	< 1.6	< 1.6	0.3	0.36	< 1.7
Perfluorohexanesulfonic acid (PFHxS)	0.76 J	0.58 J	< 1.6	< 1.6	0.83	0.76	< 1.6	< 1.6	< 1.7	0.19	< 1.7
Perfluorohexanoic acid (PFHxA)	12	13	17	13	19	13	1.6	< 1.6	1.2	1.5	1.9
Perfluoro-n-octanoic acid (PFOA)	2.9	2.7	4.7	3.3	6.2	5.8	< 1.6	< 1.6	0.38	0.48	0.33
Perfluorononanoic acid (PFNA)	< 1.7	< 1.7	< 1.6	< 1.6	< 1.6	< 1.7	< 1.6	< 1.6	< 1.7	< 1.7	< 1.7

	P-75 7/21/2020 N	P-75 4/1/2021 N	P-75 3/24/2022 N	P-75 (Field Dup) 3/24/2022 FD	P-75 5/4/2023 N	P-75 5/2/2024 N	P-76 7/20/2020 N	TW-4 (Field Dup) 4/7/2021 FD	TW-4 4/7/2021 N	TW-4 3/30/2022 N	TW-4 (Field Dup) 3/30/2022 FD	TW-4 5/9/2023 N	TW-4 5/7/2024 N
Parameter	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Hexafluoropropylene oxide dimer acid (GenX)	< 2.6	< 2.5	< 2.7	< 3.1	< 1.7	< 1.7	< 2.5	< 2.7	< 2.6	< 2.7	< 2.6	< 1.6	<1.6
Perfluoro-1-Octanesulfonate (PFOS)	1.8	2.2	< 1.8	< 2.1	0.63	0.44	< 1.7	2.9	3.3	< 1.8	2	2.6	2.5
Perfluorobutanesulfonic acid (PFBS)	< 1.8	< 1.7	< 1.8	< 2.1	0.35	0.51	1.6 J	2.6	2.8	1.9	2	2.1	1.8
Perfluorohexanesulfonic acid (PFHxS)	< 1.8	< 1.7	< 1.8	< 2.1	< 1.7	0.28	1.3 J	8.1	8.3	4.2	4.3	5.8	6.4
Perfluorohexanoic acid (PFHxA)	< 1.8	< 1.7	< 1.8	< 2.1	< 1.7	< 1.7	< 1.7	44	42	23	23	42	27
Perfluoro-n-octanoic acid (PFOA)	< 1.8	< 1.7	< 1.8	< 2.1	< 1.7	< 1.7	< 1.7	40	42	19	19	45	29
Perfluorononanoic acid (PFNA)	< 1.8	< 1.7	< 1.8	< 2.1	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.8	< 1.8	0.23	0.2

GOLDER

TABLE 1A
SUMMARY OF ANALYTICAL RESULTS-VOLATILE ORGANICS
2NDQ 2020 MONITORING
WEST KL LANDFILL

COMPOUNDS	MW-7 2/21/2023 N	MW-7 5/9/2023 N	M-8 4/16/2020 N	M-8 4/6/2021 N	M-8 3/30/2022 N	M-8 5/9/2023 N	M-8 5/8/2024 N	MW-1 4/21/2020 N	MW-1 4/6/2021 N	MW-1 3/28/2022 N	MW-1 5/4/2023 N	MW-1 5/3/2024 N	MW-12 4/17/2020 N	MW-12 4/5/2021 N	MW-12 3/28/2022 N	MW-12 5/5/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1.0	< 1.0	< 1	< 1	< 1	<1.0	<1	14	2.8	3.1	3.5	5	270	77	19	88
1,4-Dioxane	7.1	4.3	5.4	4	6.1	5.1	3.2	9.4	16	16	13	8.8	190	97	63	110
Tetrahydrofuran	<2.0	< 2.0	< 2	< 2	< 2	<2.0	<2	< 2	< 2	< 2	<2.0	<2	12	11	6.7	7.3

Notes:

µg/L = micrograms per liter

N = Normal, Field Dup = Field Duplicate

COMPOUNDS	MW-13 4/15/2020 N	MW-13 4/2/2021 N	MW-13 3/28/2022 N	MW-13 5/12/2023 N	MW-13 5/3/2024 N	MW-15 4/2/2021 N	MW-15 3/25/2022 N	MW-15 5/9/2023 N	MW-15 5/6/2024 N	P-10711 3/31/2020 N	P-10711 9/29/2020 N	P-10711 3/31/2021 N	P-10711 10/5/2021 N	P-10711 3/24/2022 N	P-10711 10/11/2022 N	P-10711 5/12/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	170	160	130	140	150	< 1	< 1	< 1.0	<1	< 1		< 1		< 1		< 1.0
1,4-Dioxane	130	210	190	150	65	< 1	< 1	<1.0	<1	69	52	18	43	80	95	120
Tetrahydrofuran	56	71	100	39	11	< 2	< 2	< 2.0	<2	22		11		36		23

COMPOUNDS	P-19 4/20/2020 N	P-19 4/5/2021 N	P-19 3/29/2022 N	P-19 5/10/2023 N	P-19 5/6/2024 N	P-20 4/20/2020 N	P-20 4/6/2021 N	P-20 3/29/2022 N	P-20 5/10/2023 N	P-20 5/6/2024 N	P-21 4/15/2020 N	P-21 4/2/2021 N	P-21 3/28/2022 N	P-21 5/2/2023 N	P-21 10/3/2023 N	P-21 5/6/2024 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	35	27	6.2	4.3	12	< 1	< 1	1.1	< 1.0	<1	230	220	90	62		70
1,4-Dioxane	53	52	50	47	39	16	10	96	27	23	100	94	59	73	55	36
Tetrahydrofuran	29	29	21	7.8	6.9	3.9	2.7	24	< 2.0	4.3	7	3.6	6	3.8		2.7

COMPOUNDS	P-24 4/20/2020 N	P-24 4/5/2021 N	P-24 3/29/2022 N	P-24 5/5/2023 N	P-24 5/6/2024 N	P-25 4/20/2020 N	P-25 4/5/2021 N	P-25 3/29/2022 N	P-25 5/5/2023 N	P-25 10/3/2023 N	P-25 5/6/2024 N	P-27 4/21/2020 N	P-27 4/5/2021 N	P-27 3/29/2022 N	P-27 5/5/2023 N	P-27 5/6/2024 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1	< 1	< 1	<1.0	<1	< 1	< 1	< 1	<1.0		<1	100	100	65	92	49
1,4-Dioxane	39	32	19	17	13	51	61	45	71	34	36	110	120	91	33	13
Tetrahydrofuran	< 2	< 2	< 2	<2.0	<2	5.7	7.7	7.6	3.2		3	5.3	8.9	7.5	2.3	2

COMPOUNDS	P-28 (Field Dup) 4/20/2020 V	P-28 4/20/2020 N	P-28 (Field Dup) 4/5/2021 V	P-28 4/5/2021 N	P-28 3/29/2022 N	P-28 (Field Dup) 3/29/2022 V	P-28 5/12/2023 N	P-28 (Field Dup) 5/12/2023 V	P-28 (Field Dup) 10/3/2023 C	P-28 10/3/2023 N	P-28 5/6/2024 N	P-28 (Field Dup) 5/6/2024 FD	P-29 4/20/2020 N	P-29 4/5/2021 N	P-29 3/29/2022 N	P-29 5/12/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	2.4	2.4	3.2	3.2	4.9	5.1	8.6	8.3			10	11	< 1	< 1	< 1	2.6
1,4-Dioxane	240	240	200	220	200	200	210	220	240	260	180	180	58	42	88	190
Tetrahydrofuran	52	52	14	14	5.1	6.1	3.8	4			4.5	4.4	< 2	< 2	2.9	18

COMPOUNDS	P-30 4/21/2020 N	P-30 (Field Dup) 4/21/2020 FD	P-30 (Field Dup) 4/5/2021 FD	P-30 4/5/2021 N	P-30 3/29/2022 N	P-30 (Field Dup) 3/29/2022 FD	P-30 5/16/2023 N	P-30 (Field Dup) 5/16/2023 FD	P-30 5/8/2024 N	P-30 (Field Dup) 5/8/2024 FD	P-31 4/21/2020 N	P-31 4/5/2021 N	P-31 3/29/2022 N	P-31 5/2/2023 N	P-31 5/8/2024 N	P-32 4/1/2020 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	190	190	160	160	120	130	130	130	130	120	85	85	110	86	64	< 1
1,4-Dioxane	120	110	110	120	120	120	87	88	96	99	78	110	66	45	47	< 1
Tetrahydrofuran	18	19	11	10	9.2	10	8.5	8.1	8	8.7	8.7	8.7	4.8	3.8	2.6	< 2

COMPOUNDS	P-33 4/14/2020 N	P-33 4/1/2021 N	P-33 3/23/2022 N	P-33 5/8/2023 N	P-33 5/1/2024 N	P-34 4/14/2020 N	P-34 4/1/2021 N	P-34 3/24/2022 N	P-34 5/4/2023 N	P-34 5/3/2024 N	P-35 4/14/2020 N	P-35 9/30/2020 N	P-35 4/1/2021 N	P-35 10/6/2021 N	P-35 3/24/2022 N	P-35 10/12/2022 N

GOLDER

TABLE 1A
SUMMARY OF ANALYTICAL RESULTS-VOLATILE ORGANICS
2NDQ 2020 MONITORING
WEST KL LANDFILL

	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1	< 1	< 1	<1.0	<1	< 1	< 1	< 1	<1.0	<1	< 1		< 1		< 1	
1,4-Dioxane	< 1	< 1	< 1	<1.0	<1	< 1	< 1	< 1	<1.0	<1	7.3	15	6.3	1.5	< 1	<1.0
Tetrahydrofuran	< 2	< 2	< 2	<2.0	<2	< 2	< 2	< 2	<2.0	<2	< 2		3		< 2	

COMPOUNDS	P-36 3/31/2020 N	P-36 9/30/2020 N	P-36 4/1/2021 N	P-36 10/6/2021 N	P-36 3/24/2022 N	P-36 10/11/2022 N	P-36 5/4/2023 N	P-36 9/13/2023 N	P-36 5/2/2024 N	P-37 3/31/2020 N	P-37 9/30/2020 N	P-37 3/31/2021 N	P-37 10/6/2021 N	P-37 3/23/2022 N	P-37 10/10/2022 N	P-37 5/11/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		25		4.7		3.8		<1	< 1		< 1		< 1		< 1.0
1,4-Dioxane	94	110	74	65	78	120	140	96	110	8.5	6.8	9	14	15	19	16
Tetrahydrofuran	11		9.4		12		8.4		6.5	< 2		< 2		< 2		< 2.0

COMPOUNDS	P-38 4/14/2020 N	P-38 4/1/2021 N	P-38 3/28/2022 N	P-38 5/5/2023 N	P-38 5/2/2024 N	P-39 4/14/2020 N	P-39 4/1/2021 N	P-39 3/28/2022 N	P-39 5/5/2023 N	P-39 5/3/2024 N	P-40 4/15/2020 N	P-40 3/31/2021 N	P-40 3/23/2022 N	P-40 5/8/2023 N	P-40 5/1/2024 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1	< 1	< 1	<1.0	<1	< 1	< 1	< 1	<1.0	<1	< 1	< 1	< 1	<1.0	<1
1,4-Dioxane	< 1	< 1	< 1	<1.0	<1	< 1	1.7	6.6	8.2	6	< 1	< 1	< 1	<1.0	<1
Tetrahydrofuran	< 2	< 2	< 2	<2.0	<2	< 2	< 2	< 2	<2.0	<2	< 2	< 2	< 2	<2.0	<2

COMPOUNDS	P-41 4/1/2020 N	P-41 9/30/2020 N	P-41 3/31/2021 N	P-41 10/6/2021 N	P-41 3/23/2022 N	P-41 10/12/2022 N	P-41 5/8/2023 N	P-41 9/12/2023 N	P-41 5/1/2024 N	P-42 4/14/2020 N	P-42 9/30/2020 N	P-42 4/1/2021 N	P-42 10/6/2021 N	P-42 3/23/2022 N	P-42 10/11/2022 N	P-42 5/9/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		<1.0		<1	< 1		< 1		< 1		< 1.0
1,4-Dioxane	18	9.3	15	16	33	32	26	22	15	5.4	5.2	5	4.9	5.4	6.4	5.7
Tetrahydrofuran	11		4.8		18		11		6.8	< 2		< 2		< 2		< 2.0

COMPOUNDS	P-43 4/15/2020 N	P-43 9/30/2020 N	P-43 3/31/2021 N	P-43 10/6/2021 N	P-43 3/25/2022 N	P-43 10/12/2022 N	P-43 5/12/2023 N	P-43 9/13/2023 N	P-43 5/1/2024 N	P-44 4/20/2020 N	P-44 9/30/2020 N	P-44 4/2/2021 N	P-44 10/6/2021 N	P-44 3/24/2022 N	P-44 10/12/2022 N	P-44 5/2/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		< 1.0		<1	< 1		< 1		< 1		< 1.0
1,4-Dioxane	< 1	<1	< 1	< 1	< 1	<1.0	<1.0	<1.0	<1	36	24	31	91	120	130	100
Tetrahydrofuran	< 2		< 2		< 2		< 2.0		<2	5		3.3		24		23

COMPOUNDS	P-45 4/15/2020 N	P-45 4/1/2021 N	P-45 3/25/2022 N	P-45 5/2/2023 N	P-45 5/1/2024 N	P-46 4/16/2020 N	P-46 10/1/2020 N	P-46 4/6/2021 N	P-46 10/7/2021 N	P-46 3/30/2022 N	P-46 10/13/2022 N	P-46 5/2/2023 N	P-46 9/14/2023 N	P-46 5/8/2024 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1	< 1	< 1	< 1.0	<1	< 1	< 1	< 1	< 1	< 1	<1.0	1.3	1.7	150
1,4-Dioxane	< 1	< 1	< 1	<1.0	<1	< 1	< 1	< 1	3.9	< 1	60	1.3	1.7	25
Tetrahydrofuran	< 2	< 2	< 2	< 2.0	<2	< 2	< 2	< 2	< 2	< 2	39	<2.0	<2.0	6.2

COMPOUNDS	P-48 4/16/2020 N	P-48 10/1/2020 N	-48 (Field Dup 10/1/2020 FD	P-48 4/6/2021 N	48 (Field Du 10/6/2021 FD	P-48 10/6/2021 N	P-48 3/28/2022 N	-48 (Field Dup 10/12/2022 FD	P-48 10/12/2022 N	P-48 5/10/2023 N	-48 (Field Dup 9/14/2023 FD	P-48 9/14/2023 N	P-48 5/7/2024 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	420	190		90		81	130		110	16		23	22
1,4-Dioxane	110	40	44	24	14	15	32	27	24	9.3	7.7	8.3	7.1
Tetrahydrofuran	110	32		33		12	35		52	2.2		3.1	3.1

COMPOUNDS	P-49 4/16/2020 N	P-49 10/1/2020 N	P-49 4/6/2021 N	P-49 10/7/2021 N	P-49 3/30/2022 N	P-49 10/12/2022 N	P-49 5/10/2023 N	P-49 9/14/2023 N	P-49 5/7/2024 N	P-50 4/16/2020 N	P-50 10/1/2020 N	P-50 4/6/2021 N	P-50 10/7/2021 N	P-50 3/30/2022 N	P-50 10/12/2022 N	P-50 5/10/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	830	680	630	890	460	420	280	<1.0	120	9.5	1.6	31	2.9	95	1.5	48

TABLE 1A
SUMMARY OF ANALYTICAL RESULTS-VOLATILE ORGANICS
2NDQ 2020 MONITORING
WEST KL LANDFILL

1,4-Dioxane	210	170	170	160	84	120	100	88	72	6.1	27	17	7.6	25	4.9	19
Tetrahydrofuran	260	200	180	190	29	87	35	24	7.2	< 2	9.2	4.4	2.1	2.2	<2.0	3.4

COMPOUNDS	P-51 4/16/2020 N	P-51 10/1/2020 N	P-51 4/6/2021 N	P-51 10/6/2021 N	P-51 3/30/2022 N	P-51 10/12/2022 N	P-51 5/2/2023 N	P-51 9/14/2023 N	P-51 5/7/2024 N	P-52 4/16/2020 N	P-52 10/1/2020 N	P-52 4/6/2021 N	P-52 10/6/2021 N	P-52 3/28/2022 N	P-52 10/12/2022 N	P-52 5/10/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	150	42	210	90	6.5	1.2	<1.0	<1.0	59	3.8	5.1	5.3	8.8	4.8	5.2	5.3
1,4-Dioxane	52	22	140	54	< 1	<1.0	1.4	<1.0	20	10	8.6	30	19	16	11	21
Tetrahydrofuran	8.5	<2	7.8	2.9	< 2	<2.0	<2.0	<2.0	6.3	< 2	<2	< 2	< 2	< 2	<2.0	< 2.0

COMPOUNDS	P-53 4/16/2020 N	53 (Field Du 4/16/2020 FD	-53 (Field Dup 10/1/2020 FD	P-53 10/1/2020 N	53 (Field Du 4/6/2021 FD	P-53 4/6/2021 N	53 (Field Du 10/7/2021 FD	P-53 10/7/2021 N	P-53 3/30/2022 N	-53 (Field Dup 3/30/2022 FD	P-53 10/13/2022 FD	P-53 10/13/2022 N	P-53 5/10/2023 N	53 (Field Du 5/10/2023 FD	P-53 9/14/2023 FD	P-53 9/14/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	13	13		55	22	22		170	3.3	3.3		4.5	1.9	2.2		5.3
1,4-Dioxane	1.1	1.3	14	14	3.8	2.8	5.6	4	1.4	1.4	3.8	4.4	3.0	2.8	<1.0	<1.0
Tetrahydrofuran	< 2	< 2		5	< 2	< 2		< 2	< 2	<2		<2.0	< 2.0	<2.0		<2.0

COMPOUNDS	P-54 4/14/2020 N	P-54 9/30/2020 N	P-54 3/31/2021 N	P-54 10/6/2021 N	P-54 3/31/2021 N	P-54 10/11/2022 N	P-54 5/8/2023 N	P-54 9/13/2023 N	P-54 5/1/2024 N	P-55 4/16/2020 N	P-55 10/1/2020 N	P-55 4/6/2021 N	P-55 10/7/2021 N	P-55 3/30/2022 N	P-55 10/12/2022 N	P-55 5/10/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		<1.0		<1	< 1	< 1	< 1	< 1	< 1	<1.0	< 1.0
1,4-Dioxane	< 1	< 1	< 1	< 1	< 1	<1.0	<1.0	<1.0	<1	90	120	89	64	130	97	70
Tetrahydrofuran	< 2		< 2		< 2		<2.0		<2	< 2	<2	< 2	< 2	< 2	2.6	< 2.0

COMPOUNDS	P-56 4/1/2020 N	P-56 9/30/2020 N	P-56 4/1/2021 N	P-56 10/5/2021 N	P-56 3/24/2022 N	P-56 10/11/2022 N	P-56 5/2/2023 N	P-56 9/13/2023 N	P-56 5/2/2024 N	P-57 4/1/2020 N	P-57 9/30/2020 N	P-57 3/31/2021 N	P-57 10/5/2021 N	P-57 3/23/2022 N	P-57 10/11/2022 N	P-57 5/5/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		< 1.0		<1	< 1		< 1		< 1		<1.0
1,4-Dioxane	97	83	100	73	95	88	90	77	55	87	68	88	50	38	69	88
Tetrahydrofuran	2.8		2.4		2.6		2.7		2.4	53		62		54		51

COMPOUNDS	P-58 4/14/2020 N	P-58 4/1/2021 N	P-58 3/24/2022 N	P-58 5/4/2023 N	P-58 5/2/2024 N	P-59 4/1/2020 N	P-59 4/1/2021 N	P-59 3/23/2022 N	P-59 5/2/2023 N	P-59 5/1/2024 N	P-60 4/1/2020 N	P-60 3/31/2021 N	P-60 3/22/2022 N	P-60 5/2/2023 N	P-60 5/1/2024 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1	< 1	< 1	<1.0	<1	< 1	< 1	< 1	<1.0	<1	< 1	< 1	< 1	<1.0	<1
1,4-Dioxane	40	37	37	26	21	< 1	< 1	< 1	<1.0	<1	< 1	< 1	< 1	<1.0	<1
Tetrahydrofuran	32	28	13	3.1	<2	< 2	< 2	< 2	<2.0	<2	< 2	< 2	< 2	<2.0	<2

COMPOUNDS	P-61 4/1/2020 N	P-61 9/30/2020 N	P-61 3/31/2021 N	P-61 10/5/2021 N	P-61 3/23/2022 N	P-61 10/11/2022 N	P-61 5/5/2023 N	P-61 9/13/2023 N	P-61 5/2/2024 N	P-62 3/31/2020 N	P-62 3/30/2021 N	P-62 3/28/2022 N	P-62 5/2/2023 N	P-62 4/30/2024 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		<1.0		<1	< 1	< 1	< 1	<1.0	<1
1,4-Dioxane	230	200	270	150	190	200	290	190	150	2.7	3.2	4.0	6.3	4.2
Tetrahydrofuran	38		37		35		25		15	< 2	< 2	< 2	<2.0	<2

COMPOUNDS	P-63 4/1/2020 N	P-63 9/30/2020 N	P-63 3/31/2021 N	P-63 10/5/2021 N	P-63 3/23/2022 N	P-63 10/11/2022 N	P-63 5/2/2023 N	P-63 9/13/2023 N	P-63 5/2/2024 N	P-64 4/1/2020 N	P-64 9/29/2020 N	P-64 3/30/2021 N	P-64 10/5/2021 N	P-64 3/22/2022 N	P-64 10/12/2022 N	P-64 5/8/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		<1.0		<1	< 1		< 1		< 1		<1.0
1,4-Dioxane	230	170	220	140	170	160	160	140	99	2.9	2.6	2.2	2.1	2.9	3.0	3
Tetrahydrofuran	23		13		8.5		6		7.7	< 2		< 2		< 2		<2.0

GOLDER

TABLE 1A
SUMMARY OF ANALYTICAL RESULTS-VOLATILE ORGANICS
2NDQ 2020 MONITORING
WEST KL LANDFILL

COMPOUNDS	P-65 3/31/2020 N	P-65 9/29/2020 N	P-65 3/30/2021 N	P-65 10/5/2021 N	P-65 3/22/2022 N	P-65 10/12/2022 N	P-65 5/8/2023 N	P-65 9/12/2023 N	P-65 4/30/2024 N	P-66 3/31/2020 N	P-66 9/29/2020 N	P-66 3/31/2021 N	P-66 10/5/2021 N	P-66 3/23/2022 N	P-66 10/12/2022 N	P-66 5/2/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		<1.0		<1	< 1		< 1		< 1		<1.0
1,4-Dioxane	44	38	29	28	42	52	74	69	60	130	110	130	110	160	140	140
Tetrahydrofuran	6.6		4.1		7.9		9.1		13	35		33		34		19

COMPOUNDS	P-67 3/31/2020 N	P-67 9/29/2020 N	P-67 3/30/2021 N	P-67 10/5/2021 N	P-67 3/22/2022 N	P-67 10/11/2022 N	P-67 5/8/2023 N	P-67 9/12/2023 N	P-67 4/30/2024 N	P-68 3/31/2020 N	P-68 9/29/2020 N	P-68 3/30/2021 N	P-68 10/5/2021 N	P-68 3/22/2022 N	P-68 10/11/2022 N	P-68 5/3/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		<1.0		<1	< 1		< 1		< 1		<1.0
1,4-Dioxane	140	130	140	100	160	160	200	150	150	38	28	26	20	25	30	39
Tetrahydrofuran	25		26		18		6		7.4	12		8.4		4.4		5.8

COMPOUNDS	P-69 3/31/2020 N	P-69 9/29/2020 N	P-69 3/30/2021 N	P-69 10/5/2021 N	P-69 3/22/2022 N	P-69 10/11/2022 N	P-69 5/3/2023 N	P-69 9/12/2023 N	P-69 4/30/2024 N	P-70 3/30/2020 N	P-70 9/29/2020 N	P-70 3/30/2021 N	P-70 10/4/2021 N	P-70 3/21/2022 N	P-70 10/10/2022 N	P-70 5/11/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		<1.0		<1	< 1		< 1		< 1		< 1.0
1,4-Dioxane	60	59	80	58	53	34	32	36	25	38	39	39	34	44	34	39
Tetrahydrofuran	7.6		14		8.8		<2.0		<2	7.2		< 2		< 2		< 2.0

COMPOUNDS	P-71 3/30/2020 N	P-71 9/29/2020 N	P-71 3/30/2021 N	P-71 10/4/2021 N	P-71 3/22/2022 N	P-71 10/10/2022 N	P-71 5/2/2023 N	P-71 9/11/2023 N	P-71 4/30/2024 N	P-72 3/31/2020 N	P-72 9/29/2020 N	P-72 3/30/2021 N	P-72 10/4/2021 N	P-72 3/21/2022 N	P-72 10/10/2022 N	P-72 5/11/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1	<1.0	<1.0		<1	< 1		< 1		< 1		< 1.0
1,4-Dioxane	32	30	33	30	41	32	34	31	21	15	17	17	13	14	14	18
Tetrahydrofuran	< 2		< 2		< 2	<2.0	<2.0		<2	2.8		3.9		3.3		2.1

COMPOUNDS	P-73 4/1/2020 N	P-73 9/30/2020 N	P-73 4/1/2021 N	P-73 10/5/2021 N	P-73 3/23/2022 N	P-73 10/11/2022 N	P-73 5/9/2023 N	P-73 9/13/2023 N	P-73 5/2/2024 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		< 1.0		<1
1,4-Dioxane	20	19	20	13	20	19	18	19	15
Tetrahydrofuran	6.6		< 2		< 2		< 2.0		<2

COMPOUNDS	P-74 3/31/2020 N	74 (Field Du 3/31/2020 FD	P-74 9/29/2020 N	74 (Field Du 3/30/2021 FD	P-74 3/30/2021 N	P-74 10/4/2021 N	P-74 3/23/2022 N	-74 (Field Dup 3/22/2022 FD	P-74 10/10/2022 N	P-74 5/3/2023 N	Dupe #1 (P-74) 5/3/2023 Field Dup	P-74 9/12/2023 N	P-74 4/30/2024 N	DUP-1 (P-74) 4/30/2024 Field Dup
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1	< 1		< 1	< 1		< 1	< 1		<1.0	<1.0		<1	<1
1,4-Dioxane	26	22	24	16	17	16	19	21	18	18	21	17	17	17
Tetrahydrofuran	3.4	3.7		< 2	< 2		< 2	<2		<2.0	<2.0		<2	<2

COMPOUNDS	P-75 4/15/2020 N	P-75 9/30/2020 N	P-75 4/1/2021 N	P-75 10/6/2021 N	P-75 3/24/2022 N	P-75 10/11/2022 N	P-75 5/4/2023 N	P-75 9/14/2023 N	P-75 5/2/2024 N	P-76 4/1/2020 N	P-76 9/29/2020 N	P-76 3/31/2021 N	P-76 10/5/2021 N	P-76 3/22/2022 N	P-76 10/10/2022 N	P-76 5/3/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		<1.0		<1	< 1		< 1		< 1		<1.0
1,4-Dioxane	< 1	< 1	< 1	< 1	< 1	<1.0	<1.0	<1.0	<1	< 1	< 1	1.1	< 1	<1	<1.0	<1.0
Tetrahydrofuran	< 2		< 2		< 2		<2.0		<2	< 2		< 2		< 2		<2.0

COMPOUNDS	P-77 3/30/2020	P-77 9/29/2020	P-77 3/29/2021	P-77 10/4/2021	P-77 3/21/2022	P-77 10/10/2022	P-77 5/11/2023	P-77 9/12/2023	P-77 4/29/2024	P-78 3/30/2020	P-78 9/28/2020	P-78 3/29/2021	P-78 10/4/2021	P-78 3/21/2022	P-78 10/10/2022	P-78 5/11/2023

GOLDER

TABLE 1A
SUMMARY OF ANALYTICAL RESULTS-VOLATILE ORGANICS
2NDQ 2020 MONITORING
WEST KL LANDFILL

	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		< 1.0		<1	< 1		< 1		< 1		< 1.0
1,4-Dioxane	18	19	17	19	21	19	25	17	14	10	8.6	8.1	8.2	10	12	15
Tetrahydrofuran	3.4		3.6		3.9		< 2.0		<2	< 2		< 2		< 2		< 2.0

COMPOUNDS	P-79 3/30/2020 N	P-79 9/28/2020 N	P-79 3/29/2021 N	P-79 10/4/2021 N	P-79 3/21/2022 N	P-79 10/10/2022 N	P-79 5/11/2023 N	P-79 9/11/2023 N	P-79 4/29/2024 N	P-80 3/30/2020 N	P-80 9/28/2020 N	P-80 3/29/2021 N	P-80 10/4/2021 N	P-80 3/21/2022 N	P-80 10/10/2022 N	P-80 5/2/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		< 1.0		<1	< 1		< 1		< 1		<1.0
1,4-Dioxane	7.3	8.4	8.3	8	9.9	11	14	14	11	18	23	22	24	28	26	31
Tetrahydrofuran	< 2		< 2		2.1		2		<2	3.1		< 2		< 2		<2.0

COMPOUNDS	P-85 3/30/2020 N	P-85 9/28/2020 N	P-85 3/29/2021 N	P-85 10/4/2021 N	P-85 3/21/2022 N	P-85 10/10/2022 N	P-85 5/2/2023 N	P-85 9/11/2023 N	P-85 4/29/2024 N	P-86 3/30/2020 N	P-86 9/29/2020 N	P-86 3/29/2021 N	P-86 10/4/2021 N	P-86 3/22/2022 N	P-86 10/10/2022 N	P-86 5/2/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		<1.0		<1	< 1		< 1		< 1		<1.0
1,4-Dioxane	< 1	< 1	< 1	< 1	< 1	<1.0	<1.0	<1.0	<1	5	4.5	3.9	5.3	5.9	6.7	6.7
Tetrahydrofuran	< 2		< 2		< 2		<2.0		<2	< 2		< 2		< 2		<2.0

COMPOUNDS	P-87 3/31/2020 N	P-87 9/29/2020 N	P-87 3/30/2021 N	P-87 10/4/2021 N	P-87 3/21/2022 N	P-87 10/10/2022 N	P-87 5/3/2023 N	P-87 9/12/2023 N	P-87 4/30/2024 N	P-88 3/31/2020 N	P-88 9/29/2020 N	P-88 3/30/2021 N	P-88 10/5/2021 N	P-88 3/22/2022 N	P-88 10/10/2022 N	P-88 5/3/2023 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		<1.0		<1	< 1		< 1		< 1		<1.0
1,4-Dioxane	6.9	3	4	5	7.6	7.4	6.2	6.3	4	< 1	< 1	< 1	< 1	< 1	<1.0	<1.0
Tetrahydrofuran	< 2		< 2		< 2		<2.0		<2	< 2		< 2		< 2		<2.0

COMPOUNDS	P-89 3/31/2020 N	P-89 9/29/2020 N	P-89 3/31/2021 N	P-89 10/5/2021 N	P-89 3/22/2022 N	P-89 10/10/2022 N	P-89 5/3/2023 N	P-89 9/12/2023 N	P-89 4/30/2024 N	P-90 10/3/2023 N	P-90 4/30/2024 N	TW-4 4/17/2020 N	TW-4 10/1/2020 N	TW-4 4/7/2021 N	TW-4 10/7/2021 N	TW-4 3/30/2022 N
	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzene	< 1		< 1		< 1		<1.0		<1	<1.0	<1	140	110	390	200	380
1,4-Dioxane	7.9	8	6.8	5.9	7.0	6.5	9.2	6.8	6.6	<1.0	<1	49	14	46	19	45
Tetrahydrofuran	2.1		< 2		< 2		<2.0		<2	<2.0	<2	< 2	<2	39	6	16

GOLDER

APPENDIX F – Summary of Remedy Implementation Activities (2020-2024)

Key Remedy Implementation Activities:

Date	Activity (2020-2024)
April 3, 2020	EPA issues the Third Five-Year Review (FYR) Report
March 30-April 3, 2020	KLA Group conduces annual residential monitoring.
March 30-April 21, 2020	KLA Group conducts annual RA groundwater monitoring.
April 9, 2020	KLA Group submits Technical Memorandum: Hydrogeologic Assessment - 22"'' Street, Fish Hatchery Road and Sunset Drive Area, to support development of an Explanation of Significant Differences and Institutional Controls in Van Buren County.
April 20-21, 2020	KLA Group conducts groundwater sampling for PFAS.
July 20-21, 2020	KLA Group conducts groundwater sampling for PFAS.
September 28-October 1, 2020	KLA Group conducts semi-annual RA groundwater monitoring.
October 5, 2020	KLA Group conducts semi-annual residential monitoring.
November 24, 2020	KLA Group submits the Third 5-Year Evaluation of Monitored Natural Attenuation.
December 16, 2020	KLA Group submits Annual Report for 2020 RD/RA Activities.
December 22, 2020	KLA Group submits Contingent Remedy Evaluation Update (CREU) Report.
February 17, 2021	KLA Group submits Residential Well Installation Report for 2019/2020 and Proposed Plan for 2021.
March 29-April 7, 2021	KLA Group conducts annual RA groundwater monitoring including PFAS.
April 5-7, 2021	KLA Group conducts annual residential monitoring.
May 7, 2021	KLA Group submits Municipal Water Supply Connection Report for 2019-2020.
August 25, 2021	EPA issues Explanation of Significant Differences (ESD) to the ROD to revise the 1,4-dioxane groundwater cleanup standard and to address alternate groundwater supply requirements and institutional controls in Van Buren County
October 1, 2021	KLA Group conducts semi-annual residential monitoring.
October 4-7, 2021	KLA Group conducts semi-annual RA groundwater monitoring.
December 16, 2021	KLA Group submits Annual Report for 2021 RD/RA Activities.
March 21-30, 2022	KLA Group conducts annual RA groundwater monitoring including PFAS.
April 18, 2022	KLA Group conducts sampling for VOCs and PFAS at two irrigation wells at Ridgeview Golf Course.
April 25-June 20, 2022	KLA Group conducts semi-annual residential monitoring.
October 6, 2022	KLA Group conducts semi-annual residential monitoring.
October 10-13, 2022	KLA Group conducts semi-annual RA groundwater monitoring.
December 16, 2022	KLA Group submits Annual Report for 2022 RD/RA Activities.
February 27-March 11, 2023	KLA Group conducts hydrogeologic investigation at Ridgeview Golf Course.

April 13, 2023	KLA Group submits memorandum entitled *1,4-Dioxane Non Potable Groundwater Human Health Risk Evaluation for a Golf Course Worker*.
April 17, 2023	KLA Group submits report summarizing hydrogeologic investigation at Ridgeview Golf Course.
May 4-16, 2023	KLA Group conducts annual RA groundwater monitoring including PFAS.
May 9-June 15, 2023	KLA Group conducts annual residential monitoring.
May 10, 2023	KLA Group submits updated memorandum golf course worker risk assessment evaluation.
May 15, 2023	EGLE approves updated memorandum golf course worker risk assessment evaluation.
June 27, 2023	EPA approves updated memorandum golf course worker risk assessment evaluation.
August 14, 2023	KLA Group conducts investigation activities in accordance with approved Work Plan for Sentinel Well (P-76R) Installation dated May 16, 2023 and Work Plan for Hydrogeologic Assessment – Campbell Creek Area dated June 16, 2023.
August 21, 2023	KLA Group submits technical memorandum entitled *Hydrogeologic Assessment – Van Kal Street Area*.
September 12, 2023	KLA Group conducts semi-annual residential monitoring.
September 11-October 3, 2023	KLA Group conducts semi-annual RA groundwater monitoring.
December 14, 2023	KLA Group submits Annual Report for 2023 RD/RA Activities.
April 29-May 8, 2024	KLA Group conducts annual RA groundwater monitoring including PFAS.
May 20-24, 2024	KLA Group conducts annual residential monitoring.
May 31, 2024	KLA Group submits Municipal Water Supply and Well Abandonment Report 2021-2023.
May 31, 2024	KLA Group submits Residential Supply Well Installation Report 2021-2023 and Proposed Plan for 2024.
October 2020	KLA Group conducts hydrogeologic investigation to evaluate extent of 1,4-dioxane impacts detected in residential well near West J Avenue.
2020-2024	O&M of the landfill cap system continued including quarterly site inspections and monitoring of perimeter gas probes in accordance with the Landfill Cap O&M Plan dated June 11, 2007.
2020-2024	Monthly operations and maintenance of the active gas collection system was conducted.

Kalamazoo County GRZ Activities:

Date	Activity (2020-2024)
September 10, 2020	KLA Group submits proposed expansion of GRZ boundary to EPA and EGLE due to reduction Part 201 DWC for 1,4-dioxane from 85 µg/L to 7.2 µg/L (approved by EPA in letter dated November 6, 2020).
March 15, 2021	KLA Group submits a Request for Preliminary Consideration of the proposed amended GRZ to the Kalamazoo County Administrator.
September 9, 2021	KLA Group submits an email to EPA and EGLE updating the proposed amended GRZ.

November 22, 2021	EPA provides comments on the update to the proposed GRZ.
July 29, 2022	KLA Group submits a letter to EPA and EGLE updating the proposed amended GRZ.
August 21, 2023	KLA Group submits technical memorandum entitled "*Proposed Amended Groundwater Restricted Zone: Withdrawal from GRZ*" to EPA and EGLE in support of the proposed Amended GRZ for Kalamazoo County.
September 25, 2023	KLA Group submits proposed Amended GRZ for Kalamazoo County and request for approval to EPA and EGLE.
October 19, 2023	KLA Group submits revised proposed Amended GRZ in accordance with EPA comments.
October 19, 2023	EPA approves the proposed Amended GRZ.
December 13, 2023	KLA Group meets with Kalamazoo County Environmental Health Advisory Council to discuss proposed amended GRZ.
March 22, 2024	KLA Group submits application for amended GRZ to Kalamazoo County following EPA and EGLE approvals.
May 21, 2024	Kalamazoo County issues comments on the March 22, 2024 application.
June 19, 2024	KLA Group submits response to comments.
September 26, 2024	KLA Group submits revised GRZ boundary for EPA and EGLE approval due to detection of 1,4-dioxane in residential well along West J Avenue.
October 4, 2024	EPA, in consultation with EGLE, issues a letter approving the September 26, 2024 revision to the proposed GRZ boundary.
November 5, 2024	KLA Group submits supplement to March 22, 2024 application for amended GRZ to Kalamazoo County.

Van Buren County GRZ Activities:

Date	Activity (2021-2024)
December 10, 2021	KLA Group submits a draft Water Well Restriction Ordinance to EPA and EGLE to address institutional controls in Van Buren County.
April 15, 2022	KLA Group submits a draft Van Buren Cass County Groundwater Restriction Ordinance to the Van Buren Cass District Health Department.
June 8, 2022	KLA Group submits a draft Appendix Map as part of the Van Buren Cass County Groundwater Restriction Ordinance for EPA and EGLE review.
July 12, 2022	EPA provides comments on the draft ordinance and appendix map.
August 5, 2022	KLA Group submits a draft Van Buren Cass County Groundwater Restriction Ordinance and Appendix Map to the Van Buren Cass District Health Department following review by EPA and EGLE.
August 2, 2023	KLA Group submits proposed groundwater restriction ordinance to Van Buren Cass District Health Department.
August 9, 2023	KLA Group presents at Van Buren Cass District Health Department Board meeting regarding proposed groundwater restriction ordinance.
December 11, 2023	KLA Group submits revised groundwater ordinance and appendix map with Van Buren Cass District Health Department requested edits for EPA and EGLE review.
February 7, 2024	EPA provides additional comments on draft ordinance.

April 11, 2024	EPA provides additional comments on draft ordinance.
June 28, 2024	KLA Group submits draft proposed ordinance and appendix map for EPA and EGLE review.
July 16, 2024	EPA, in coordination with EGLE, provides letter in support of draft ordinance and appendix map dated June 28, 2024.
October 9, 2024	KLA Group presents at Van Buren Cass District Health Department public hearing regarding proposed groundwater restriction ordinance.
January 2024	County approval of the GRZ amendment.
February 28, 2024	GRZ amendment effective date.

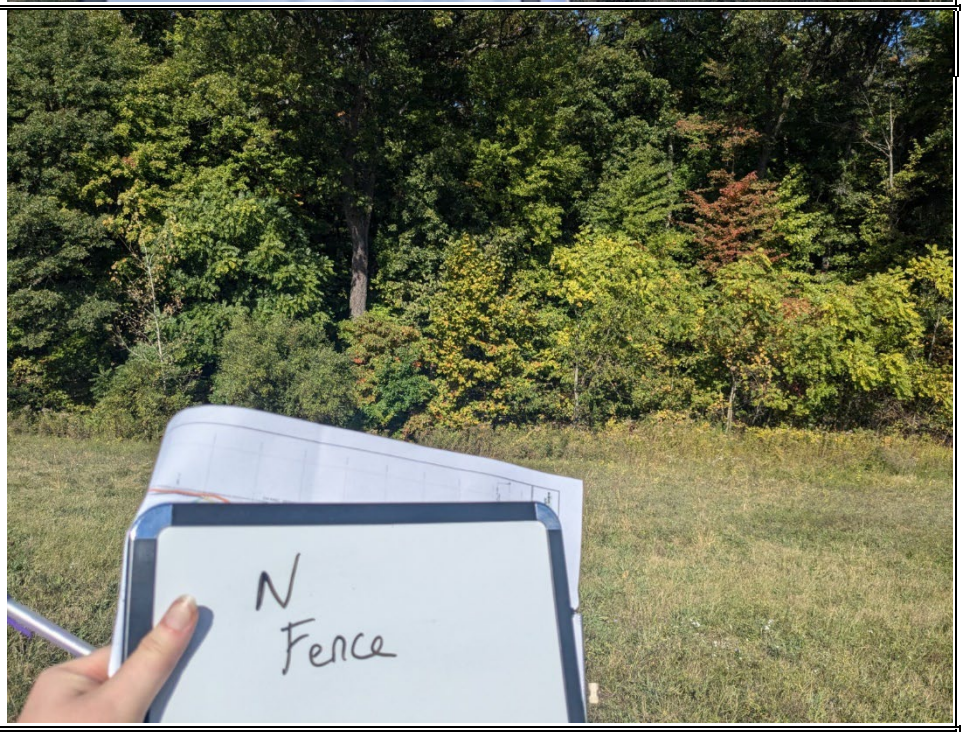
Municipal Connection, Supply Well Abandonment, Supply Well Replacement Activities:

Date	Activity (2019-2024)
July 8-September 20, 2019	KLA Group extends municipal water to three residential properties on Almena Dr., Wickford Dr., and West Main St.
August 5-November 21, 2019	KLA Group replaces two residential supply wells on Big Rock Dr. and one on 22nd Street.
March 23-April 13, 2020	KLA Group extends municipal water to two residences on Wickford Dr. and West J Ave.
November 3-December 11, 2020	KLA Group replaces two residential supply wells on 22nd St.
March 1, 2021	Kalamazoo County issues letters informing residents within the current GRZ who retained their private wells for non-potable purposes that their wells must be plugged as waivers were not granted.
March 31, 2021	KLA Group issues letters to residents that received the March 1, 2021 letter from Kalamazoo County requesting access to abandon their residential wells.
April 2021	KLA Group extends municipal water to one property on West J Ave.
July 2021	KLA Group extends municipal water to one residence on Almena Dr. and two residences on West J Ave.
August 3, 2021	Kalamazoo County issues letters to three residents regarding conditional approval of well waiver applications.
August 23, 2021	KLA Group issues follow-up letters to March 31, 2021 letters requesting access to abandon residential wells.
September 1, 2021	KLA Group conducts PFAS sampling at three residential wells pursuant to August 3, 2021 Kalamazoo County well waiver letters.
October 6, 2021	Kalamazoo County sends follow-up letters to select residents within the current GRZ informing them of the requirement to plug and abandon their private water supply wells.
December 9, 2021	KLA Group sends letters to select residents within the current GRZ requesting access to plug and abandon private water supply wells.
September-December 2021	KLA Group completes plugging and abandonment of residential supply wells for residents who provided access pursuant to Kalamazoo County letter dated March 1, 2021.
April 2022	KLA Group extends municipal water to residence on N 2nd Street.

April-May 2022	KLA Group continues attempts to contact residents who have not abandoned their private water supply wells located within the current GRZ via letters, e-mails and telephone calls.
May 12, 2022	KLA Group holds meeting to discuss design for extension of the water main on Big Rock Road.
May 19, 2022	KLA Group conducts additional PFAS sampling at three residential wells at the request of Kalamazoo County Health and Community Services Department as a condition for well waiver approval.
July 2022	KLA Group extends municipal water to residence on West J Avenue.
September 13, 2022	KLA Group meets with Oshtemo Township Board to present planned municipal water extension on Big Rock Drive.
September 29, 2022	Public information session held to present planned municipal water expansion on Big Rock Drive.
October 2022	KLA Group replaces residential well on Fish Hatchery Rd.
November 2022	KLA Group replaces residential well on Big Rock Drive.
December 2021 through December 2022	KLA Group abandons additional residential supply wells for residents who provided access pursuant to Kalamazoo County letter dated March 1, 2021.
March 2023	KLA Group extends municipal water to residence on West J Ave. and to three residences on Skyview Drive to service airport hangars and irrigation. Existing wells associated with these locations were abandoned.
May 2023	KLA Group replaces residential well on 22nd St.
May-September 2023	City of Kalamazoo extends municipal water supply to the Big Rock Drive area and connects ten residences, including two within the proposed amended GRZ.
August 2023	KLA Group replaces residential well on Van Kal St.
August 17, 2023	KLA Group abandons residential well on West Main St.
October 2, 2023	KLA Group abandons two former residential wells on 2nd St. and West KL Ave.
December 5, 2023	KLA Group abandons clubhouse irrigation well at Ridgeview Golf Course.
March 2024	KLA Group replaces residential well on Fish Hatchery Rd.
March 22, 2024	KLA Group sends notices of application to property owners within the proposed Amended GRZ.
June 14, 2024	KLA Group abandons irrigation well on Wickford Dr.
August 30, 2024	Irrigation well on 1st Street disconnected from irrigation system.
October 15, 2024	KLA Group abandons heat pump well on Springwood Drive.
November 2024	Kalamazoo County issues letters to two homeowners on West KL Ave and Almena Drive requiring abandonment of existing wells.

APPENDIX G – Site Inspection Photos

EPA RPM: Alyssa Graveline
Photographic Record from Site Inspection

Photograph 1 Date: 29 October, 2024 Direction: NE Comments: Adjacent to the NE corner of the Site is Bonnie Lake. The NW Site Area is the highest site topography.	
Photograph 2 Date: 29 October, 2024 Direction: N Comments: Several Areas of the fence around the Site have dense foliage covering the fence. In these areas there are no gates, and no signs of fence distress, but access to the perimeter is more restricted by vegetation.	
Photograph 3	

Date: 29 October, 2024 Direction: W Comments: West side of the landfill, view from the top of the landfill hill.	

Photograph 4 Date: 29 October, 2024 Direction: E Comments: East Drain channel, one of the channels created and maintained to control rainwater flow.	

Photograph 5 & 6 Date: 29 October, 2024 Direction: W Comments: Well P-46 on the west border of the landfill. Wells are kept locked and in good condition. Tubing inside is for low-flow sampling.	 

Photograph 7	
Date: 29 October, 2024	
Direction:	
Comments: Gas probes 4, 4M, 4D for venting the different landfill waste depths.	

Photograph 8 Date: 29 October, 2024 Direction: W Comments: Central West Gate, in good condition and with proper security and signage.	

Photograph 9 Date: 29 October, 2024 Direction: Comments: Gas venting stack shown, running during the time of inspection. The venting stack only runs occasionally when needed currently.	

Photograph 10	

Date: 29 October, 2024 Direction: N Comments: Main access gate, view from outside. The gate is in good condition, kept secured, and proper signage is posted.	

Photograph 11 Date: 29 October, 2024 Direction: Comments:	

Photograph 12	
Date: 29 October, 2024	
Direction:	
Comments: Sentinel well P-90 shown, recently installed about ½ mile downgradient to the previous sentinel wells (P78 and 79), past Fish Hatchery Rd.	

APPENDIX H – Site Inspection Checklist

Site Inspection Checklist

I. SITE INFORMATION	
Site name: K&L Avenue Landfill	**Date of inspection: 10/9/2024**
Location and Region: Kalamazoo, Michigan	**EPA ID: MID980506463**
Agency, office, or company leading the five-year review: Region 5 EPA	**Weather/temperature:**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☐ Other_____Used to include groundwater pump and treat_____

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
Name Title Date
Interviewed ☐at site ☐at office ☐by phone Phone no. _____
Problems, suggestions; ☐Report attached _____
_____

2. **O&M staff** _____ _____ _____
Name Title Date
Interviewed: ☐at site ☐at office ☐by phone Phone no. _____
Problems, suggestions; ☐Report attached _____
_____

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

Agency _____EGLE_____
Contact _____Waleign Wagaw_____ __Senior Project Manager_____ _____
_____
Name Title Date 10/28/2024
Phone no.
Problems; suggestions; ☐Report attached _____Stated that evidence does not support that MNA will be able to reach clean=up goals in a reasonable timeframe. _____
_____

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

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

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

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

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

1. O&M Documents

☒ O&M manual ☒ Readily available ☒ Up to date ☐ N/A
☒ As-built drawings ☒ Readily available ☒ Up to date ☐ N/A
☒ Maintenance logs ☒ Readily available ☒ Up to date ☐ N/A
Remarks_____EPA receives logs in Semi-Annual reports_____
_

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

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

4. **Permits and Service Agreements**

☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits_____ ☐ Readily available ☐ Up to date ☒ N/A
Remarks_____
_____

5. **Gas Generation Records** ☒ Readily available ☒ Up to date ☐ N/A
Remarks___Included in semi-annual reports_____
_____

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

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

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

9. **Discharge Compliance Records**

☐ Air ☐ Readily available ☐Up to date ☐ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☐ N/A
Remarks_____
_____

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

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☒ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____
_____

2. **O&M Cost Records**

☐Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
*Annual O&M costs are
Original O&M cost estimate_____ ☐Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

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

Describe costs and reasons: _____
_____
_____
_____
_____
_____

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

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A
Remarks_____Gates in good condition and locked _____
_____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks_____Signs posted on all sides of landfill along the fence and were in good condition._____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

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

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached
_____
_____
_____
_____

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

D. General

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

2. **Land use changes on site** ☐ N/A
Remarks_____
_____

3. **Land use changes off site** ☐ N/A
Remarks_____
_____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks_____no evidence of damage, some roads by furthest sentinel wells may be more difficult to access in poor weather conditions. _____
_____

B. Other Site Conditions

Remarks _____
_____
_____
_____
_____
_____

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

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

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

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

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

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

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

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

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent_____
Remarks_____
_____

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

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

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

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

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

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

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

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

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

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

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

D. Cover Penetrations ☐ Applicable ☐ N/A

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

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

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

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

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____
_____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
☒ Flaring ☐ Thermal destruction ☐ Collection for reuse
☒ Good condition ☐ Needs Maintenance
Remarks_____
_____

2. **Gas Collection Wells, Manifolds and Piping**
☒ Good condition ☐ Needs Maintenance
Remarks_____
_____

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

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_____
_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_____
_____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____
_____

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____
_____

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks_____
_____

4. **Dam** ☐ Functioning ☐ N/A
Remarks_____
_____

H. Retaining Walls ☐ Applicable ☒ N/A

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

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

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

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

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

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

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

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

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

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

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

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

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks_____
_____
_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

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

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

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

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

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

C. Treatment System ☐ Applicable ☐ N/A

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

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

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

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

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

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

D. Monitoring Data

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

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

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

B. Adequacy of O&M

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

_____

_____ O&M implementation and scope of O&M activities are adequate and protective of public health and remedy components.__

_____
_____
_____
_____
_____

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

_____ There are no early indicators of potential remedy problems, based on inspection and review of quarterly inspection checklists in the Semi-Annual Progress Reports._____

D. Opportunities for Optimization

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

APPENDIX I – FYR Advertisement Notice

MICHIGAN TRAVEL

A LOOK INTO THE PAST

Saugatuck's Mt. Baldy hasn't always been about the steps

History center offers a glimpse into the popular site's past.

Lindsay Moore *lmoore@mlive.com*

Before there were "I climbed Mount Baldhead" T-shirts, the massive sand dune was the site of tribal ceremonies, early glamping and snow skiing.

After you climb the 303 steps to the panoramic overlook, consider taking a few more steps to the Saugatuck-Douglas History Center, just across the street from the parking lot.

The Lure of Mount Baldhead exhibit takes visitors back to the 1800s, when the site was used for celebrations and ceremonies for Indigenous tribes. Tribes used this spot as a landmark for the mouth of the Kalamazoo River.

Saugatuck started to bill itself as a tourist destination after 1850, and Mt. Baldy became a new kind of landmark. The Village of Saugatuck bought the land for $275 in the 1880s. Stairs and an observation tower were built in 1884.

Before then, the Fat Men's Association of Allegan came to Saugatuck to face the 250-foot summit as an exercise challenge.

Visitors made the base of Mt. Baldhead a destination all its own.

The earliest rendition of "glamping" took hold at the bottom of Mt. Baldy in the 19th century with wooden-floored tents, rugs and easy chairs set out for campers to rent for $1 per month.

The growth of the middle class after World War II accelerated tourism in Saugatuck even further as families were looking for lakeside vacation spots.

The history center archives include three brochures from the Mount Baldhead Hotel from 1945 to 1948 advertising a "charming home-like retreat in the midst of natural beauty that only Michigan can give."

Winter sports were also popular in the area. Before vegetation took over the sand dune, skiing on Mt. Baldy was popular in the 20th century as well.

Saugatuck's historical hand-cranked ferry was used to bring families over the Kalamazoo River for picnics at Mt. Baldy.

An aerial view of Mt. Baldhead and the unmanned radar station built in 1956 in Saugatuck. At the left of the frame is Oval Beach along Lake Michigan, and the Kalamazoo River is on the upper right. *Photos by Joel Bissell, MLive.com*

The history center gathered stories and photos from one Saugatuck resident who shared family tales from three generations who visited for school picnics in the 1920s, 1940s and 1960s.

In 1952, locals started a new Christmas tradition when they brought up a lighted star at the top, shining down over the river and downtown.

The star was later moved to the radar tower where it is still visible.

The exhibit also gives historical context to the radar annex, the tall white round tower at the observation deck.

The structure was built during the Cold War era. In 1956, Saugatuck leased the top of Mt. Baldhead to the U.S. Air Force to build a radar tower in exchange for new stairs to replace their aging set.

In 1960, the radar stations scanned the skies for an enemy attack. Only three of these installations still exist, including the one atop Mt. Baldy.

The radar annex was listed on the National Register of Historic Places in 2023.

In 1960, radar stations scanned the skies for an enemy attack. Only three of these installations still exist, including the one atop Mt. Baldy.

People look over downtown Saugatuck from the top of Mt. Baldhead.

In 1956, the top of Mt. Baldhead was leased to the U.S. Air Force to build a radar tower.

People climb the 303 stairs to the panoramic overlook.