Agenda
Natural Features Protection Review Board

City of Kalamazoo

Wednesday, May 28, 2025 4:00 PM

City Commission Chambers at City Hall - 241 W. South Street

A. CALL TO ORDER/ROLL CALL

1. Excuse Absent Board Members **(Action: Motion to Excuse Absent Board Members)**

B. ADOPTION OF AGENDA

(Action: Motion to approve the agenda)

1. Agenda Approval **(Action: Motion to Approve Agenda as presented)**

C. APPROVAL OF MINUTES

1. Approval of the minutes from the Natural Features Protection Review Board meeting on April 22nd, 2025 **(Action: Motion to approve the minutes from the Natural Features Protection Review Board meeting on April 22nd, 2025 as presented)**

D. PUBLIC COMMENTS

E. BOARD MEMBER COMMENTS

F. NEW BUSINESS

1. Kalamazoo Country Club Legacy Golf Course Project at 1609 Whites Road

2. City of Kalamazoo Water Station #5 Improvements at 2045 E Michigan Avenue

3. NFP Site Plan for the Verburg Park Improvement Project at 669 Gull Road.

G. UNFINISHED BUSINESS

1. NFP Board Work Session

H. STAFF REPORTS AND UPDATES

I. COMMUNICATIONS AND ANNOUNCEMENTS

J. ADJOURNMENT

Natural Features Protection Review Board Minutes April 22nd, 2025

Held at City Hall Commission Chambers 4:00 p.m.

A. Call to Order: Director Martin called the meeting to order at 4:00 p.m.

Members absent: Director Hollander and Director Bassett

1. **Excuse Absent Board Members: The motion to excuse absent board members was made by Director Fuller and supported by Director Fredrickson, and the motion passed unanimously.**

B. Adoption of Agenda

Motion to adopt the agenda made by Director Fuller, supported by Director Lettow, motion passed unanimously.

C. Approval of the Meeting Minutes

Motion to approve the minutes from March 25th, 2025, NFP Review Board Meeting made by Director Lettow supported by Director Fuller, passed unanimously.

D. General Citizen Comments

Raymond Gant – Long-time resident and wants to offer support of the stormwater restoration project at 433 Reed Avenue / Reed Court. Lives adjacent to the property.

E. Board Comments

No comments

F. New Business

It is recommended that the Natural Features Protection (NFP) Review Board approve a recommendation to the Zoning Board of Appeals to grant relief from the NFP Wetlands and Water Resources Standards to allow the installation of New Stormwater BMPs within the setbacks of Wetlands and Water Resources for the City of Kalamazoo Stormwater Project at 433 Reed Court. Currently in the Variance approval stage and will come back to the board when it is in the Site Plan stage.

Presentation from Tom Palumbo, City of Kalamazoo Civil Engineer, and Mark Kaiser. Kaiser Associates is the Consulting Designer/Environmental Scientist on Reed Court project. The project is on a Superfund site. It is focused restoration work at the 433 Reed Avenue/Court site which is a part of a larger Superfund site. The Applicant described / presented on:

- The Mechanical treatment device that filters trash and sediment from the water and releases the water back through the system.
- The two bioswales proposed , one will take the stormwater, and the other one will open to Portage Creek acting as an overflow through the center of the site.
- Proposed new habitat from restoration work. Applicant is working with Fish and Wildlife Service and Michigan Department of Environment, Great Lakes, and Energy (EGLE).
- Addition of Public Access at the southern extent of the site via a boardwalk and overlook.

The City of Kalamazoo will monitor the site, and when sediment builds up, they will come out with a Vactor truck and remove it. Many other sites are already being maintained with this process.

Some Trees will be removed and placed on-site; they will become part of the riparian habitat. There will be specific placement of new trees to enhance habitat opportunities. The project is Subject to City of Kalamazoo's Tree Committee evaluation and approval as well.

The Natural Features Protection (NFP) Review Board approves a recommendation to the Zoning Board of Appeals to grant relief from the NFP Wetlands and Water Resources Standards to allow the installation of New Stormwater BMPs within the setbacks of Wetlands and Water Resources for the City of Kalamazoo Stormwater Project at 433 Reed Court.
Motion to approve by Director Fredrickson, supported by Director Lettow, passed unanimously.

Question?

Public Comments:

Unfinished Business

1. NFP Board Work Session discussion on a guide to improving NFP

Staff Reports and Update

None

Communications and Announcements

None

Adjourn Meeting

Director Martin adjourned the meeting at 5:04 pm

NFP Review Board Staff Report

City of Kalamazoo

TO: The Natural Features Protection Review Board

FROM: Nolan Bergstrom, NFP Board Liaison

DATE: May 28, 2025

SUBJECT: 1609 Whites Road (Country Club Legacy Golf Course)

RECOMMENDATION:

It is recommended the Natural Features Protection (NFP) Review Board not approve the NFP plan as presented until the plans are modified and resubmitted to the NFP Review Board for Full NFP Approval.

Recommended Modifications are:

- Move underground utilities out of the Slopes and Slope Setbacks within the 500ft setback of Whites Lake to limit impacts to protected slopes to the extent possible.
- Provide justification for Protected Tree Removals
- Provide a slope restoration plan and planting plan with SESC plans for slopes within 500ft of Whites Lake.
- Any other changes that could affect NFP following the Site Plan Review Meeting

BACKGROUND:

The property is the Kalamazoo Country Club Golf Course, owned by CD-1909 LLC. It is located at 1609 Whites Road in the South Westnedge Neighborhood. The parcel is zoned Single-Family Residential or RS-5. The applicant is proposing work to remove the existing golf course and install a new golf course layout with new amenities such as an upgraded irrigation pump house, removal of existing structures and drives off of Whites Road, and the inclusion of new cart paths and snack shack facilities. This work would also include new tree plantings and slope restoration work. New Utilities will be installed across the site and major regrading is proposed to redesign and implement the new golf course layout.

The project is scheduled for Site Plan Review on June 4th. This project has been before the NFP Board twice before related to variance request recommendations for the pump house in February and December 2024. The project is seeking NFP approval to obtain full site plan approval and site permits.

FINDINGS:

The applicant's design team evaluated the site to identify all protected natural features on the property. The site was placed in the NFP Overlay District due to the following:

- **Primary Natural Feature:** Adjacent to Hydrology (Whites Lake)
- **Secondary Natural Feature:** Protected Slopes
- **Tertiary Natural Feature:** Protected Trees and Woodlands (Protected Trees in pockets throughout the Site, Woodland areas are near the edges of the property).
- **Rare Species Review:** Not Required

The site requires the following NFP Site Development Standards:

- **Water Resources Standard** – Whites Lake is a feature of the site and is used to supply water for irrigation of the existing golf course. The 25ft Water Resources setback is shown. Activities within the 25 setback are limited to permitted activities per § 50-6.2C(3)(c).
- **Protected Tree Standard**– There are trees slated for removal, many of which are protected. The Kalamazoo Country Club has been a Golf Course since the early-1900s as is zoned appropriately to be used as a golf course. Per § 50-6.2F(3)(a) of the NFP Ordinance tree removals facilitate the continued use of the golf course for its zoned purpose. There is a forestry management plan concept showing where replacement trees will be located alongside a general list of species.

- Protected Trees Slated for removal by Number (reference Tree Removal Table)
    - Spruce Species (402-408; 412-416; 418-421; 562; 3-5; 93; 99; 101-103; 106-108; 532-534) (316-317; 466 – 469; do not have DBH information)
    - Oak Species (92; 117; 119; 120; 376; 491; 500; 504; 527; 470; 471; 213; 214; 222; 271; 285; 387; 490; 526; 542; 563; 567; 514) (459 and 460 have no DBH information)
    - Pine Species (512; 513; 48; 272; 564; 565)
    - Maple Species (121; 531; 566; 506; 537; 569; 573)
    - Sycamore (39; 227; 288; 290; 292; 295; 493; 495; 499; 503; 515; 547; 548; 549; 550; 571
    - Hickory (249; 254; 270; 289; 380 – 383) (355-360 have no DBH information)
    - Cedar (399; 400; 430)
    - Elm (539)

- Ash (419; 497)
- Tuliptree (57; 109)
- Sweet Gum (68; 291; 494)
- Cherry (432; 386)
- Fir (49; 73)
- Any Tree Species Larger than 24" DBH

- **Slopes and Slope Setbacks Standard** - The Dimensional Variance for Slopes and Slope Setbacks is related to the location of the New Pump House on the Northeast side of Whites Lake. This variance does not apply to the entire site. Regrading and underground utilities are proposed on protected slopes and slope setbacks within 500ft of Whites Lake. Protected Slopes and Slope Setbacks are to be maintained and not disturbed per § 50-6.2H(3)(b) and § 50-6.2H(3)(c).

- **Woodland Protection Standard** –2.1% of area is wooded (125,005 Sq Ft / 2.86 acres) and the applicant is proposing 5.5% of Existing Wooded Area to be removed (6,841 Sq Ft / 0.157 Acres). Less than 25% of the Parent Parcel (1609 Whites Road) is woodland coverage (2.1%). This means Minimum Required Woodland Coverage to be Preserved is 90% Per § 50-6.2G. 10% removal by-right = 12,500 Square Feet. The proposed removal is within this limit.

- **Plant Selection** – New trees are proposed to be planted on-site per Zoning Requirements. Selected species are all native species. A restoration plan for slopes within 500ft of Whites Lake is needed.

- **Stormwater Management** – Stormwater management is handled by the Public Works Stormwater Engineer Reviewer during the Site Plan Review process. Soil Erosion & Soil Control measures will be required.

After staff review, staff recommend not approving the NFP plan as presented until the plans are modified and resubmitted to the NFP Review Board for Full NFP Approval.

Recommended Modifications are:

- Move underground utilities out of the Slopes and Slope Setbacks within the 500ft setback of Whites Lake to limit impacts to protected slopes to the extent possible.

- Provide justification for Protected Tree Removals
- Provide a slope restoration plan and planting plan with SESC plans for slopes within 500ft of Whites Lake.
- Any other changes that could affect NFP following the Site Plan Review Meeting

THE CITY OF Kalamazoo
Community Planning & Economic Development
245 N Rose St • Suite 100 • Kalamazoo, MI 49007
(269) 337-8000 • www.kalamazoocity.org

SUPPLEMENTAL SITE PLAN REVIEW APPLICATION

FOR NATURAL FEATURES PROTECTION

For projects located within the Natural Features Protection (NFP) Overlay District, separate site plan approval is required before the full site plan can be approved. This review is done either by the NFP Review Board or administratively by staff to verify conformance with NFP Overlay District zoning code (Chapter 50, NFP). The NFP Overlay District map can be found on the City's GIS mapping website (select "Planning & Zoning" layer and make sure "NFP Overlay" is clicked on).

The NFP Supplemental Application must be completed and submitted with the regular Site Plan Review Application and checklists. The NFP Review Board meets monthly to review and approve applications. City staff can assist in scheduling a project at an upcoming NFP Review Board meeting. While the review process offers some flexibility, projects often seek NFP approval between the Pre-Application meeting and regular Site Plan Review meeting.

Section I. Project & Applicant Information

All projects must complete Section I. If the project will not impact any natural features on the site, and does not trigger additional stormwater controls or treatment, applicants should sign and submit Section I only. Staff will review and determine if the application can be approved administratively.

Section II. Natural Features Checklist & Attachments

For projects proposing improvements or changes to the site that impact natural features, change grading, or involve work in or near NFP setbacks, Sections II and III must be completed. Section II identifies which natural features are present and standards apply. Section III will assist you in determining what documentation and additional plan sets are needed for a complete application. Once a complete application is submitted to the City, the project will be scheduled for the next available NFP Review Board meeting and an application fee of $110 will apply.

QUESTIONS

Contact the NFP staff liaison with any questions about your NFP Supplemental Application at (269) 337-8045 or development@kalamazoocity.org .

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SECTION I. PROJECT AND APPLICANT INFORMATION

Please provide all of the project and applicant information requested below. Include the date of your regular site plan review meeting, if one has been scheduled or already taken place.

APPLICANT NAME:	(first) Timothy (last) Stewart		
APPLICANT ADDRESS:	2800 (number) South 11th Street (street name)		
	(city) Kalamazoo (state) MI (Zip) 49009		
APPLICANT EMAIL:	tstewart@hurleystewart.com	**PHONE:**	(269) 492-3770
PARCEL ADDRESS/PIN:	1609 Whites Road, Kalamazoo, MI 49008 / PIN #06-33-112-001		
PROJECT DESCRIPTION:	Building new pump house, Existing buildings demolition and golf course renovations		
OWNER NAME: *(if different)*	(first) CD 1909, LLC (last)		
HAS REGULAR SITE PLAN REVIEW MEETING OCCURRED?	☐ Yes ☒ No	**DATE OF SITE PLAN REVIEW MEETING:**	06/04/2025

NFP APPLICATION REQUIRED?

Is the project limited to interior work only with no exterior ground changes or increase in impervious coverage?	
☐ **YES**	If YES, Sections II & III of this application are not needed. Sign below & submit only this page with your site plan review or permit application.
☑ **NO**	If NO, proceed to Sections II & III. Do **NOT** sign below.

By signing below, the applicant certifies that no natural features will be disturbed as part of this project.

Print name: Timothy Stewart

Signature:  Date: 05/08/2025

SECTION II. NFP SITE PLAN CHECKLIST & ATTACHMENTS

Use the checklist to determine what documentation and addition plans sets must be prepared for this application. All plan sets, maps, and additional information must be attached to this application to be considered complete. If you checked "no" to certain NFP items in questions 1-7 in Section II, record "N/A" on the checklist.

REQUIRED: NFP SITE PLAN SET

All applications must include separate sheets in the plan set showing the following:

1. Existing conditions map showing an inventory of all protected natural features and any associated natural features setbacks with distances (use checklist below)

2. Future development plan overlaid onto the existing conditions and natural features inventory; indicate where and to what extent protected natural features will be disturbed, removed, altered, or impacted in any way and which natural features will be protected during and after construction

   Future development plan must include:

   - **Boundary with extent of re-grading**, construction, or site preparation activities
   - **All existing and new building footprints** (mark whether existing buildings will be removed or maintained)
   - **New and existing parking** surfaces or structures, sidewalks, trails, and other impervious or semi-impervious surfaces including decks, patios, viewing platforms, etc. (list proposed surface materials and whether existing surfaces will be maintained or removed)
   - **Proposed location of fencing and screening**, whether permanent, natural, or construction silt fencing and/or natural feature protection fencing (with specifications)
   - **Stormwater facilities** showing boundary of ground disturbance, grading or construction activities, if located near natural features
   - **New utilities** and/or relocation of existing utilities showing corridors that could impact natural features

3. Landscape plan detailing the minimum elements needed to meet zoning code requirements and all proposed additional landscaping elements or features (include table with species name)

4. Any additional plans or tables detailing which natural features will be restored or replaced after construction, if required (e.g., riparian buffer installation or slope restoration plan may be required under certain circumstances when the ordinance allows changes within these protected areas)

WETLANDS	Present:	Included on page #:	Notes:
Mark existing wetland boundaries with notes about wetland conditions. *Attach a copy of EGLE permit or permit application for work impacting Part 303 wetlands regulated by the State.*	■ Yes ☐ No	All Sheets	
WATER RESOURCES	**Present:**	**Included on page #:**	**Notes:**
Mark the location of all water resources on the parcel and those within 25 feet of the parcel boundaries. *Attach a copy of EGLE permit or permit application for work impacting Part 301 waters regulated by the State.*	■ Yes ☐ No	C 400	
Show required setbacks with dimensions; describe existing or future ground cover within riparian setbacks.		C 400	Ground cover won't change
TREES	**Present:**	**Included on page #:**	**Notes:**
Mark the location of all "protected" trees that are proposed to be removed and those that will remain and require protection fencing.	■ Yes ☐ No	CD 100, C 400	
Include a table with species name, size (DBH and height), and condition of "protected" trees that are proposed to be removed and list replacement tree information.			Attached
Provide a note with justification for removal.		C 400	NFP Note #2
WOODLANDS	**Present:**	**Included on page #:**	**Notes:**
Delineate the boundary of all woodlands on the parcel noting where woodlands likely extend onto adjacent parcels.	■ Yes ☐ No	CD 100, C 400	
Mark all areas of woodland that will be retained and removed (i.e., cleared).		CD 100, C 400	
Include a table or note with the required preservation ratio (based on existing woodland coverage), percentage proposed to be removed, and rationale for selecting area for removal.		C 400	
SLOPES	**Present:**	**Included on page #:**	**Notes:**
Provide a slope analysis that shows the boundaries of all "protected" slopes and mark the required setback(s).	■ Yes ☐ No	C 400	
Include a note with co-existing feature that triggers "protected" slope status (e.g., wooded, within 500 ft of water resource.		C 400	NFP Note #3

NATURAL HERITAGE AREAS	Present:	
Is an MNFI* rare species review required? *Parcels can be pre-screened using the City's GIS website, click on the "Planning & Zoning" layer and "NFP Overlay" layer; then click on parcel and see MNFI status.*	☐ Yes ■ No	
If an MNFI rare species review is required, attach the resulting report.		

*Michigan Natural Features Inventory (MNFI) Rare Species Reviews can be requested at: https://mnfi.anr.msu.edu/services/rare-species-reviews

ACCEPTED DATA SOURCES & ANALYSIS

All data sources, analysis, and professionals are subject to approval by the City Planner according to Chapter 50-6.2. The following guidance may be useful when selecting a professional or methodology for inventorying natural features.

1. **WETLANDS**
   - Wetland delineation report performed by a qualified consultant including a map denoting delineated boundary of all wetlands, OR
   - Most recent US Fish & Wildlife Service's National Wetlands Inventory boundary (State of Michigan mapper: https://www.michigan.gov/egle/about/organization/water-resources/wetlands/inventory-maps)

2. **PROTECTED TREE IDENTIFICATION**
   - May be performed by an qualified professional (including ISA Certified Arborist or similar); a full tree inventory is not required if all necessary information can be obtained and communicated using another survey, inventory, or site assessment methodology

3. **WOODLANDS**
   - A qualified professional, such as an ISA Certified Arborist, landscape architect, or license engineer may perform a desktop analysis or field survey to delineate woodlands
   - When a variances is being requests to remove more woodland cover than is allowed under the preservation ration, the following is required
     - Woodland assessment report with determination that the Trees per Area (TPA) meets the NFP definition of a woodland and mapped delineation of woodland
     - Woodland assessment report with a determination that Basal Area is equivalent to the TPA in the NFP definition and meets definition of a woodland and mapped delineation of woodland
     - In addition to determination of whether stand of trees meets NFP definition of a woodland, assessment must include information on general species diversity,
     -

composition of species, any notable trees (either notable species or size), invasive species composition, and general health and age observations of tree stand

4. **PROTECTED SLOPES**
   - Topographic survey performed in the field by a qualified consultant to delineate areas of a slope with grade of 20% or greater
   - Desktop analysis performed using U.S. Geological Survey digital topographic maps, LIDAR, digital elevation map, or equivalent data showing 2’ intervals or finer resolution, performed by a qualified consultant or engineer

LOCATION	TREE #	TREE SPECIES	PPROX SI	NOTES	New Hole	Keep/Remove?
#1 Tee - R	1	SUGAR MAPLE	30"			
	2	NORWAY MAPLE - CK	16"	CK = Crimson King		REMOVE
	3	NORWAY SPRUCE	20"			REMOVE
	4	NORWAY SPRUCE	20'			REMOVE
	5	NORWAY SPRUCE	20"			REMOVE
	6	NORWAY MAPLE - CK	22"			REMOVE
	7	NORWAY MAPLE - CK	16"			REMOVE
	8	SUGAR MAPLE	20"			
	9	RED MAPLE	10"			
	10	NORWAY MAPLE	26"			REMOVE
	11	RED MAPLE	10"			
	12	SUGAR MAPLE	8"			
	13	AMERICAN SYCAMORE	24"			
	14	NORWAY MAPLE - CK	12"	Old		
	15	AMERICAN SYCAMORE	22"			
	16	NORWAY MAPLE	30"			
	17	DOUGLAS FIR	24"			
	18	DOUGLAS FIR	24"			
By #2 Green	19	SILVER MAPLE	24"			
By #2 Green	20	SILVER MAPLE	30"	Double Leader		
By #2 Green	21	SILVER MAPLE	36"	Multi Leader		

	22	HONEY LOCUST	22"			
	23	WHITE OAK	10"			
	24	NORWAY MAPLE	30"			
In Circle	25	RED ALDER	46"			REMOVE
Back Right #1 Green	26	SIBERIAN ELM	22"			REMOVE
	27	SIBERIAN ELM	26"			REMOVE
	28	SIBERIAN ELM	24"			REMOVE
	29	SIBERIAN ELM	25"			REMOVE
Start 1 Green -L	30	RED OAK	20"	Back Righ 1 Green		
Back toward Tee	31	SOUTHERN SUGAR MAPLE	8"	Back - 1 Green		
	32	NORWAY MAPLE	16"			
	33	SIBERIAN ELM	46"	Triple leader		
#1 App Left	34	SILVER BIRCH	26"			REMOVE
	35	SILVER BIRCH	24"			REMOVE
	36	NORWAY MAPLE	32"			REMOVE
	37	RED OAK	20"			
	38	RED OAK	24"			
	39	AMERICAN SYCAMORE	20"			REMOVE
	40	AMERICAN ELM	46"	Beat up pretty good		
	41	NORWAY MAPLE - CK	18"			REMOVE
	42	SILVER BIRCH	18"			REMOVE
	43	PIN OAK	26"			
	44	PIN OAK	26"			

	45	SIBERIAN ELM	30"			REMOVE
	46	HONEY LOCUST	28"			REMOVE
	47	HONEY LOCUST	28"			REMOVE
	48	SCOTS PINE	16"			REMOVE
	49	DOUGLAS FIR	20"			REMOVE
	50	DOUGLAS FIR	16"			REMOVE
1 Fairway Left	51	RED OAK	24"			
	52	NORWAY MAPLE	24"			REMOVE
	53	HONEY LOCUST	30"	Double Leader		REMOVE
	54	SUGAR MAPLE	12"			
	55	RED OAK	10"		Between 16 F-tee and 17 fairway	Keep?
	56	NORWAY MAPLE - CK	28"		16 Forward Tee	Remove
1 Tee - Left	57	TULIP TREE	46"	Specimen	Between 16 F-tee and 17 fairway	Keep? Tough to do
Behind 18 Green	58	JAPANESE TREE LILAC	rnamental		17 Approach	Remove
	59	JAPANESE TREE LILAC	All 4"- 6"		17 Approach	Remove
	60	JAPANESE TREE LILAC			17 Approach	Remove
	61	JAPANESE TREE LILAC			17 Approach	Remove
	62	JAPANESE TREE LILAC			17 Approach	Remove
	63	JAPANESE TREE LILAC			17 Approach	Remove
	64	JAPANESE TREE LILAC			17 Approach	Remove
Between 18 & Drive	65	NORWAY MAPLE - CK	24"	Bad	17 Fairway	Remove
Start at Green	66	LITTLE LEAF LINDEN	26"	Double Leader	17 Fairway	Remove
Go toward Tee	67	AMERICAN BASSWOOD	14"		17 Fairway	Remove

	68	SWEET GUM	26"		17 Fairway	Remove
	69	NORWAY MAPLE	26"		17 Fairway	Remove
	70	NORWAY MAPLE	26"		17 Fairway	Remove
	71	SIBERIAN ELM	26"	Triple leader	17 Frwy - R	Remove
	72	SIBERIAN ELM	24"	Triple leader	17 Frwy - R	Remove
	73	DOUGLAS FIR	30"		17 Frwy - R	Remove
	74	NORWAY MAPLE	30"			
	75	SILVER MAPLE	40"			
	76	SUGAR MAPLE	7"			
	77	RED MAPLE	24"			
	78	TULIP TREE	7"			
	79	NORWAY MAPLE	30"			
	80	SUGAR MAPLE	6"			
	81	AMERICAN SYCAMORE	36"			
	82	NORWAY MAPLE	30"			
	83	HONEY LOCUST	28"			
	84	NORWAY MAPLE	38"	Bad		
	85	KENTUCKY COFFEE TREE	8"			
	86	SUGAR MAPLE	42"			
	87	RED OAK	8"			
	88	RED MAPLE	8"			
	89	RED OAK	8"			
BR 17 Green	90	AMERICAN LINDEN	5"	Damaged - Deer		

	91	COL BLUE SPRUCE	18"			
	92	RED OAK	20"		#7	REMOVE
	93	NORWAY SPRUCE	18"		#7	REMOVE
17 Bunker - R	94	NORWAY SPRUCE	16"		#7	REMOVE
Between 17 & Drive	95	NORWAY MAPLE	26"		#3	REMOVE
	96	WHITE OAK	6"		#3	REMOVE
	97	NORWAY MAPLE	16"		#3	REMOVE
	98	NORWAY MAPLE	16"		#3	REMOVE
	99	NORWAY SPRUCE	24"		#3	REMOVE
	100	NORWAY SPRUCE	10"		#3	REMOVE
	101	NORWAY SPRUCE	18"		#3	REMOVE
	102	NORWAY SPRUCE	24"		#3	REMOVE
	103	NORWAY SPRUCE	30"		#3	REMOVE
	104	RED MAPLE	10"		#3	REMOVE
	105	RED MAPLE	10"		#3	REMOVE
	106	NORWAY SPRUCE	30"		#3	REMOVE
	107	NORWAY SPRUCE	24"		#3	REMOVE
	108	NORWAY SPRUCE	32"		#3	REMOVE
	109	TULIP TREE	52"		#3	REMOVE
	110	HAWTHORN	10"			
	111	HAWTHORN	12"			
	112	HAWTHORN	10"			
	113	HAWTHORN	12"			

17 Green - L / 18 Tee - F	114	NORWAY MAPLE	30"			REMOVE
	115	NORWAY MAPLE	18"			REMOVE
	116	SUGAR MAPLE	10"			REMOVE
	117	RED OAK	24"			REMOVE
Between 1 & 2 & 17	118	RED MAPLE	14"			REMOVE
2 Tee Back	119	RED OAK	22"			REMOVE
	120	RED OAK	20"			REMOVE
16 Green - L	121	RED MAPLE	20"			REMOVE
17 Tee Fence	122	JUNIPER	)RNAMENTAL			
	123	JUNIPER				
	124	JUNIPER				
	125	JUNIPER				
	126	JUNIPER				
	127	JUNIPER				
	128	JUNIPER				
	129	JUNIPER				
17 Tee - L	130	COL BLUE SPRUCE	22"			
2 Tee - L	131	AUSTRIAN PINE	20"			
	132	RED MAPLE	22"			
	133	TULIP TREE	50"			
2 Ladies Tee - L	134	CRAB APPLE	12"			
2 Ladies Tee - L	135	CRAB APPLE	16"			
3 Tee - Back	136	SUGAR MAPLE	24"			

Left	137	WHITE OAK	64"			
Right	138	COL BLUE SPRUCE	18"			
3 Tee - Front	139	PIGNUT HICKORY	42"			
Between 3 & 16	140	NORWAY MAPLE	24"			
	141	NORWAY MAPLE	36"			
	142	NORWAY MAPLE	30"			
3 Side	143	PIN OAK	30"			
	144	NORWAY MAPLE	18"			
16 Side	145	RED OAK	36"			
	146	PIN OAK	30"			
3 Side	147	NORWAY MAPLE	18"			
	148	WHITE PINE	32"			
	149	WHITE PINE	36"			
	150	WHITE PINE	36"			
Behind 15 Green	151	NORWAY MAPLE	18"			
Behind 15 Green	152	NORWAY MAPLE	18"			
16 Senior - L	153	SIBERIAN ELM	28"			
3 Side of 15	154	NORWAY MAPLE - CK	24"			
	155	WHITE PINE	30"			
	156	WHITE PINE	30"			
	157	WHITE PINE	24"			
	158	WHITE PINE	36"			
	159	WHITE PINE	32"			

	160	COPPER LEAF BEECH	12"	Multi Leader		
15 Ladies	161	COL SPRUCE	24"			
P. Lot	162	RED OAK	12"			
P. Lot	163	HONEY LOCUST	22"			
16 Tee -Back - R	164	SIBERIAN ELM	24"			
16 Tee -Back - L	165	SIBERIAN ELM	36"			
16 Tee - Back - L	166	COL SPRUCE	24"			
16 Tee - L	167	CRAB APPLE	24"	Multi Leader		
16 Tee - L	168	CRAB APPLE	24"	Multi Leader		
16 Tee - L	169	SILVER MAPLE	28"			
	170	SIBERIAN ELM	36"			
16 Tee - R	171	SIBERIAN ELM	32"			
Seelye	172	RED MAPLE	20"			
Seelye	173	RED MAPLE	18"			
	174	AMERICAN SYCAMORE	24"			
	175	PIN OAK	24"			
	176	RED MAPLE	26"			
	177	LITTLE LEAF LINDEN	24"	Multi Leader		
	178	AMERICAN SYCAMORE	26"			
Bottom 16	179	PIN OAK	32"			
	180	HONEY LOCUST	24"			
16 App - R	181	LITTLE LEAF LINDEN	24"	Multi Leader		
	182	SYCAMORE	20"			

	183	RED MAPLE	24"			
	184	LITTLE LEAF LINDEN	24"			
	185	NORWAY MAPLE	20"			
	186	NORWAY MAPLE	30"	Double Leader		
16 Green - R	187	LITTLE LEAF LINDEN	36"	Big		
4 Tee - R	188	COL BLUE SPRUCE	18"			REMOVE
	189	CS	20"			REMOVE
	190	CBS	18"			REMOVE
	191	CS	18"			REMOVE
	192	CBS	18"			REMOVE
	193	CBS	16"			REMOVE
	194	CS	18"			REMOVE
	195	CS	14"			REMOVE
	196	CBS	18"			REMOVE
	197	CBS	16"			REMOVE
	198	CS	18"			REMOVE
	199	CS	16"			REMOVE
	200	CS	18"			REMOVE
4 Tee - L	201	NORWAY MAPLE	24"			REMOVE
	202	CBS	20"			REMOVE
Between 4 & Range	203	CBS	20"			REMOVE
	204	CBS	20"			REMOVE
	205	CBS	20"			REMOVE

	206	CBS	20"			REMOVE
	207	CBS	20"			REMOVE
	208	LOCUST	24"			REMOVE
	209	CBS	16"			REMOVE
	210	CBS	22"			REMOVE
	211	N SPRUCE	16"			REMOVE
	212	N SPRUCE	16"			REMOVE
	213	PIN OAK	26"			REMOVE
4 frwy right	214	PIN OAK	30"			REMOVE
	215	NORWAY SPRUCE	6			
	216	NORWAY SPRUCE	7			
	217	NORWAY SPRUCE	8			
	218	NORWAY MAPLE	24			REMOVE
	219	NORWAY SPRUCE	7			
	220	NORWAY SPRUCE	8			
	221	NORWAY SPRUCE	6			
	222	PIN OAK	22			REMOVE
	223	NORWAY MAPLE	24			REMOVE
	224	NORWAY SPRUCE	8			
	225	NORWAY SPRUCE	7			
	226	NORWAY SPRUCE	6			
	227	SYCAMORE	18			REMOVE
	228	NORWAY SPRUCE	10			REMOVE

	229	NORWAY SPRUCE	11			REMOVE
	230	NOWWAY SPRUCE	12			REMOVE
	231	NORWAY SPRUCE	11			REMOVE
	232	NORWAY SPRUCE	10			REMOVE
	233	COLORADO BLUE SPRUCE	12			REMOVE
	234	COLORADO BLUE SPRUCE	12			REMOVE
	235	COLORADO BLUE SPRUCE	12			REMOVE
	236	NORWAY SPRUCE	12			REMOVE
	237	NORWAY SPRUCE	12			REMOVE
4 frwy right bunker	238	COLORADO BLUE SPRUCE	12			REMOVE
	239	COLORADO BLUE SPRUCE	12			REMOVE
	240	COLORADO BLUE SPRUCE	12			REMOVE
	241	COLORADO BLUE SPRUCE	12			REMOVE
	242	COLORADO BLUE SPRUCE	12			REMOVE
	243	CONCOLOR FIR	26			
	244	WHITE PINE	26			
	245	WHITE PINE	12			
	246	WHITE PINE	18			
	247	WHITE PINE	14			
	248	WHITE PINE	12			
North 4 frwy bunker	249	HICKORY	24			REMOVE
	250	WHITE PINE	18			
	251	WHITE PINE	18			

	252	WHITE PINE	22			
	253	WHITE PINE	18			
	254	HICKORY	30			REMOVE
	255	WHITE PINE	16			
	256	WHITE PINE	20			
	257	NORWAY MAPLE	24			REMOVE
	258	NORWAY SPRUCE	11			REMOVE
	259	NORWAY SPRUCE	12			REMOVE
	260	NORWAY SPRUCE	13			REMOVE
	261	COLORADO BLUE SPRUCE	12			REMOVE
	262	COLORADO BLUE SPRUCE	13			REMOVE
	263	NORWAY SPRUCE	11			REMOVE
	264	NORWAY SPRUCE	13			REMOVE
	265	NORWAY SPRUCE	12			REMOVE
	266	NORWAY SPRUCE	11			REMOVE
	267	NORWAY SPRUCE	14			REMOVE
4 approach right	268	SUGAR MAPLE	16			REMOVE
	269	HICKORY	16			REMOVE
	270	HICKORY	22			REMOVE
Behind Range	271	PIN OAK	30			REMOVE
4 green right path	272	SCOT PINE	23			REMOVE
Behind 4 Green	273	HAWTHORN	10			REMOVE
"	274	HAWTHORN	8			REMOVE

"	275	HAWTHORN	10			REMOVE
"	276	HAWTHORN	9			REMOVE
4 green back left	277	NORWAY MAPLE	14			
4 green left	278	SIBERIAN ELM				REMOVE
4 approach left	279	DAWN REDWOOD	6			
Veg Garden Area	280	BLUE SPRUCE	13			REMOVE
Veg Garden Area	281	BLUE SPRUCE	10			REMOVE
No mow at garden	282	SUGAR MAPLE	8			
West of no mow 4	283	FLOWERING CRAB	16			REMOVE
4 frwy left	284	SYCAMORE	16			REMOVE
4 frwy left corner	285	PIN OAK	26			REMOVE
5 frwy left corner	286	NORWAY MAPLE	20			REMOVE
	287	HONEY LOCUST	20			REMOVE
BL 6 green at bunker	288	SYCAMORE	32			REMOVE
BL 6 green	289	HICKORY (dbl ldr)	36			REMOVE
	290	SYCAMORE	27			REMOVE
4 left	291	SWEET GUM	26			REMOVE
beginning 4 frwy left	292	SYCAMORE	40			REMOVE
	293	NORWAY MAPLE	22			REMOVE
between 9 & 4	294	SYCAMORE	14			REMOVE
	295	SYCAMORE	27			REMOVE
9 approach left	296	NORWAY MAPLE	20			REMOVE
9 GREEN LEFT	297	NORWAY MAPLE	22			REMOVE

9 green back right	298	BLUE SPRUCE	11			REMOVE
	299	BLUE SPRUCE	15			REMOVE
Wedding area	300	TRICOLOR BEECH	14			
"	301	NORWAY MAPLE	16			
"	302	NORWAY MAPLE	16			
9 green back right	303	WHITE OAK	40			
	304	WHITE OAK	36			
9 green right	305	WALNUT	28			
	306	WHITE OAK	50			
	307	WHITE OAK	40			
WG-9-10 cart path corner	308	GINKGO	14			
10 Fairway Right	309	BLUE SPRUCE	26			
10 Fairway Right	310	BLUE SPRUCE	24			
	311	HONEY LOCUST	26			
10 GREEN	312	WHITE OAK	55			
9 SENIOR TEE	313	HICKORY (dbl ldr)	18-26			
8 green back right	314	RED OAK	30			
BACK 5 TEE	315	N MAPLE				REMOVE
	316	SPRUCE				REMOVE
	317	SPRUCE				REMOVE
R 5 TEE BACK	318	RED OAK				
	319	HICKORY	48"			
	320	HICKORY	8"			

	321	HICKORY	14"			
	322	COL MAPLE	12"			
	323	COL MAPLE	10"			
	324	COL MAPLE	10"			
	325	COL MAPLE	12"			
	326	COL MAPLE	10"			
	327	COL MAPLE	7"			
	328	COL MAPLE	10"			
	329	COL MAPLE	12"			
	330	COL MAPLE	12"			
	331	COL MAPLE	10"			
	332	COL MAPLE	10"			
5 TEE FRONT R	333	SUGAR MAPLE	24"			
5 TEE FRONT L	334	CHERRY	8"			REMOVE
	335	MAPLE	5"			REMOVE
	336	CHERRY	6"			REMOVE
	337	N MAPLE	16"			REMOVE
	338	N MAPLE	20"			REMOVE
	339	MAPLE	SAP			REMOVE
	340	MAPLE	SAP			REMOVE
	341	MAPLE	6-10"			REMOVE
	342	MAPLE	6-10"			REMOVE
	343	MAPLE	6-10"			REMOVE

	344	MAPLE	6-10"			REMOVE
	345	MAPLE	6-10"			REMOVE
	346	MAPLE	6-10"			REMOVE
	347	MAPLE	6-10"			REMOVE
	348	MAPLE	6-10"			REMOVE
	349	MAPLE	6-10"			REMOVE
	350	OAK	4-6"			REMOVE
	351	OAK	4-6"			REMOVE
	352	OAK	4-6"			REMOVE
	353	OAK	4-6"			REMOVE
	354	OAK	4-6"			REMOVE
Between 1 Short & 5 Te	355	HICKORY				REMOVE
	356	HICKORY				REMOVE
	357	HICKORY				REMOVE
	358	HICKORY				REMOVE
	359	HICKORY				REMOVE
	360	HICKORY				REMOVE
SHORT COURSE (B2T)	361	NORWAY MAPLE	12"			REMOVE
3 green right	362	CRAB APPLE				REMOVE
	363	CRAB APPLE				REMOVE
	364	CRAB APPLE				REMOVE
	365	CRAB APPLE				REMOVE
Behind 3 green	366	NORWAY MAPLE	20"			REMOVE

Behind 3 green	367	NORWAY MAPLE	8"			REMOVE
Behind 3 green	368	NORWAY MAPLE	10"			REMOVE
Behind 3 green	369	NORWAY MAPLE	10"			REMOVE
Behind 3 green	370	NORWAY MAPLE	10"			REMOVE
Behind 3 green	371	NORWAY MAPLE	24"			REMOVE
Between 2-3	372	NORWAY MAPLE	10"			
	373	RED MAPLE	20"			
Behind 2 green	374	HICKORY	20"			
	375	RED OAK	24"			
Behind 3 tee	376	RED OAK	36"			REMOVE
	377	RED OAK	24"			
	378	RED OAK	20"			
Behind 4 green	379	RED OAK	50"			
Right 4 frwy	380	HICKORY	20"			REMOVE
	381	HICKORY	22"			REMOVE
	382	HICKORY	30"			REMOVE
	383	HICKORY	24"			REMOVE
4 green - 5 fairway	384	SYCAMORE	16"			REMOVE
5 frd tee right	385	COLORADO BLUE SPRUCE	14"			REMOVE
N. Audubon 5 tee left	386	SWEET CHERRY	20"			REMOVE
S. Audubon 5 left	387	PIN OAK	20"			REMOVE
S. Audubon 5 left	388	SILVER MAPLE	18"			REMOVE
S. Audubon 5 left	389	NORWAY MAPLE	12"			REMOVE

S. Audubon 5 left	390	NORWAY MAPLE	10"			REMOVE
S. Audubon 5 left	391	NORWAY MAPLE	10"			REMOVE
S. Audubon 5 left	392	NORWAY MAPLE	20"			REMOVE
S. Audubon 5 left	393	NORWAY MAPLE	24"			REMOVE
S. Audubon 5 left	394	SILVER MAPLE	24"			REMOVE
S. Audubon 5 left	395	PINE	16"			REMOVE
S. Audubon 5 left	396	PINE #38	36"			REMOVE
left of 5	397	SILVER MAPLE	46"			REMOVE
	398	NORWAY MAPLE	30"			REMOVE
left of 5	399	CEDAR	12"			REMOVE
	400	CEDAR	12"			REMOVE
	401	SILVER MAPLE	40"			REMOVE
Behind 5 green	402	COLORADO BLUE SPRUCE	20"			REMOVE
	403	COLORADO BLUE SPRUCE	20"			REMOVE
	404	COLORADO BLUE SPRUCE	20"			REMOVE
	405	COLORADO BLUE SPRUCE	20"			REMOVE
	406	COLORADO BLUE SPRUCE	20"			REMOVE
	407	COLORADO BLUE SPRUCE	20"			REMOVE
	408	COLORADO BLUE SPRUCE	20"			REMOVE
Left 6 no mow	409	SILVER MAPLE	50"			
	410	NORWAY SPRUCE	22"			
	411	COLORADO BLUE SPRUCE	20"			
Behind chipping green	412	COLORADO BLUE SPRUCE	24"			REMOVE

Left 1 tee	413	CRAB APPLE	8"			REMOVE
	414	CRAB APPLE	8"			REMOVE
Behind 8 green	415	COLORADO BLUE SPRUCE	24"			REMOVE
Right 8 approach	416	COLORADO BLUE SPRUCE	18"			REMOVE
	417	COLORADO BLUE SPRUCE	16"			REMOVE
	418	COLORADO BLUE SPRUCE	20"			REMOVE
Left 7 tee	419	GREEN ASH	18"			REMOVE
Right 7 tee	420	COLORADO BLUE SPRUCE	20"			REMOVE
	421	COLORADO BLUE SPRUCE	20"			REMOVE
Behind 7 green	422	ARBORVITAE	6			REMOVE
	423	ARBORVITAE	7			REMOVE
	424	ARBORVITAE	7			REMOVE
	425	ARBORVITAE	6			REMOVE
	426	ARBORVITAE	8			REMOVE
	427	ARBORVITAE	6			REMOVE
	428	ARBORVITAE	8			REMOVE
	429	ARBORVITAE	8			REMOVE
BR 8 tee	430	CEDAR	12"			REMOVE
Right 8 tee	431	SWEET CHERRY	10"			REMOVE
	432	SWEET CHERRY	12"			REMOVE
Entry west	433	HAWTHORNE	6"			REMOVE
Entry west	434	HAWTHORNE	6"			REMOVE
Entry west	435	HAWTHORNE	6"			REMOVE

Entry west	436	HAWTHORNE				REMOVE
Entry west	437	HAWTHORNE				REMOVE
8 descent at drive	438	NORWAY MAPLE				REMOVE
	439	CRAB APPLE				REMOVE
	440	SILVER MAPLE				REMOVE
	441	NORWARY MAPLE				REMOVE
	442	SILVER MAPLE	36"			REMOVE
	443	SUGAR MAPLE	8"			REMOVE
Begin 8 frwy at drive	444	RED MAPLE	6"			REMOVE
	445	RED MAPLE	8"			REMOVE
	446	RED MAPLE	8"			REMOVE
	447	RED MAPLE	7"			REMOVE
	448	SYCAMORE	6"			REMOVE
	449	NORWAY MAPLE				REMOVE
8 frwy at drive	450	SILVER MAPLE				REMOVE
	451	NORWAY MAPLE				REMOVE
	452	NORWAY MAPLE				REMOVE
	453	RED MAPLE	6"			REMOVE
	454	SILVER MAPLE	24"			REMOVE
8 frwy at drive	455	SIBERIAN ELM	72"			REMOVE
8 approach at drive	456	NORWAY MAPLE				REMOVE
	457	NORWAY MAPLE				REMOVE
9 cartpath-drive corner	458	SUGAR MAPLE	12"			REMOVE

9 approach left	459	RED OAK				REMOVE
9 approach left	460	RED OAK				REMOVE
9 approach left	461	OAK				REMOVE
9 approach left	462	OAK				REMOVE
9 approach left	463	OAK				REMOVE
9 approach left	464	OAK				REMOVE
9 green left	465	NORWAY MAPLE	16"			REMOVE
behind 9 green	466	COLORADO BLUE SPRUCE				REMOVE
behind 9 green	467	COLORADO BLUE SPRUCE				REMOVE
behind 9 green	468	COLORADO BLUE SPRUCE				REMOVE
behind 9 green	469	COLORADO BLUE SPRUCE				REMOVE
9 approach right	470	OAK	24"			REMOVE
	471	OAK	24"			REMOVE
	472	SUGAR MAPLE	10"			REMOVE
begin 9 frwy right	473	SUGAR MAPLE	10"			REMOVE
	474	SUGAR MAPLE	10"			REMOVE
END Short Course						
LOCATION	476	TREE SPECIES	PPROX SI	NOTES		
8 approach - right	478	N. Red Oak	26"	1		
8-RIGHT	479	SYCAMORE	26	2		
	480	WHITE OAK	32	3		
	481	RED MAPLE	22	4		
	482	NORWAY MAPLE	40	5	#1	REMOVE

	483	RED OAK	10	6		
8-RIGHT	484	SYCAMORE	24	7		
8-TEE LEFT	485	SUGAR MAPLE	18	8		
	486	SUGAR MAPLE	14	9		
	487	NORWAY MAPLE	24	10		REMOVE
7 GREEN - 8 TEE	488	RED MAPLE	12	11		
7 GREEN LEFT	489	LITTLE LEAF LINDEN	24	12		
7 APP LEFT	490	PIN OAK	30	13	#1	REMOVE
7 APP LEFT	491	RED OAK	24	14	#1	REMOVE
8 FAIRWAY BEG. LEFT	492	LITTLE LEAF LINDEN	30	15	#1	REMOVE
BETWEEN 7-8	493	SYCAMORE	36	16	#1	REMOVE
BETWEEN 7-8	494	SWEETGUM	36	17	#1	REMOVE
BETWEEN 7-8	495	SYCAMORE	26	18	#1	REMOVE
BETWEEN 7-8	496	LOCUST	22	19	#1	REMOVE
BETWEEN 7-8	497	MOUNTAIN ASH	22	20	#1	REMOVE
BETWEEN 7-8	498	LOCUST	36	21	#1	REMOVE
BETWEEN 7-8	499	SYCAMORE	30	22	#1	REMOVE
BETWEEN 7-8	500	RED OAK	32	23	#1	REMOVE
BETWEEN 6-7	501	NORWAY MAPLE	30	24	#9	REMOVE
BETWEEN 6-7	502	SIBERIAN ELM	26	25	#9	REMOVE
BETWEEN 6-7	503	SYCAMORE	24	26	#9	REMOVE
BETWEEN 6-7	504	RED OAK	24	27	#9	REMOVE
BETWEEN 6-7	505	SILVER MAPLE	40	28	#9	REMOVE

BETWEEN 6-7	506	SUGAR MAPLE	32	29	#9	REMOVE
BETWEEN 6-7	507	SYCAMORE	26	30		
BETWEEN 6-7	508	SUGAR MAPLE	30	31		
BETWEEN 6-7	509	N. Red Oak	30	32		
BETWEEN 6-7	510	NORWAY MAPLE	22	33		REMOVE
BETWEEN 6-7	511	LOCUST	24	34	#9	REMOVE
BETWEEN 6-7	512	RED PINE	20	35	#8	REMOVE
BETWEEN 6-7	513	RED PINE	18	36	#8	REMOVE
7 APP RIGHT	514	N. Red Oak	30	37	#1	REMOVE
7 APP RIGHT	515	SYCAMORE	24	38	#1	REMOVE
7 APP RIGHT	516	LOCUST	24	39	#1	REMOVE
7 APP RIGHT	517	LITTLE LEAF LINDEN	24	40	#1	REMOVE
7 GRN RIGHT	518	COLORADO BLUE SPRUCE	24	41		
7 GRN RIGHT	519	COLORADO BLUE SPRUCE	20	42		
7 GRN RIGHT	520	COLORADO BLUE SPRUCE	20	43		
6-7 @WALL	521	KENTUCKY COFFEE TREE	16	44		
5 GRN LEFT @WALL	522	COLORADO BLUE SPRUCE	8	45		
6 LADIES TEE	523	NORWAY MAPLE	16	46		REMOVE
6 LADIES TEE	524	NORWAY MAPLE	20	47		REMOVE
6 LADIES TEE	525	NORWAY MAPLE	16	48		REMOVE
BETWEEN 5-6	526	PIN OAK	24	49	#8	REMOVE
BETWEEN 5-6	527	RED OAK	24	50	#8	REMOVE
BETWEEN 5-6	528	SWEET BIRCH	22	51	#8	REMOVE

BETWEEN 5-6	529	NORWAY MAPLE	20	52	#8	REMOVE
BETWEEN 5-6	530	LOCUST	24	53	#8	REMOVE
BETWEEN 5-6	531	RED MAPLE	26	54	#8	REMOVE
BETWEEN 5-6	532	NORWAY SPRUCE	30	55	#8	REMOVE
BETWEEN 5-6	533	NORWAY SPRUCE	24	56	#8	REMOVE
BETWEEN 5-6	534	NORWAY SPRUCE	24	57	#8	REMOVE
BETWEEN 5-6	535	SIBERIAN ELM	20	58	#8	REMOVE
BETWEEN 5-6	536	NORTHERN CATALPA	24	59	#8	REMOVE
	537	SUGAR MAPLE	30	60	#8	REMOVE
6 LEFT	538	LOCUST	26	61		REMOVE
NO MOW 6 LEFT	539	AMERICAN ELM	48	62	#8	REMOVE
	540	SCOT PINE	8	63	#8	REMOVE
	541	SIBERIAN ELM	24	64	#8	REMOVE
	542	PIN OAK	20	65	#8	REMOVE
	543	SIBERIAN ELM	20	66	#8	REMOVE
	544	RED OAK	14	67		
	545	PIN OAK	24	68		
IN NO MOW 4-5-6	546	SYCAMORE	16	69	#8	REMOVE
IN NO MOW 4-5-6	547	SYCAMORE	20	70	#8	REMOVE
IN NO MOW 4-5-6	548	SYCAMORE	18	71	#8	REMOVE
IN NO MOW 4-5-6	549	SYCAMORE	18	72	#8	REMOVE
IN NO MOW 4-5-6	550	SYCAMORE	20	73	#8	REMOVE
5 FRWY BEG LEFT	551	SIBERIAN ELM	28	74		REMOVE

5 FRWY BEG LEFT	552	SIBERIAN ELM	30	75		REMOVE
5 FRWY BEG LEFT	553	PIN OAK	28	76		
5 green right	554	HICKORY	16	77		
5 approach right	555	PIN OAK	20	78		
	556	PIN OAK	24	79		
	557	WHITE PINE	24	80		
5 frwy right	558	NORWAY SPRUCE	28	81		
	559	RED MAPLE	12	82		
	560	WHITE PINE	18	83		
	561	RED MAPLE	12	84	#2	REMOVE
	562	COLORADO BLUE SPRUCE	24	85	#2	REMOVE
	563	PIN OAK	24	86	#2	REMOVE
	564	WHITE PINE	24	87	#2	REMOVE
	565	WHITE PINE	24	88	#2	REMOVE
in water bottom	566	RED MAPLE	48	89	#2	REMOVE
	567	BLACK OAK	30	90	#2	REMOVE
	568	SUGAR MAPLE	16	91	#2	REMOVE
Begin 5 frwy right	569	SUGAR MAPLE	32	92	#2	REMOVE
	570	SILVER MAPLE	48	93	#2	REMOVE
	571	SYCAMORE	20	94	#2	REMOVE
	572	NORWAY MAPLE	16	95	#2	REMOVE
	573	SUGAR MAPLE	20	96	#2	REMOVE
	574	RED MAPLE	12	97	#2	REMOVE

	575	COTTONWOOD	16	98	#2	REMOVE
	576	COTTONWOOD	20	99	#2	REMOVE
	577	COTTONWOOD	16	100	#2	REMOVE
Cartpath 5 senior tee	578	SUGAR MAPLE	10	101	#2	REMOVE
12 Green Back Left	579	Scarlet Oak	12			
	580	RED OAK	28			
	581	Scarlet Oak	17			
	582	RED OAK	28			
13 Tee Back	583	Dawn Redwood	18			
13 Tee Left	584	RED OAK	19			
13 Fairway Left	585	WHITE OAK	30			
	586	WHITE OAK	34			
	587	WHITE OAK	37			
	588	WHITE OAK	29			
	589	WHITE OAK	30			
	590	RED OAK	4			
13 Fry Left x bunker	591	WHITE OAK	30			
	592	WHITE OAK	30			
	593	WHITE OAK	30			
	594	WHITE OAK	26"			
	595	WHITE OAK	36			
13 FURTHER LEFT	596	COLORADO BLUE SPRUCE	12			
	597	COLORADO BLUE SPRUCE	12			

13 Approach Left	598	COLORADO BLUE SPRUCE	16			
13 R of bunker @ lake	599	POPLAR	12			
	600	POPLAR	12			
	601	POPLAR	16			
	602	BLACK WALNUT	7			
13 Frwy/Appr right	603	TULIP TREE	11			
13 Appr right @ lake	604	COTTONWOOD	15			
	605	SILVER MAPLE	30			
	606	SILVER MAPLE	30			
	607	SYCAMORE (double leader)	15-19			
13 Green FR	608	BLACK LOCUST	28			
13 Green right @ fence	609	WHITE OAK (double leader)	16-11			
	610	WHITE OAK	30			
	611	WHITE OAK	32			
	612	WHITE OAK	24			
Huff fence	613	WHITE OAK	22			
	614	BLACK OAK	30			
14 back tee right	615	WHITE OAK	30			
14 men tee right (JJ)	616	RED OAK	23			
14 ladies tee left	617	RED OAK	48			
14 descent left east	618	WHITE OAK	33			
middle	619	RED OAK	24			
west	620	WHITE OAK	36			

east	621	BLACK OAK	32			
middle 2	622	BLACK OAK	26			
middle 3	623	BLACK OAK	32			
west	624	RED OAK	32			
east	625	RED OAK	12			
middle	626	WHITE OAK	16			
west (tennis side of pat	627	HICKORY	26			
14 tennis side of path	628	HICKORY	24			
14 Frwy Beg left	629	HICKORY	28			
14 Frwy left (start grove	630	RED OAK	40			
	631	HICKORY	13			
	632	RED OAK	38			
	633	HICKORY	12			
	634	HICKORY	14			
	635	RED OAK	32			
By gravel path	636	BLACK OAK	26			
By gravel path	637	BLACK OAK	32			
	638	WHITE OAK	30			
	639	BLACK OAK	30			
	640	BLACK OAK	40			
Behind 15 tee	641	BLACK OAK	40			
15 Tee right	642	BLACK OAK	26			
	643	BLACK OAK	32			

	644	WHITE OAK	22			
	645	BLACK OAK	40			
	646	RED OAK	46			
14 Green back left	647	COPPERLEAF BEECH	8			
14 Green back right	648	SUGAR MAPLE	8			
14 ladies tee right	649	WHITE OAK	36			
	650	WHITE OAK	34			
	651	WHITE OAK	36			
	652	WHITE OAK	40			
14 descent right botton	653	WHITE OAK	40			
14 right mounds bottor	654	HICKORY	8			
	655	RED OAK	10			
	656	RED OAK	10			
	657	RED OAK	10			
	658	HICKORY	6			
14 frwy beg right	659	WHITE OAK	42			
	660	WHITE OAK	28			
	661	WHITE OAK	36			
	662	WHITE OAK	26			
14 fbr closer to OB	663	WHITE OAK	26			
	664	WHITE OAK	32			
	665	WHITE OAK	30			
	666	WHITE OAK	30			

	667	WHITE OAK	32			
	668	WHITE OAK	27			
10 Frwy left s of sat	669	RED OAK	50			
closest to 10	670	WHITE OAK	26			
middle	671	WHITE OAK	43			
southeast	672	WHITE OAK	36			
12 approach east	673	Dawn Redwood	8			
Butterfly bottom	674	WHITE OAK	40			
11 Lad tee left	675	WHITE OAK	37			
12 lad tee left	676	SWAMP WHITE OAK	8			
11 lad end of path	677	WHITE OAK	21			
12 tee front left	678	SWEETGUM	18			
	679	SUGAR MAPLE	24			
11 Frwy left mid of hill	680	SUGAR MAPLE	26			
12 tee left Chafty	681	RED MAPLE	3			
11 Frwy left middle	682	RED OAK	22			
12 tee left	683	SUGAR MAPLE	28			
"	684	SUGAR MAPLE	20			
"	685	LOCUST	19			
11 Frwy left middle	686	RED OAK	20			
	687	RED OAK	21			
	688	SUGAR MAPLE	19			
11 App cart path top	689	WHITE OAK	32			

	690	RED OAK	38			
	691	WHITE OAK	11			
	692	WHITE OAK	14			
	693	RED OAK	26			
11 green left	694	WHITE OAK	25			
	695	WHITE OAK	23			
	696	WHITE OAK	28			
12 back tee left	697	WHITE OAK	19			
11 green back right	698	RED OAK	30			
	699	SUGAR MAPLE	29			
	700	POPLAR	9			
	701	POPLAR	6			
	702					
	703					
	704					
	705					
	706					
	707					
	708					

TREE PLANTING KEY

- LARGE CALIPER TREES
- UNDERSTORY TREES
- SHRUBS
- EXISTING TREES TO REMAIN

UNDERSTORY/SHRUBS
+/- 200 TO BE PLANTED

LARGE CALIPER TREES
+/- 100 TO BE PLANTED

EXISTING TREES TO REMAIN

Scale in Feet
0 100 200 300

Tree list for reforestation of woodlands

Overstory and understory Trees & Shrubs

Trees

Red Maple (Acer rubrum)
Juneberry (Amelanchier arborea)
Bitternut Hickory (Carya cordiformis)
Pignut Hickory (Carya glabra)
Shagbark Hickory (Carya ovata)
Alternate-leaved Dogwood (Cornus alternifolia)
Flowering Dogwood (Cornus florida)
White Ash (Fraxinus americana)
Ironwood (Ostrya virginiana)
Black Cherry (Prunus serotina)
White Oak (Quercus alba)
Northern Pin Oak (Quercus ellipsoidalis)
Red Oak (Quercus rubra)
Black Oak (Quercus velutina)
Sassafras (Sassafras albidum)
Basswood (Tilia americana)

Shrubs

Serviceberries (Amelanchier spp.)
Gray Dogwood (Cornus foemina)
American Hazelnut (Corylus americana)
Wintergreen (Gaultheria procumbens)
Huckleberry (Gaylussacia baccata)
Witch-hazel (Hamamelis virginiana)
Choke Cherry (Prunus virginiana)
Prickly Gooseberry (Ribes cynosbati)
Common Blackberry (Rubus allegheniensis)
Black Raspberry (Rubus occidentalis)
Wild Red Raspberry (Rubus strigosus)
Low Sweet Blueberry (Vaccinium angustifolium)
Canada Blueberry (Vaccinium myrtilloides)
Hillside Blueberry (Vaccinium pallidum)
Maple-leaved Arrow-wood (Viburnum acerifolium)

Note: While there are a number of species listed that we would not use as specimen for the golf course/landscape, this list is designed to rebuild a Dry-mesic Southern Forest in Southwest Lower Michigan. We need to have as much of this bio-diversity as possible to achieve that goal. It is also understood that once established, these areas would not be managed and allowed to develop (over time) into their natural woodland state. It should also be noted that this will be a "phased" install. Overstory trees will go in first and allowed a couple years to develop, followed by the understory trees and shrubs... which will need the shade and protection of the overstory to establish and thrive.

LEGACY COURSE TREE REFORESTATION PLAN

DESIGN

DRAWING LOCATION: G:\Jobs\2025 Kalamazoo Country Club Legacy Course\1_Final\DRAWINGS\C 000 Title Sheet.dwg LAST SAVED By: ASTAUDT On: 4/29/2025

CITY NFP SUBMITTAL

KALAMAZOO COUNTRY CLUB LEGACY COURSE

1609 WHITES ROAD
CITY OF KALAMAZOO
KALAMAZOO COUNTY, MI

KALAMAZOO COUNTRY CLUB LEGACY COURSE, ISSUED FOR CITY NFP SUBMITTAL, 5/9/25

OWNER

oakland finance company, llc
100 w. michigan ave. suite 300
kalamazoo, michigan 49007

CONSTRUCTION MANAGER

CSMGROUP
csm group
100 w. michigan ave., suite 200
kalamazoo, michigan 49007

PLANS PREPARED BY:

hurley & stewart, llc
2800 s. 11th street
kalamazoo, michigan 49009
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a.h. green design
p.o. box 533
forest hill, maryland 21050
308.991.7099

tower pinkster
242 e. kalamazoo ave.
kalamazoo, michigan 49007
269.343.6633

abonmarche byce
306 s. kalamazoo mall
kalamazoo, michigan 49007
269.381.6170

UTILITY CONTACTS:

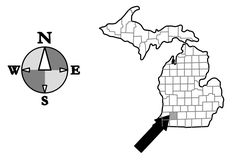
CONSUMERS ENERGY CO. MIKE SOKOLOV 2500 E. CORK STREET KALAMAZOO, MI 49001 269.337.2246	ELECTRIC
CONSUMERS ENERGY CO. KYLE OAK 2500 E. CORK STREET KALAMAZOO, MI 49001 269.337.2366	GAS
CHARTER COMMUNICATIONS MARK BURKE 4176 COMMERCIAL AVE. PORTAGE, MI 49002 269.217.8152	CABLE TELEVISION
AT&T TODD SHIBAYAMA 2919 MILLCORK ST. KALAMAZOO, MI 49001 269.384.4436	TELEPHONE
CITY OF KALAMAZOO DEPARTMENT OF PUBLIC SERVICES ENGINEERING DIVISION JAMIE BARNIER/ETHAN RAY KALAMAZOO, MI 49001 269.337.8055/269.337.8595	WATER/SANITARY

PROJECT LOCATION



SITE LOCATION MAP

SCALE: 1" = 500'



CIVIL DRAWING INDEX

SHT #	DESCRIPTION
C 000	TITLE SHEET
C 001	PROJECT NOTES & LEGEND
CD 100	EXISTING CONDITIONS & DEMO PLAN
C 100	OVERALL SITE LAYOUT PLAN
C 101	SITE LAYOUT PLAN ENLARGEMENTS
C 200	OVERALL UTILITY PLAN
C 201	UTILITY PLAN ENLARGEMENTS
C 202	PROPOSED WATER MAIN PROFILE
C 300	OVERALL GRADING & SESC PLAN
C 301	GRADING PLAN ENLARGEMENTS
C 400	NATURAL FEATURES INVENTORY
C 500	DETAILS

IRRIGATION BUILDING DRAWING INDEX

SHT #	DESCRIPTION
S 101	FOUNDATION AND FRAMING PLANS
A 101	SITE PLAN
A 102	OVERALL FIRST FLOOR PLAN & REFLECTED CEILING PLAN
A 301	BUILDING SECTIONS & EXTERIOR ELEVATIONS
ES 101	ELECTRICAL SITE PLAN

SNACK SHACK BUILDING DRAWING INDEX

SHT #	DESCRIPTION
A 101	PLANS & ELEVATIONS REVIEW
S 200	FIRST FLOOR FRAMING & FOUNDATION PLANS
P1.1	PLUMBING PLAN
E1.0	ELECTRICAL PLANS

PRELIMINARY NOT FOR CONSTRUCTION

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5/9/25

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LEGEND

PROPOSED CONTOUR HIGHLIGHTED	EXISTING CONTOUR HIGHLIGHTED
PROPOSED CONTOUR NORMAL	EXISTING CONTOUR NORMAL
PROPOSED SANITARY SEWER	EXISTING SANITARY SEWER
PROPOSED STORM SEWER	EXISTING STORM SEWER
PROPOSED CATV	EXISTING CATV
PROP ELEC (OVERHEAD)	EXIST ELEC (OVERHEAD)
PROP ELEC (UNDERGROUND)	EXIST ELEC (UNDERGROUND)
PROPOSED FIBEROPTIC CABLE	EXISTING FIBEROPTIC CABLE
PROPOSED GAS	EXISTING GAS
PROPOSED TELEPHONE	EXISTING TELEPHONE
PROPOSED WATER MAIN	EXISTING WATER MAIN
PROPOSED TREELINE	EXISTING TREELINE
PROPOSED FENCE	EXISTING FENCE
CURB CATCH BASIN	GAS METER
SQUARE CATCH BASIN	TELEPHONE MANHOLE
ROUND CATCH BASIN	TELEPHONE PEDESTAL
MANHOLE STORM	TELEPHONE POLE
MANHOLE SANITARY	+896.32 PROPOSED SPOT GRADE
SANITARY CLEANOUT	+865.25 EXISTING SPOT GRADE
FIRE HYDRANT	BENCH MARK
WATER VALVE	POST/BOLLARD
WATER VALVE IN VAULT	SIGN
WATER METER	MAILBOX
WATER REDUCER	SOIL BORING
LIGHT POLE	MONITOR WELL
POWER POLE	
GUY WIRE	
ELECTRIC MANHOLE	
ELECTRIC METER	

NOTE: ALL SYMBOLS IN THIS LEGEND ARE SHOWN AS EXISTING. PROPOSED SYMBOLS WILL USE THE CORRESPONDING SYMBOL WITH A THICKER LINE.

GENERAL NOTES

1. THE CONTRACTOR SHALL LOCATE ALL ACTIVE UNDERGROUND UTILITIES PRIOR TO STARTING WORK AND SHALL CONDUCT HIS OPERATIONS IN A MANNER AS TO ENSURE THAT THOSE UTILITIES NOT REQUIRING RELOCATION WILL NOT BE DISTURBED.
2. EXCEPT WHERE OTHERWISE INDICATED ON THESE PLANS, ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT EDITION OF THE MICHIGAN DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, AND THE CITY OF KALAMAZOO STANDARD SPECIFICATIONS.
3. ALL WORK SHALL CONFORM TO ALL LOCAL, STATE AND FEDERAL LAWS, RULES AND REGULATIONS IN FORCE AT THE TIME OF CONSTRUCTION.
4. ANY BITUMINOUS OR CONCRETE PAVEMENT, SANITARY SEWER, SANITARY SEWER SERVICE LEADS, OR STORM SEWER, WHICH IS DAMAGED BY THE CONTRACTOR DURING HIS OPERATIONS, SHALL BE REPAIRED TO THE OWNER'S SATISFACTION AND AT THE CONTRACTOR'S EXPENSE.
5. IF ANY ERRORS, DISCREPANCIES, OR OMISSIONS BECOME APPARENT, THESE SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO CONSTRUCTION OF ANYTHING AFFECTED SO THAT CLARIFICATION OR REDESIGN MAY OCCUR.
6. ALL EXTERIOR CONCRETE SHALL BE 4000PSI, AIR ENTRAINED, LIMESTONE AGGREGATE, BROOM FINISHED, CURING SEAL.
7. ALL COMPACTION SHALL BE ACCOMPLISHED BY PLACING THE FILL IN 12" LOOSE LIFTS AND MECHANICALLY COMPACTING EACH LIFT TO AT LEAST THE SPECIFIED MINIMUM DRY DENSITY. FIELD DENSITY TESTS SHOULD BE PERFORMED ON EACH LIFT AS NECESSARY TO ENSURE THE ADEQUATE MOISTURE CONDITIONS AND COMPACTION ARE BEING ACHIEVED.
8. PLACE "DO NOT ENTER CONSTRUCTION ZONE" SIGNS AT ALL ENTRY POINTS TO PROJECT.

UTILITY NOTES

1. PLACE SANITARY CLEANOUT EVERY 100' AND/OR AT BENDS ON ALL 6" SANITARY SEWER LEADS.
2. ALL WATER MAIN INSTALLED IN GROUNDWATER SHALL BE WRAPPED WITH POLYETHYLENE.
3. DEWATERING MAY BE REQUIRED TO INSTALL OR REMOVE SOME UTILITIES. REFER TO SPECIFICATIONS FOR SPECIFIC REQUIREMENTS. REFER TO GEOTECHNICAL REPORT FOR MORE INFORMATION.
4. COORDINATE ALL UTILITY LOCATIONS AND ELEVATIONS WITH MECHANICAL DRAWINGS AND BUILDING CONTRACTOR PRIOR TO INSTALLATION.
5. VERIFY NUMBER OF FITTINGS PRIOR TO ORDERING. TOTALS DO NOT INCLUDE VERTICAL DEFLECTIONS THAT MAY BE NEEDED.
6. PROVIDE 18" WATER MAIN SEPARATION WHEN CROSSING OTHER UTILITIES. DEFLECT UNDER OTHER UTILITIES W/O USING FITTINGS WHENEVER POSSIBLE. SEE WATER MAIN PROFILE SHEET.
7. SITE CONTRACTOR TO INSTALL TO FIRST VALVE FOR TESTING PURPOSES AND TO SIMPLIFY COORDINATION WITH THE TRADES (PLUMBING AND FIRE).
8. WATER MAIN MATERIALS AND INSTALLATION SHALL COMPLY WITH THE CITY OF KALAMAZOO STANDARD SPECIFICATIONS FOR WATER MAIN AND SERVICE INSTALLATION, 2021.
9. CONTRACTOR SHALL REFER TO THE GEOTECHNICAL REPORT FOR GROUNDWATER AND SOILS INFORMATION. ANY UTILITIES REQUIRING DEWATERING SHALL BE INSTALLED TO THE CITY OF KALAMAZOO STANDARDS AND INCLUDED IN THE INSTALLATION COSTS. CONTRACTOR IS RESPONSIBLE FOR ALL DEWATERING NECESSARY TO CONSTRUCT UTILITIES IN THE DRY.
10. ALL EXISTING STRUCTURE RIMS TO BE ADJUSTED TO PROPOSED GRADES.

REMOVAL NOTES

1. REVIEW ALL THE REMOVALS AND PROTECTION WITH OWNER PRIOR TO COMMENCING CONSTRUCTION. INSTALL TEMPORARY SNOW FENCE AROUND ALL TREES REQUIRING PROTECTION. SNOW FENCE SHALL BE PLACED AT EDGE OF DRIP LINE.
2. SAWCUT ALL CURB, SIDEWALK, AND PAVEMENTS PRIOR TO REMOVAL. ADDITIONAL SAWCUT MAY BE NECESSARY PRIOR TO REPLACEMENT TO ENSURE CLEAN EDGE.
3. ALL REMOVALS SHALL BE TAKEN OFF-SITE AND DISPOSED OF. NO STOCKPILE OR BURNING OF DEBRIS IS ALLOWED.
4. COMPLY WITH ALL ASPECTS OF THE SOIL EROSION CONTROL PERMIT AS ISSUED BY THE CITY OF KALAMAZOO. ALL TEMPORARY CONTROL MEASURES SHALL BE IN PLACE PRIOR TO COMMENCING CONSTRUCTION.
5. ALL REMOVALS SHALL BE TO THE LIMITS INDICATED UNLESS OTHERWISE DIRECTED BY THE ENGINEER. UNAUTHORIZED REMOVALS AND SUBSEQUENT REPLACEMENT SHALL BE AT THE CONTRACTOR'S EXPENSE.
6. REMOVE, STORE, AND RESET ANY EXISTING SIGNS AS DIRECTED BY THE ENGINEER/OWNER.
7. REMOVE TREES ONLY AS INDICATED ON THE DEMOLITION AND TREE REMOVAL PLANS.
8. REVIEW CLEARING LIMITS WITH OWNER PRIOR TO COMMENCING WORK. PRESERVE TREES WHERE INDICATED.
9. FOR PROTECTION OF UNDERGROUND UTILITIES, THE CONTRACTOR SHALL CALL 1-800-482-7171 A MINIMUM OF THREE FULL WORKING DAYS EXCLUDING SATURDAYS, SUNDAYS AND HOLIDAYS PRIOR TO BEGINNING EACH EXCAVATION IN AREAS WHERE PUBLIC UTILITIES HAVE NOT BEEN PREVIOUSLY LOCATED. MEMBERS WILL THUS BE ROUTINELY NOTIFIED. THIS DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF NOTIFYING OWNERS WHO MAY NOT BE A PART OF THE "MISS DIG" ALERT SYSTEM.

GRADING/SESC NOTES

1. MATCH EXISTING GRADES AROUND PERIMETER WITH SLOPES AS SHOWN. MATCH AT 1 ON 4 IF NOT LABELED.
2. THE CONTRACTOR SHALL INSTALL PEDESTRIAN FENCE AROUND ALL EXCAVATIONS TO BE LEFT OPEN OVERNIGHT AS REQUIRED.
3. ALL SPOT ELEVATIONS ARE TOP OF PAVEMENT GRADES AT EDGE OF METAL (EOM) UNLESS OTHERWISE NOTED.
4. ALL EXCAVATION SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS AND GEOTECHNICAL REPORT.
5. REMOVE AND REPLACE WITH CONTROLLED FILL ANY AREAS THAT HAVE BEEN SOFTENED BY RAINS, FREEZING, CONSTRUCTION EQUIPMENT, ETC.
6. ALL REQUIRED FILL FOR THIS PROJECT SHALL BE SELECTED EXCAVATED MATERIAL FROM THE SITE APPROVED BY THE ENGINEER OR CLASS II GRANULAR MATERIAL FROM BORROW AND SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
7. ALL GRANULAR FILL UNDER THE INFLUENCE OF THE PATH SHALL BE COMPACTED TO 95% MODIFIED PROCTOR DENSITY. ALL COMPACTION SHALL BE ACCOMPLISHED BY PLACING THE FILL IN 12" LOOSE LIFTS AND MECHANICALLY COMPACTING EACH LIFT TO AT LEAST THE SPECIFIED MINIMUM DRY DENSITY. FIELD DENSITY TESTS SHOULD BE PERFORMED ON EACH LIFT AS NECESSARY TO ENSURE THAT ADEQUATE MOISTURE CONDITIONS AND COMPACTION ARE BEING ACHIEVED.
8. SITE CONTRACTOR SHALL REMOVE AND STOCKPILE ALL TOPSOIL AND BLACK ORGANIC SOILS ON-SITE TO BE USED IN THE REGRADING OF LANDSCAPE AREAS. THIS MATERIAL IS NOT TO BE USED FOR FILL OR PAVEMENT SUBBASE. REMOVAL OF ANY EXCESS SOIL OFF-SITE SHALL BE THE CONTRACTOR'S RESPONSIBILITY. COORDINATE TOPSOIL STOCKPILE WITH OWNER.
9. ALL WORK WILL COMPLY WITH THE PROVISIONS OF THE SOIL EROSION AND SEDIMENTATION CONTROL ACT (PA 347 OF 1972 AS AMENDED) ADMINISTERED BY THE COUNTY DRAIN COMMISSIONER.
10. SITES LARGER THAN 5 ACRES NEED TO FOLLOW THE SOIL EROSION AND SEDIMENTATION CONTROL GUIDEBOOK BY THE STATE OF MICHIGAN DEPARTMENT OF MANAGEMENT AND BUDGET OFFICE OF FACILITIES, DESIGN AND CONSTRUCTION DIVISION.
11. AVOID UNNECESSARY DISTURBING OR REMOVING EXISTING VEGETATED TOPSOIL OR EARTH COVER. THESE AREAS ACT AS SEDIMENT FILTERS.
12. CONTRACTOR SHALL AT ALL TIMES COMPLY WITH THE SOIL EROSION CONTROL PERMIT FROM THE CITY OF KALAMAZOO.
13. ALL TEMPORARY SOIL EROSION PROTECTION SHALL REMAIN IN PLACE UNTIL REMOVAL IS REQUIRED FOR FINAL CLEANUP AND APPROVAL.
14. CONTRACTOR TO PROVIDE SILT FENCES ACROSS ALL DITCHES, SWALES, AND ROUGH CUT ROADS WHICH EXIST FROM THE SITE TO ELIMINATE SEDIMENT RUNOFF. PROVIDE SILT FENCES OR INSTALL FILTER FABRIC UNDER INLETS AT ALL STORM SEWER STRUCTURES DURING CONSTRUCTION.
15. ALL SOIL PILES SHALL BE SURROUNDED BY SILT FENCE IF ALLOWED TO REMAIN IN PLACE FOR MORE THAN 7 DAYS. TOPSOIL PILES SHALL BE SEEDED IF ALLOWED TO REMAIN IN PLACE FOR MORE THAN 20 DAYS. SPOIL PILES SHALL NOT BE PLACED WITHIN 50' FROM ANY TEMPORARY OR PERMANENT WATERCOURSE.
16. THE CONTRACTOR SHALL COMPLY WITH THE WEEKLY RECOMMENDATIONS OF THE CERTIFIED STORM WATER OPERATOR.
17. IT IS THE INTENT FOR THE EARTHWORK TO BALANCE AND THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THAT THE EARTHWORK SHOWN BALANCES PRIOR TO BEGINNING WORK. .
18. PROVIDE SILT SACKS IN EACH NEARBY CATCH BASIN UNTIL SITE IS STABILIZED.
19. ALL SOIL EROSION MEASURES SHALL BE IN PLACE PRIOR TO COMMENCING WORK.
20. SEE MASTER PLAN FOR FINAL SLOPE TREATMENTS.
21. CLEAN ADJACENT ROADWAYS WHEN NECESSARY.
22. WATER SITE WHEN NECESSARY TO PREVENT AIR BORNE SEDIMENT TRANSFER.
23. PLACE MULCH BLANKET AN ALL SLOPES 1 ON 3 OR STEEPER.

KALAMAZOO COUNTRY CLUB
1609 Whites Rd, Kalamazoo, MI 49008

hurley & stewart, llc
2800 s. 11th street
kalamazoo, michigan 49009
269.552.4960 fax 269.552.4961
www.hurleystewart.com

hurley & stewart

Job No.: 21-046E P.M.: TAS Dft: NJR QA/QC: 5/9/25

ISSUED FOR/REVISIONS:
1 CITY SITE PLAN REVIEW SUBMITTAL 4/25/25
2 CITY NFP SUBMITTAL 5/9/25

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Sheet Title: PROJECT NOTES & LEGEND
Project: LEGACY COURSE
Client: KALAMAZOO COUNTRY CLUB

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5/9/25
Sheet
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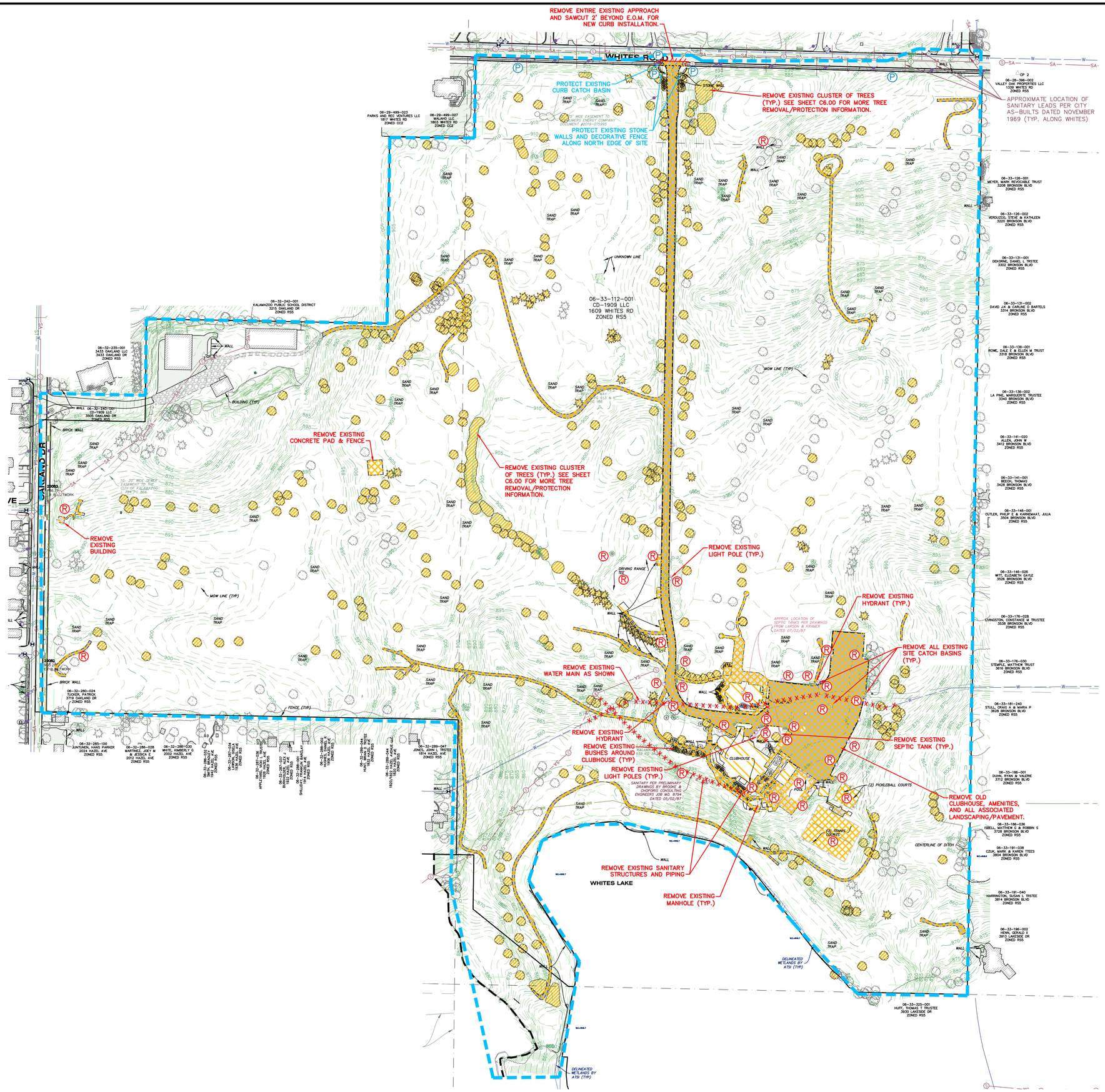

REMOVALS LEGEND

- CURB REMOVAL
- SAWCUT
- PAVEMENT/SIDEWALK REMOVAL
- BUILDING DEMOLITION
- UTILITY LINE REMOVAL
- TREE REMOVAL
- REMOVE
- PROTECT
- LIMITS OF CONSTRUCTION

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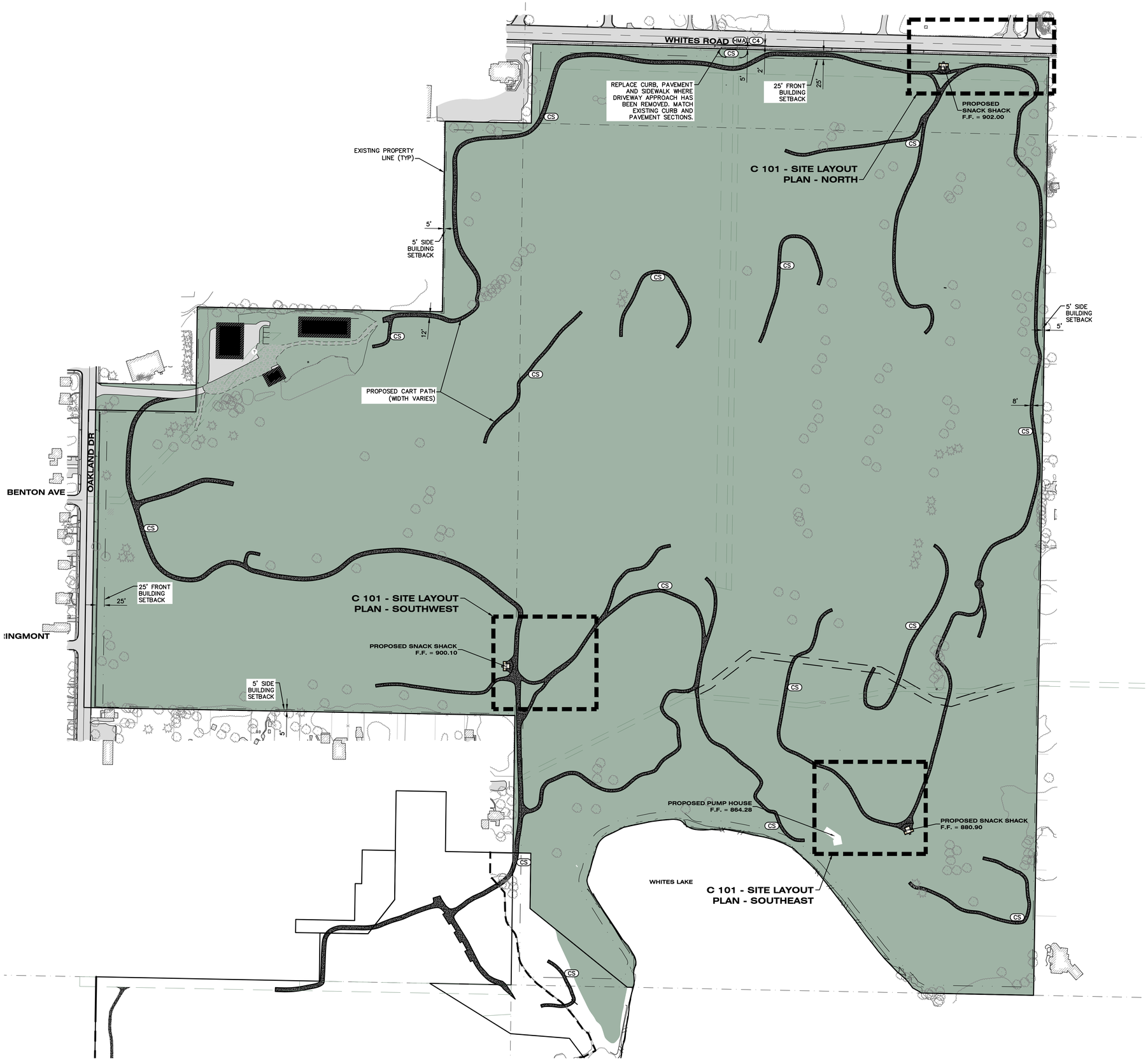
Sheet Title: EXISTING CONDITIONS & DEMO PLAN
Project: LEGACY COURSE
KALAMAZOO COUNTRY CLUB
Client:

5/9/25
Sheet
CD 100

DRAWING LOCATION: p:\21-046E Kalamazoo Country Club Legacy Course_FINAL PLANS\CD\CD 100 Existing Conditions & Demo Plan.dwg LAST SAVED BY: NRICHMOND ON 5/9/2025

DRAWING LOCATION: m:\21-046E (Kalamazoo Country Club Legacy Course)_Plot_DRAWINGS\C 100 Overall Site Layout Plan.dwg LAST SAVED BY: ASTAUGUST ON 4/25/2025



0 60 120 240
1 inch = 120ft.

N W E S

ZONING REQUIREMENTS

ZONING

THE SITE IS ZONED RS-5 (RESIDENTIAL)

SETBACKS: FRONT – 25'
SIDES – 5'
HEIGHT OF STRUCTURE = 13'
REAR – 25'

PROPOSED USE

GOLF COURSE

SITE COVERAGE

GROSS SITE AREA: 6,046,622 SFT
EXISTING IMPERVIOUS COVERAGE: 6.62%
PROPOSED IMPERVIOUS COVERAGE: 2.85%

SITE LEGEND

- HMA HMA PAVEMENT
- C4 C4 CURB AND GUTTER
- CS CONCRETE SURFACE
- CP CART PATH

LEGEND

- CONCRETE PAVEMENT AND CART PATH (SEE DETAIL)
- PROPOSED BUILDING

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Job No.: 21-046E P.M.: TAS Drft: NJR QA/QC: 5/9/25

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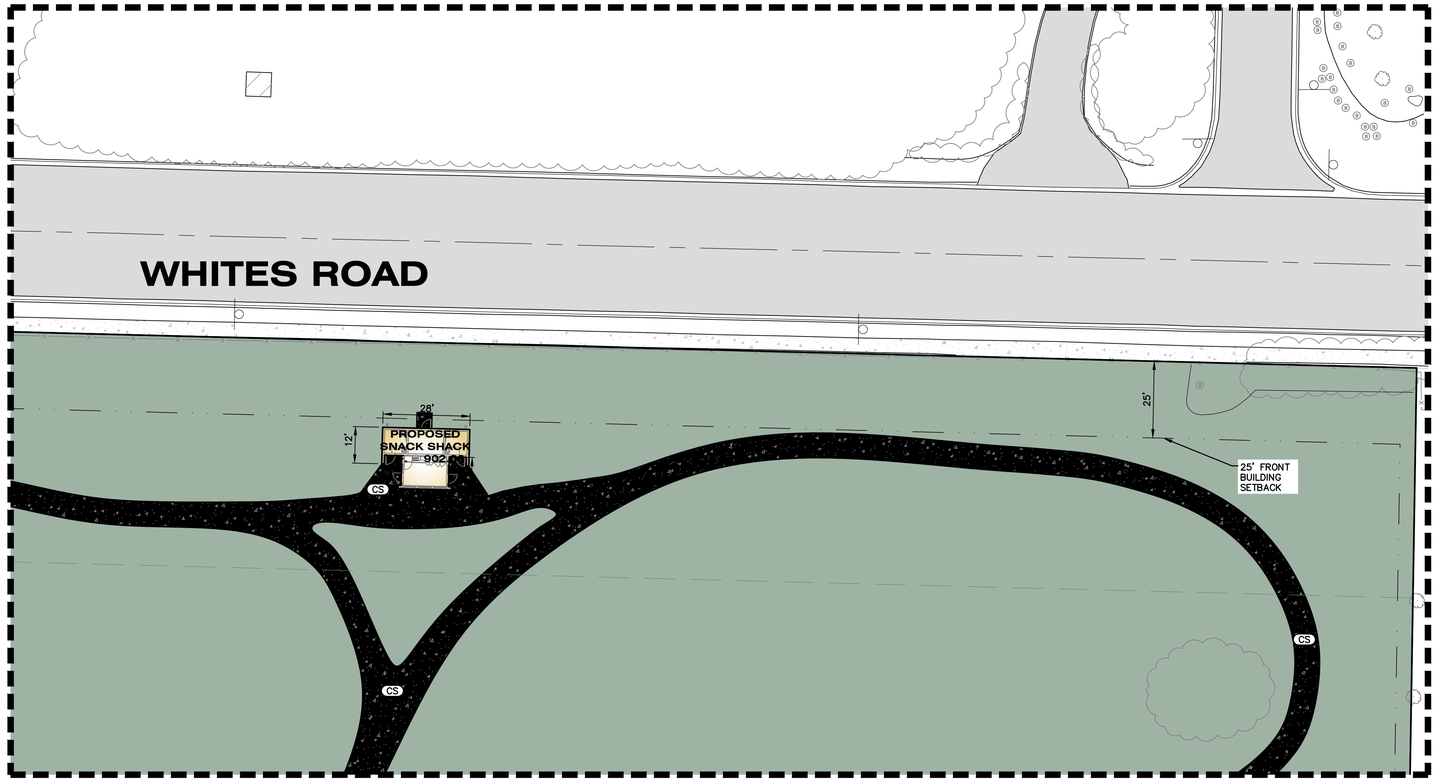
Project: **LEGACY COURSE**
Client: **KALAMAZOO COUNTRY CLUB**

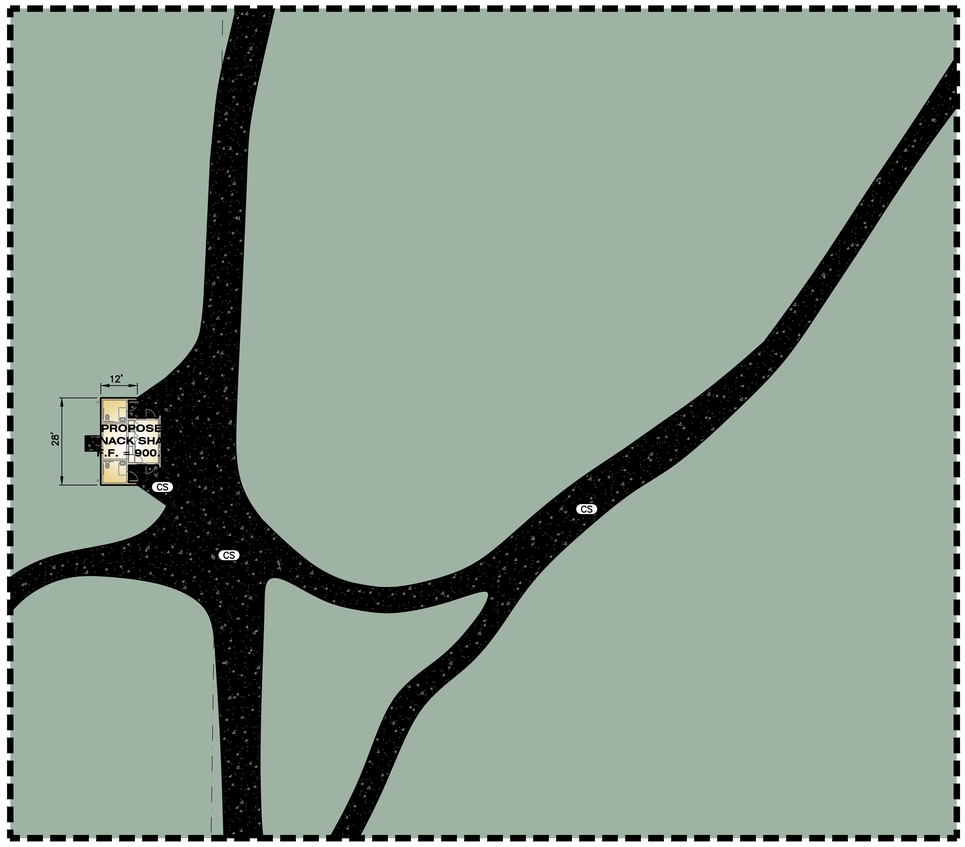
5/9/25
Sheet
C 100

DRAWING LOCATION: m:\21-0468 Kalamazoo Country Club Legacy Course_ PMA\ DRAWINGS\C 100 Overall Site Layout Plan.dwg LAST SAVED BY: ASTAUDT ON 4/25/2025

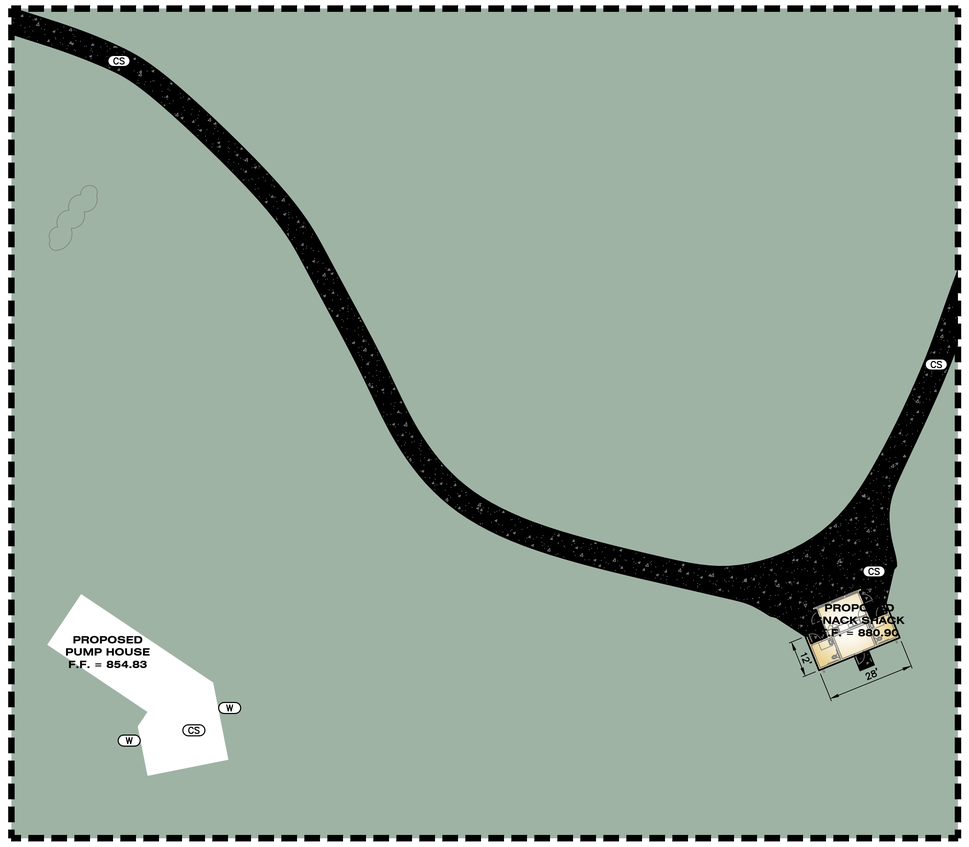


SITE LAYOUT PLAN - NORTH

SCALE: 1" = 20'



SITE LAYOUT PLAN - SOUTHWEST



SITE LAYOUT PLAN - SOUTHEAST

SCALE: 1" = 20'

0 10 20 40

1 inch = 20ft.

N W E S

SITE LEGEND

- (W) RETAINING WALL
- (CS) CONCRETE SURFACE

LEGEND

- CONCRETE PAVEMENT AND CART PATH (SEE DETAIL)
- PROPOSED BUILDING

Know what's below. Call before you dig.

ALL UTILITIES AS SHOWN ARE APPROXIMATE LOCATIONS DERIVED FROM ACTUAL MEASUREMENTS AND AVAILABLE RECORDS. THEY SHOULD NOT BE INTERPRETED TO BE EXACT LOCATION NOR SHOULD IT BE ASSUMED THAT THEY ARE THE ONLY UTILITIES IN THE AREA.

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1609 Whites Rd, Kalamazoo, MI 49008

hurley & stewart, llc
2800 s. 11th street
kalamazoo, michigan 49009
269.552.4960 fax 269.552.4961
www.hurleystewart.com

hurley & stewart

Job No. 21-0468 P.M. TAS Dft. NJR QA/QC 5/9/25

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2	CITY NFP SUBMITTAL	5/9/25

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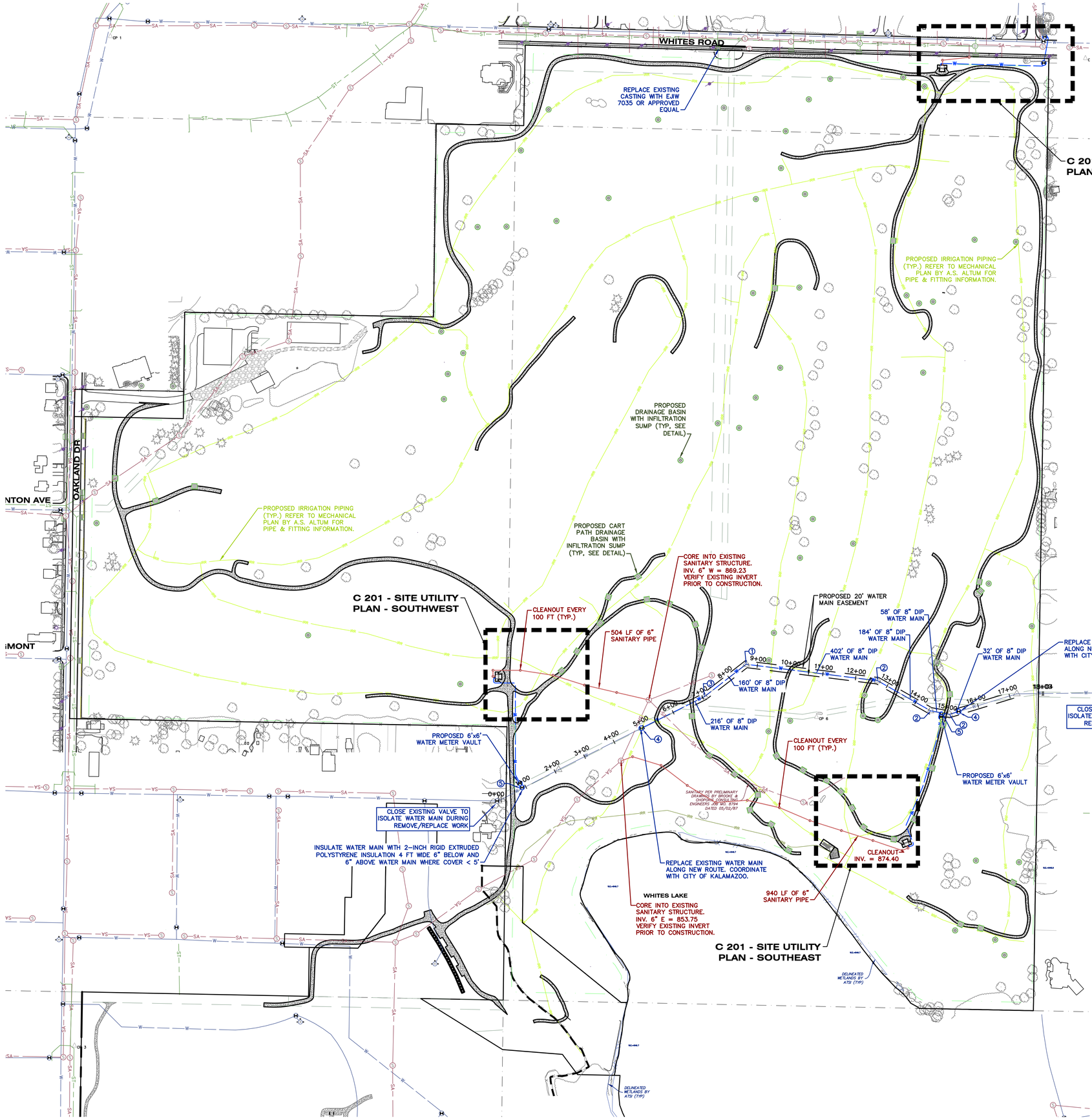
Sheet Title: SITE LAYOUT PLAN ENLARGEMENTS
Project: LEGACY COURSE
Client: KALAMAZOO COUNTRY CLUB

5/9/25

Sheet

C 101



N
W E
S
0 60 120 240
1 inch = 120ft.

WATER MAIN FITTING SCHEDULE

FITTING NUMBER	DESCRIPTION	TOTAL THIS SHEET
1	8" 45° BEND	1
2	8" 22.5° BEND	3
3	8" 11.25° BEND	1
4	8" GATE VALVE	2
5	2" TAP AND CURB BOX	2

LEGEND

DEFLECT WATER MAIN 18" UNDER PIPE CONFLICT (SEE DETAIL)

NOTE:
CONTRACTOR RESPONSIBLE FOR VERIFYING FITTINGS. AMOUNTS DO NOT TAKE INTO CONSIDERATION VERTICAL DEFLECTIONS.

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Job No.: 21-046E P.M.: TAS Dft: NJR QA/QC: 5/9/25

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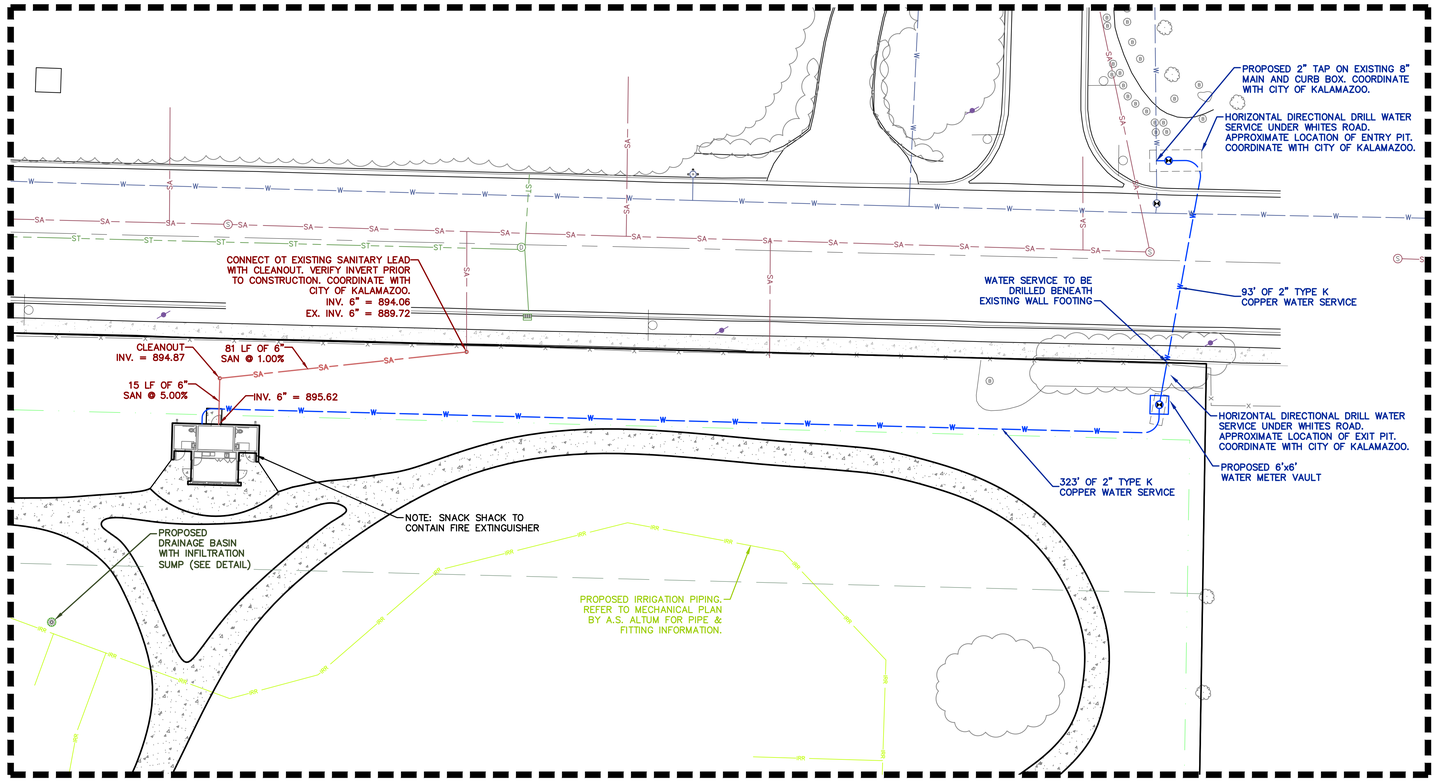
OVERALL UTILITY PLAN
LEGACY COURSE
KALAMAZOO COUNTRY CLUB

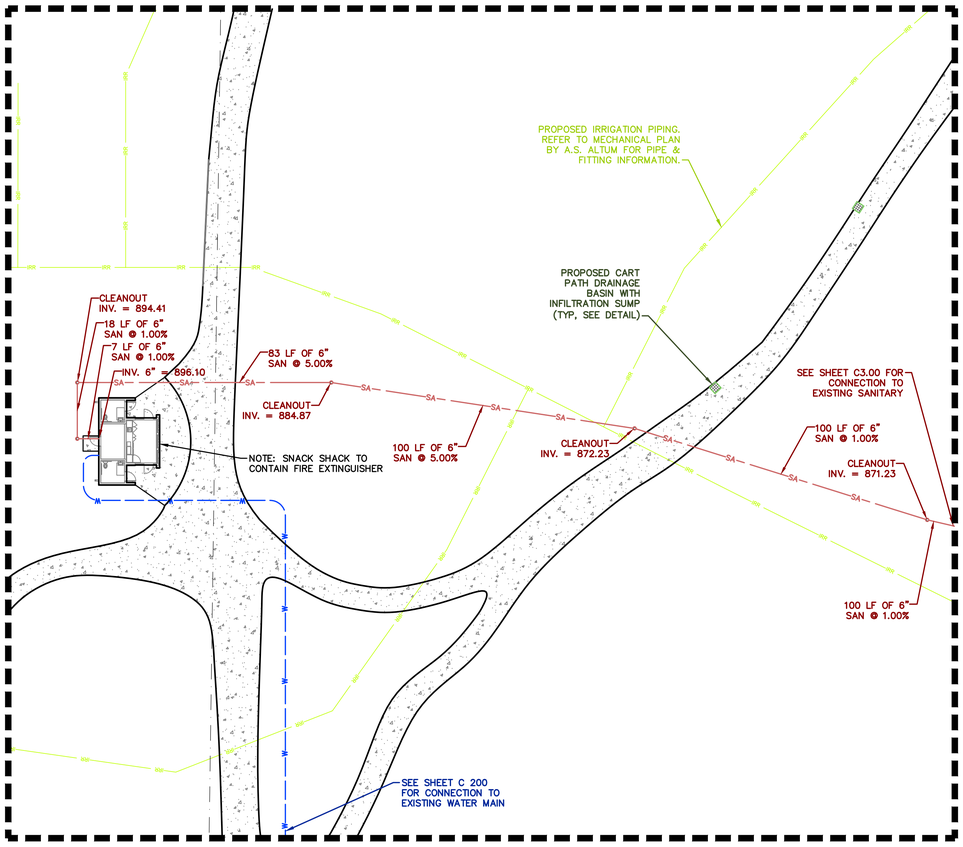
Sheet Title:
Project:
Client:

5/9/25
Sheet
C 200

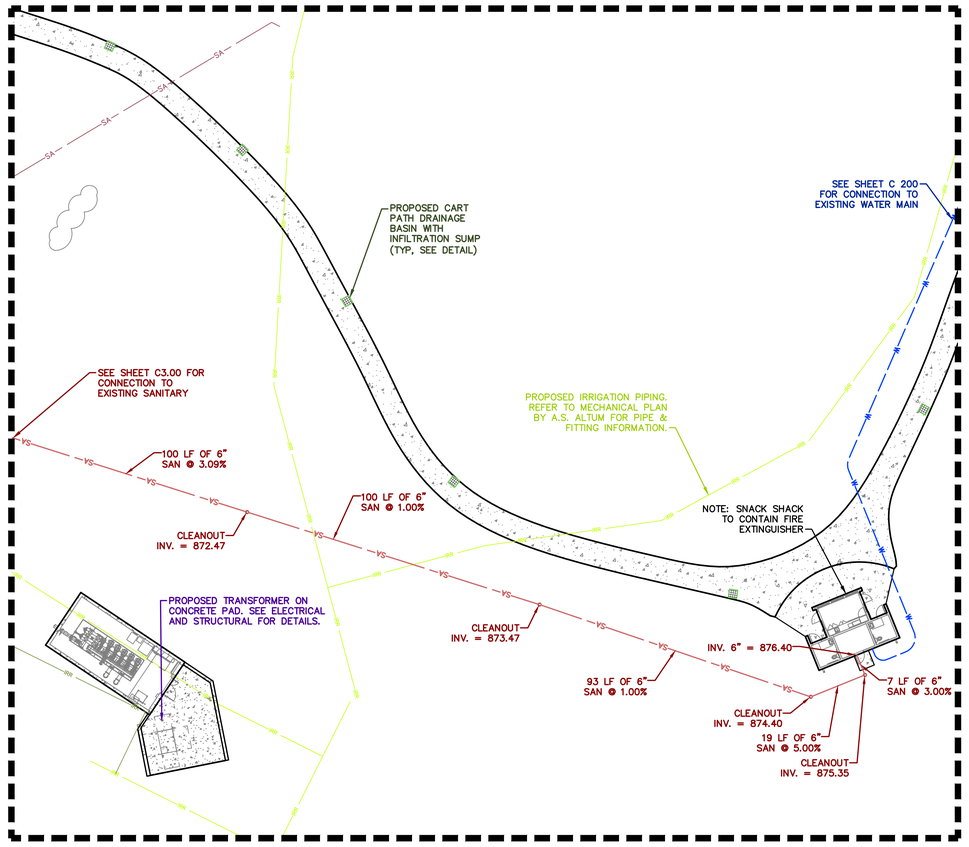
DRAWING LOCATION: N:\21-0466 (Kalamazoo Country Club Legacy Course)_ PAVE DRAWINGS\C 200 Overall Utility Plan.dwg LAST SAVED BY: ASTAUGUST ON 4/25/2025



SITE UTILITY PLAN - NORTH
SCALE: 1" = 20'



SITE UTILITY PLAN - SOUTHWEST
SCALE: 1" = 20'



SITE UTILITY PLAN - SOUTHEAST
SCALE: 1" = 20'

0 10 20 40
1 inch = 20ft.

N W E S

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Job No. 21-0466 P.M. TAS DR. NJR QA/QC 5/9/25

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UTILITY PLAN ENLARGEMENTS
LEGACY COURSE
KALAMAZOO COUNTRY CLUB

Sheet Title:
Project:
Client:

5/9/25
Sheet
C 201

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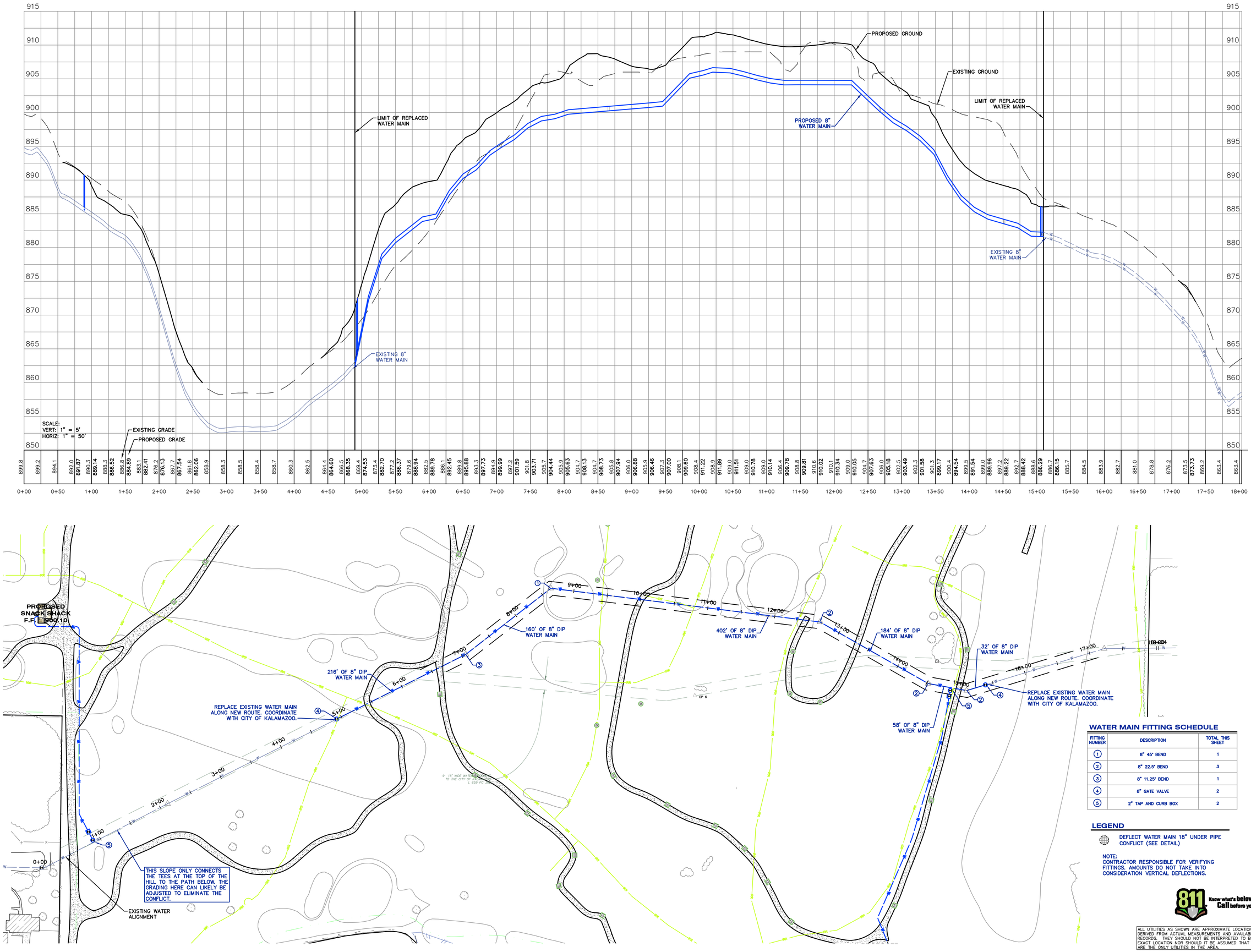
DRAWING LOCATION: N:\21-046E Kalamazoo Country Club Legacy Course\1_FINAL DRAWINGS\C 202 Proposed Water Main Profile.dwg LAST SAVED BY: ASTAUDT ON 4/29/2025



WATER MAIN FITTING SCHEDULE

FITTING NUMBER	DESCRIPTION	TOTAL THIS SHEET
1	8" 45° BEND	1
2	8" 22.5° BEND	3
3	8" 11.25° BEND	1
4	8" GATE VALVE	2
5	2" TAP AND CURB BOX	2

LEGEND

DEFLECT WATER MAIN 18" UNDER PIPE CONFLICT (SEE DETAIL)

NOTE:
CONTRACTOR RESPONSIBLE FOR VERIFYING FITTINGS. AMOUNTS DO NOT TAKE INTO CONSIDERATION VERTICAL DEFLECTIONS.

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PROPOSED WATER MAIN PROFILE
LEGACY COURSE
KALAMAZOO COUNTRY CLUB

Sheet Title:
Project:
Client:

5/9/25
Sheet
C 202

DRAWING LOCATION: m:\21-046E Kalamazoo County Club Legacy Course_Plan Drawings\C 300 Overall Grading & SESC Plan.dwg LAST SAVED BY: ASTAUDT ON 4/29/2025

0 60 120 240
1 inch = 120ft.

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W E
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WHITES RO

PROPOSED SNACK SHACK
F.F. = 902.00

C 301 - SITE GRADING
PLAN - NORTH

OAKLAND DR

ON AVE

ONT

PROPOSED SNACK SHACK
F.F. = 900.10

C 301 - SITE GRADING
PLAN - SOUTHWEST

PROPOSED SNACK SHACK
F.F. = 880.90

PROPOSED PUMP HOUSE
F.F. = 854.74

WHITES LAKE

C 301 - SITE GRADING
PLAN - SOUTHEAST

INSTALL DOUBLE ROW OF
SILT FENCE AT BOTTOM
OF SLOPE ABOVE LAKE

SOIL EROSION AND SEDIMENTATION CONTROL MEASURES

KEY	BEST MANAGEMENT PRACTICES	SYMBOL	WHERE USED
E8	PERMANENT SEEDING		Stabilization method utilized on sites where earth change has been completed (final grading attained).
E9	MULCH BLANKETS		On exposed slopes, newly seeded areas, new ditch bottoms, or areas subject to erosion.
S51	SILT FENCE		Use adjacent to critical areas, to prevent sediment laden sheet flow from entering these areas.
S53	STABILIZED CONSTRUCTION ACCESS		Used at every point where construction traffic enters or leaves a construction site.
S58	INLET PROTECTION FABRIC DROP		Use at stormwater inlets, especially at construction sites.

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OVERALL GRADING & SESC PLAN
LEGACY COURSE
KALAMAZOO COUNTRY CLUB

Sheet Title:
Project:
Client:

5/9/25
Sheet
C 300

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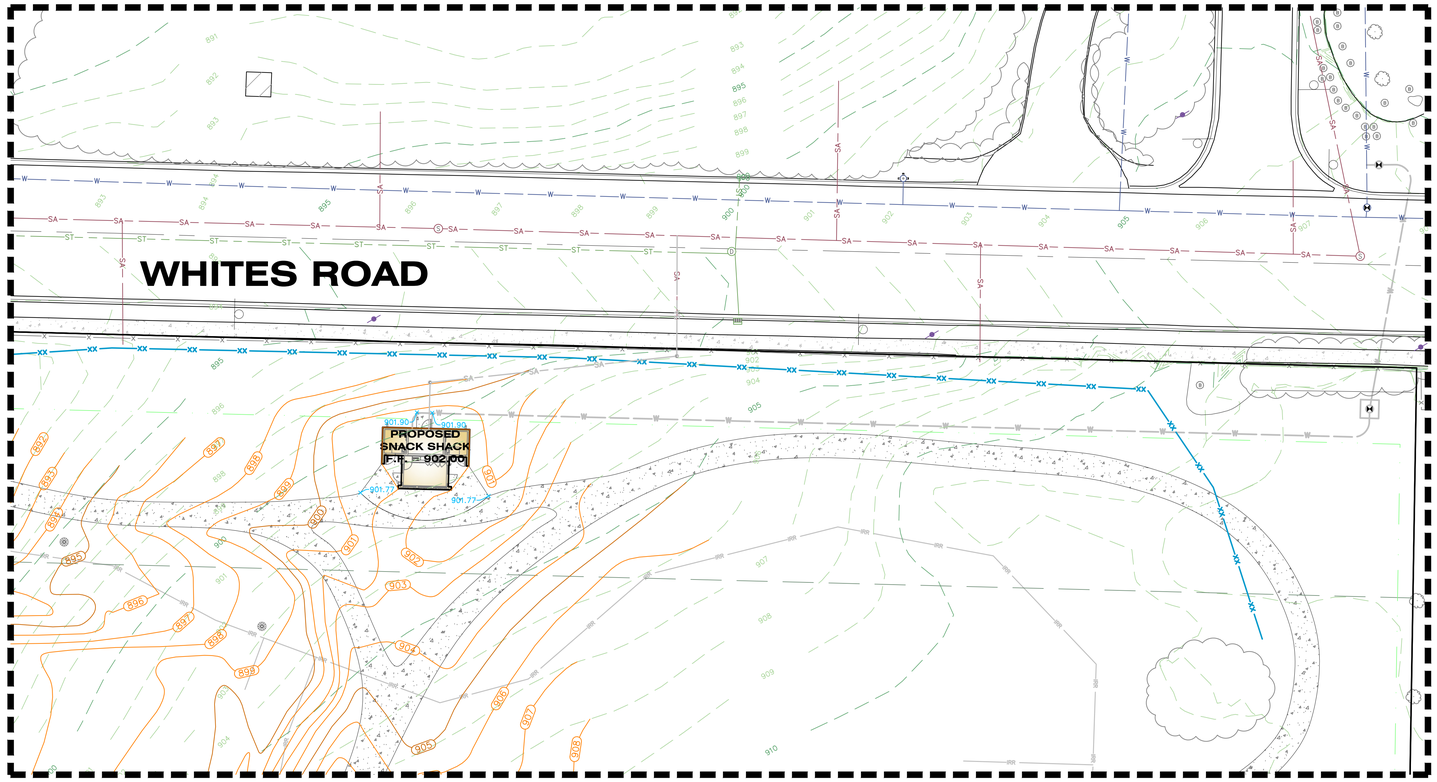
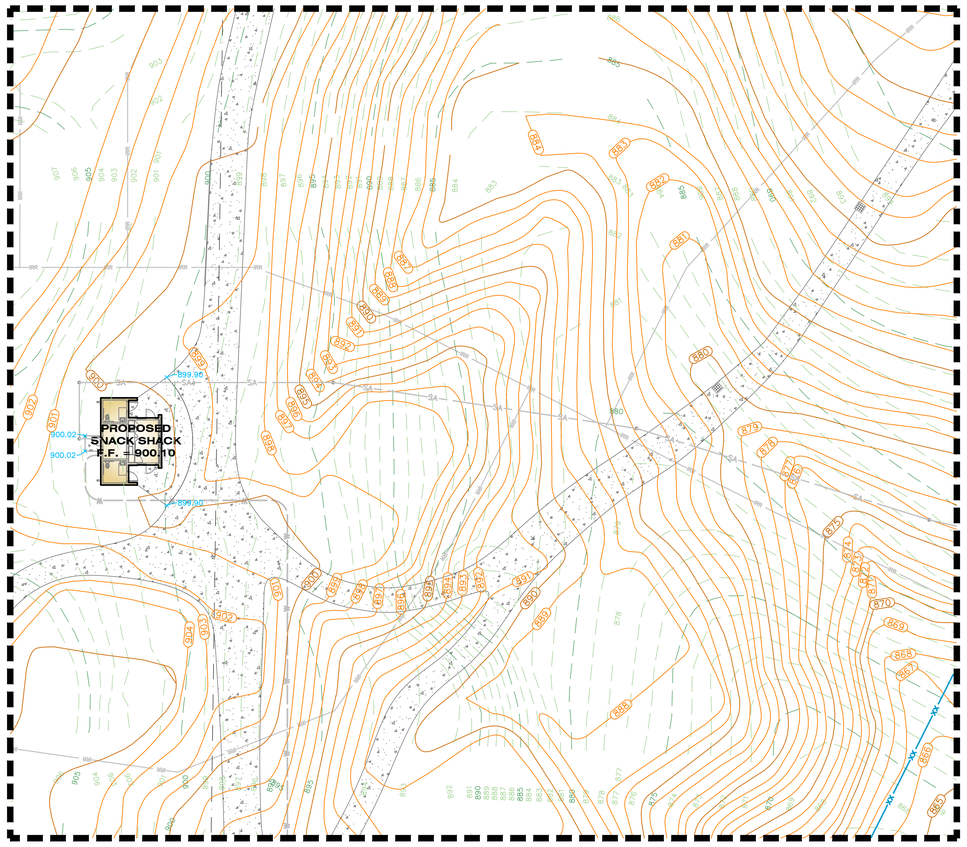
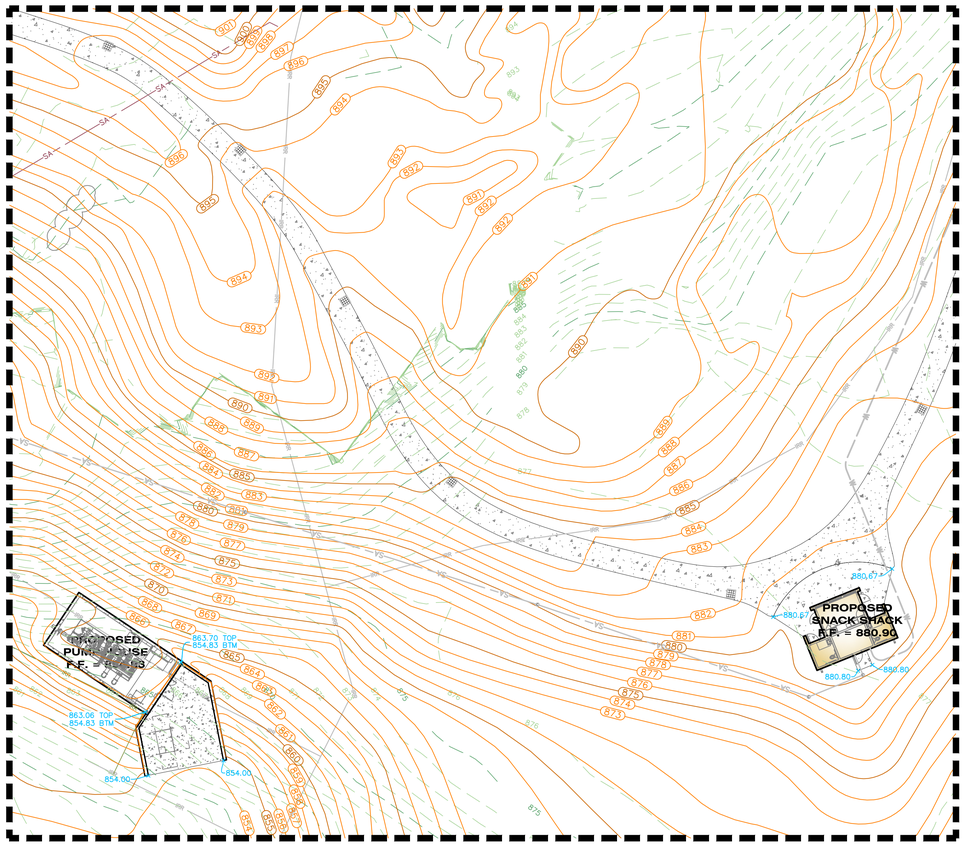
DRAWING LOCATION: m:\21-0466 Kalamazoo County Club Legacy Course_PHASE DRAWINGS\C 300 Overall Grading & SESC Plan.dwg LAST SAVED BY: ASTAUGUST ON 4/25/2025



SITE GRADING PLAN - NORTH
SCALE: 1" = 20'



SITE GRADING PLAN - SOUTHWEST
SCALE: 1" = 20'



SITE GRADING PLAN - SOUTHEAST
SCALE: 1" = 20'

0 10 20 40
1 inch = 20ft.

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Job No. 21-0466 P.M. TAS Dft. NJR QA/QC 5/9/25

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GRADING PLAN ENLARGEMENTS
LEGACY COURSE
KALAMAZOO COUNTRY CLUB

Sheet Title:
Project:
Client:

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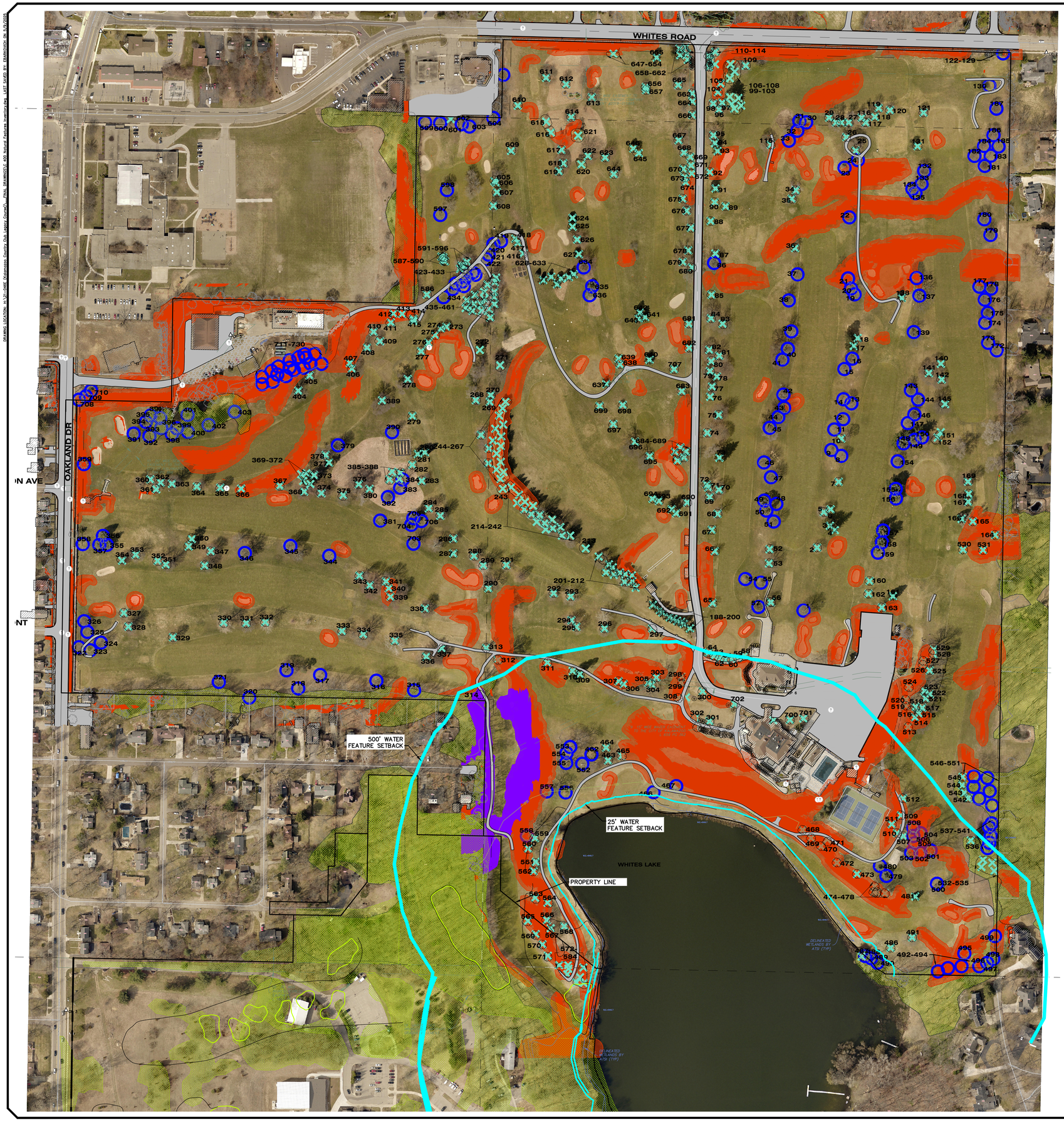
5/9/25
Sheet
C 301

DRAWING LOCATION: K:\21-046E Kalamazoo Country Club Legacy Course_ FINAL DRAWINGS\C 400 Natural Features Inventory.dwg LAST SAVED BY: EBANOVICH ON 5/9/2025



0 60 120 240
1 inch = 120 ft.

N
W E
S

NATURAL FEATURES LEGEND

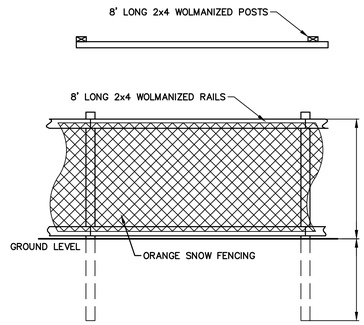
- MANMADE SLOPES GREATER THAN 20%
- MINIMUM 10' SETBACK AT TOP/BOTTOM OF MANMADE SLOPE
- NATIVE SLOPES GREATER THAN 20%
- MINIMUM 10' SETBACK AT TOP/BOTTOM OF NATIVE SLOPE
- WOODLANDS GREATER THAN 1/2 ACRE
- 25 FOOT SETBACK FROM WATER FEATURES
- 500 FOOT BUFFER AREA FROM WATER FEATURES
- TREE TO BE REMOVED (515)
- TREE TO BE SAVED (224)

NFP QUANTITIES

ALL QUANTITIES WERE CALCULATED USING A TOTAL PARCEL AREA OF 5,896,190 SF (135.4 ACRES).
MANMADE SLOPES GREATER THAN 20% WITH SETBACK:
330,432 SF, 7.6 ACRES
DISTURBED MANMADE SLOPES GREATER THAN 20% WITH SETBACK:
219,220 SF, 5.03 ACRES
NATIVE SLOPES GREATER THAN 20% WITH SETBACKS:
40,086 SF, 0.92 ACRES
DISTURBED NATIVE SLOPES GREATER THAN 20% WITH SETBACKS:
33,893 SF, 0.78 ACRES
2.1% OF AREA IS WOODED (125,005 SF)
5.5% OF EXISTING WOODED AREA TO BE REMOVED (6,841 SF)

NOTES

1. ALL TREES BEING SAVED SHALL BE WRAPPED WITH TREE PROTECTION FENCING (SEE DETAIL THIS SHEET).
2. TREE REMOVALS ARE REQUIRED TO FACILITATE THE NEW GOLF COURSE LAYOUT AND ASSOCIATED REGRADING.
3. VARIANCE APPROVED ON 2/13/25 FOR REGRADING OF PROTECTED SLOPE AREA WITHIN 500' OF THE LAKE.



TREE PROTECTION FENCE
NOT TO SCALE

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Job No. 21-046E P.M. TAS DH. NJR QA/QC 5/9/25
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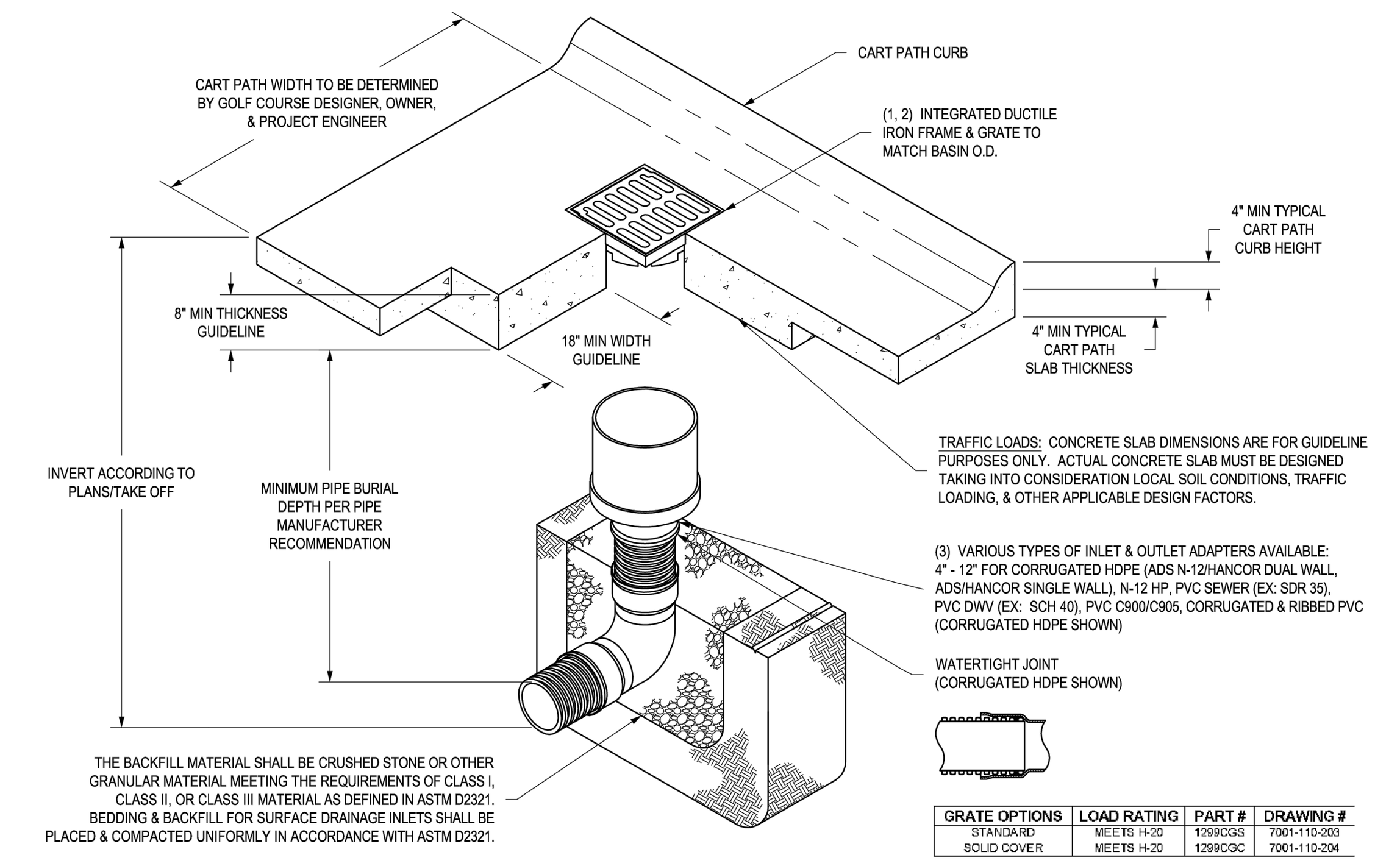
Sheet Title: NATURAL FEATURES INVENTORY
Project: LEGACY COURSE
KALAMAZOO COUNTRY CLUB
Client:

5/9/25
Sheet
C 400

NYLOPLAST 12" INLINE DRAIN: 2712AG _ _ X



GRATE OPTIONS	LOAD RATING	PART #	DRAWING #
STANDARD	MEETS H-20	1299CGS	7001-110-203
SOLID COVER	MEETS H-20	1299CGC	7001-110-204

1 - STANDARD GRATE/SOLID COVER SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
2 - FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
3 - DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS N-12/HANCOR DUAL WALL), N-12 HP, & PVC SEWER.

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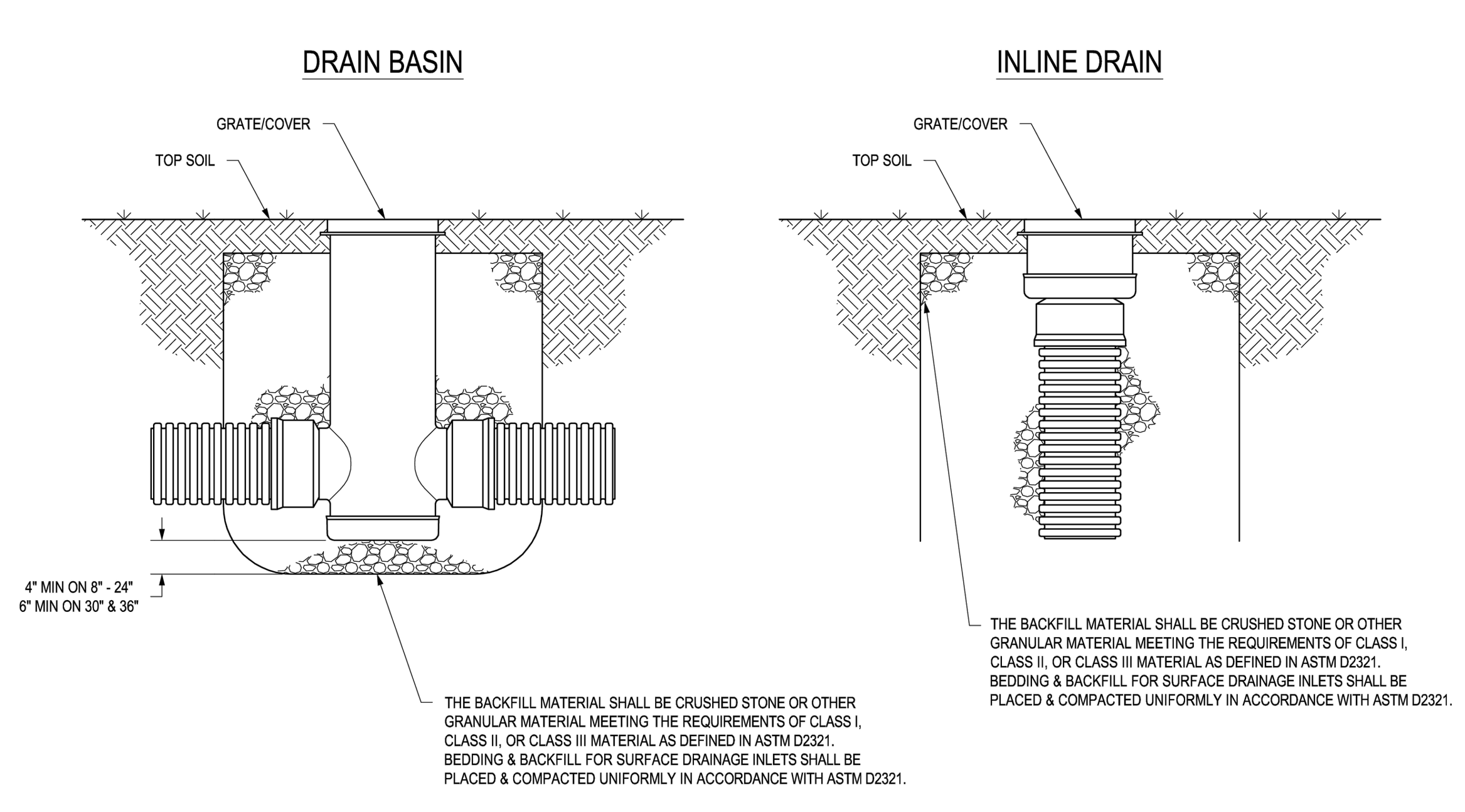
DRAWN BY EBC | DATE 07-31-07 | REVISED BY NMH | DATE 03-16-16 | MATERIAL | PROJECT NO./NAME | DWG SIZE A | SCALE 1:20 | SHEET 1 OF 1

ADS Nyloplast — 3130 VERONA AVE, BUFORD, GA 30518, PHN (770) 932-2443, FAX (770) 932-2490, www.nyloplast-us.com

TITLE: 12 IN INLINE DRAIN GOLF COURSE CART PATH INSTALLATION DETAIL — DWG NO. 7003-110-039 REV D

NON TRAFFIC INSTALLATION



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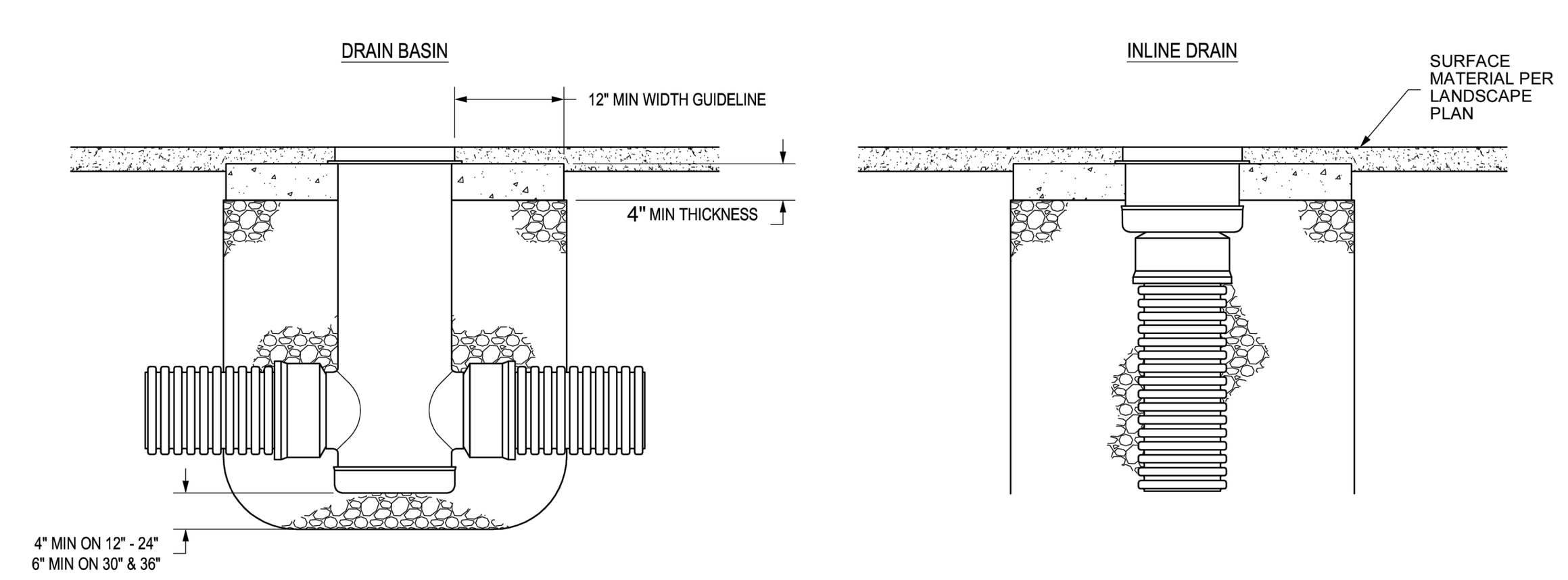
DRAWN BY CJA | DATE 9-30-99 | REVISED BY NMH | DATE 03-11-16 | MATERIAL | PROJECT NO./NAME | DWG SIZE A | SCALE 1:25 | SHEET 1 OF 1

ADS Nyloplast — 3130 VERONA AVE, BUFORD, GA 30518, PHN (770) 932-2443, FAX (770) 932-2490, www.nyloplast-us.com

TITLE: DRAIN BASIN & INLINE DRAIN NON TRAFFIC INSTALLATION — DWG NO. 7001-110-111 REV F

PAVEMENT INSTALLATION



STRUCTURE SIZE	H-10 GRATE OPTIONS
12"	12" PEDESTRIAN
15"	15" PEDESTRIAN
18"	18" PEDESTRIAN
24"	24" PEDESTRIAN
30"	30" PEDESTRIAN
36"	30" PEDESTRIAN

1 - THE BACKFILL MATERIAL SHALL BE CRUSHED STONE OR OTHER GRANULAR MATERIAL MEETING THE REQUIREMENTS OF CLASS I, CLASS II, OR CLASS III MATERIAL AS DEFINED IN ASTM D2321. BEDDING & BACKFILL FOR SURFACE DRAINAGE INLETS SHALL BE PLACED & COMPACTED UNIFORMLY IN ACCORDANCE WITH ASTM D2321.
2 - MEDIUM DUTY TRAFFIC LOADS: CONCRETE SLAB DIMENSIONS ARE FOR GUIDELINE PURPOSES ONLY. ACTUAL CONCRETE SLAB MUST BE DESIGNED TAKING INTO CONSIDERATION LOCAL SOIL CONDITIONS, TRAFFIC LOADING, & OTHER APPLICABLE DESIGN FACTORS.
3 - 36" DRAIN BASINS REQUIRE 36"X30" REDUCING CONE. REDUCING CONE REQUIRES 2.25 FT FROM GRADE TO TOP OF PIPE.

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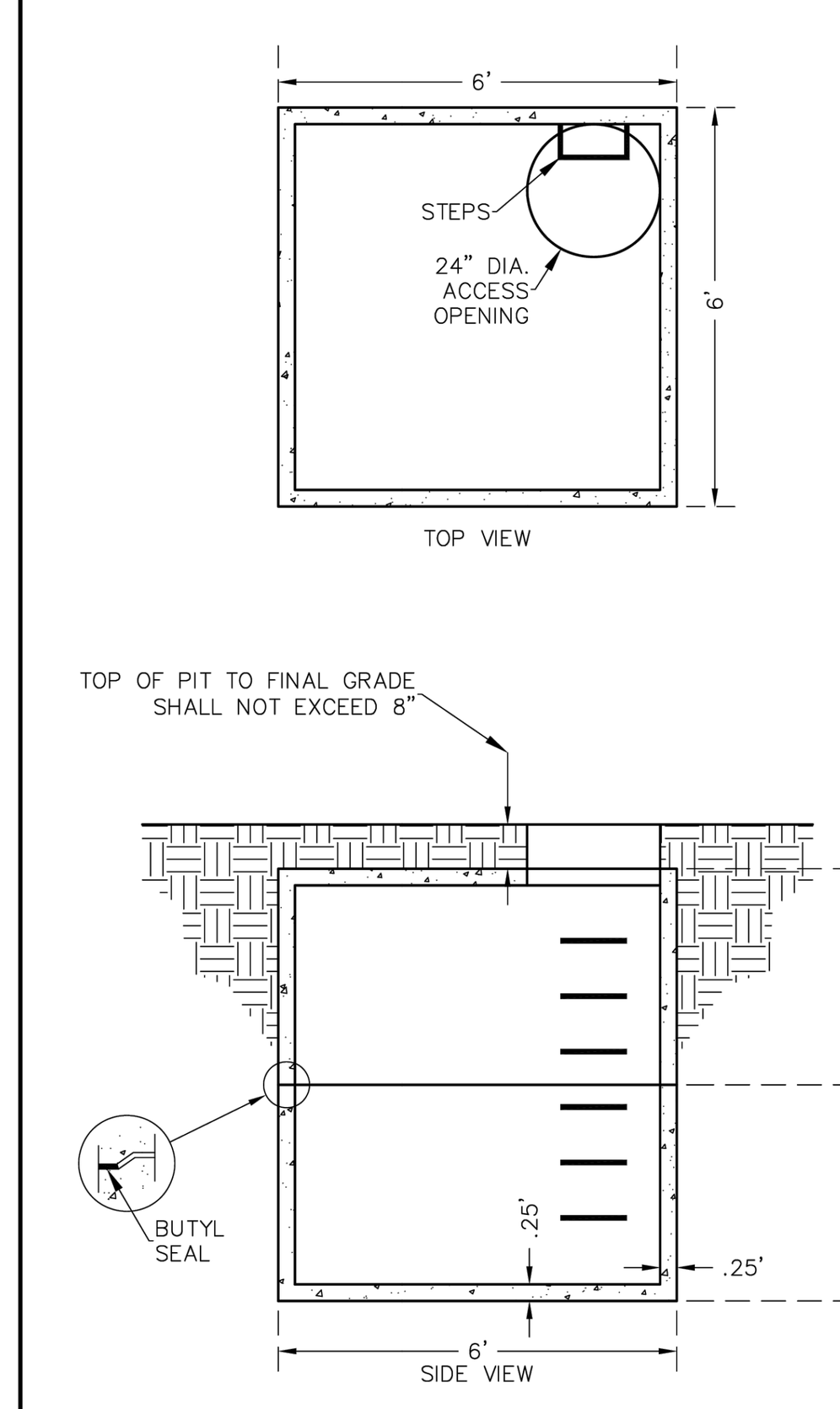
ADS Nyloplast — 3130 VERONA AVE, BUFORD, GA 30518, PHN (770) 932-2443, FAX (770) 932-2490, www.nyloplast-us.com

TITLE: DRAIN BASIN & INLINE DRAIN (H-10 TRAFFIC LOAD) ASPHALT INSTALLATION DETAIL — DWG NO. 7001-110-392 REV E

WA-07-A



NOTES:
1. METER VAULT DESIGN TO BE SUBMITTED AND APPROVED FOR EACH INDIVIDUAL INSTALLATION. DESIGN SHALL CONFORM TO KALAMAZOO WATER ENGINEERING STANDARDS LATEST REVISION.
2. THE DISTANCE BETWEEN RUNGS, CLEATS AND STEPS SHALL NOT EXCEED 12 INCHES AND SHALL BE UNIFORM THROUGHOUT THE LENGTH OF THE LADDER.
3. PLACEMENT OF CURB BOX CAN VARY FROM A MAXIMUM OF 5 FEET OUTSIDE THE PROPERTY LINE TO A MAXIMUM OF 5 FEET INSIDE THE PROPERTY LINE. PLACEMENT OF THE CURB BOX OUTSIDE THE PROPERTY LINE IS PREFERRED.
4. ACCESS COVER – FORD MC-24-MB-T WITH AN INNER LID, VESTAL 32-055, 32-104, AND 32-046 OR APPROVED EQUAL.

THE CITY OF Kalamazoo — CITY OF KALAMAZOO, Department Of Public Services

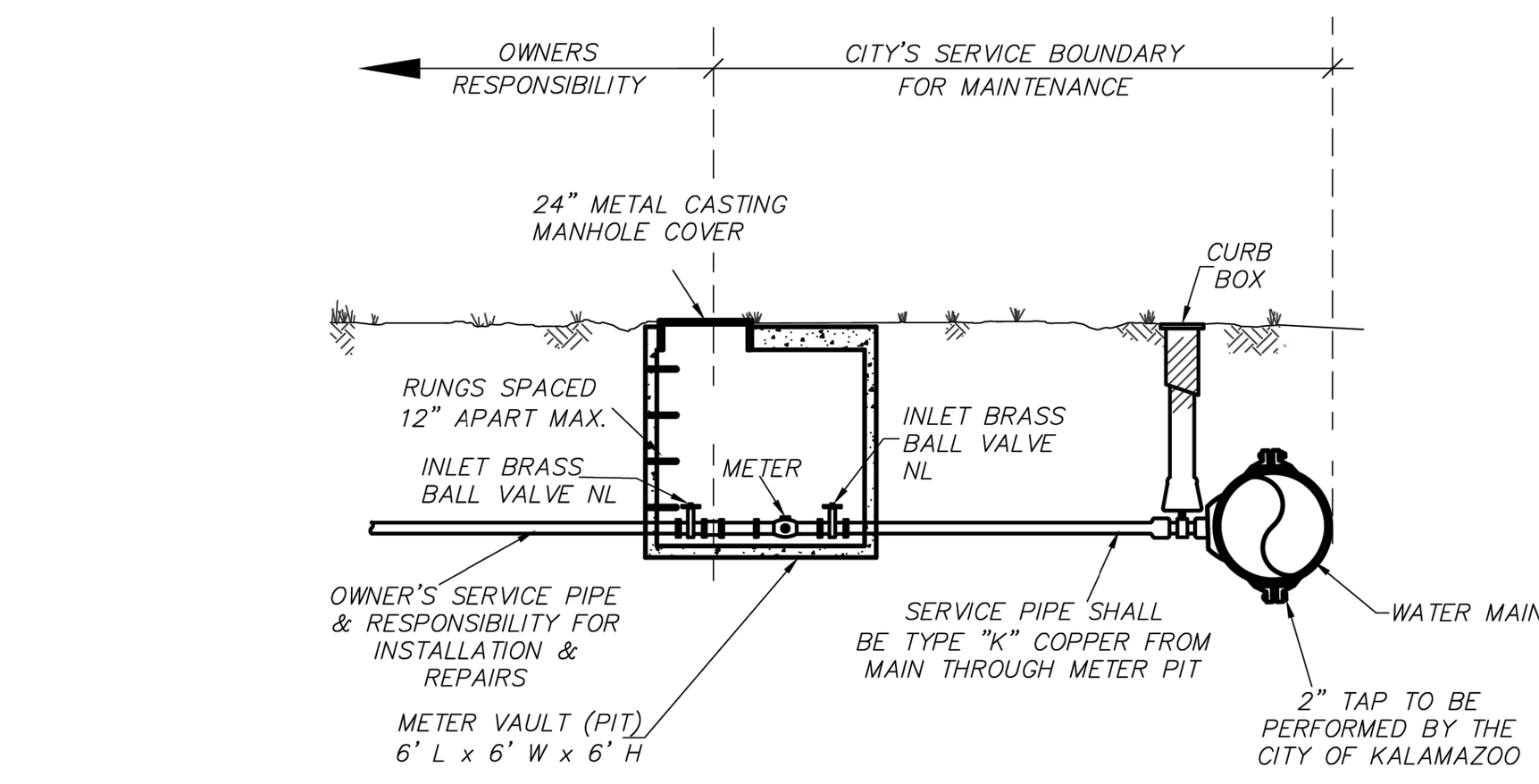
STANDARD METER PIT

RECOMMENDED BY | APPROVED BY | APPROVED BY | ACCEPTED BY | DATE

WS-1-A

NOTES:

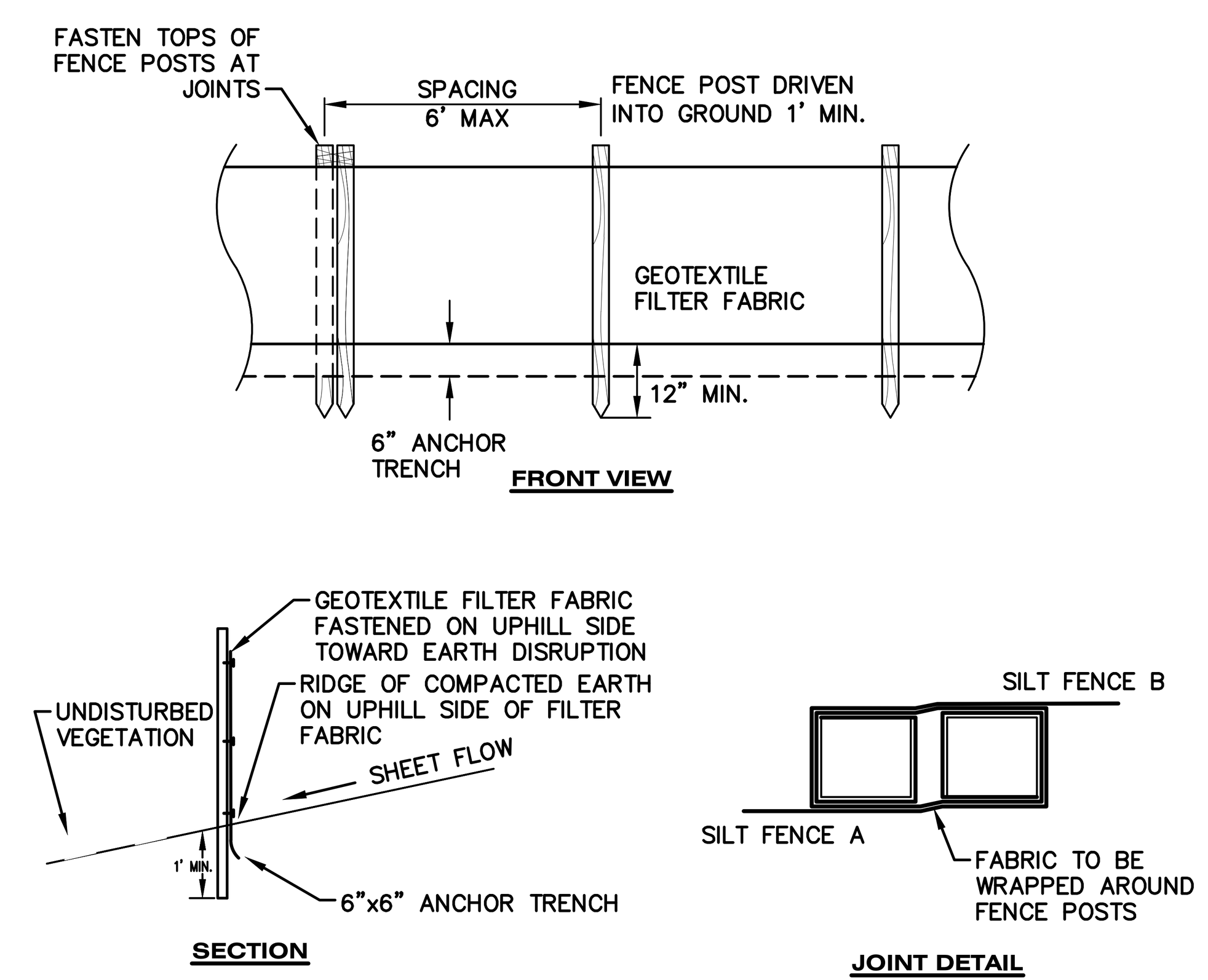
1. METER VAULT (PIT) DESIGN MUST BE SUBMITTED AND APPROVED FOR EACH INDIVIDUAL INSTALLATION. DESIGN SHALL CONFORM TO THE CITY OF KALAMAZOO STANDARD SPECIFICATIONS FOR WATER MAIN AND SERVICE INSTALLATION LATEST REVISION.
2. THE DISTANCE BETWEEN RUNGS, CLEATS & STEPS SHALL NOT EXCEED 12 INCHES AND SHALL BE UNIFORM THROUGHOUT THE LENGTH OF THE LADDER.
3. CURB BOX WILL BE INSTALLED AT THE WATER MAIN.
4. COVER FOR METER PIT & CURB BOX SHALL BE INSTALLED & MAINTAINED LEVEL WITH THE ADJACENT GROUND.



THE CITY OF Kalamazoo — CITY OF KALAMAZOO, Department Of Public Services

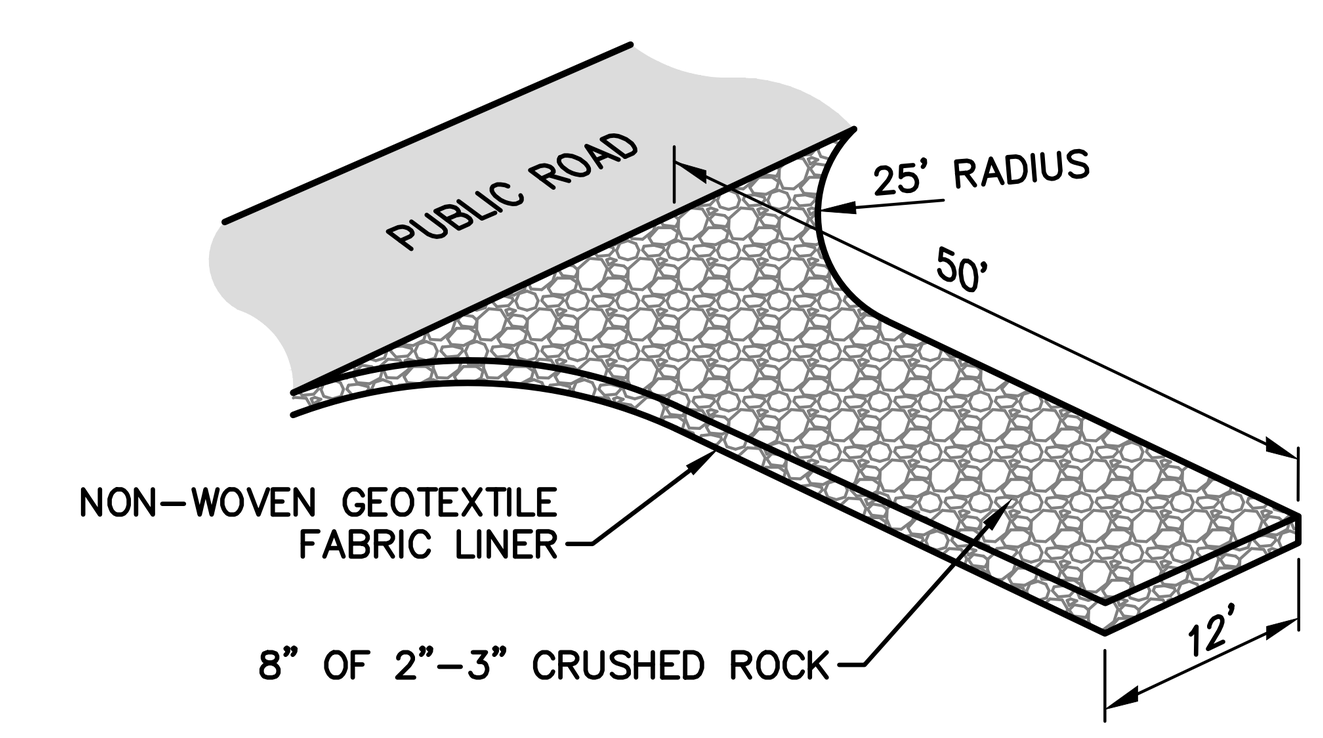
2" SERVICE LINE METER VAULT

RECOMMENDED BY | APPROVED BY | APPROVED BY | ACCEPTED BY | DATE



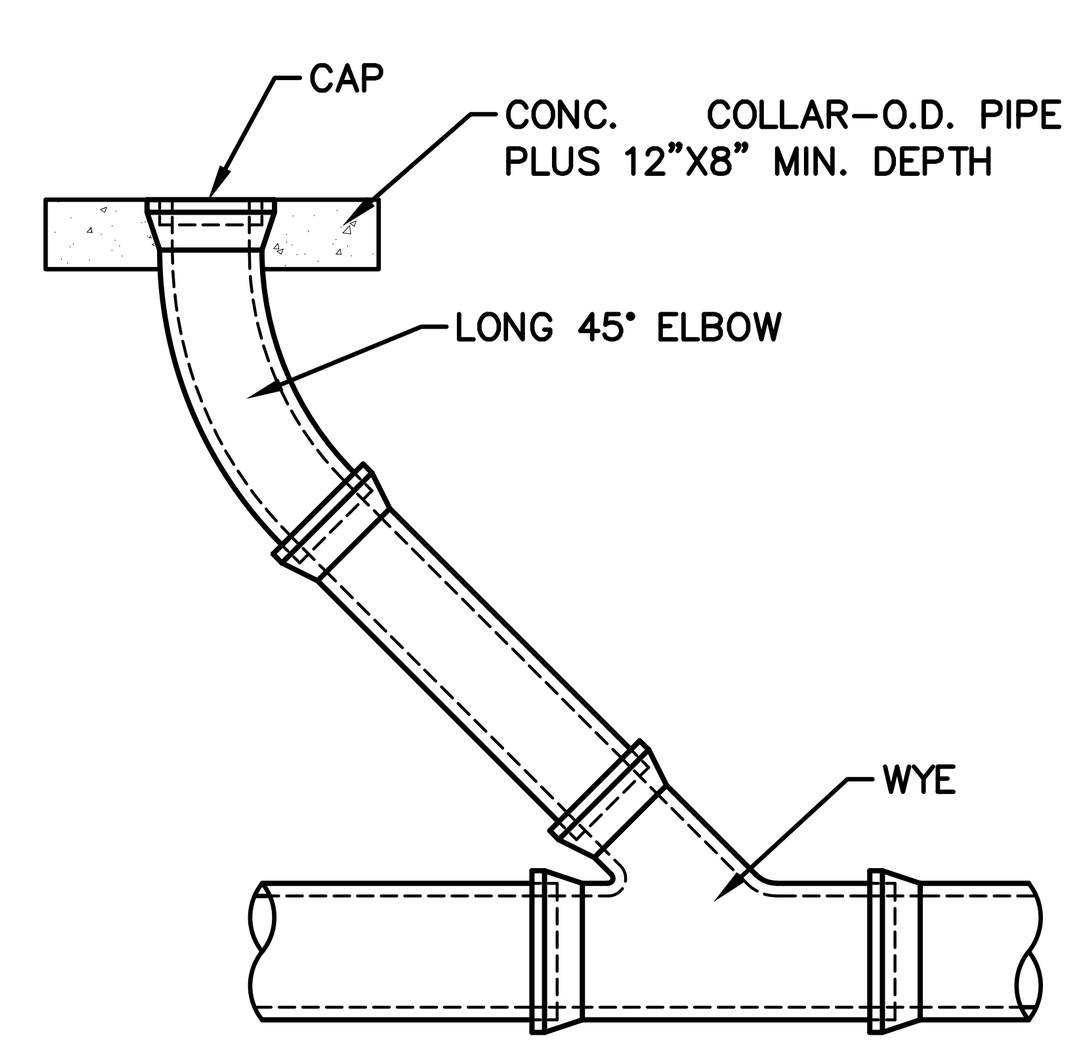
S51 SILT FENCE DETAIL

NOT TO SCALE



S53 STABILIZED CONSTRUCTION ACCESS

NOT TO SCALE



SANITARY CLEANOUT DETAIL

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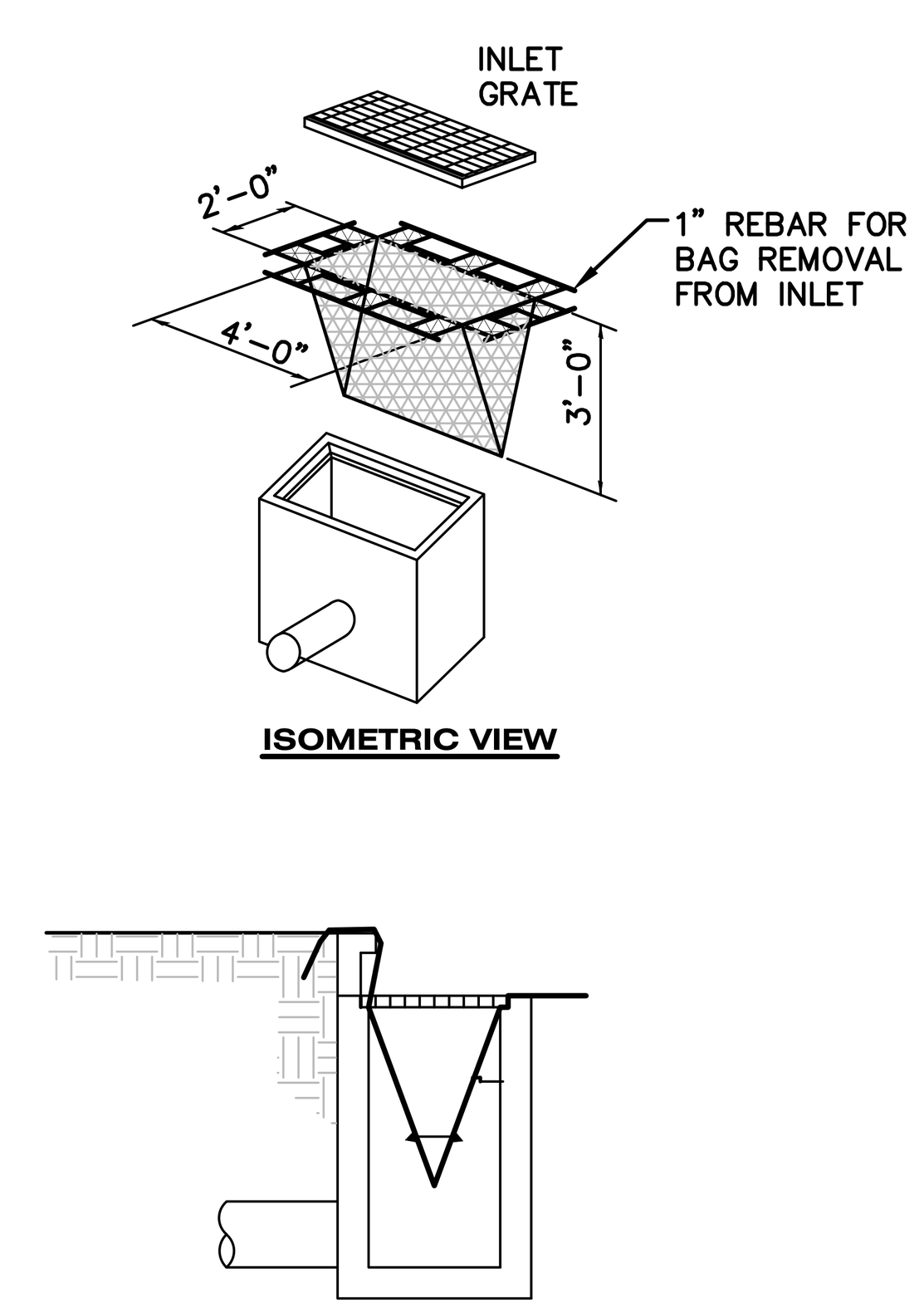
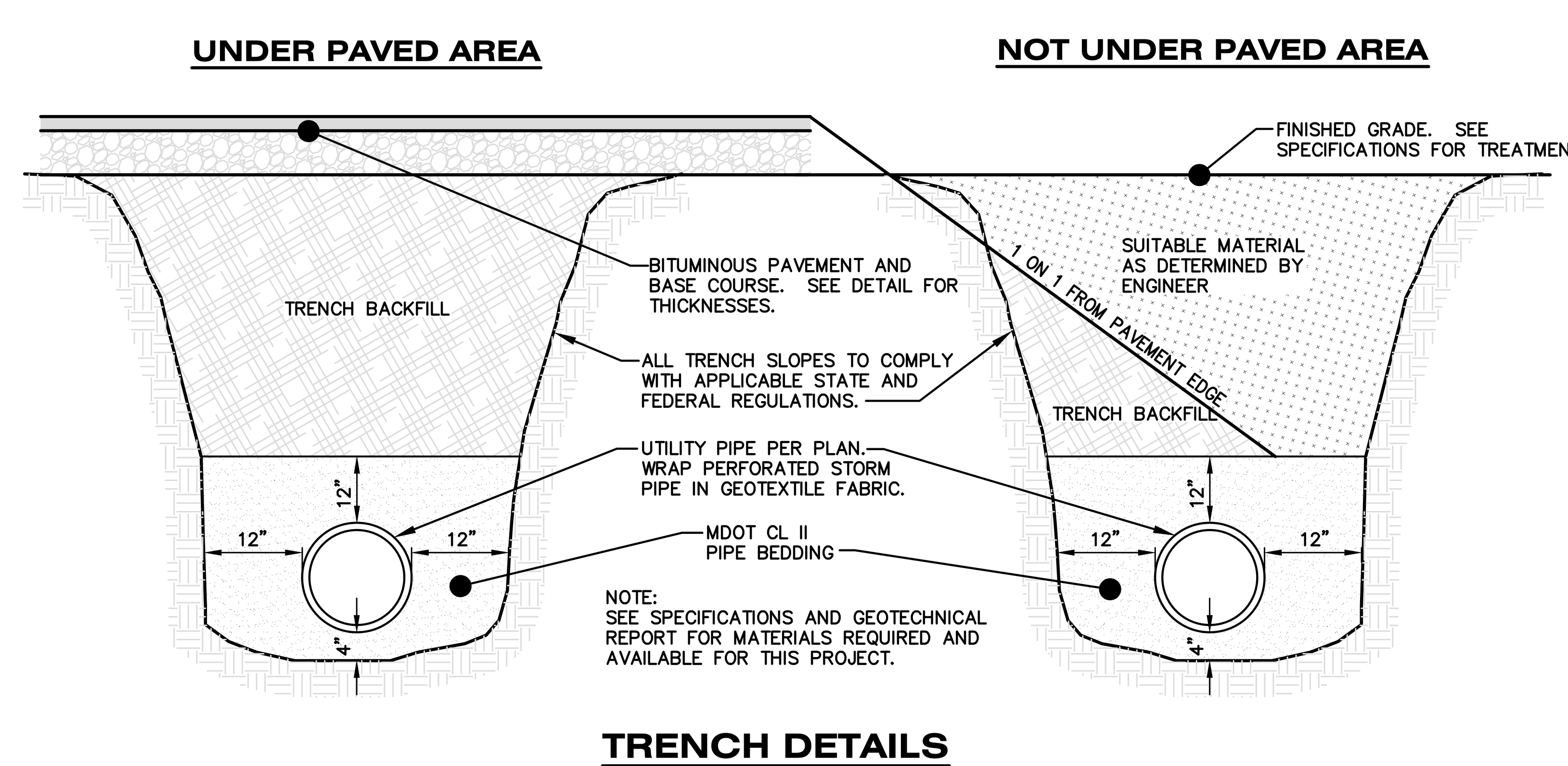


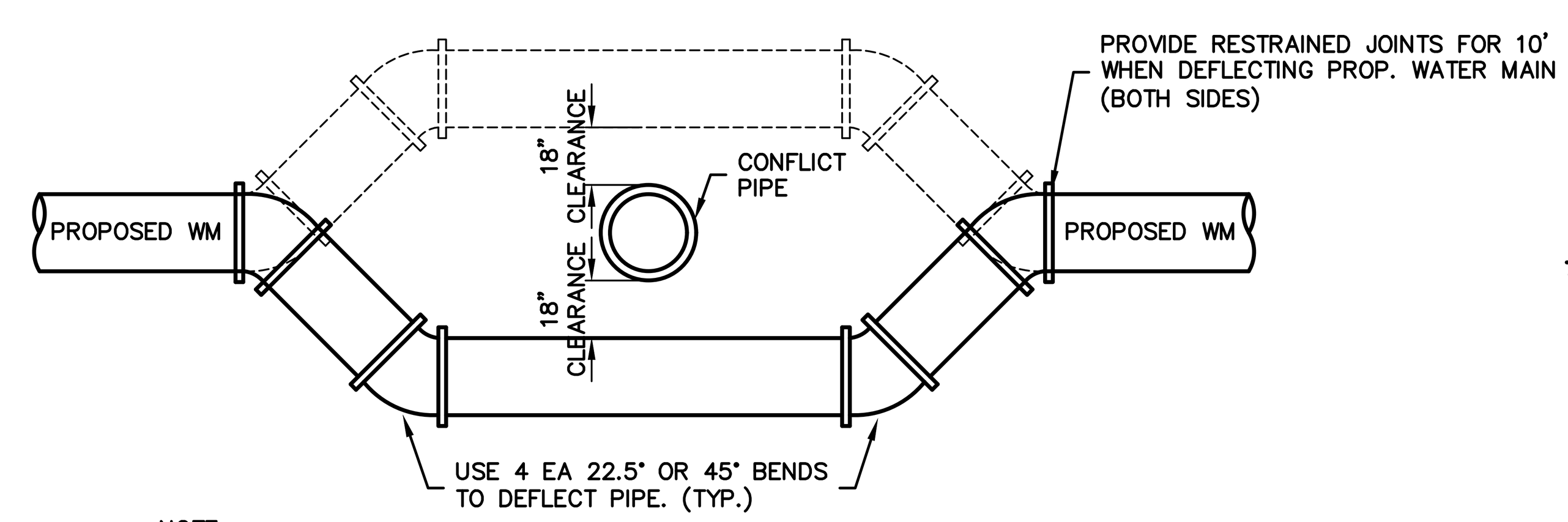
S58 INLET PROTECTION FABRIC DROP

NOT TO SCALE



TRENCH DETAILS

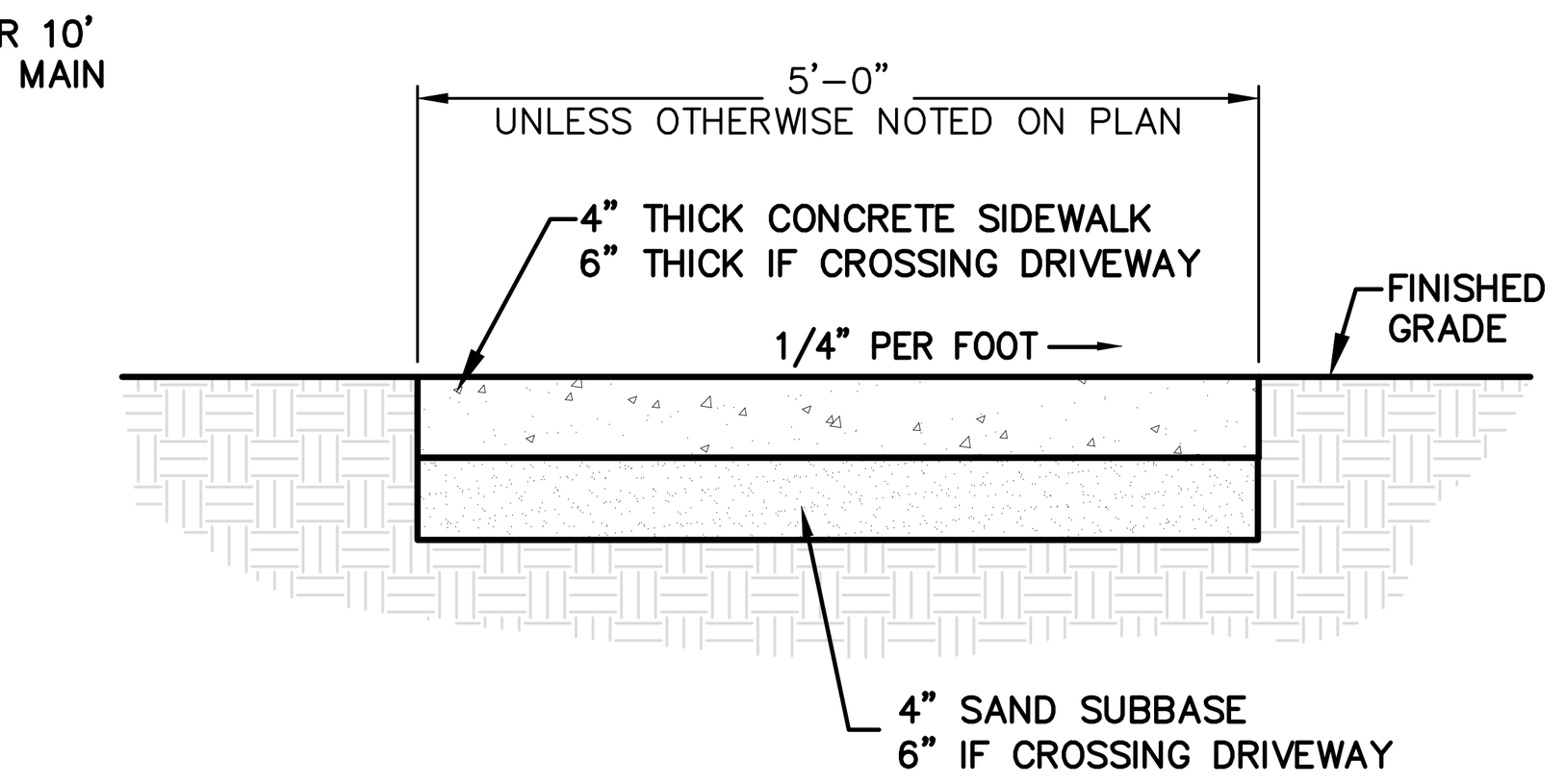
NO SCALE



NOTE:
RESTRAIN ALL JOINTS IN DEFLECTION AREA.

WATER MAIN DEFLECTION DETAIL

NOT TO SCALE



SIDEWALK PAVEMENT SECTION

NOT TO SCALE

Know what's below. Call before you dig. (811)

ALL UTILITIES AS SHOWN ARE APPROXIMATE LOCATIONS DERIVED FROM ACTUAL MEASUREMENTS AND AVAILABLE RECORDS. THEY SHOULD NOT BE INTERPRETED TO BE EXACT LOCATION NOR SHOULD IT BE ASSUMED THAT THEY ARE THE ONLY UTILITIES IN THE AREA.

KALAMAZOO COUNTRY CLUB
1609 Whites Rd, Kalamazoo, MI 49008

hurley & stewart, llc
2800 s. 11th street
kalamazoo, michigan 49009
269.552.4960 fax 269.552.4961
www.hurleystewart.com

Job No.: 21-046E P.M.: TAS Dft: NJR QA/QC: 5/9/25

ISSUED FOR/REVISIONS:
1 CITY SITE PLAN REVIEW SUBMITTAL 4/25/25
2 CITY NFP SUBMITTAL 5/9/25

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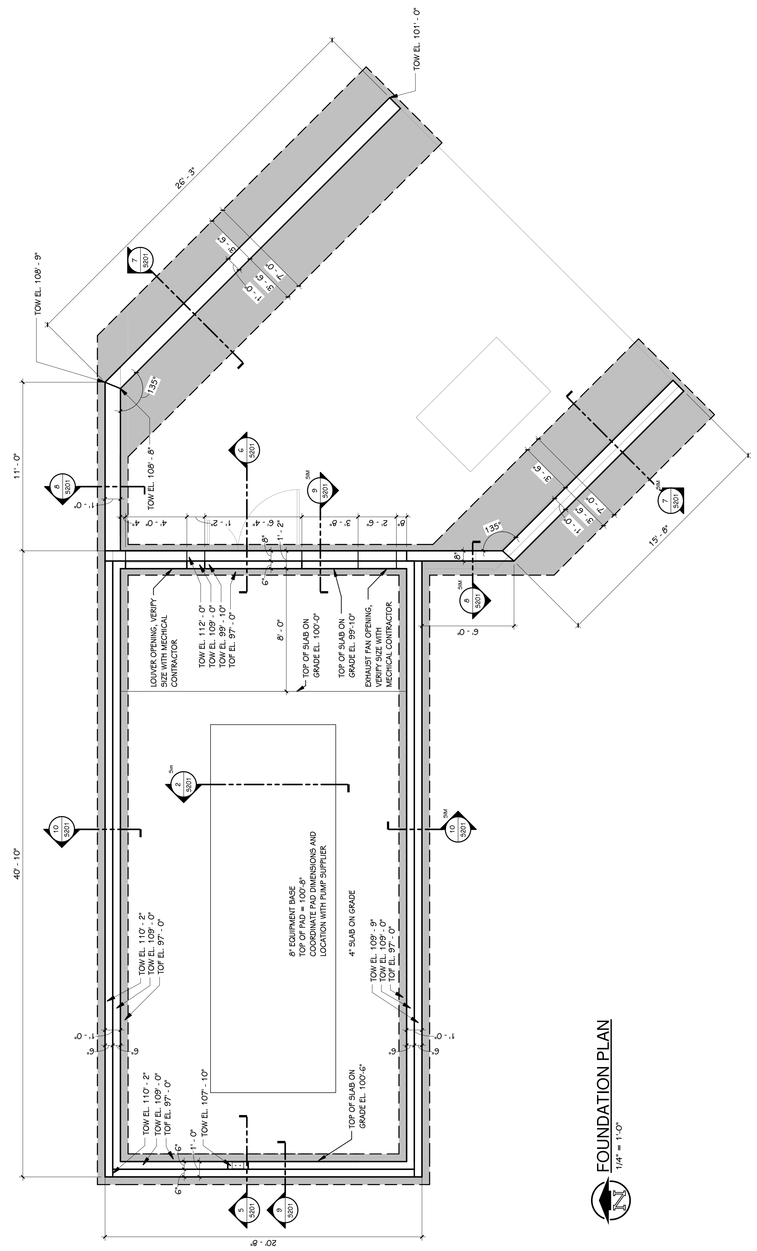
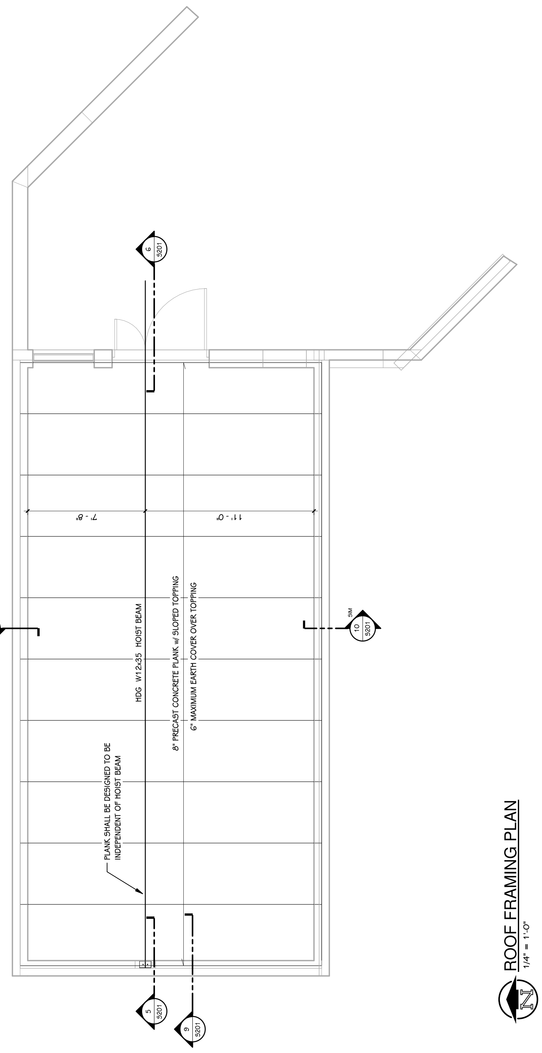
Sheet Title: **OVERALL SITE LAYOUT PLAN**
Project: **LEGACY COURSE**
Client: **KALAMAZOO COUNTRY CLUB**

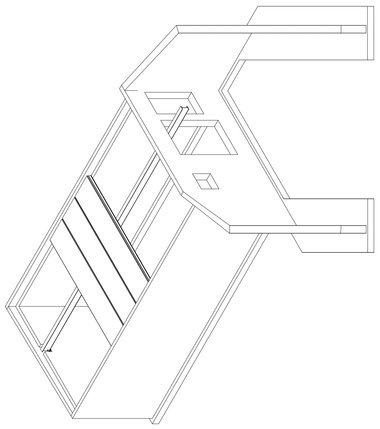
5/9/25
Sheet
C 500



FOUNDATION PLAN
1/4" = 1'-0"



ROOF FRAMING PLAN
1/4" = 1'-0"



STRUCTURAL AXONOMETRIC - SE

SHEET TITLE
FOUNDATION AND FRAMING PLANS

OWNER
KALAMAZOO COUNTRY CLUB

PROJECT TITLE
IRRIGATION BUILDING
Kalamazoo, Michigan

DATE
APRIL 22, 2025

SHEET NUMBER
S101

24-113.000

ISSUED FOR | DATE
PRELIMINARY

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DRAWN BY: XXX 4/21/2025 12:34:56 PM



SITE PLAN
1/16" = 1'-0"

SHEET TITLE
SITE PLAN

OWNER
KALAMAZOO COUNTRY CLUB

Kalamazoo, Michigan

PROJECT TITLE
IRRIGATION BUILDING

ISSUED FOR
PRELIMINARY
NOT FOR CONSTRUCTION

DATE

SHEET NUMBER
A 101
24-113.000

DATE
APRIL 16, 2025

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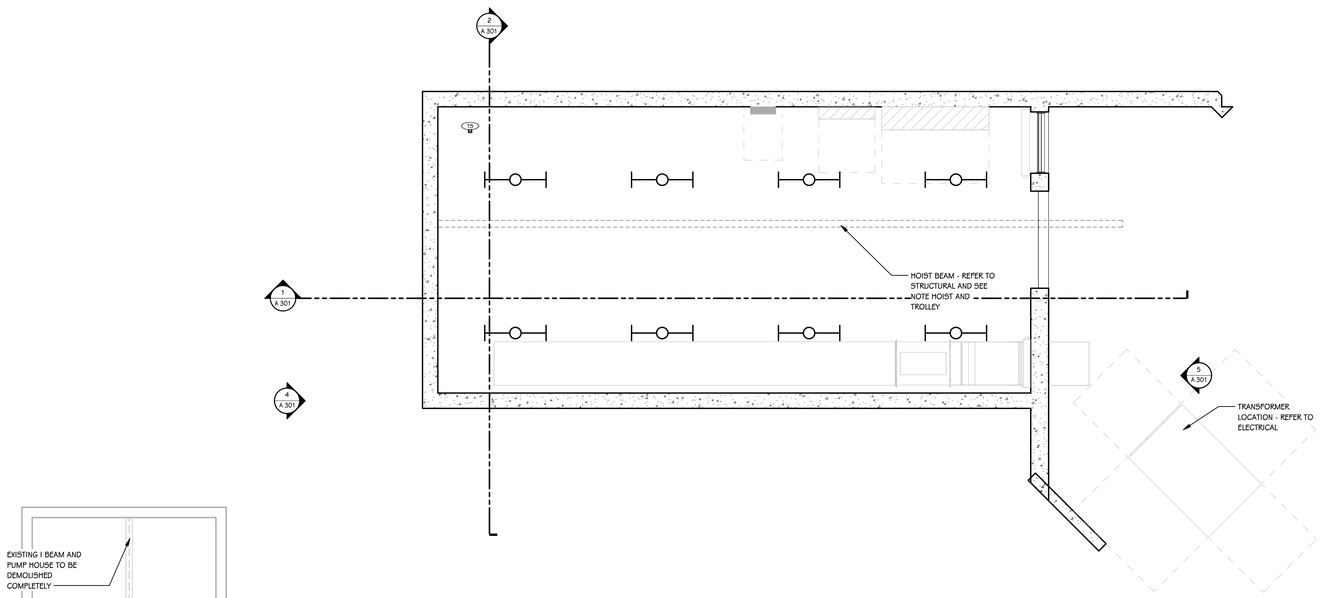
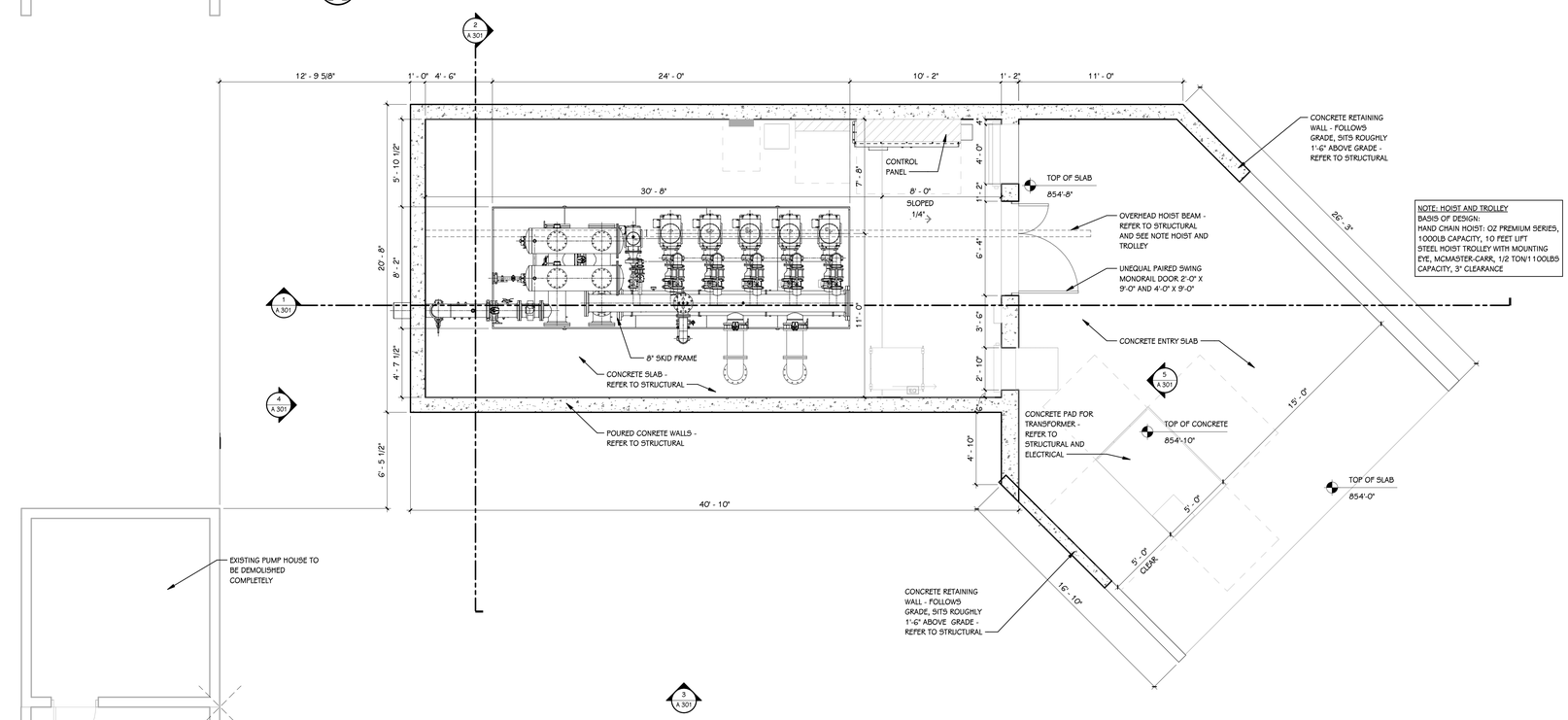


OVERALL FIRST FLOOR REFLECTED CEILING PLAN

1/4" = 1'-0"



OVERALL FIRST FLOOR PLAN

1/4" = 1'-0"

GENERAL NOTES - ARCHITECTURAL - DEMOLITION

1 CONTRACTORS ARE REQUIRED TO INSPECT/REVIEW THE EXISTING BUILDING PRIOR TO RELATED DEMOLITION WORK. UNLESS NOTED OTHERWISE, REMOVAL OF ANY WALL, FLOOR OR CEILING INCLUDES ALL GENERAL MECHANICAL AND ELECTRICAL ITEMS WHICH ARE A PART OF, OR ATTACHED TO IT.

2 CONTRACTOR SHALL VERIFY ALL EXISTING JOB SITE CONDITIONS AND DIMENSIONS AND BE RESPONSIBLE FOR THE SAME ADVISE CONSTRUCTION MANAGER OF ANY AND ALL DISCREPANCIES.

3 AT LOCATIONS OF REMOVED WALLS, ALL ASSOCIATED ITEMS ATTACHED TO THE WALL ARE TO BE REMOVED. SUCH AS: DOORS, WINDOWS, FRAMES, MARKERBOARDS, TACKBOARDS, TACK STRIPS, ETC.

GENERAL NOTES - ARCHITECTURAL - NEW CONSTRUCTION

1 THE OWNER RESERVES THE RIGHT TO REMOVE ANY ITEM FROM THE PROJECT PRIOR TO COMMENCEMENT OF CONTRACTED DEMOLITION WORK.

2 ALL EXISTING CONDITIONS SHOULD BE FIELD VERIFIED BEFORE WORK BEGINS.

3 DIMENSIONS GIVEN ARE ACTUAL AND ARE TO THE FACE OF MASONRY UNITS OR TO THE FACE OF STUD FRAMING, UNLESS NOTED OTHERWISE.

4 DETAILS SHOWN ILLUSTRATE DESIGN INTENT, NOT ALL POSSIBLE CONDITIONS. FOR CONDITIONS NOT SHOWN, USE DETAILS CLOSEST TO CONDITION IN QUESTION.

5 DOORS ARE TO BE 4" FROM CORNER OF ROOM, UNLESS NOTED OR DIMENSIONED OTHERWISE.

6 PAINT ALL ELECTRICAL PANEL COVERS AND ACCESS PANELS TO MATCH ADJACENT FINISHES. USING OIL-BASED PAINT, NOT LATEX WALL PAINT.

7 PROVIDE WOOD BLOCKING IN WALLS THAT REQUIRE WALL MOUNTED EQUIPMENT OR ACCESSORIES. COORDINATE WITH EQUIPMENT OR ACCESSORY MANUFACTURER.

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PROJECT TITLE
IRRIGATION BUILDING

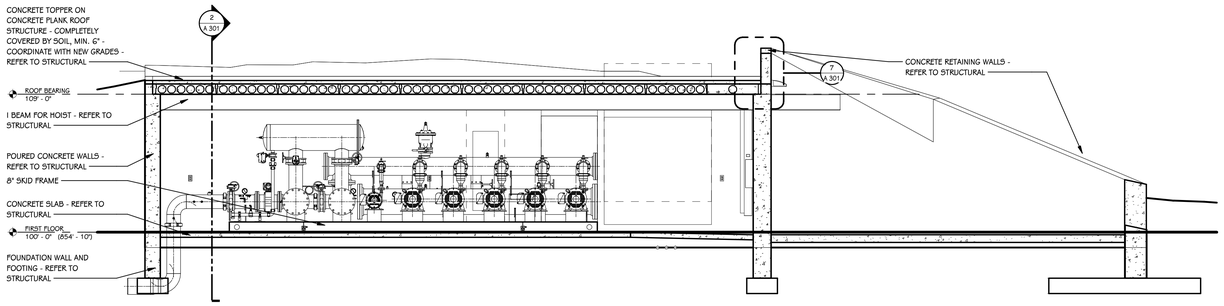
OWNER
KALAMAZOO COUNTRY CLUB

Kalamazoo, Michigan

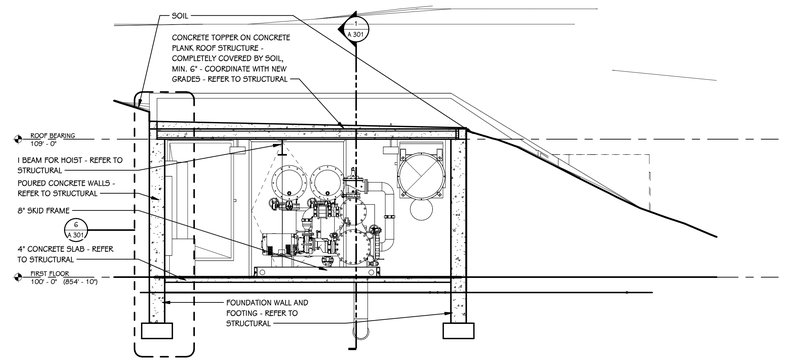
SHEET TITLE
OVERALL FIRST FLOOR PLAN AND REFLECTED CEILING PLAN

DATE
APRIL 16, 2025

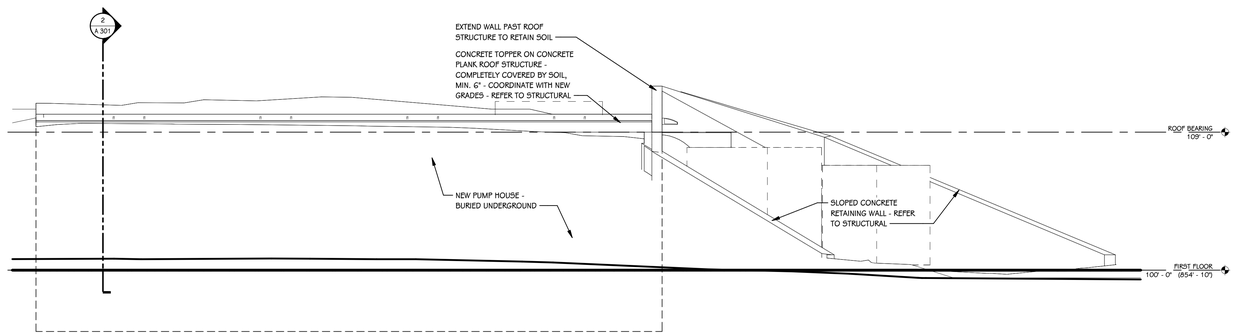
SHEET NUMBER
A 102
24-113.000



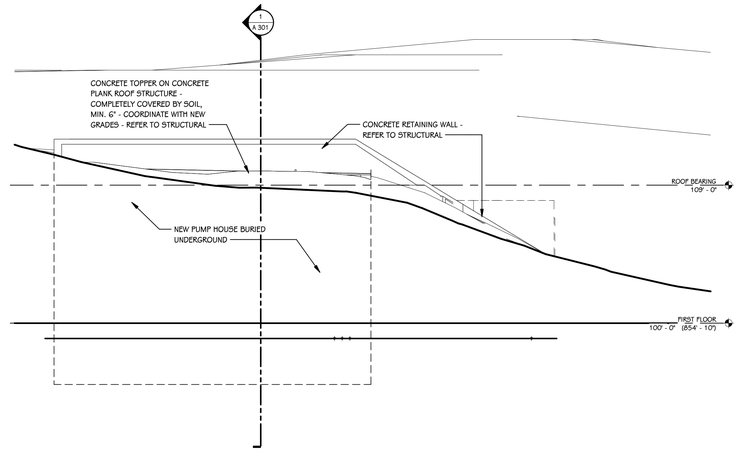
1 A 301 BUILDING SECTION
1/4" = 1'-0"



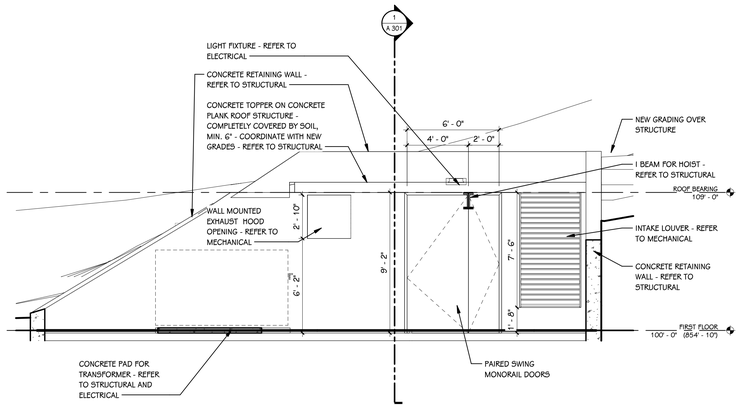
2 A 301 BUILDING SECTION
1/4" = 1'-0"



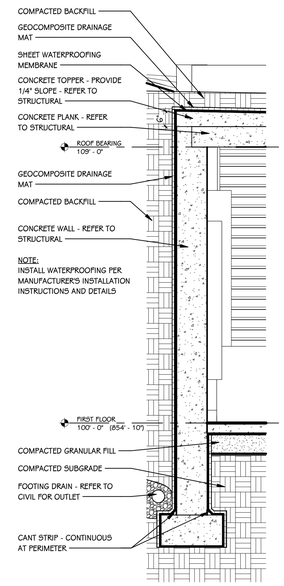
3 A 301 EXTERIOR SOUTH ELEVATION
1/4" = 1'-0"



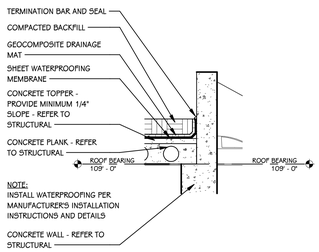
4 A 301 EXTERIOR WEST ELEVATION
1/4" = 1'-0"



5 A 301 EXTERIOR EAST ELEVATION
1/4" = 1'-0"



6 A 301 WALL SECTION DETAIL
1/2" = 1'-0"



7 A 301 WALL SECTION DETAIL
1/2" = 1'-0"

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IRRIGATION BUILDING

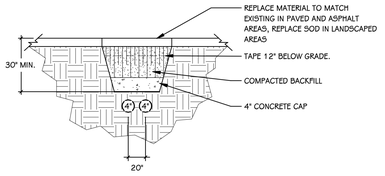
OWNER
KALAMAZOO COUNTRY CLUB

Kalamazoo, Michigan

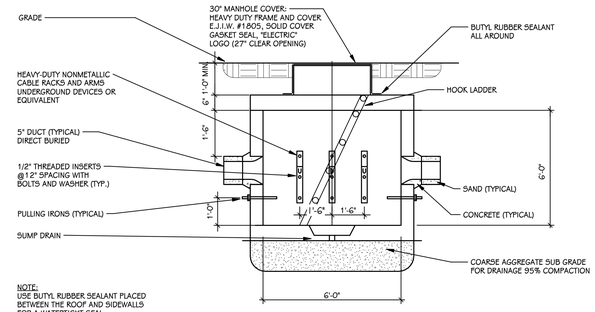
SHEET TITLE
BUILDING SECTIONS AND EXTERIOR ELEVATIONS

DATE
APRIL 16, 2025

SHEET NUMBER
A 301
24-113.000



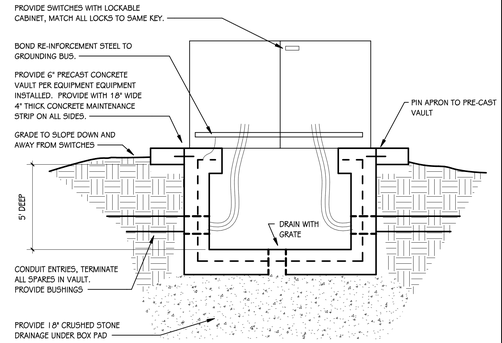
UNDERGROUND CONDUIT 2X1
SCALE: NONE

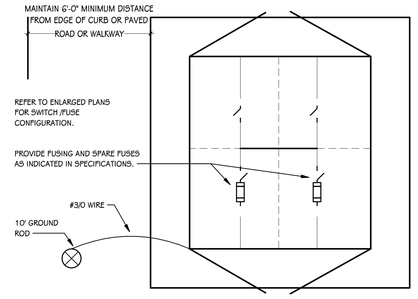


MANHOLE DETAIL
SCALE: NONE



ELECTRICAL SITE PLAN
1" = 80'-0"





MEDIUM VOLTAGE SWITCH DETAILS
PME 9, 12 & VFI SHOWN
SCALE: NONE

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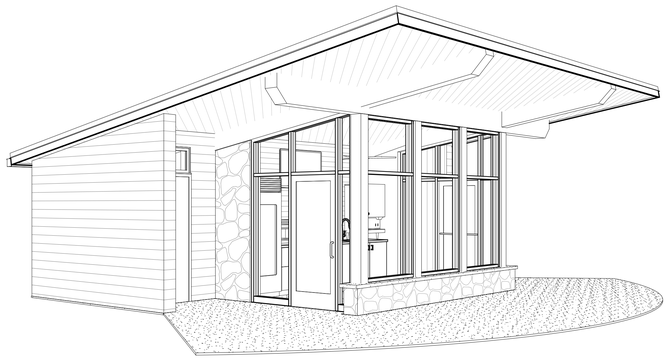
KALAMAZOO COUNTRY CLUB

Kalamazoo, Michigan

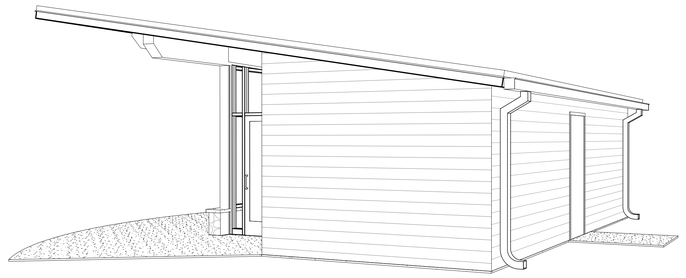
SHEET TITLE
ELECTRICAL SITE PLAN

DATE
APRIL 17, 2025

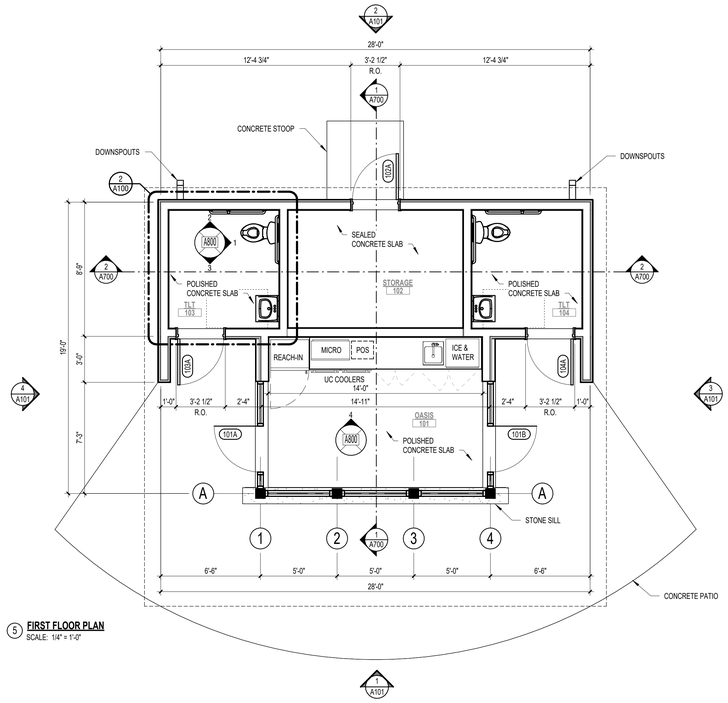
SHEET NUMBER
ES101
24-113.000



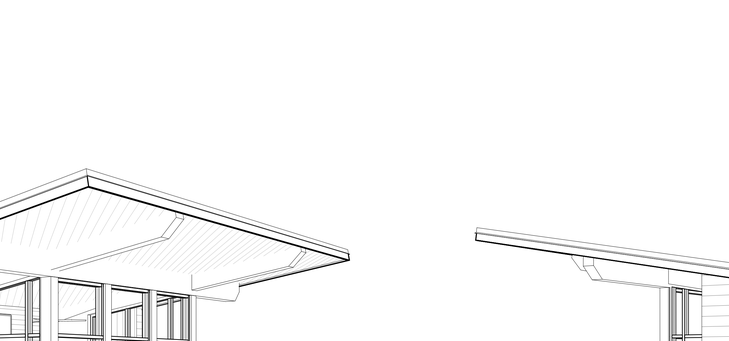
7 **Perspective 01**
SCALE:



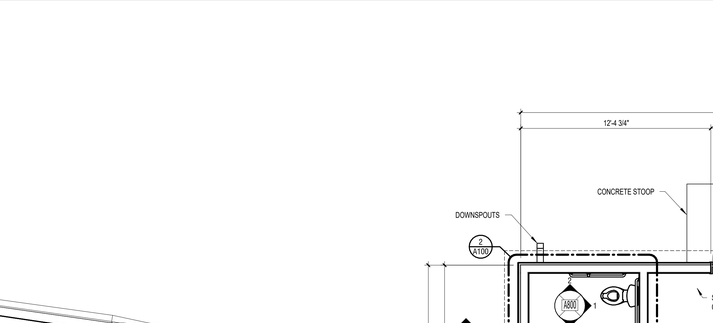
6 **Perspective 02**
SCALE:



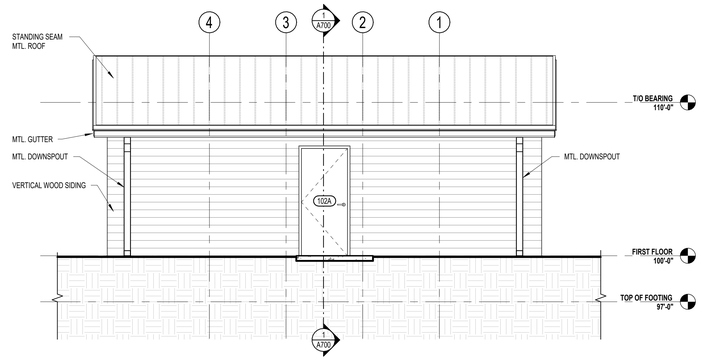
5 **FIRST FLOOR PLAN**
SCALE: 1/4" = 1'-0"



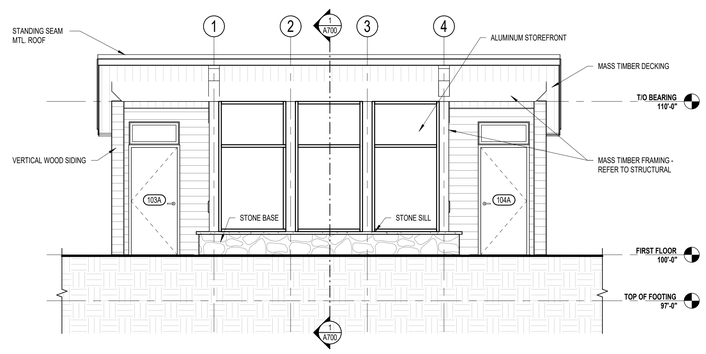
4 **EXTERIOR ELEVATION - SIDE 01**
SCALE: 1/4" = 1'-0"



3 **EXTERIOR ELEVATION - SIDE 02**
SCALE: 1/4" = 1'-0"



2 **EXTERIOR ELEVATION - REAR**
SCALE: 1/4" = 1'-0"



1 **EXTERIOR ELEVATION - FRONT**
SCALE: 1/4" = 1'-0"

DRAFT SET

NO.	REVISION DESCRIPTION	BY	DATE

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Engineering, Architecture, Land Surveying
229 W. Berry St.
Fort Wayne
IN 46802
T 260.213.2500
abonmarche.com

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PROJECT:
KALAMAZOO COUNTRY CLUB
NEW OUTBUILDINGS
1609 WHITES RD
KALAMAZOO, MI 49008

NOT FOR CONSTRUCTION
PLANS & ELEVATIONS
REVIEW
SITE PLAN REVIEW SET

SHEET TITLE:

MODELED BY: JCA
DESIGNED BY:
PM REVIEW:
QA/QC REVIEW:
DATE: 2025.04.15
SEAL:

SIGNATURE:
DATE:

HARD COPY IS INTENDED TO BE 30" x 42" WHEN PLOTTED TO SCALE(S) INDICATED. GRAPHIC QUALITY MAY NOT BE ACCURATE FOR ANY OTHER SIZES

SCALE:
UNLESS NOTED OTHERWISE

ACI JOB #: 23-1225

SHEET NO.: A101

4/14/2025 9:59:09 AM

FOUNDATIONS:

1. ASSUMED ALLOWABLE SOIL BEARING CAPACITY IS 2,000 PSF. CONTRACTOR TO VERIFY BEARING CAPACITY.
2. REMOVE ALL UNSUITABLE MATERIAL WITHIN THE CONSTRUCTION AREA OF THE FOUNDATIONS AND CONCRETE SLAB.
3. ENGINEERED FILL. IF REQUIRED TO CORRECT SUBGRADE DEFICIENCIES, SHALL CONSIST OF APPROVED FILL MATERIAL, SUCH AS CLEAN GRADED GRANULAR FILL PLACED IN 9 INCH MAXIMUM DEPTH LIFTS AND COMPACTED BY SUITABLE VIBRATORY EQUIPMENT. THE FILL IS TO BE COMPACTED SUCH THAT THE DRY DENSITY OF THE FILL IS EQUAL TO 95% OF ITS MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR TEST (ASTM D-1557).
4. ALL SHEETING, SHORING AND BRACING REQUIREMENTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
5. EXCAVATE AND FILL AS REQUIRED. REMOVE UNSTABLE SOILS. COMPACT FILL AND BACKFILL.
6. ALL FOOTINGS SHALL BEAR ON UNDISTURBED SOIL OR COMPACTED FILL. FILL AND BACKFILL MATERIALS SHALL BE COMPACTED SOILS AS RECOMMENDED BY THE PROJECT SOILS REPORT.

GENERAL:

1. REFER TO ARCHITECTURAL DRAWINGS FOR DIMENSIONS NOT SHOWN ON STRUCTURAL DRAWINGS.
2. COORDINATE DETAILS AND DIMENSIONS ON THE STRUCTURAL DRAWINGS WITH RELATED REQUIREMENTS ON THE ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS. COORDINATE EXACT SIZES AND LOCATIONS OF FLOOR AND WALL OPENINGS, SLEEVES AND INSERTS WITH ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS.
3. OWNER TO PROVIDE ALL SPECIAL INSPECTION AND TESTING BY INDEPENDENT TESTING COMPANIES AS REQUIRED.
4. THE STRUCTURE HAS BEEN DESIGNED FOR IN-SERVICE LOADS ONLY AND TO BE SELF-SUPPORTING AFTER THE BUILDING IS COMPLETE. THE METHODS, MEANS, PROCEDURES, AND SEQUENCES OF CONSTRUCTION ARE THE RESPONSIBILITY OF THE CONTRACTOR. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ERECTION PROCEDURES AND SEQUENCE TO ENSURE SAFETY OF THE BUILDING AND ITS COMPONENTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF NECESSARY SHORING, SHEETING, TEMPORARY BRACING, GUYS, TIEDOWNS, ETC.

WOOD FRAMING:

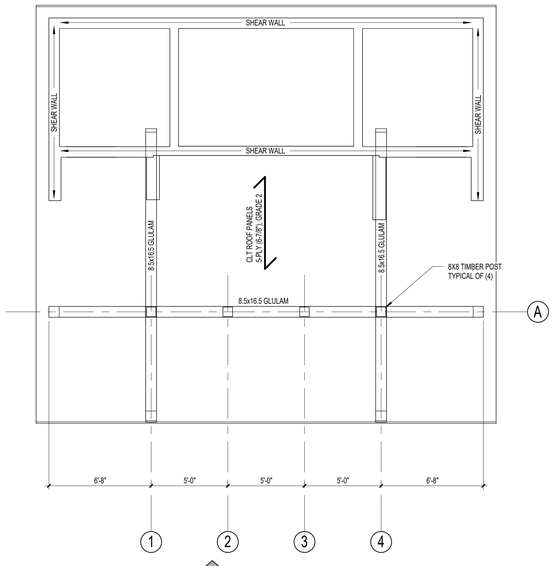
1. WOOD FRAMING TO MEET NATIONAL DESIGN SPECIFICATIONS FOR WOOD CONSTRUCTION BY AF & PA, TIMBER CONSTRUCTION STANDARDS BY AITC AND DESIGN SPECIFICATIONS FOR LIGHT METAL PLATE CONNECTED WOOD TRUSSES BY ANSI/TPI AS APPLICABLE.
2. DIMENSION LUMBER FOR FRAMING SHALL BE SPRUCE-PINE-FIR (SPF), NO.1/NO.2 OR BETTER, UNLESS NOTED OTHERWISE. ALLOWABLE STRESSES PER 2015 SUPPLEMENT TO THE 2015 EDITION OF THE NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION.
3. ALL METAL HANGERS AND CONNECTORS SHALL BE MANUFACTURED BY SIMPSON STRONG-TIE OR APPROVED EQUIVALENT AND BE OF THE SIZE AND TYPE RECOMMENDED BY THE MANUFACTURER.
4. ALL HEADERS AND BUILT-UP DIMENSION LUMBER BEAMS SHALL BE GLUED AND NAILED AT 8" O.C. STAGGERED BOTH SIDES WITH 16D NAILS, UNLESS SPECIFICALLY NOTED OTHERWISE (SEE NOTES BELOW).
5. SUPPLY PRESSURE TREATED LUMBER, TREATED IN ACCORDANCE WITH AWPA C-1 AND DRIED AFTER TREATMENT, FOR ALL POTENTIALLY WET LOCATIONS SUCH AS SILL PLATES, CANTS, NAILERS, BLOCKING, ETC.
6. GLUE LAMINATED TIMBER SHALL BE SOUTHERN PINE WITH A STRESS CLASS OF 24F-1.8E.
7. LAMINATED VENEER LUMBER (LVL) SHALL BE DESIGNED, MANUFACTURED AND INSTALLED IN ACCORDANCE WITH THE STANDARDS SET FORTH IN THE CURRENT NATIONAL EVALUATION REPORT (NER). A COPY OF THE CURRENT APPLICABLE REPORT SHALL BE SUBMITTED AS PART OF THE SUBMITTAL PROCESS FOR ANY LVL MATERIAL TO BE INCLUDED ON THIS PROJECT.
8. ALL LVL HEADERS AND BUILT-UP BEAMS SHALL BE ASSEMBLED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDED PRACTICE.
9. PROVIDE BUILT-UP COLUMNS UNDER ALL HEADER BEARING LOCATIONS UTILIZING SUFFICIENT NUMBER OF STUDS TO PROVIDE MINIMUM BEARING LENGTHS. GLUE AND NAIL BUILT-UP COLUMNS TOGETHER.
10. BUILT UP COLUMNS: LAMINATE WITH (2) ROWS OF 30d COMMON WIRE NAILS. NAILS SHALL BE SPACED 16 INCHES O.C., ROWS SHALL BE 1-1/2 INCHES FROM MEMBER EDGE; ROWS SHALL BE STAGGERED 8 INCHES. LAST NAIL IN ROW SHALL BE 3-1/2 INCHES FROM END OF BUILT-UP COLUMN.
11. DOUBLE TOP PLATE MEMBER SPLICES ARE TO BE STAGGERED AND FASTENED WITH (18) 16d NAILS.
12. FRAMING PLANS SHOW PRIMARY FRAMING MEMBERS, SIZES AND SUPPORTS. FRAMER SHALL PROVIDE ALL FRAMING REQUIRED (WHETHER SPECIFICALLY SHOWN OR NOT) FOR HEADERS, NAILERS, CORNERS, PARTITION SUPPORTS, ROOF CRICKETS, CEILING JOISTS, STAIRS, BRIDGING, ETC. TO MAKE A COMPLETE AND SOUND INSTALLATION IN ACCORDANCE WITH ALL APPLICABLE CODES.
13. MATERIAL STANDARDS:
    - SPRUCE-PINE-FIR
      GRADE = NO.1/NO.2, Fb = 875 psi, Fc|| = 1,150 psi, Fv = 135 psi, E = 1.4x10^6 psi
    - LAMINATED VENEER LUMBER (LVL)
      GRADE = 2.0E, Fb = 2,600 psi, Fc|| = 2,510 psi, Fv = 285 psi, E = 2.0x10^6 psi
    - PARALLEL STRAND LUMBER (PSL)
      GRADE = 1.8E, Fb = 2,400 psi, Fc|| = 2,500 psi, Fv = 285 psi, E = 1.8x10^6 psi

CONCRETE & REINFORCEMENT:

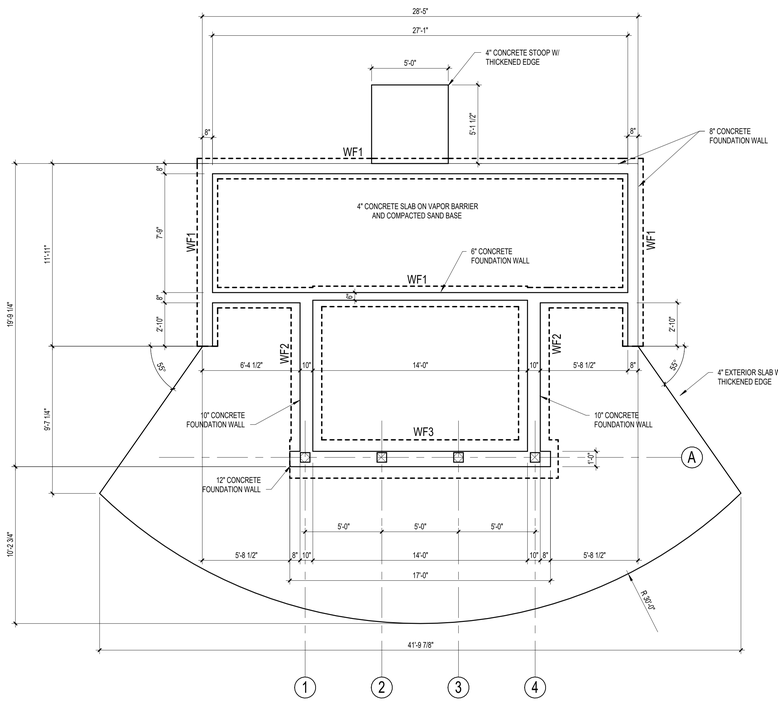
1. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE SPECIFICATION FOR STRUCTURAL CONCRETE FOR BUILDINGS, ACI 318 & 301.
2. CONCRETE PLACEMENT AND QUALITY: SPECIFIED IN PROJECT SPECIFICATIONS.
3. DEBRIS: REMOVE ALL DEBRIS FROM FORMS BEFORE POURING.
4. SEGREGATION OF AGGREGATES: CONCRETE SHALL NOT BE DROPPED THROUGH REINFORCING STEEL (AS IN WALLS, COLUMNS AND DROP CAPITALS) SO AS TO CAUSE SEGREGATION OF AGGREGATES. USE HOPPERS, CHUTES OR TRUNKS OF VARYING LENGTH SO THAT THE FREE UNCONFINED FALL OF CONCRETE SHALL NOT EXCEED EIGHT FEET, AND A SUFFICIENT NUMBER SHALL BE USED TO ENSURE THAT THE CONCRETE IS KEPT LEVEL AT ALL TIMES.
5. INSERTS: ALL ITEMS TO BE CAST IN CONCRETE SUCH AS REINFORCING, DOWELS, BOLTS, ANCHORS, PIPES, SLEEVES, ETC., SHALL BE SECURELY POSITIONED IN THE FORMS BEFORE PLACING.
6. SPLICES: SPLICE BARS IN MEMBERS SUCH AS SPANDRELS, BEAMS, ETC., AS FOLLOWS: TOP BARS AT CENTERLINE OF SPAN, BOTTOM BARS AT THE SUPPORT. ALL REINFORCING STEEL SHALL BE SECURELY WIRED AND PROPERLY SUPPORTED ABOVE GROUND AND AWAY FROM THE FORMS.
7. CONSTRUCTION JOINTS: CONSTRUCTION JOINTS SHALL HAVE ENTIRE SURFACE REMOVED TO EXPOSE CLEAN, SOLIDLY EMBEDDED AGGREGATE. THE CONTRACTOR SHALL OBTAIN THE ENGINEER'S APPROVAL OF CONSTRUCTION JOINT LOCATION IN SLABS AND BEAMS.
8. ALL REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A-615 GRADE 60, U.N.O.
9. WELDED WIRE FABRIC: WELDED WIRE FABRIC SHALL CONFORM TO ASTM A82 AND A185.
10. WELDING: TACK WELDING OF REBAR IS NOT PERMITTED UNLESS CALLED FOR OR APPROVED BY THE ENGINEER. WELDING OF STIRRUPS, TIES, INSERTS OR OTHER SIMILAR ELEMENTS TO LONGITUDINAL REINFORCING BARS SHALL NOT BE PERMITTED.
11. REBAR COVER: MINIMUM REBAR COVER FOR CONCRETE SHALL BE AS FOLLOWS:
    - CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH: 3"
    - EXPOSED TO EARTH OR WEATHER: 2"
    - NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND: 2"
12. PROVIDE POSITIVE SUPPORT FOR REINFORCEMENT PRIOR TO PLACING CONCRETE TO ASSURE CORRECT POSITIONING AND TO MAINTAIN 3" MINIMUM CLEAR CONCRETE COVER AT BOTTOM AND SIDES OF ALL FOOTINGS AND THICKENED SLABS. PLACE SLAB REINFORCING ON CHAIRS.
13. REINFORCING CHAIRS AND SCREED POSTS SHALL NOT PENETRATE VAPOR BARRIER.
14. CONCRETE QUALITY: SPECIFIED IN PROJECT SPECIFICATIONS.
15. CONCRETE WEIGHT: ALL CONCRETE SHALL BE OF NORMAL WEIGHT UNLESS NOTED OTHERWISE.
16. ALL CONCRETE SHALL BE ROCK CONCRETE CONFORMING TO ASTM C-33.
17. AGGREGATE: SIZE OF AGGREGATE SHALL CONFORM TO ASTM C33-03.
    - 3/4"ASTM SIZE C67
    - 1"ASTM SIZE C57
18. CEMENT: SHALL BE TYPE I OR TYPE 1L PORTLAND.
19. CONCRETE AGE: NO MORE THAN 90 MINUTES SHALL ELAPSE BETWEEN CONCRETE BATCHING AND CONCRETE PLACEMENT UNLESS APPROVED BY TESTING AGENCY.
20. WET SET: REINFORCEMENT MAY NOT BE WET SET IN CONCRETE POURS.
21. ROUGHENED SURFACES: WHERE INDICATED ON THE DRAWINGS, ROUGHENED SURFACES SHALL BE PROVIDED BY MEANS OF HEAVY RAKING OR GROOVING. OTHER METHODS MAY BE ACCEPTABLE PENDING WRITTEN APPROVAL FROM THE ENGINEER. ALL INTERFACING SURFACES MUST BE CLEAN AND FREE OF LOOSE MATERIALS.
22. INTERIOR SLABS THAT DO NOT RECEIVE A FINISH FLOORING MATERIAL SHALL BE SEALED AFTER CURING.
23. ADMIXTURES: NO ADMIXTURES SHALL BE ADDED TO THE CONCRETE MIX WITHOUT THE APPROVAL OF THE ENGINEER, UNLESS NOTED OTHERWISE.
24. PROVIDE BENT BAR DOWELS OR HOOKED VERTICAL BARS AT ALL FOOTINGS INTO FOUNDATION WALLS AS INDICATED ON THE DRAWINGS.
25. UNLESS OTHERWISE NOTED, PROVIDE 24"x24" INCH CORNER BARS AT ALL FOOTING AND FOUNDATION WALL INTERSECTIONS MATCHING THE SIZE AND SPACING OF CONTINUOUS HORIZONTAL REINFORCING.
26. WHEN REINFORCEMENT IS LAP SPLICED, PROVIDE CLASS B SPLICE TYPICAL, UNLESS NOTED.
27. PROVIDE A 3/4" INCH CHAMFER ON ALL EXPOSED CORNERS OF CONCRETE, UNLESS NOTED OTHERWISE.
28. CONCRETE FINISHES:
    - EXTERIOR SLABS - LIGHT BROOM FINISH
    - INTERIOR SLABS ON GRADE - HARD STEEL TROWEL
29. OPENING THROUGH WALLS, SLABS OR OTHER STRUCTURAL ELEMENTS NOT DETAILED ON THE STRUCTURAL DRAWINGS MUST BE SHOWN ON THE APPLICABLE REINFORCING STEEL SHOP DRAWINGS. THE FINAL LOCATION OF ALL OPENINGS MUST BE REVIEWED BY THE ENGINEER/ARCHITECT BEFORE THE CONCRETE IS PLACED.
30. REINFORCING AND ANCHOR SETTING EPOXY SHALL BE HILTI HIT-HY 200 OR EQUIVALENT.
31. SLAB CONTROL JOINTS SHALL BE SAWCUT. PROVIDE CONTROL JOINTS IN SLABS ON GRADE AT 12'-0" MAXIMUM SPACING AND AS REQUIRED TO CONTROL CRACKING.
32. CONCRETE MIXTURES:
    FOOTINGS AND FOUNDATION WALLS:
    - MINIMUM 28-DAY COMPRESSIVE STRENGTH: 3,500 PSI
    - MAXIMUM WATER/CEMENT RATIO: 0.45
    - SLUMP LIMIT: 4 INCHES, PLUS/MINUS 1 INCH
    - AIR CONTENT: 5.5%, PLUS/MINUS 1.5%

    INTERIOR SLABS-ON-GRADE:
    - MINIMUM 28-DAY COMPRESSIVE STRENGTH: 4,000 PSI
    - MAXIMUM WATER/CEMENT RATIO: 0.45
    - SLUMP LIMIT: 4 INCHES, PLUS/MINUS 1 INCH
    - AIR CONTENT: 3% MAX, NO AIR-ENTRAINING ADMIXTURE
    - TUFF-STRAND FIBERS: 4.0 LBS / CUBIC YARD

    EXTERIOR SLABS-ON-GRADE:
    - MINIMUM 28-DAY COMPRESSIVE STRENGTH: 4,000 PSI
    - MAXIMUM WATER/CEMENT RATIO: 0.45
    - SLUMP LIMIT: 4 INCHES, PLUS/MINUS 1 INCH
    - AIR CONTENT: 6%, PLUS/MINUS 1.5%
    - TUFF-STRAND FIBERS: 4.0 LBS / CUBIC YARD
33. PROVIDE REINFORCING STEEL SHOP DRAWINGS. DRAWINGS ARE TO DETAIL FABRICATION, BENDING AND PLACEMENT, INCLUDE BAR SIZES, LENGTHS, MATERIALS, GRADES, BAR SCHEDULES, STIRRUP SPACING, BENT BAR DIAGRAMS, BAR ARRANGEMENT, LOCATION OF SPLICES, LENGTHS OF LAP SPLICES, DETAILS OF MECHANICAL SPLICE COUPLERS, TIE SPACING, HOOP SPACING, AND SUPPORT FOR CONCRETE REINFORCEMENT.
34. PROVIDE SUBMITTALS FOR THE FOLLOWING PRODUCTS: PORTLAND CEMENT, FLY ASH, SLAG CEMENT, AGGREGTES, ADMIXTURES, VAPOR RETARDERS, FLOOR AND SLAB TREATMENTS, CURING MATERIALS, AND JOINT FILLERS.
35. PROVIDE SUBMITTALS FOR CONCRETE MIX DESIGNS. SUBMITTALS ARE TO INCLUDE MIXTURE IDENTIFICATION, MINUMUM 28-DAY COMPRESSIVE STRENGTH, MAXIMUM WATER/CEMENT RATIO, SLUMP LIMIT, AIR CONTENT, AND NOMINAL MAXIMUM AGGREGATE SIZE.



ROOF FRAMING PLAN
SCALE: 1/4" = 1'-0"



FOUNDATION PLAN
SCALE: 1/4" = 1'-0"
TOP OF FOOTING = 97'-0", UNLESS NOTED OTHERWISE
FLOOR ELEVATION = 100'-0"

WALL FOOTING SCHEDULE

MARK	SIZE	REINFORCEMENT
WF1	1'-4"x1'-0"	(2) #5 CONTINUOUS
WF2	2'-0"x1'-0"	(2) #5 CONTINUOUS
WF3	2'-6"x1'-0"	(2) #5 CONTINUOUS

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abonmarche.com
Engineering, Architecture, Land Surveying

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PROJECT:
KALAMAZOO COUNTRY
NEW OLD BUILDINGS
1609 WHITES RD
KALAMAZOO, MI 49008

NOT FOR CONSTRUCTION
FIRST FLOOR FRAMING &
FOUNDATION PLANS
SITE PLAN REVIEW SET

SHEET TITLE:
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QA/QC REVIEW:
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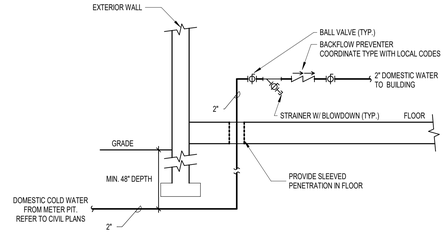

1 / P1.1 **DOMESTIC WATER SERVICE DETAIL**
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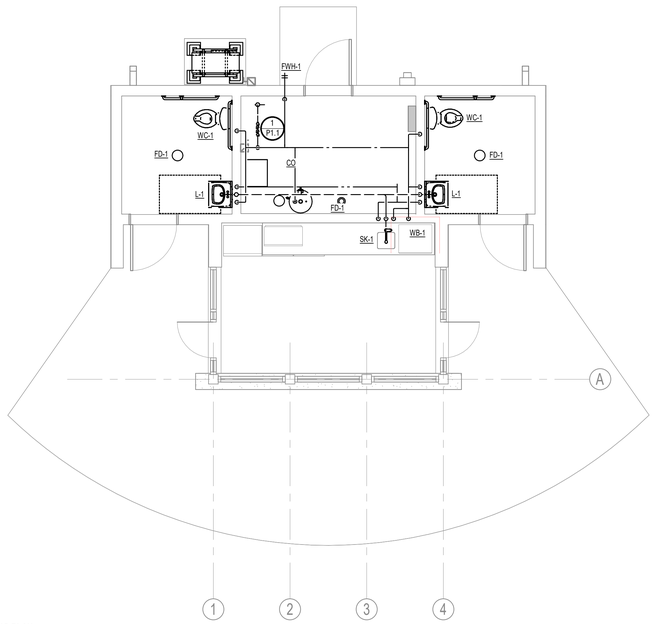

N **PLUMBING PLAN**
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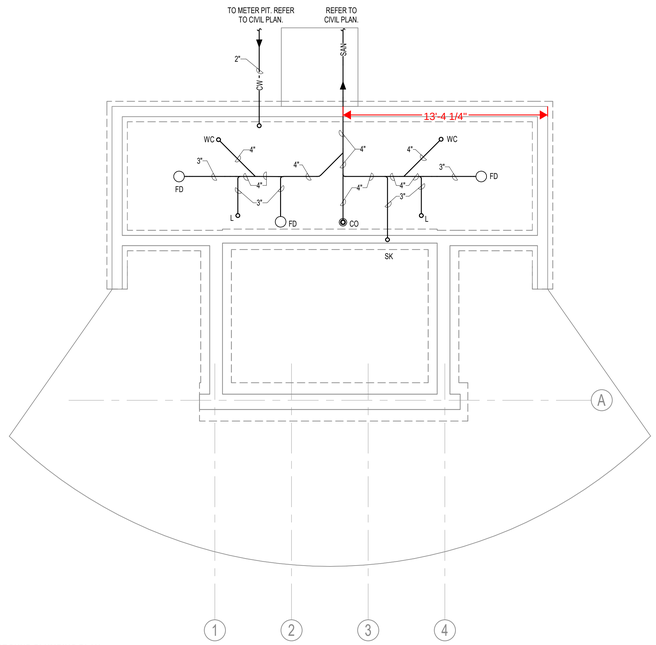

N **UNDERGROUND PLUMBING PLAN**
SCALE: 1/4" = 1'-0"

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1609 WHITES RD
KALAMAZOO, MI 49008

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PLUMBING PLAN
SITE PLAN REVIEW SET

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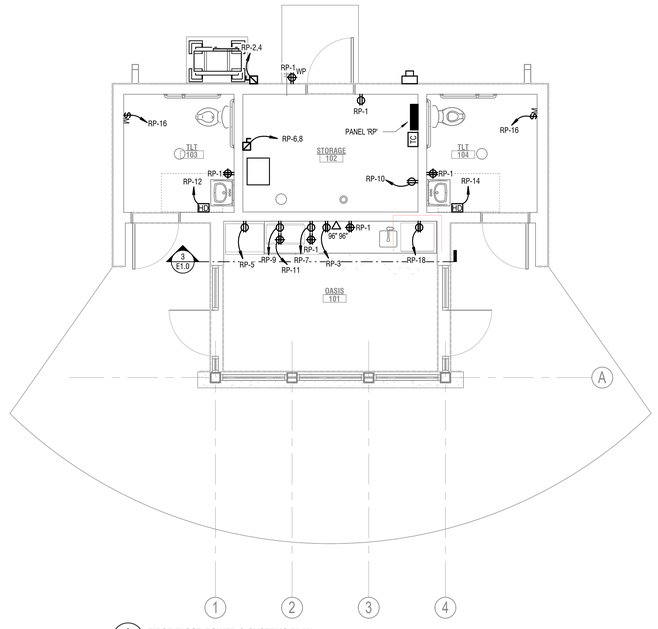

2 FIRST FLOOR POWER & SYSTEMS PLAN
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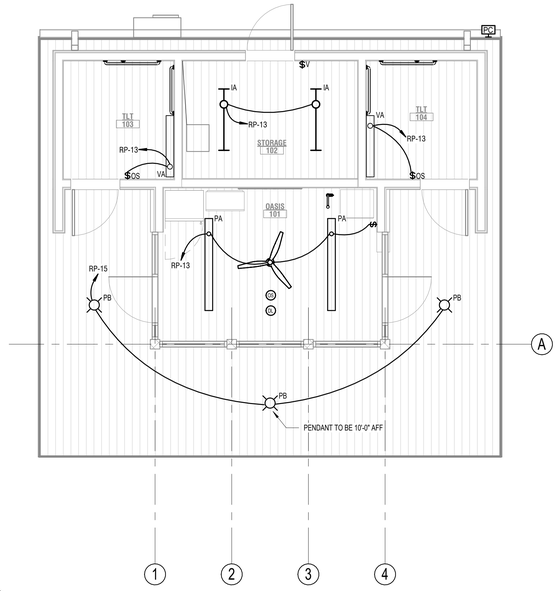

1 FIRST FLOOR LIGHTING PLAN
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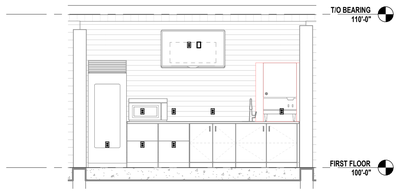

3 E1.0 OASIS SECTION VIEW
SCALE: 1/4" = 1'-0"

DRAFT SET

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ELECTRICAL PLANS
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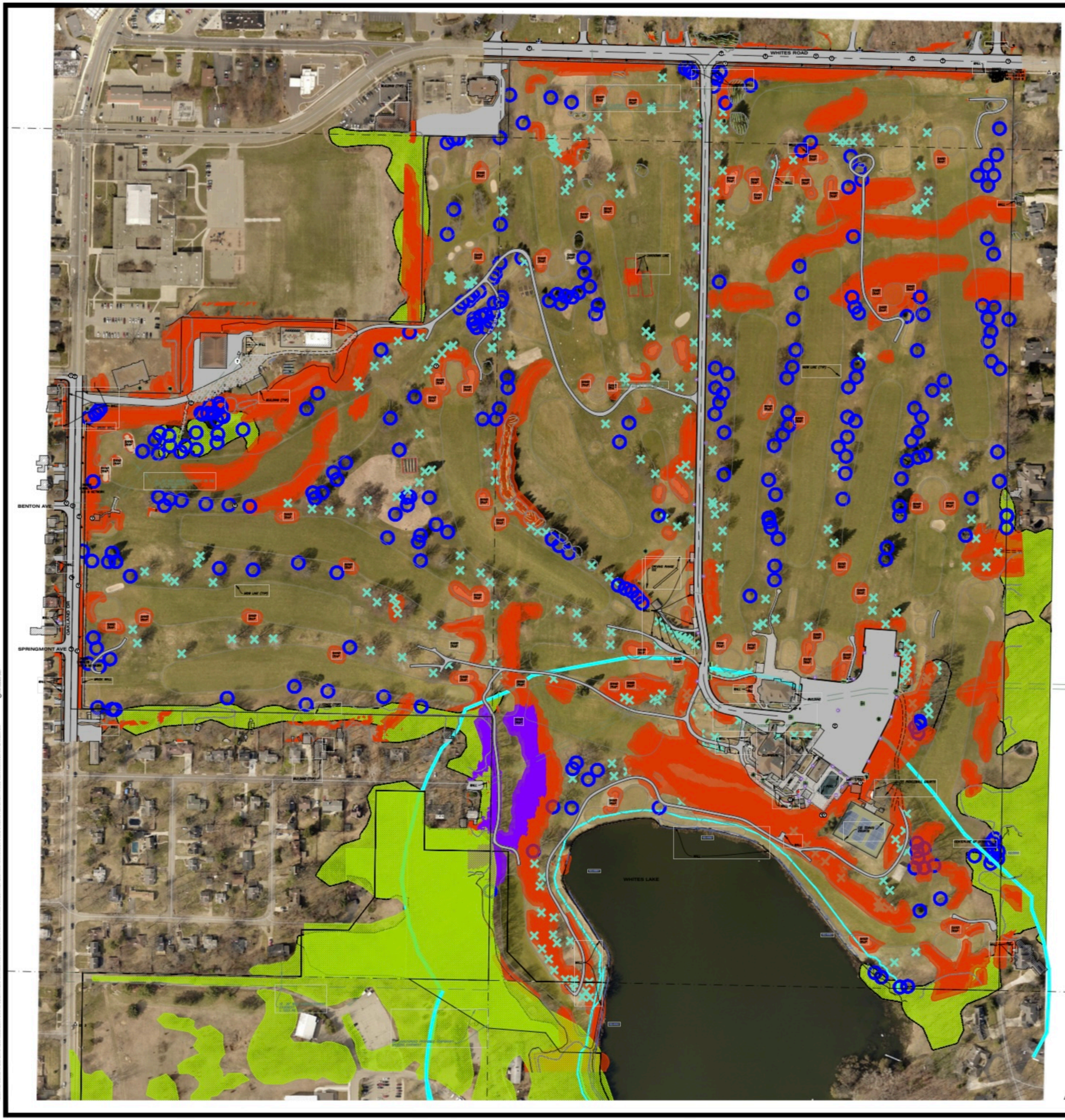

0 30 60 120
1 inch = 60 ft.

N
W E
S

NATURAL FEATURES LEGEND

- MANMADE SLOPES GREATER THAN 20%
- MINIMUM 10' SETBACK AT TOP/BOTTOM OF MANMADE SLOPE
- NATIVE SLOPES GREATER THAN 20%
- MINIMUM 10' SETBACK AT TOP/BOTTOM OF NATIVE SLOPE
- WOODLANDS GREATER THAN 1/2 ACRE
- 25 FOOT SETBACK FROM WATER FEATURES
- 500 FOOT BUFFER AREA FROM WATER FEATURES
- TREE TO BE REMOVED (307)
- TREE TO BE SAVED (274)

NFP QUANTITIES

MANMADE SLOPES GREATER THAN 20% WITH SETBACK:
330,432 SF, 7.6 ACRES
DISTURBED MANMADE SLOPES GREATER THAN 20% WITH SETBACK:
219,220 SF, 5.03 ACRES
NATIVE SLOPES GREATER THAN 20% WITH SETBACKS:
40,086 SF, .92 ACRES
DISTURBED NATIVE SLOPES GREATER THAN 20% WITH SETBACKS:
33,893 SF, .78 ACRES
2.5% OF AREA IS WOODED (150,479 SF)
8.5% OF EXISTING WOODED AREA TO BE REMOVED (12,736 SF)

PLANNING
ARCHITECTURE
INTERIOR DESIGN
PURCHASING

ARCHITECT & INTERIORS
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KALAMAZOO COUNTRY CLUB

1609 Whites Rd, Kalamazoo, MI 49008

CONSTRUCTION DOCUMENTS

	DATE	ISSUE
2	05/19/2023	ADV BID #1 - ADD #1
3	06/20/2023	ADV BID #2 - ADD #2
5	08/31/2023	BULLETIN #2
6	09/29/2023	BULLETIN #3
7	10/31/2023	BULLETIN #4

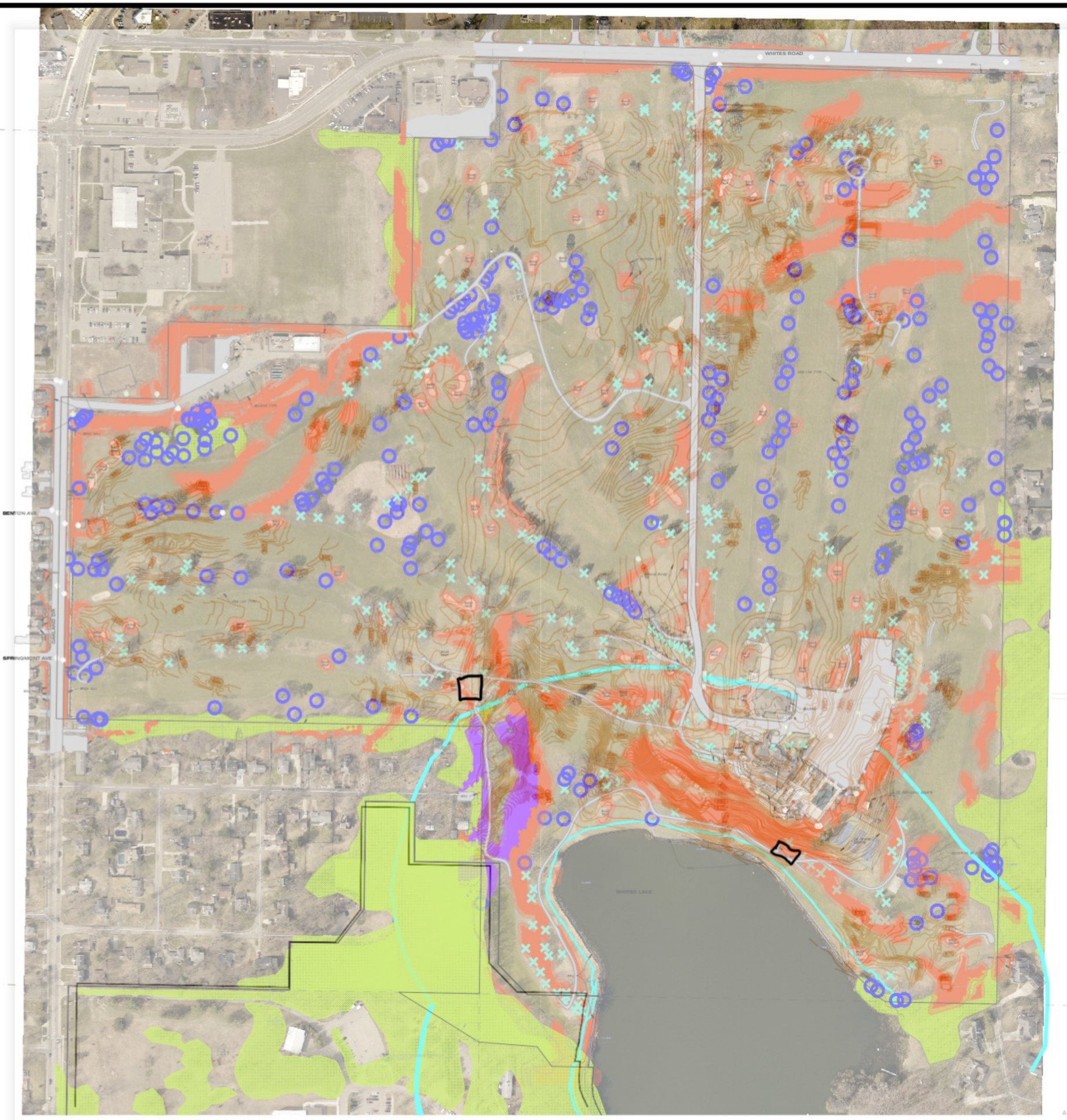
08/31/2023	PERMIT RESUBMIT
06/30/2023	POOL PERMIT
06/13/2023	SITE RESUBMIT
12/23/2022	PERMIT

Date : 10/31/23

Job No.: 21-124

Sheet Title
NATURAL FEATURES INVENTORY

Sheet Number
C5.00



0 30 60 120
1 inch = 60 ft.

N

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CONSTRUCTION DOCUMENTS

	DATE	ISSUE
4	05/19/2023	ADV BID #1 - ADD #1
5	06/20/2023	ADV BID #2 - ADD #2
6	08/31/2023	BULLETIN #2
6	09/20/2023	BULLETIN #3
7	10/31/2023	BULLETIN #4

08/31/2023	PERMIT RESUBMIT
06/30/2023	POOL PERMIT
06/13/2023	SITE RESUBMIT
12/23/2022	PERMIT

Date : 10/31/23

Job No.: 21-124

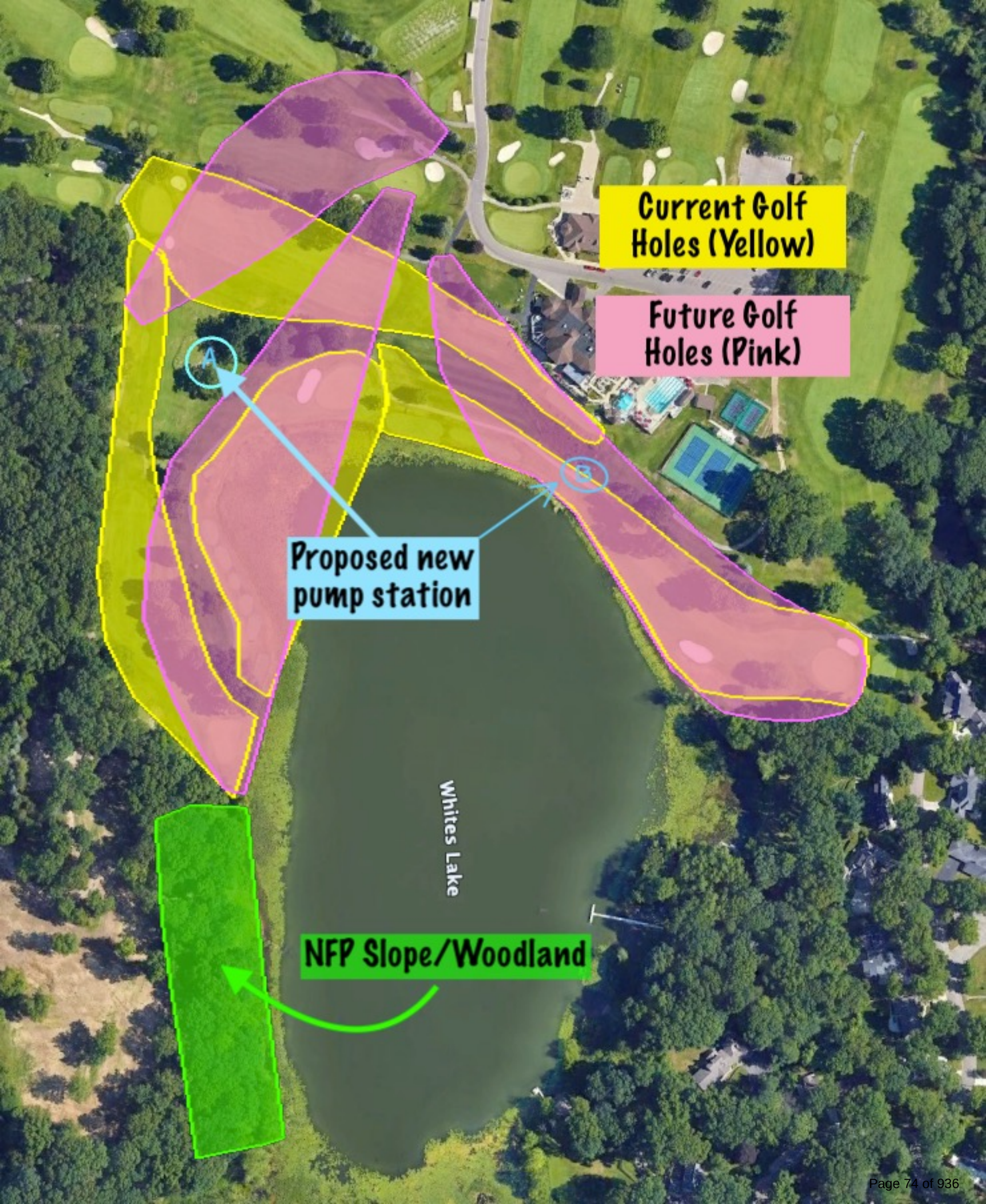
Sheet Title
NATURAL FEATURES INVENTORY

Sheet Number
C5.00

58 Cu. Yd.
2 Cu. Yd.<Cut>




Proposed location 1
(Previously Approved)
New proposal location


Current Golf Holes (Yellow)
Future Golf Holes (Pink)
A
B
Proposed new pump station
Whites Lake
NFP Slope/Woodland

Number	TREE SPECIES	NFP Protect	DBH "	Remove	Removel Reason
1	AMERICAN ELM	18	46		
2	AMERICAN ELM	18	48	1	50-6.2 (F)(3)(a)
3	AMERICAN SYCAMORE	18	20		
4	AMERICAN SYCAMORE	18	22		
5	AMERICAN SYCAMORE	18	24		
6	AMERICAN SYCAMORE	18	24		
7	AMERICAN SYCAMORE	18	26		
8	AMERICAN SYCAMORE	18	36	1	50-6.2 (F)(3)(a)
9	AUSTRIAN PINE	18	20	1	50-6.2 (F)(3)(a)
10	BLACK LOCUST	16	18	1	50-6.2 (F)(3)(a)
11	BLACK LOCUST	16	28	1	50-6.2 (F)(3)(a)
12	BLACK OAK	16	16	1	50-6.2 (F)(3)(a)
13	BLACK OAK	16	18	1	50-6.2 (F)(3)(a)
14	BLACK OAK	16	24	1	50-6.2 (F)(3)(a)
15	BLACK OAK	16	24	1	50-6.2 (F)(3)(a)
16	BLACK OAK	16	26		
17	BLACK OAK	16	26	1	50-6.2 (F)(3)(a)
18	BLACK OAK	16	26	1	50-6.2 (F)(3)(a)
19	BLACK OAK	16	30	1	50-6.2 (F)(3)(a)
20	BLACK OAK	16	30		
21	BLACK OAK	16	30	1	50-6.2 (F)(3)(a)
22	BLACK OAK	16	30	1	50-6.2 (F)(3)(a)
23	BLACK OAK	16	32		
24	BLACK OAK	16	32		
25	BLACK OAK	16	32	1	50-6.2 (F)(3)(a)
26	BLACK OAK	16	32	1	50-6.2 (F)(3)(a)
27	BLACK OAK	16	40	1	50-6.2 (F)(3)(a)
28	BLACK OAK	16	40	1	50-6.2 (F)(3)(a)
29	BLACK OAK	16	40	1	50-6.2 (F)(3)(a)
30	BLACK WALNUT	18	32		
31	BLUE SPRUCE	18	24	1	50-6.2 (F)(3)(a)
32	BLUE SPRUCE	18	26	1	50-6.2 (F)(3)(a)
33	CBS	18	20	1	50-6.2 (F)(3)(a)
34	CBS	18	20	1	50-6.2 (F)(3)(a)

35	CBS	18	20	1	50-6.2 (F)(3)(a)
36	CBS	18	20	1	50-6.2 (F)(3)(a)
37	CBS	18	20	1	50-6.2 (F)(3)(a)
38	CBS	18	20	1	50-6.2 (F)(3)(a)
39	CBS	18	22	1	50-6.2 (F)(3)(a)
40	CEDAR	12	12	1	50-6.2 (F)(3)(a)
41	CEDAR	12	12	1	50-6.2 (F)(3)(a)
42	COL BLUE SPRUCE	18	18	1	50-6.2 (F)(3)(a)
43	COL BLUE SPRUCE	18	22		
44	COL SPRUCE	18	24	1	50-6.2 (F)(3)(a)
45	COL SPRUCE	18	24	1	50-6.2 (F)(3)(a)
46	COLORADO BLUE SPRUCE	18	18	1	50-6.2 (F)(3)(a)
47	COLORADO BLUE SPRUCE	18	18	1	50-6.2 (F)(3)(a)
48	COLORADO BLUE SPRUCE	18	20		
49	COLORADO BLUE SPRUCE	18	20		
50	COLORADO BLUE SPRUCE	18	20	1	50-6.2 (F)(3)(a)
51	COLORADO BLUE SPRUCE	18	20	1	50-6.2 (F)(3)(a)
52	COLORADO BLUE SPRUCE	18	20	1	50-6.2 (F)(3)(a)
53	COLORADO BLUE SPRUCE	18	20	1	50-6.2 (F)(3)(a)
54	COLORADO BLUE SPRUCE	18	20	1	50-6.2 (F)(3)(a)
55	COLORADO BLUE SPRUCE	18	20	1	50-6.2 (F)(3)(a)
56	COLORADO BLUE SPRUCE	18	20	1	50-6.2 (F)(3)(a)
57	COLORADO BLUE SPRUCE	18	20		
58	COLORADO BLUE SPRUCE	18	20	1	50-6.2 (F)(3)(a)
59	COLORADO BLUE SPRUCE	18	20	1	50-6.2 (F)(3)(a)
60	COLORADO BLUE SPRUCE	18	20	1	50-6.2 (F)(3)(a)
61	COLORADO BLUE SPRUCE	18	20	1	50-6.2 (F)(3)(a)
62	COLORADO BLUE SPRUCE	18	24		
63	COLORADO BLUE SPRUCE	18	24		
64	COLORADO BLUE SPRUCE	18	24	1	50-6.2 (F)(3)(a)
65	COLORADO BLUE SPRUCE	18	24	1	50-6.2 (F)(3)(a)
66	COLORADO BLUE SPRUCE	18	26	1	50-6.2 (F)(3)(a)
67	CONCOLOR FIR	18	26	1	50-6.2 (F)(3)(a)
68	CRAB APPLE	24	24	1	50-6.2 (F)(3)(a)
69	CRAB APPLE	24	24	1	50-6.2 (F)(3)(a)
70	DOUGLAS FIR	18	20		

71	DOUGLAS FIR	18	24	1	50-6.2 (F)(3)(a)
72	DOUGLAS FIR	18	24	1	50-6.2 (F)(3)(a)
73	DOUGLAS FIR	18	30	1	50-6.2 (F)(3)(a)
74	GREEN ASH	18	18	1	50-6.2 (F)(3)(a)
75	HICKORY	12	12	1	50-6.2 (F)(3)(a)
76	HICKORY	12	13	1	50-6.2 (F)(3)(a)
77	HICKORY	12	14		
78	HICKORY	12	14	1	50-6.2 (F)(3)(a)
79	HICKORY	12	16	1	50-6.2 (F)(3)(a)
80	HICKORY	12	16		
81	HICKORY	12	20		
82	HICKORY	12	20	1	50-6.2 (F)(3)(a)
83	HICKORY	12	22	1	50-6.2 (F)(3)(a)
84	HICKORY	12	22	1	50-6.2 (F)(3)(a)
85	HICKORY	12	24	1	50-6.2 (F)(3)(a)
86	HICKORY	12	24	1	50-6.2 (F)(3)(a)
87	HICKORY	12	24	1	50-6.2 (F)(3)(a)
88	HICKORY	12	26	1	50-6.2 (F)(3)(a)
89	HICKORY	12	28	1	50-6.2 (F)(3)(a)
90	HICKORY	12	30	1	50-6.2 (F)(3)(a)
91	HICKORY	12	30	1	50-6.2 (F)(3)(a)
92	HICKORY	12	48		
93	HICKORY (dbl ldr)	12	20	1	50-6.2 (F)(3)(a)
94	HICKORY (dbl ldr)	12	36	1	50-6.2 (F)(3)(a)
95	HONEY LOCUST	16	20	1	50-6.2 (F)(3)(a)
96	HONEY LOCUST	16	22		
97	HONEY LOCUST	16	22	1	50-6.2 (F)(3)(a)
98	HONEY LOCUST	16	24		
99	HONEY LOCUST	16	26	1	50-6.2 (F)(3)(a)
100	HONEY LOCUST	16	28		
101	HONEY LOCUST	16	28		
102	HONEY LOCUST	16	28	1	50-6.2 (F)(3)(a)
103	HONEY LOCUST	16	30	1	50-6.2 (F)(3)(a)
104	LITTLE LEAF LINDEN	18	24		
105	LITTLE LEAF LINDEN	18	24		
106	LITTLE LEAF LINDEN	18	24		

107	LITTLE LEAF LINDEN	18	24		
108	LITTLE LEAF LINDEN	18	24	1	50-6.2 (F)(3)(a)
109	LITTLE LEAF LINDEN	18	26	1	50-6.2 (F)(3)(a)
110	LITTLE LEAF LINDEN	18	30	1	50-6.2 (F)(3)(a)
111	LITTLE LEAF LINDEN	18	36		
112	LOCUST	16	19	1	50-6.2 (F)(3)(a)
113	LOCUST	16	22	1	50-6.2 (F)(3)(a)
114	LOCUST	16	24	1	50-6.2 (F)(3)(a)
115	LOCUST	16	24	1	50-6.2 (F)(3)(a)
116	LOCUST	16	24	1	50-6.2 (F)(3)(a)
117	LOCUST	16	24	1	50-6.2 (F)(3)(a)
118	LOCUST	16	26	1	50-6.2 (F)(3)(a)
119	LOCUST	16	36	1	50-6.2 (F)(3)(a)
120	N MAPLE	18	20	1	50-6.2 (F)(3)(a)
121	N MAPLE	18	30	1	50-6.2 (F)(3)(a)
122	N. Red Oak	16	26		
123	N. Red Oak	16	30		
124	N. Red Oak	16	30	1	50-6.2 (F)(3)(a)
125	NORTHERN CATALPA	24	24	1	50-6.2 (F)(3)(a)
126	NORWAY MAPLE	24	24	1	50-6.2 (F)(3)(a)
127	NORWAY MAPLE	24	24	1	50-6.2 (F)(3)(a)
128	NORWAY MAPLE	24	24	1	50-6.2 (F)(3)(a)
129	NORWAY MAPLE	24	24	1	50-6.2 (F)(3)(a)
130	NORWAY MAPLE	24	24		
131	NORWAY MAPLE	24	24	1	50-6.2 (F)(3)(a)
132	NORWAY MAPLE	24	24	1	50-6.2 (F)(3)(a)
133	NORWAY MAPLE	24	24	1	50-6.2 (F)(3)(a)
134	NORWAY MAPLE	24	24	1	50-6.2 (F)(3)(a)
135	NORWAY MAPLE	18	24	1	50-6.2 (F)(3)(a)
136	NORWAY MAPLE	24	26	1	50-6.2 (F)(3)(a)
137	NORWAY MAPLE	24	26	1	50-6.2 (F)(3)(a)
138	NORWAY MAPLE	24	30		
139	NORWAY MAPLE	24	30		
140	NORWAY MAPLE	24	30	1	50-6.2 (F)(3)(a)
141	NORWAY MAPLE	24	30	1	50-6.2 (F)(3)(a)
142	NORWAY MAPLE	24	30	1	50-6.2 (F)(3)(a)

143	NORWAY MAPLE	24	30	1	50-6.2 (F)(3)(a)
144	NORWAY MAPLE	24	30		
145	NORWAY MAPLE	24	30	1	50-6.2 (F)(3)(a)
146	NORWAY MAPLE	18	30	1	50-6.2 (F)(3)(a)
147	NORWAY MAPLE	24	32	1	50-6.2 (F)(3)(a)
148	NORWAY MAPLE	24	36	1	50-6.2 (F)(3)(a)
149	NORWAY MAPLE	24	38	1	50-6.2 (F)(3)(a)
150	NORWAY MAPLE	24	40	1	50-6.2 (F)(3)(a)
151	NORWAY MAPLE	24	40		
152	NORWAY MAPLE	24	26	1	50-6.2 (F)(3)(a)
153	NORWAY MAPLE - CK	24	24		
154	NORWAY MAPLE - CK	24	28	1	50-6.2 (F)(3)(a)
155	NORWAY SPRUCE	18	18	1	50-6.2 (F)(3)(a)
156	NORWAY SPRUCE	18	20		
157	NORWAY SPRUCE	18	20		
158	NORWAY SPRUCE	18	20	1	50-6.2 (F)(3)(a)
159	NORWAY SPRUCE	18	21.5	1	50-6.2 (F)(3)(a)
160	NORWAY SPRUCE	18	24	1	50-6.2 (F)(3)(a)
161	NORWAY SPRUCE	18	24	1	50-6.2 (F)(3)(a)
162	NORWAY SPRUCE	18	24	1	50-6.2 (F)(3)(a)
163	NORWAY SPRUCE	18	24	1	50-6.2 (F)(3)(a)
164	NORWAY SPRUCE	18	24	1	50-6.2 (F)(3)(a)
165	NORWAY SPRUCE	18	26	1	50-6.2 (F)(3)(a)
166	NORWAY SPRUCE	18	28		
167	NORWAY SPRUCE	18	30	1	50-6.2 (F)(3)(a)
168	NORWAY SPRUCE	18	30	1	50-6.2 (F)(3)(a)
169	NORWAY SPRUCE	18	30	1	50-6.2 (F)(3)(a)
170	NORWAY SPRUCE	18	30	1	50-6.2 (F)(3)(a)
171	NORWAY SPRUCE	18	32	1	50-6.2 (F)(3)(a)
172	PIGNUT HICKORY	12	42		
173	PIN OAK	12	20		
174	PIN OAK	12	20		
175	PIN OAK	12	20	1	50-6.2 (F)(3)(a)
176	PIN OAK	12	22	1	50-6.2 (F)(3)(a)
177	PIN OAK	12	24		
178	PIN OAK	12	24	1	50-6.2 (F)(3)(a)

179	PIN OAK	12	24		
180	PIN OAK	12	24		
181	PIN OAK	12	24		
182	PIN OAK	12	26		
183	PIN OAK	12	26		
184	PIN OAK	12	26	1	50-6.2 (F)(3)(a)
185	PIN OAK	12	26	1	50-6.2 (F)(3)(a)
186	PIN OAK	12	28		
187	PIN OAK	12	30		
188	PIN OAK	12	30		
189	PIN OAK	12	30	1	50-6.2 (F)(3)(a)
190	PIN OAK	12	30	1	50-6.2 (F)(3)(a)
191	PIN OAK	12	30	1	50-6.2 (F)(3)(a)
192	PIN OAK	12	32		
193	PIN OAK	12	32		
194	PINE #38	18	36	1	50-6.2 (F)(3)(a)
195	POPLAR	12	12		
196	POPLAR	12	12		
197	POPLAR	12	16		
198	RED ALDER	24	46	1	50-6.2 (F)(3)(a)
199	RED MAPLE	18	18		
200	RED MAPLE	18	20	1	50-6.2 (F)(3)(a)
201	RED MAPLE	18	20		
202	RED MAPLE	18	20		
203	RED MAPLE	18	22		
204	RED MAPLE	18	22		
205	RED MAPLE	18	24		
206	RED MAPLE	16	24	1	50-6.2 (F)(3)(a)
207	RED MAPLE	18	26		
208	RED MAPLE	18	26	1	50-6.2 (F)(3)(a)
209	RED MAPLE	18	48		
210	RED OAK	16	19		
211	RED OAK	16	20		
212	RED OAK	16	20		
213	RED OAK	16	20	1	50-6.2 (F)(3)(a)
214	RED OAK	16	20	1	50-6.2 (F)(3)(a)

215	RED OAK	16	20	1	50-6.2 (F)(3)(a)
216	RED OAK	16	20		
217	RED OAK	16	20	1	50-6.2 (F)(3)(a)
218	RED OAK	16	20	1	50-6.2 (F)(3)(a)
219	RED OAK	16	20	1	50-6.2 (F)(3)(a)
220	RED OAK	16	21	1	50-6.2 (F)(3)(a)
221	RED OAK	16	22	1	50-6.2 (F)(3)(a)
222	RED OAK	16	22	1	50-6.2 (F)(3)(a)
223	RED OAK	16	23		
224	RED OAK	16	24		
225	RED OAK	16	24		
226	RED OAK	16	24	1	50-6.2 (F)(3)(a)
227	RED OAK	16	24	1	50-6.2 (F)(3)(a)
228	RED OAK	16	24	1	50-6.2 (F)(3)(a)
229	RED OAK	16	24	1	50-6.2 (F)(3)(a)
230	RED OAK	16	24		
231	RED OAK	16	24		
232	RED OAK	16	24		
233	RED OAK	16	26	1	50-6.2 (F)(3)(a)
234	RED OAK	16	28	1	50-6.2 (F)(3)(a)
235	RED OAK	16	28	1	50-6.2 (F)(3)(a)
236	RED OAK	16	30	1	50-6.2 (F)(3)(a)
237	RED OAK	16	30	1	50-6.2 (F)(3)(a)
238	RED OAK	16	32	1	50-6.2 (F)(3)(a)
239	RED OAK	16	32	1	50-6.2 (F)(3)(a)
240	RED OAK	16	32	1	50-6.2 (F)(3)(a)
241	RED OAK	16	36	1	50-6.2 (F)(3)(a)
242	RED OAK	16	36	1	50-6.2 (F)(3)(a)
243	RED OAK	16	38	1	50-6.2 (F)(3)(a)
244	RED OAK	16	38	1	50-6.2 (F)(3)(a)
245	RED OAK	16	40		
246	RED OAK	16	40	1	50-6.2 (F)(3)(a)
247	RED OAK	16	46	1	50-6.2 (F)(3)(a)
248	RED OAK	16	48		
249	RED OAK	16	50		
250	RED OAK	16	50		

251	RED PINE	18	18	1	50-6.2 (F)(3)(a)
252	RED PINE	18	20	1	50-6.2 (F)(3)(a)
253	Scarlet Oak	16	17	1	50-6.2 (F)(3)(a)
254	SCOT PINE	18	23	1	50-6.2 (F)(3)(a)
255	SIBERIAN ELM	24	24	1	50-6.2 (F)(3)(a)
256	SIBERIAN ELM	24	24	1	50-6.2 (F)(3)(a)
257	SIBERIAN ELM	24	25	1	50-6.2 (F)(3)(a)
258	SIBERIAN ELM	24	26	1	50-6.2 (F)(3)(a)
259	SIBERIAN ELM	24	28		
260	SIBERIAN ELM	24	28	1	50-6.2 (F)(3)(a)
261	SIBERIAN ELM	24	30	1	50-6.2 (F)(3)(a)
262	SIBERIAN ELM	24	30		
263	SIBERIAN ELM	24	30	1	50-6.2 (F)(3)(a)
264	SIBERIAN ELM	24	30	1	50-6.2 (F)(3)(a)
265	SIBERIAN ELM	24	30		
266	SIBERIAN ELM	24	30	1	50-6.2 (F)(3)(a)
267	SIBERIAN ELM	24	32		
268	SIBERIAN ELM	24	36	1	50-6.2 (F)(3)(a)
269	SIBERIAN ELM	24	36		
270	SIBERIAN ELM	24	46		
271	SIBERIAN ELM	24	50	1	50-6.2 (F)(3)(a)
272	SIBERIAN ELM	24	100	1	50-6.2 (F)(3)(a)
273	SILVER BIRCH	12	18		
274	SILVER BIRCH	12	24	1	50-6.2 (F)(3)(a)
275	SILVER BIRCH	12	26	1	50-6.2 (F)(3)(a)
276	SILVER MAPLE	18	18	1	50-6.2 (F)(3)(a)
277	SILVER MAPLE	18	24		
278	SILVER MAPLE	18	24	1	50-6.2 (F)(3)(a)
279	SILVER MAPLE	18	24	1	50-6.2 (F)(3)(a)
280	SILVER MAPLE	18	28	1	50-6.2 (F)(3)(a)
281	SILVER MAPLE	18	30		
282	SILVER MAPLE	18	30		
283	SILVER MAPLE	18	30		
284	SILVER MAPLE	18	30	1	50-6.2 (F)(3)(a)
285	SILVER MAPLE	18	36		
286	SILVER MAPLE	18	36	1	50-6.2 (F)(3)(a)

287	SILVER MAPLE	18	40	1	50-6.2 (F)(3)(a)
288	SILVER MAPLE	18	40	1	50-6.2 (F)(3)(a)
289	SILVER MAPLE	18	40	1	50-6.2 (F)(3)(a)
290	SILVER MAPLE	18	40	1	50-6.2 (F)(3)(a)
291	SILVER MAPLE	18	46	1	50-6.2 (F)(3)(a)
292	SILVER MAPLE	18	48	1	50-6.2 (F)(3)(a)
293	SILVER MAPLE	18	50		
294	SPRUCE	18	18	1	50-6.2 (F)(3)(a)
295	SPRUCE	18	22	1	50-6.2 (F)(3)(a)
296	SUGAR MAPLE	18	18		
297	SUGAR MAPLE	18	19	1	50-6.2 (F)(3)(a)
298	SUGAR MAPLE	18	20		
299	SUGAR MAPLE	18	20	1	50-6.2 (F)(3)(a)
300	SUGAR MAPLE	18	20	1	50-6.2 (F)(3)(a)
301	SUGAR MAPLE	18	24		
302	SUGAR MAPLE	18	24		
303	SUGAR MAPLE	18	24	1	50-6.2 (F)(3)(a)
304	SUGAR MAPLE	18	26	1	50-6.2 (F)(3)(a)
305	SUGAR MAPLE	18	28	1	50-6.2 (F)(3)(a)
306	SUGAR MAPLE	18	29	1	50-6.2 (F)(3)(a)
307	SUGAR MAPLE	18	30		
308	SUGAR MAPLE	18	30		
309	SUGAR MAPLE	18	30	1	50-6.2 (F)(3)(a)
310	SUGAR MAPLE	18	32	1	50-6.2 (F)(3)(a)
311	SUGAR MAPLE	18	32	1	50-6.2 (F)(3)(a)
312	SUGAR MAPLE	18	42		
313	SWEET BIRCH	12	22	1	50-6.2 (F)(3)(a)
314	SWEET CHERRY	18	20	1	50-6.2 (F)(3)(a)
315	SWEET GUM	12	26	1	50-6.2 (F)(3)(a)
316	SWEET GUM	12	26	1	50-6.2 (F)(3)(a)
317	SWEETGUM	12	18	1	50-6.2 (F)(3)(a)
318	SWEETGUM	12	36	1	50-6.2 (F)(3)(a)
319	SYCAMORE	18	18	1	50-6.2 (F)(3)(a)
320	SYCAMORE	18	18	1	50-6.2 (F)(3)(a)
321	SYCAMORE	18	18	1	50-6.2 (F)(3)(a)
322	SYCAMORE	18	20		

323	SYCAMORE	18	20		
324	SYCAMORE	18	20	1	50-6.2 (F)(3)(a)
325	SYCAMORE	18	20	1	50-6.2 (F)(3)(a)
326	SYCAMORE	18	24		
327	SYCAMORE	18	24	1	50-6.2 (F)(3)(a)
328	SYCAMORE	18	24	1	50-6.2 (F)(3)(a)
329	SYCAMORE	18	26		
330	SYCAMORE	18	26	1	50-6.2 (F)(3)(a)
331	SYCAMORE	18	26		
332	SYCAMORE	18	27	1	50-6.2 (F)(3)(a)
333	SYCAMORE	18	27	1	50-6.2 (F)(3)(a)
334	SYCAMORE	18	30	1	50-6.2 (F)(3)(a)
335	SYCAMORE	18	32	1	50-6.2 (F)(3)(a)
336	SYCAMORE	18	36	1	50-6.2 (F)(3)(a)
337	SYCAMORE	18	40	1	50-6.2 (F)(3)(a)
338	TULIP TREE	18	46		
339	TULIP TREE	18	50		
340	TULIP TREE	18	52	1	50-6.2 (F)(3)(a)
341	WALNUT	18	28	1	50-6.2 (F)(3)(a)
342	WHITE OAK	16	16	1	50-6.2 (F)(3)(a)
343	WHITE OAK	16	19	1	50-6.2 (F)(3)(a)
344	WHITE OAK	16	21	1	50-6.2 (F)(3)(a)
345	WHITE OAK	16	22		
346	WHITE OAK	16	22	1	50-6.2 (F)(3)(a)
347	WHITE OAK	16	23	1	50-6.2 (F)(3)(a)
348	WHITE OAK	16	24		
349	WHITE OAK	16	25	1	50-6.2 (F)(3)(a)
350	WHITE OAK	16	26	1	50-6.2 (F)(3)(a)
351	WHITE OAK	16	26	1	50-6.2 (F)(3)(a)
352	WHITE OAK	16	26		
353	WHITE OAK	16	26		
354	WHITE OAK	16	27		
355	WHITE OAK	16	28	1	50-6.2 (F)(3)(a)
356	WHITE OAK	16	28	1	50-6.2 (F)(3)(a)
357	WHITE OAK	16	29	1	50-6.2 (F)(3)(a)
358	WHITE OAK	16	30	1	50-6.2 (F)(3)(a)

359	WHITE OAK	16	30	1	50-6.2 (F)(3)(a)
360	WHITE OAK	16	30	1	50-6.2 (F)(3)(a)
361	WHITE OAK	16	30	1	50-6.2 (F)(3)(a)
362	WHITE OAK	16	30	1	50-6.2 (F)(3)(a)
363	WHITE OAK	16	30		
364	WHITE OAK	16	30		
365	WHITE OAK	16	30	1	50-6.2 (F)(3)(a)
366	WHITE OAK	16	30		
367	WHITE OAK	16	30		
368	WHITE OAK	16	32		
369	WHITE OAK	16	32		
370	WHITE OAK	16	32		
371	WHITE OAK	16	32		
372	WHITE OAK	16	32	1	50-6.2 (F)(3)(a)
373	WHITE OAK	16	33		
374	WHITE OAK	16	34	1	50-6.2 (F)(3)(a)
375	WHITE OAK	16	34	1	50-6.2 (F)(3)(a)
376	WHITE OAK	16	36	1	50-6.2 (F)(3)(a)
377	WHITE OAK	16	36	1	50-6.2 (F)(3)(a)
378	WHITE OAK	16	36		
379	WHITE OAK	16	36	1	50-6.2 (F)(3)(a)
380	WHITE OAK	16	36	1	50-6.2 (F)(3)(a)
381	WHITE OAK	16	36	1	50-6.2 (F)(3)(a)
382	WHITE OAK	16	36		
383	WHITE OAK	16	37	1	50-6.2 (F)(3)(a)
384	WHITE OAK	16	37		
385	WHITE OAK	16	40	1	50-6.2 (F)(3)(a)
386	WHITE OAK	16	40	1	50-6.2 (F)(3)(a)
387	WHITE OAK	16	40	1	50-6.2 (F)(3)(a)
388	WHITE OAK	16	40	1	50-6.2 (F)(3)(a)
389	WHITE OAK	16	40		
390	WHITE OAK	16	42	1	50-6.2 (F)(3)(a)
391	WHITE OAK	16	43		50-6.2 (F)(3)(a)
392	WHITE OAK	16	50	1	50-6.2 (F)(3)(a)
393	WHITE OAK	16	55	1	50-6.2 (F)(3)(a)
394	WHITE OAK	16	64		

395	WHITE PINE	18	18	1	50-6.2 (F)(3)(a)
396	WHITE PINE	18	18	1	50-6.2 (F)(3)(a)
397	WHITE PINE	18	18	1	50-6.2 (F)(3)(a)
398	WHITE PINE	18	18	1	50-6.2 (F)(3)(a)
399	WHITE PINE	18	18		
400	WHITE PINE	18	20	1	50-6.2 (F)(3)(a)
401	WHITE PINE	18	22	1	50-6.2 (F)(3)(a)
402	WHITE PINE	18	24		
403	WHITE PINE	18	24		
404	WHITE PINE	18	24		
405	WHITE PINE	18	24		
406	WHITE PINE	18	26	1	50-6.2 (F)(3)(a)
407	WHITE PINE	18	30		
408	WHITE PINE	18	30		
409	WHITE PINE	18	32		
410	WHITE PINE	18	32		
411	WHITE PINE	18	36		
412	WHITE PINE	18	36		
413	WHITE PINE	18	36		


Imagery Date: 4/7/2024 42°15'34.21" N 85°38'44.65" W elev 0 ft eye alt 3313 ft






Google Earth


Google Earth




4/2017
1985
Imagery Date: 4/23/2017 42°15'20.21" N

NFP Review Board Staff Report

City of Kalamazoo

TO: The Natural Features Protection Review Board

FROM: Nolan Bergstrom, NFP Board Liaison

DATE: May 28, 2025

SUBJECT: 2045 E Michigan Avenue (City of Kalamazoo Water Pump Station #5 Consolidation)

RECOMMENDATION:

It is recommended the Natural Features Protection (NFP) Review Board approve the NFP Site Plan application for the 2045 E. Michigan Avenue Water Pump Station #5 and #14 Consolidation Project conditioned upon:

- Replacement Trees follow § 50-6.2F(4) of the NFP Ordinance.
- Replacement Tree List and Locations are Provided to Staff prior to obtain full site plan approval.
- Tree Protection Fencing Specifications are Provided.
- Full Approval by the Site Plan Review Committee.

BACKGROUND:

The subject parcel is owned by the City of Kalamazoo in the Eastside Neighborhood at 2045 E Michigan Avenue and is the location of Pump Station #5. The parcel is zoned Limiting Manufacturing or M-1. Utilities and Public Services are permitted uses in the M-1 Zone District. The proposed work is a utility consolidation project to upgrade Pump Stations 5 and 14 with additional water treatment to remove iron and PFAS to meet regulatory standards. The existing pump stations do not currently have a way to remove these pollutants. Water treatment is recommended to remove levels of iron and per- and polyfluoroalkyl substances (PFAS) that may negatively impact human health if not treated. Station 5 has been a part of the Municipal System since 1914. The City of Kalamazoo is working with Tetra Tech to complete this work.

The project was originally slated for NFP Board Review in 2023 but withdrew the application alongside the site plan application. The project had a checklist meeting at the end of April 2025 and is working through the site plan process concurrent to the NFP Board Review. The project is seeking NFP Board approval to obtain full site plan approval and site permits.

FINDINGS:

The property is within the NFP Overlay District due to:

Primary Natural Feature: Hydrology
Secondary Natural Feature: Protected Trees (pockets scattered throughout the site)
Tertiary Natural Feature: Woodlands (pockets to the East of the Property)
MNFI Rare Species Review: Not Required.

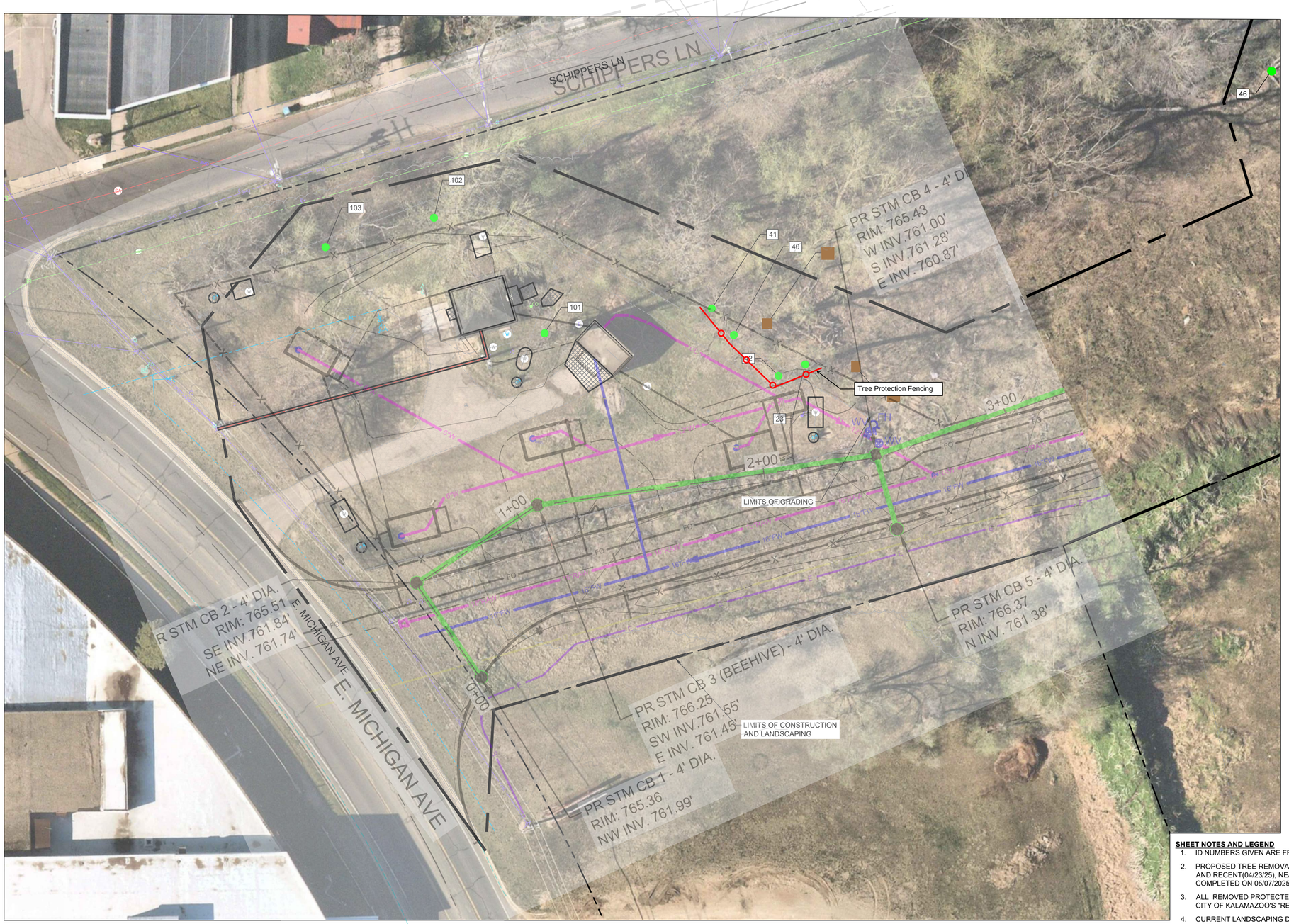
The property is also within 1-, 5-, and 10-year **wellhead capture zones**.

The following NFP Site Development Standards Apply to this project:

- **Water Resources Standard** – There is surface hydrology near / within the site. The water resources setback is shown in the plans with no new structures shown within the setback areas. There is a stormwater BMP (retention basin) near the water resources setback that is located there due to a conflict restricted by topographic and EGLE Act 399 permitting constraints which prevents stormwater basins within 200 feet of a Type 1 Municipal Well. Stormwater will be directed away from the water resource. Any vegetative buffers would be outlined in a Stormwater Agreement per **§ 50-6.2D(5)**
- **Wetland Standard** –Similar standards to Water Resources. Permits from State or Federal Agencies required to be on-file, if needed.
- **Protected Tree Standard** – There are trees proposed for removal and protection on-site in various conditions of health. Trees slated for protection and removal are clearly labeled, and protection fencing locations are shown. Protected trees slated for removal are justified per **§ 50-6.2F(3)(a) .** For the project, removals are required to build the site improvements, including the new Pump Station 5 and 14 Building to utilize the site for its zoned purpose.
- **Woodland Protection Standard** – Large woodland areas are isolated to the eastern edge of the property more closely connected with the neighboring property. Woodland should not be affected for this project.
- **Natural Heritage Areas Standard** – MNFI Rare Species review is not required for this project.
- **Plant Selection** – Plant selection needs to adhere to **§ 50-6.2J(4)** and tree plantings will come from the Tree Replacement List (**Table 6.2-5**)
- **Stormwater Management** – A Soil Erosion and Soil Control Plan is required and stormwater management will adhere to NFP Guidlines per **§ 50-6.2J(6)**. The project is also located within multiple wellhead capture zones.

After staff review, the plan appears to meet NFP standards and qualifies for conditional approval based upon the following:

- Replacement Trees follow **§ 50-6.2F(4)** of the NFP Ordinance.
- Replacement Tree List and Locations are Provided to Staff prior to obtain full site plan approval.
- Tree Protection Fencing Specifications are Provided.
- Full Approval by the Site Plan Review Committee.



SHEET NOTES AND LEGEND

1. ID NUMBERS GIVEN ARE FROM PREVIOUS TREE SURVEY BY WIGHTMAN.
2. PROPOSED TREE REMOVALS WERE MADE BY USING WIGHTMAN DRAWINGS AND RECENT(04/23/25), NEARMAPS IMAGERY, AND A TREE SURVEY COMPLETED ON 05/07/2025
3. ALL REMOVED PROTECTED TREES SHALL BE REPLACED WITH TREES FROM CITY OF KALAMAZOO'S "REPLACEMENT TREE LIST".
4. CURRENT LANDSCAPING DESIGN HAS 11 TREES FROM "TREE REPLACEMENT LIST"
   - 4.1. 2 EASTERN WHITE PINE (PINUS STROBUS)
   - 4.2. 12 AMERICAN ARBORVITAE (THUJA OCCIDENTALIS)

● TREE TO STAY

N

0 10' 20' 40'
SCALE: 1" = 20'

Bar Measures 1 inch, otherwise drawing not to scale

TETRA TECH
www.tetratech.com
1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR SITE PLAN REVIEW
05-12-2025

MARK	DATE	DESCRIPTION	BY
	05/01/25	ISSUED FOR BIDS	

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

PUMP STATION 5 & 14 BUILDING TREE REMOVAL

PROJ:	200-19743-24012
DESN:	-
DRWN:	-
CHKD:	

C-990

Copyright: Tetra Tech

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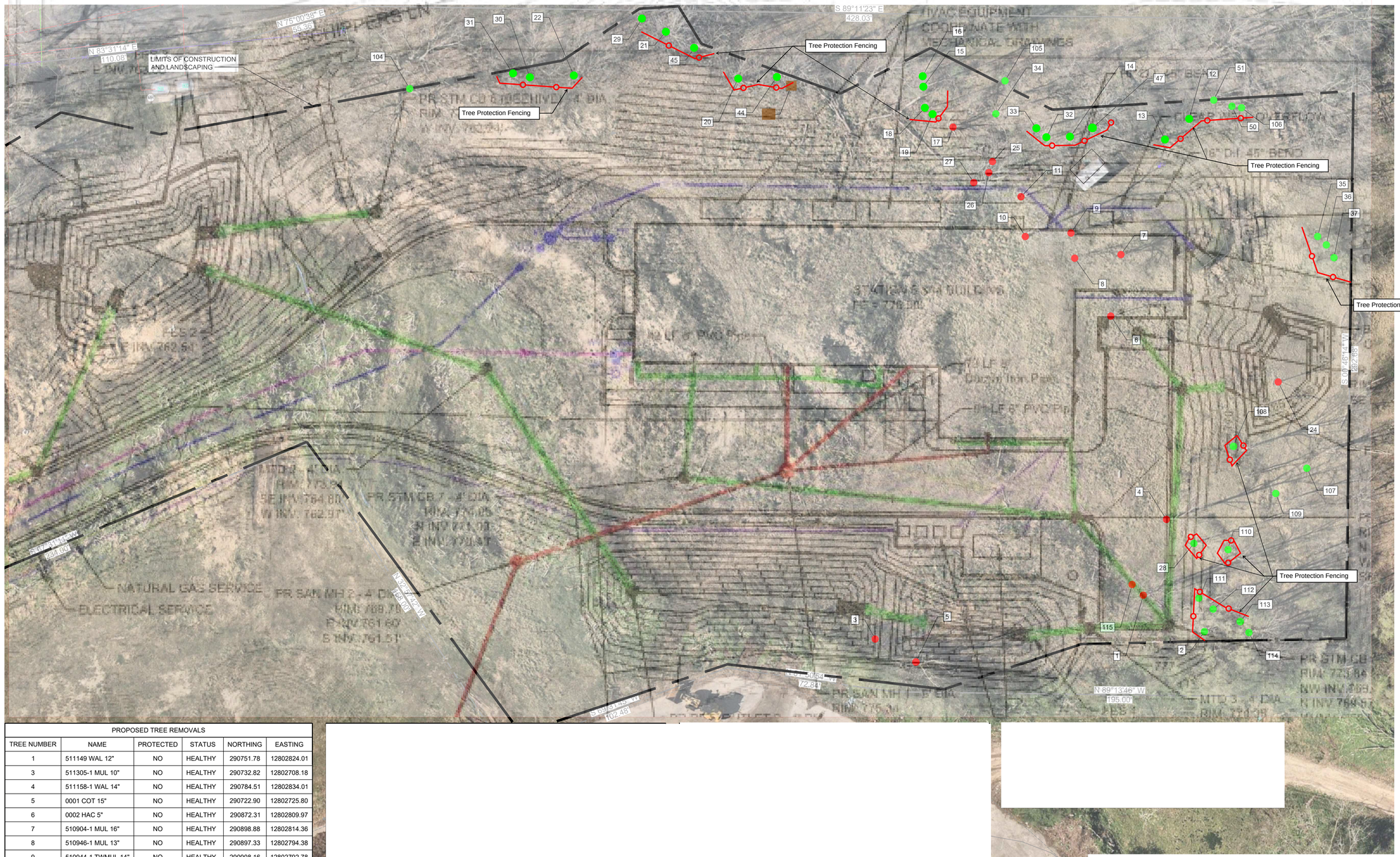

PROPOSED TREE REMOVALS					
TREE NUMBER	NAME	PROTECTED	STATUS	NORTHING	EASTING
1	511149 WAL 12"	NO	HEALTHY	290751.78	12802824.01
3	511305-1 MUL 10"	NO	HEALTHY	290732.82	12802708.18
4	511158-1 WAL 14"	NO	HEALTHY	290784.51	12802834.01
5	0001 COT 15"	NO	HEALTHY	290722.90	12802725.80
6	0002 HAC 5"	NO	HEALTHY	290872.31	12802809.97
7	510904-1 MUL 16"	NO	HEALTHY	290898.88	12802814.36
8	510946-1 MUL 13"	NO	HEALTHY	290897.33	12802794.38
9	510944-1 TWMUL 14"	NO	HEALTHY	290908.16	12802792.78
10	510800-1 WAL 10"	NO	HEALTHY	290906.69	12802773.06
11	0003 MUL 10"	NO	50% DEAD	290923.87	12802771.18
17	510743-1 CHE 9"	NO	DEAD	290953.94	12802741.83
24	0006 WAL 4"	NO	HEALTHY	290843.87	12802882.29
25	510746-1 WAL 6"	NO	HEALTHY	290939.07	12802758.88
26	510745-1 WAL 7"	NO	HEALTHY	290934.28	12802757.26
27	510716-1 WAL 13"	NO	HEALTHY	290930.01	12802750.79
115	0024 HAC 10"	NO	HEALTHY	290756.39	12802819.17

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- TREE TO STAY
- TREE TO BE REMOVED

SCALE: 1" = 20'

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1136 OAK VALLEY DRIVE, SUITE 100
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PHONE: (734) 665-6000 FAX: (734) 213-3003

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MARK	DATE	DESCRIPTION	BY
	05/01/25	ISSUED FOR BIDS	

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING TREE REMOVAL

PROJ: 200-19743-24012
DESN: -
DRWN: -
CHKD:

C-991

Copyright: Tetra Tech

Bar Measures 1 inch, otherwise drawing not to scale

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THE CITY OF Kalamazoo

Public Services
415 E Stockbridge Ave
Kalamazoo, MI 49001
Phone: (269) 337-8047
311 (269) 337-8000
www.kalamazoocity.org

May 5, 2025

Notice of Natural Features Protection Review Meeting
Water Pump Station 5&14 Reconstruction Project

Dear Resident,

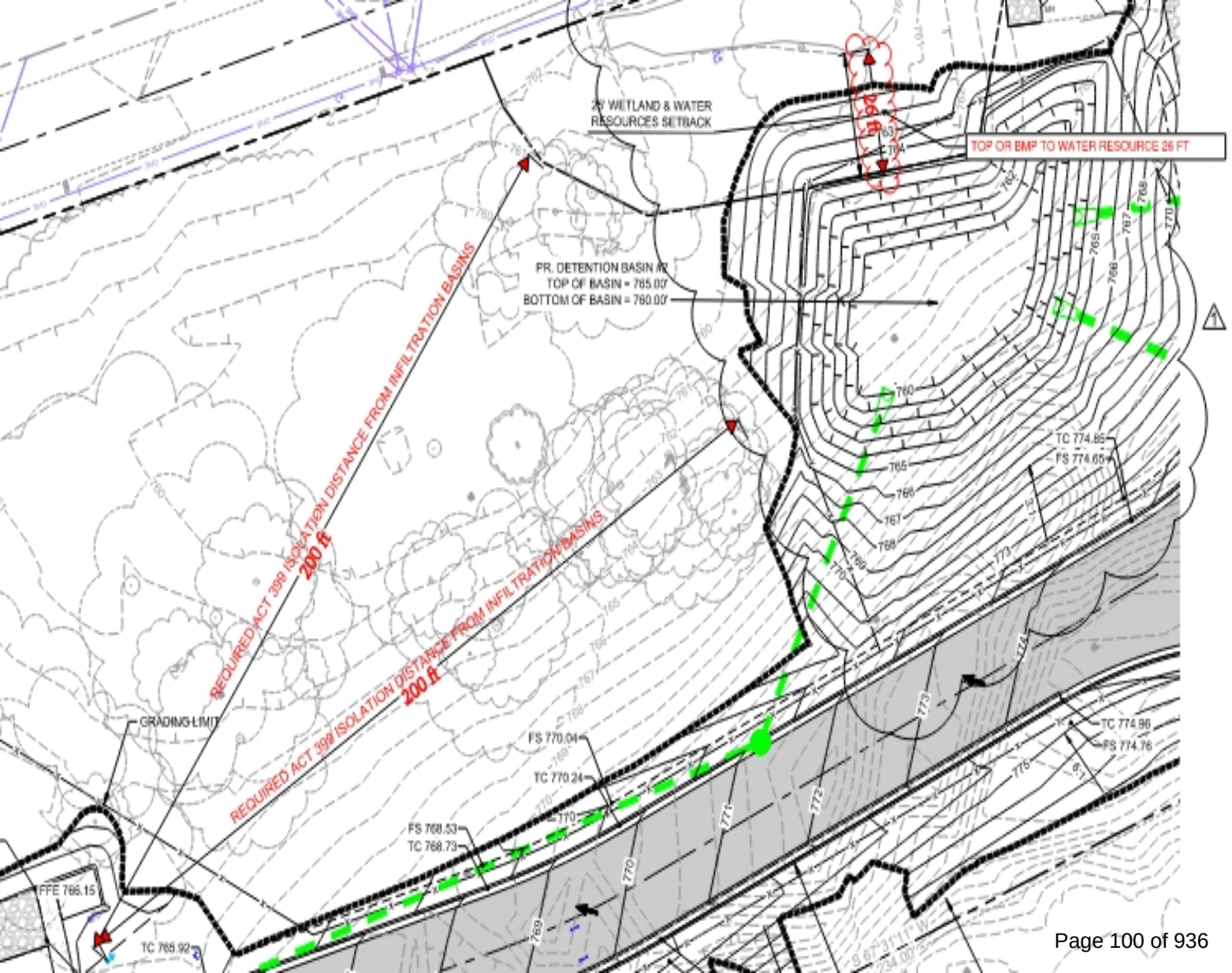
The City of Kalamazoo is presenting the proposed Water Pump Station 5&14 Reconstruction Project (Project) to the Natural Features Protection Board on May 28, 2025 between 4:00 PM and 6:00 PM.

The proposed Project is located at 2045 E. Michigan Ave.. The property is owned by the City and is bound by Schippers Lane to the north and E. Michigan Ave. to the south. The 5.59-acre property's parcel ID is 06-14-476-002.

The project involves reconstruction of an existing municipal well field and construction of a municipal drinking water treatment plant, including site grading, paving and the installation of necessary utilities. The project is supported by funds from the City of Kalamazoo and Michigan's Drinking Water State Revolving Fund.

Plans can be reviewed at 415 E. Stockbridge Ave., Kalamazoo, MI or on the City of Kalamazoo's Site Plan Review Website: https://www.kalamazoocity.org/Business-Development/Real-Estate-Development/Apply-for-Site-Plan-Review.

Comments should be emailed to sajtare@kalamazoocity.org before June 4. Construction is anticipated to begin in September 2025.


25' WETLAND & WATER RESOURCES SETBACK
TOP OR BMP TO WATER RESOURCE 26 FT
PR. DETENTION BASIN #2
TOP OF BASIN = 765.00'
BOTTOM OF BASIN = 760.00'
REQUIRED ACT 399 ISOLATION DISTANCE FROM INFILTRATION BASINS
200 ft
REQUIRED ACT 399 ISOLATION DISTANCE FROM INFILTRATION BASINS
200 ft
GRADING LIMIT
FFE 766.15
TC 765.92
FS 770.04
TC 770.24
FS 768.53
TC 768.73
TC 774.85
FS 774.65
TC 774.96
FS 774.76

Received:
04/14/2025
City of Kalamazoo

1. Checklist Meeting Application

Community Planning & Economic Development

245 N Rose St, Suite 100
Kalamazoo, MI 49007
www.kalamazoocity.org

Site Plan Review is an administrative process through the Site Plan Review Committee (SPRC). The Committee is comprised of members of many City Departments, including Public Safety, Public Services, Building and Trades, Community Planning and Economic Development (CPED). For Site Plan Approval, an applicant must attend two meetings: **Checklist Meeting** and **Site Plan Review**. The SPRC will approve plans once a proposed project has gone through both meetings and complies with all City of Kalamazoo standards.

Checklist Meeting

The Checklist Meeting is for projects with a defined scope and provides an opportunity for an applicant and their design professional (if applicable) to meet with the SPRC ahead of Site Plan Review. During this meeting, the Committee will walk through the Checklist and provide relevant Code requirements to help you prepare for Full Site Plan Review. Please be prepared to discuss your project in detail; this is the perfect time to ask the Committee questions to better understand Codes and the information needed for Site Plan Review and Approval.

Ready for a Checklist Meeting?

Review the following items to ensure you get the most out of the Checklist Meeting:

1. **Have a defined scope of work.**

   This includes project address, intended use, proposed site changes.

   For example: Sit-down restaurant with a new parking lot, grab & go smoothie shop, clothes store with upper floor residential, multi-family *residential development, etc.*

   Still finalizing your project's scope? A Project Review Meeting may be helpful.

2. **Submit a complete Checklist Meeting Application.**
   For an Application to be complete:
   - Page 1 is filled out in its entirety.
   - You've identified any Checklist items (pages 2-8) that you have specific questions about, indicating '***X***' by the item, under the '**Areas of Focus**' column.
   - The Checklist Meeting Application has been paid. See CoK Fee Schedule for fee amount.

Conceptual plans are not required for Checklist Meetings!

Fees:	Questions:	Accommodations:	Learn More:
Reference the Fee Schedule at:	siteplan@kalamazoocity.org	311@kalamazoocity.org	More Site Plan information is at:
kalamazoocity.org/CPEDFeeSchedule	311 or (269) 337-8000	311 or (269) 337-8000	kalamazoocity.org/SitePlanReview

Checklist Meeting Application

Community Planning & Economic Development
245 N Rose St, Suite 100
Kalamazoo, MI 49007
www.kalamazoocity.org

Project Details

SITE INFORMATION	
Property Address/Addresses:	2045 E. Michigan Avenue
Parcel Identification Numbers (PINs):	06-14-476-002

DESCRIPTION OF PROJECT
New Water Treatment Plant, Well Condos and Site Work

APPLICANT SIGNATURE	
Name:	City of Kalamazoo, Department of Public Services, Water Resources Division
Signature: Eric Sajtar	Date: 4-14-25

Applicant / Owner & Details

APPLICANT INFORMATION		
Name:	City of Kalamazoo - Eric Sajtar	
Address:	415 E. Stockbridge Ave.	
City: Kalamazoo	State: MI	Zip: 49001
Phone: 269-491-3882	Preferred Contact: (•) Email ( ) Phone	
Email:	sajtare@kalamazoocity.org	

PROPERTY OWNER INFORMATION		
Name:	City of Kalamazoo - Eric Sajtar	
Address:	415 E. Stockbridge Ave.	
City: Kalamazoo	State: MI	Zip: 49001
Phone: 269-491-3882	Preferred Contact: (•) Email ( ) Phone	
Email:	sajtare@kalamazoocity.org	

THE CITY OF Kalamazoo

Checklist Meeting Application

Checklist Items

EXISTING CONDITIONS	Applicant AREAS OF FOCUS	Internal SPRC Codes
Vicinity Maps - Illustrating adjacent streets and existing structures (within 200'), zoning, land use, and 2025 Master Plan Land Development designation of adjacent parcels.	☐	
Note Presence of Special District or Designation:		
• Historic District	☐	
• Brownfield Redevelopment Authority	☐	
• State/Federal List for Soil/Groundwater Contamination – If yes, also contact MEGLE	☐	
• Endangered / Rare species or Habitat area -if yes, also contact MDNR	☐	
• Required reporting for RCRA/US EPA Hazardous Waste Handler site (note site type: small quantity generator, large quantity generator, transporter, treatment/storage/ disposal, notifier, other)	☐	
• Solid Waste Facility	☐	
• Baseline Environmental Assessment (BEA), Environmental Site Assessments (ESA's), Due Care plans (DCP) or other environmental info / reports, as applicable	☐	
• Tax capture or deferment area (such as CIA, TIF, NEZ, etc.)	☐	
• Natural Features Protection – 2025 Master Plan	☐	
• Wellhead Protection Area	☐	
Location and Type of Existing Features on the Subject property and on Adjacent Properties - Woods, wetlands, streams, rivers, lake, drains, 100-year flood plains, flood way, wetland, soil contamination, groundwater contamination etc. Also required are:	☐	
• Topography (2' contour lines labeled with USGS datum)	☐	
• Tree inventory (note all trees 10" or greater at diameter breast height or dbh on the site with species type, condition, and remain/ remove status)	☐	
If Project Disturbs an Area Greater than 1 Acre within 500' of a Lake or Stream, EGLE Permit Required.	☐	
Location, Dimensions, and/or Capacities of - Existing lots; recorded and unrecorded easements (including County drains); all utilities, including water, sewer, electric, gas, phone, cable, Internet, wells and cisterns, hydrants; Fire Department Connections, rights-of-way (including sidewalk, trails, landscaping, lighting, pavement, notes on vacation, etc. within it); and points of access.	☐	

THE CITY OF Kalamazoo

Checklist Meeting Application

PLANNING / ZONING	Applicant AREAS OF FOCUS	Internal SPRC Codes
Alignment with 2025 Master Plan.	☐	
Zoning Table to Include:		
• Building Location - Distance from property lines, zone district, impervious coverage (pre and post development)	☐	
• **Parking (Vehicle and Bicycle) and Loading - Location, quantity, dimensions, barrier-free, signage, driveway width and location**	☐	
• Building Elevations - Number of stories, window and door locations, facade materials, and lighting	☐	
• All On-Site Lighting - Location, height, type, wattage	☐	
• Signage Details - Type, location, and size	☐	
• Site Access for All Modes (Vehicle, Pedestrian, Bicycle, Transit) - Location, dimension, radii, materials, signage	☐	
• Refuse Location & Screening	☐	
• Landscape Plan - Include location / type of fencing, walls, plant schedule (number, size, species), and number of existing / proposed trees, vegetation, and tree canopy	☐	
If LW1, LW2, D1, D2, D3 - Identify the Following Form Standards:		
• Lot Type	☐	
• Entry Type	☐	
• Number of Entrances	☐	
• Setbacks/BTZ	☐	
• Transparency	☐	
• Number and Location of Driveways	☐	

BUILDING / TRADES	Applicant AREAS OF FOCUS	Internal SPRC Codes
Soil Erosion Control Measures.	☐	
Final Site Grading/Topography - 2' contour lines labeled with USGS datum.	☐	
USGS First Floor Elevation of Buildings.	☐	
Locations, Dimensions, Area, Use and Construction Type of All Buildings.	☐	
ADA Compliance - Parking, routes, accessible dwellings, fixtures, etc.	☐	
Occupant Egress Path from All Structures.	☐	
Fire Separation Distance.	☐	

THE CITY OF Kalamazoo

Checklist Meeting Application

KDPS - FIRE MARSHAL	Applicant AREAS OF FOCUS	Internal SPRC Codes
Emergency Entry:		
• A Knox key vault box 3200 series or larger is required by the building entrance. Multiple may be required	☐	
• Emergency egress cannot cross the roof and needs to be protected and illuminated	☐	
• A Knox elevator key box shall be installed adjacent to any elevator	☐	
Fire Lane:		
• Fire access lanes, when required, shall be a minimum of 24' wide and provide 13' 6" height clearance. Signage shall be erected to prohibit parking in this designation	☐	
• Turning radius of parking lots and fire access lanes shall be constructed to allow turning and full operation of fire apparatus during an emergency	☐	
• Dead-end access roads and parking lots in excess of 150 feet in length shall be provided with approved provisions for the fire apparatus to turn around	☐	
• Overhangs, sky walks, bridges or other similar structures shall be approved by the Fire Marshal's Office. Engineered specs shall be provided	☐	
• Security gates restricting access shall be approved pursuant to Code. Approved fences, gates or other barriers shall be accessed through Knox padlocks or access switches	☐	
• Parking lots, driveways and service & access drives shall be designed and constructed to allow the maneuverability and weight of fire service aerial devices	☐	
Fire Hydrants:		
• Hydrants not publicly owned cannot be considered for use for SPR	☐	
• Placement shall be approved by the Fire Marshal's Office	☐	
• Shall not be more than 300 feet from the site	☐	
• Fire hydrant spacing shall not exceed 300 feet from each hydrant	☐	
Addressing:		
• Building identification shall be placed in a position that is plainly legible and visible from any street or road fronting the property	☐	
• Those properties fronting more than one street or road shall identify the address by both number and street name on each side of road frontage	☐	
• The address numbers and street name shall contrast with their background	☐	
• Commercial structures shall have address numbers at least 12" to 24" high, as determined by the Fire Marshal	☐	
• Address letters indicating street names shall be 6" to 24", height to be approved by the Fire Marshal	☐	

THE CITY OF Kalamazoo

Checklist Meeting Application

KDPS - FIRE MARSHAL - continued	Applicant: AREAS OF FOCUS	Internal: SPRC Codes
Fire Department Connections (FDC):		
• Immediate access to FDC shall be maintained in clear view without obstruction by parked vehicles, fences, bushes, trees, walls, dumpsters or any other object	☐	
• The FDC shall be located in a location approved by the Fire Marshal's Office	☐	
• The FDC shall be within 100' of a fire hydrant	☐	
• The Fire Department Connections (FDC) shall have Knox 5" Locking storz FDC Plugs Model 5002	☐	
• The FDC shall be accessible by hard surfaced pavement which is maintained during all-weather environments. Hard surface shall be cement or asphalt. The width shall allow a vehicle or hose line to be advanced or connected	☐	
• FDC shall be located so that fire apparatus and hydrant lines connected to supply the system will not obstruct access to the buildings for other fire apparatus	☐	
• FDC shall have an exterior rated horn and strobe device above the FDC at a minimum 10' above grade in height. Device shall be in clear view to approaching fire apparatus. The horn and strobe shall remain active until manually reset	☐	
FDC Placement:		
• Fire department connections not remotely located shall be located on the street side of the building	☐	
• FDC's not remotely located shall be fully visible and recognizable from the street	☐	
• The FDC shall be identifiable to approaching fire apparatus	☐	
FDC Signage:		
• The FDC shall be indicated by an approved sign mounted on the street, front, side of the building or adjacent to a remotely located FDC	☐	
• FDC signage shall have the letters "FDC" at least 6 inches high. The letters shall be a Arabic or Helvetica style font	☐	
• FDC Signage shall be installed at a minimum 10' above grade or above obstructions above the connection. The signage shall be mounted directly above the exterior horn and strobe that is tied to the fire alarm and fire suppression systems.	☐	
• FDC signage shall be reflective with white letters with a red background. All such signs shall be subject to the approval by the Fire Marshal.	☐	

THE CITY OF Kalamazoo

Checklist Meeting Application

PUBLIC SERVICES - TRANSPORTATION & UTILITIES	Applicant AREAS OF FOCUS	Internal SPRC Codes
Location and Dimensions of New Rights-of-Way.	☐	
Site Access for All Modes (Vehicle, Pedestrian, Bicycle, Transit) - Location, approach type, dimension, radii, materials, signage.	☐	
Access & Circulation of Site or Proposed Street Network.	☐	
Improvements to Existing Off-Site Rights-of-Way for All Modes (Vehicle, Pedestrian, Bicycle, Transit).	☐	
Timeline of Proposed Right-of-Way Work, Street Closures, Lane Restrictions, or Sidewalk Closures.	☐	
Location and Dimension of Proposed Traffic Control Measures - Acceleration, deceleration, passing lanes, traffic signals or signs.	☐	
Location and Dimension of Utilities & Easements - Gas, electric, phone, cable, etc.	☐	
Provide a Sheet to Demonstrate Turning Radius and Clearance for - City Kalamazoo Fire Apparatus, garbage trucks, delivery trucks, etc.	☐	

PUBLIC SERVICES - SANITARY SEWER	Applicant AREAS OF FOCUS	Internal SPRC Codes
Sanitary Sewer Service Lateral Location and Sizing:		
• All existing & proposed new, including identification & depth of underground utility crossings	☐	
• Invert elevation of existing lateral at ROW/easement lines which will continue to be active	☐	
• Invert Elevation of proposed new lateral at ROW/easement line	☐	
• Sanitary main U.S. invert elevation	☐	
• Sanitary main D.S. invert elevation	☐	
Compliance with Chapter 28 of the City of Kalamazoo Ordinances & Engineering Best Practices.	☐	
Discharge Basis of Design Flow Rate, Per Connection: Residential – Multi-Family 3+; Commercial – Restaurant, Laundry Facility, Manufacturing, Hotel/Motel, Medical, and others, as required.		
• Contribution Per REU (gpd)	☐	
• Total REU's with justification/calculation	☐	
• Average Flow Rate (gpm)	☐	
• Peaking Factor with justification/calculation	☐	
• Peak Flow Rate (gpm)	☐	

If a new connection is proposed, a Sanitary Sewer Connection Application Form is required

THE CITY OF Kalamazoo

Checklist Meeting Application

PUBLIC SERVICES - WATER	Applicant AREAS OF FOCUS	Internal SPRC Codes
Location & Capacity of Water Main, Water Service, and Hydrants.	☐	
For New Water Service, Also Detail:		
• Size of line required	☐	
• Use for fire service	☐	
• Domestic meter size required	☐	
• Irrigation meter size required	☐	
For New Public Water Mains:		
• Located in public right-of-way -or - Located in easement dedicated to CoK	☐	
• MDEQ PA399 Permit Application	☐	
Number of New Hydrants _____		
Fire Service (Note: Existing Systems May Require Inspection & Upgrade):		
• Locate cross-connections	☐	
• Backflow prevention devices	☐	

PUBLIC SERVICES - STORMWATER	Applicant AREAS OF FOCUS	Internal SPRC Codes
SW Structures, Pipes, and Other Drainage System Components - Shown on plans and on detail sheets.	☐	
Site Size (Small 1/2 acre or less, medium up to 1 acre, large over 1 acre) Determined.	☐	
Provide Stormwater Worksheets (from City of Kalamazoo templates):		
• Stormwater Calculations	☐	
• Water Quality Treatment (Uniform Standard 1)	☐	
• Channel Protection Volume (Uniform Standard 2)	☐	
If Discharging to County Drain or MDOT System - Contact appropriate authority for more information, additional standards, and permitting.	☐	
Provide Permit Documentation Required by MEGLE for Floodplain, Wetlands, and Discharge to Surface Waters.	☐	
Feasibility of Runoff Infiltration - Depends on soil type, groundwater depth, capture zone, existing environmental contamination, and/or proposed use of regulated substances. If infiltration will be restricted, basins/other infiltrating surfaces shall be lined with impervious material with minimum 60-mill (0.060 or 1/16-inch) thickness.	☐	
Buffer Adjacent to Water Features On/Near Site.	☐	
Existing or Planned Manufactured Treatment Devices (MTDs), Retention/Detention Basins, Rain Gardens & Swales - Will require a recorded Stormwater Operation and Maintenance Agreement with the City of Kalamazoo.	☐	

THE CITY OF Kalamazoo

Checklist Meeting Application

PUBLIC SERVICES - ENVIRONMENTAL / WELLHEAD PROTECTION	*Applicant* AREAS OF FOCUS	*Internal* SPRC Codes
Compliance with Wellhead Protection & Stormwater Management Performance Standards. Include the Following Information on the Plan Set:		
• Note whether de-watering is or is not anticipated.	☐	
• Management of abandoned wells, cisterns, dry wells, generators and above or underground storage tanks, including information on installation, operation, capping, or removing.	☐	
• Installation of new well (temporary, permanent or geothermal) with or without a Reduced Principle Backflow Prevention Assembly.	☐	
• Property/site/floor drains or sump pumps present? Detail connection to sanitary or storm sewer, on-site holding tank with pumping/disposal plan, or other.	☐	
• Detail direct or indirect discharge into or toward a storm sewer, drain, wetland, pond, lagoon, or other surface water feature?	☐	
• Detail all grade changes, cutting, and fill, including management of existing vegetation and soil erosion and/or sedimentation.	☐	
• Note whether an existing snow melt system is present or whether one is proposed.	☐	
Submit Environmental Reports (ESA, BEA, DCP, or other). Refer to the Performance Standards on Infiltration.	☐	
Provide Completed Chemical Inventory& Storage (CSI) Forms 1 & 2. If no chemicals used/stored on site, write 'N/a' in all applicable boxes.	☐	
A Spill Containment Plan (SCP) is required if - Chemicals used/stored on-Site exceed the quantities stated on the CSI Form.	☐	

Site Plan Review Forms / Documents & CoK Code Standards can be found on the Site Plan Review Webpage, by visiting:

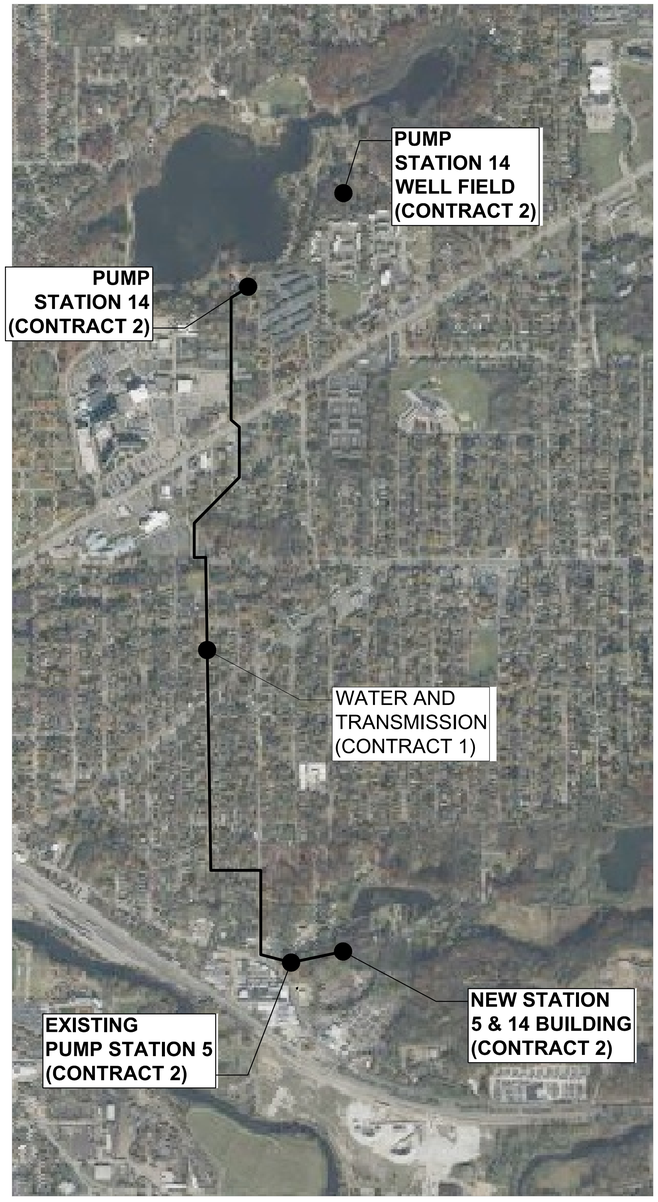
kalamazoocity.org/SitePlanResources

If you're completing this form in Adobe Acrobat you can click the button below to submit this form. You can also save a completed copy and email it to **siteplan@kalamazoocity.org**.

SUBMIT

CITY OF KALAMAZOO
PUMP STATION 5 & 14 RECONSTRUCTION
CONTRACT 2

DWSRF NO. 7866-01



CALL MISS DIG
(800) 482-7171

FOR PROTECTION OF UNDERGROUND UTILITIES AND IN CONFORMANCE WITH PUBLIC ACT 53, 1974, THE CONTRACTOR SHALL CALL (800) 482-7171 A MINIMUM OF THREE (3) FULL WORKING DAYS (EXCLUDING SATURDAYS, SUNDAYS AND HOLIDAYS) PRIOR TO EXCAVATING IN THE VICINITY OF UTILITY LINES. ALL "MISS DIG" PARTICIPATING MEMBERS WILL THUS BE ROUTINELY NOTIFIED. THIS DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF NOTIFYING UTILITY OWNERS WHO MAY NOT BE A PART OF THE "MISS DIG" ALERT SYSTEM.

1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX (734) 213-3003
www.tetratech.com

TETRA TECH

PROJECT LOCATION:
2045 EAST MICHIGAN AVENUE,
KALAMAZOO, MI 49048

CLIENT INFORMATION:
CITY OF KALAMAZOO

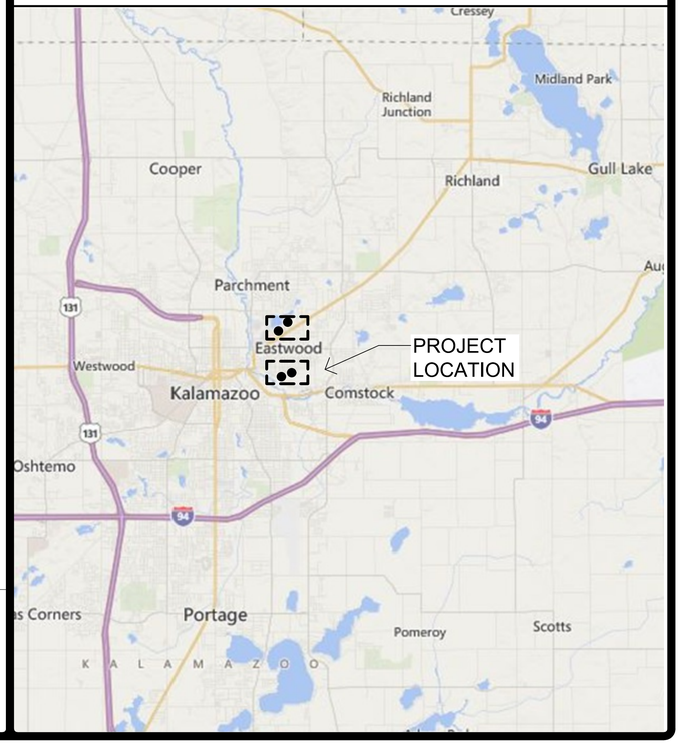
Tt PROJECT No.:
200-19743-24012

CLIENT PROJECT No.:

PROJECT DESCRIPTION / NOTES:
PUMP STATION 5 & 14 CONSOLIDATION, CONTRACT 2
NEW CONSTRUCTION OF PUMP STATION 5 & 14 BUILDING, PROJECT SITE WORK, WELL CONDOS, PIPING, WELL FIELD PUMPS, AND WATER MAIN UPDATES.

ISSUED:
ISSUED FOR SITE PLAN
REVIEW 05-12-2025

VICINITY MAP:



NOTES

GENERAL NOTES (ALL DRAWINGS):

1. THESE GENERAL NOTES PRESENT AND/OR SUMMARIZE KEY PROJECT INFORMATION FOR THE DRAWINGS. FOR ADDITIONAL INFORMATION REFER TO DRAWING NOTES AND PROJECT SPECIFICATIONS FOR FURTHER DETAILS AND REQUIREMENTS.
2. ALL EXISTING DIMENSIONS SHOWN WITH THE (+/-) SYMBOL ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR BEFORE FABRICATION AND CONSTRUCTION. FIELD VERIFY UTILITY LOCATIONS.
3. THE INTENT OF THE DRAWINGS IS THAT THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, TOOLS, EQUIPMENT AND TRANSPORTATION NECESSARY FOR THE PROPER EXECUTION OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND ALL INCIDENTAL WORK NECESSARY TO COMPLETE THE PROJECT IN AN ACCEPTABLE MANNER, READY FOR USE BY THE OWNER.
4. THE CONTRACTOR SHALL REVIEW AND COORDINATE THE SCHEDULING OF ALL CONSTRUCTION WITH THE OWNER AND SUBMIT DETAILED CONSTRUCTION SCHEDULE PRIOR TO BEGINNING WORK.
5. ALL GENERAL NOTES APPLY TO THE SCOPE OF THIS PROJECT.
6. THE GENERAL CONTRACTOR SHALL ENSURE THAT ALL CONSTRUCTION MEETS OR EXCEEDS APPLICABLE CODES AND STANDARD PRACTICES, INCLUDING ALL FEDERAL, STATE AND LOCAL BUILDING AND ACCESSIBILITY REQUIREMENTS AND REGULATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY VIOLATION OF THE SAME AND SHALL MAKE ALL WORK ACCEPTABLE TO THE AUTHORITY HAVING JURISDICTION INVOLVED WITHOUT EXTRA CHARGE.
7. EACH TRADE SHALL VERIFY ALL REQUIREMENTS PERTAINING TO WORK PERFORMED IN THE PROJECT AND ANY REQUIRED PERMITS. ALL SUBCONTRACTORS SHALL DIRECT QUESTIONS, CHANGES OR REQUESTS THROUGH THE GENERAL CONTRACTOR. THE GENERAL CONTRACTOR SHALL SUBMIT ALL REQUESTS, CHANGES OR QUESTIONS TO THE OWNER'S REPRESENTATIVE IN WRITING.
8. THE CONTRACTOR IS RESPONSIBLE FOR ALL FEDERAL, STATE, AND LOCAL CODE REVIEW, PERMITTING AND ASSOCIATED FEES.
9. THE CONTRACTOR SHALL MEET ALL OCCUPATIONAL SAFETY AND HEALTH STANDARDS (OSHA), PART 1910 AND EQUIVALENT OSHA AND FEDERAL STANDARDS.
10. THE CONTRACTOR SHALL FOLLOW OWNER SOIL EROSION AND SEDIMENTATION CONTROL REQUIREMENTS (SESC).
11. CONTRACTOR TO PROVIDE ANY AND ALL NECESSARY FENCES, BARRICADES, OR TRAFFIC CONTROLS TO ENSURE VEHICLE AND PERSONNEL SAFETY AND ADEQUATELY PROTECT THE SITE AT ALL TIMES.
12. PROVIDE ADEQUATE PROTECTION TO PREVENT DAMAGE TO ADJACENT STRUCTURES.
13. CONTRACTOR SHALL COORDINATE WITH OWNER AND ENGINEER FOR ALL RELOCATING AND REROUTING OF EQUIPMENT, PIPING, CONDUIT, ETC.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TRAFFIC CONTROL AND WORK SITE SAFETY ON THIS PROJECT, INCLUDING SHEETING, BRACING, SIGNAGE, AND MEETING ALL STATE, FEDERAL AND LOCAL SAFETY CODES.
15. ALL HARDWARE SHALL BE 304 STAINLESS STEEL INCLUDING NUTS, BOLTS, WASHER, ANCHORS, STRUTS, ETC. FOR ALL DRAWINGS. ANY REFERENCES IN ANY SPECIFICATION OR ANY DRAWING REFERRING TO 304 STAINLESS STEEL SHALL HAVE PRECEDENCE OVER STANDARD DETAILS, AND PROJECT MANUAL/SPECIFICATIONS.
16. ALL EXISTING SITE CONDITIONS SHOWN ON THE PLANS ARE FOR REFERENCE ONLY.
17. NO PIPES, CONDUIT, ETC. MAY BE EMBEDDED IN CONCRETE FLOORS, WALLS, OR CEILING UNLESS APPROVED BY ENGINEER.
18. UNDERGROUND UTILITIES ARE APPROXIMATE LOCATIONS ONLY. UNDERGROUND UTILITY LOCATIONS HAVE NOT BEEN FIELD VERIFIED. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFICATION OF ALL UNDERGROUND UTILITIES. ALL EX. UTILITIES MAY NOT BE SHOWN.
19. CONTRACTOR SHALL NOT UTILIZE ANY PAVED ROADWAYS FOR TRACK EQUIPMENT OPERATION OR STORAGE. ALL DAMAGED ROADWAYS CAUSED BY CONTRACTOR TO BE REPAIRED AT CONTRACTORS EXPENSE.
20. THE CONTRACTOR AND SUBCONTRACTOR SHALL MAKE A PERSONAL INVESTIGATION OF THE SITE AND EXISTING SURFACE AND SUBSURFACE CONDITIONS. THE CONTRACTOR IS RESPONSIBLE TO ACQUAINT THEMSELVES WITH CONDITIONS OF THE WORK AREA. THE CONTRACTOR IS ADVISED TO DETERMINE THE SUBSURFACE SOIL AND GROUND WATER CONDITIONS. DEWATERING, IF DETERMINED NECESSARY BY THE CONTRACTOR AND IF NOT SPECIFICALLY CALLED OUT IN THE CONTRACT DOCUMENTS, WILL BE INCIDENTAL TO THE COST OF INSTALLATION.
21. ALL DISTURBED AREAS SHALL BE RESTORED.
22. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE PROPERTY, INCLUDING EXISTING FENCING, LAWN, TREES AND SHRUBBERY.
23. CONTRACTOR TO PROVIDE DEWATERING AS REQUIRED FOR THE WORK.
24. DO NOT LEAVE ANY OPENINGS UNCOVERED AT END OF WORKING DAY.
25. THE ELEVATIONS SHOWN ON THE CIVIL DRAWINGS ARE BASED ON NAVD88 DATUM. ELEVATIONS ON ALL OTHER SHEETS ARE BASED ON NGVD29 DATUM. NGVD29 ELEVATIONS ARE 0.436' HIGHER THAN NAVD88 ELEVATIONS.

GENERAL DEMOLITION NOTES (ALL DRAWINGS):

1. DEMOLITION DRAWINGS MAY NOT SHOW ALL DEMOLITION WORK REQUIRED UNDER THIS CONTRACT. OTHER CONTRACT DRAWINGS MAY ALSO SHOW DEMOLITION WORK. COORDINATE DEMOLITION WITH REQUIREMENTS LISTED IN SECTION 01110 OF THE PROJECT MANUAL.
2. SITE INVESTIGATION PRIOR TO BIDS IS STRONGLY RECOMMENDED TO DETERMINE THE COMPLETE EXTENTS OF DEMOLITION REQUIRED. THESE DRAWINGS DO NOT INDICATE ALL MATERIALS THAT ARE TO BE REMOVED OR REROUTED IN AREA OF PROPOSED WORK.
3. PRIOR TO STARTING WORK THE DEMOLITION CONTRACTOR IS TO FIELD VERIFY NOTED AREAS OF DEMOLITION TO DETERMINE ACTUAL SCOPE OF DEMOLITION, AND TO REVIEW SCOPE WITH THE OWNER'S REPRESENTATIVE TO CONFIRM SPECIFIC ITEMS TO BE SALVAGED AND STORED FOR REUSE.
4. COORDINATE WITH OWNER DURING ANY INTERRUPTION OF SERVICE, SO THAT THAT OPERATION OF THE PROCESS EQUIPMENT IS NOT EFFECTED. SEE SPECIFICATIONS 01110 - SUMMARY OF WORK FOR ADDITIONAL REQUIREMENTS. REVIEW WORK ITEMS WITH ENGINEER PRIOR TO PERFORMING WORK.
5. PRIOR TO THE START OF ANY DEMOLITION WORK, COORDINATE WITH PLANT OPERATORS THE LOCATION OF ALL UTILITIES. PLANT LOCK OUT/TAG OUT PROCEDURES SHALL BE STRICTLY FOLLOWED.
6. EXPANSION AND ANCHOR BOLTS REMAINING IN WALL, CEILINGS OR FLOORS SHALL BE POUNDED OR CUT FLUSH WITH SURFACE. IN FINISHED AREAS THEY SHALL BE RECESSED AND PATCHED TO MATCH EXISTING FINISH.
7. ALL OPENINGS REMAINING IN FLOORS, WALLS, OR CEILINGS, INCLUDING SLEEVES, AFTER PIPING AND DUCT DEMOLITION SHALL BE PATCHED TO MATCHING EXISTING FINISH AND AS DETAILED ON DRAWINGS.
8. CAP AND BLIND FLANGE MATERIAL TO BE SAME AS PIPE BEING CAPPED.
9. PROMPTLY PATCH AND REPAIR DAMAGE CAUSED TO ADJACENT BUILDING ELEMENTS BY DEMOLITION WORK. RESTORE EXPOSED FINISHES OF PATCHED AREAS IN A MANNER THAT ELIMINATES EVIDENCE OF PATCHING AND REFINISHING.
10. OWNER RESERVES RIGHT TO RETAIN ANY EQUIPMENT OR MATERIALS REMOVED UNDER THIS CONTRACT. CONTRACTOR IS RESPONSIBLE TO HAUL AND DISPOSE OF OFFSITE ALL REMAINING REMOVED EQUIPMENT, MATERIAL, PIPING, CONDUIT, SOILS AND DEBRIS, NOT RETAINED BY OWNER, IN ACCORDANCE WITH ALL APPLICABLE CODES, LAWS, AND ORDINANCES.
11. CONTRACTOR IS RESPONSIBLE TO PROVIDE AND MAINTAIN SHORING, BRACING, OR STRUCTURAL SUPPORT TO PRESERVE STABILITY AND PREVENT MOVEMENT, SETTLEMENT, OR COLLAPSE OF ITEMS TO BE SELECTIVELY DEMOLISHED OR STABILIZED AND ITEMS WHICH ARE IMMEDIATELY ADJACENT TO THOSE BEING REMOVED. CONTRACTOR SHALL HIRE A LICENSED STRUCTURAL ENGINEER TO PROPERLY DESIGN ANY SHORING OR TEMPORARY SUPPORTS THAT MAY BE REQUIRED DURING THE DEMOLITION PHASE.
12. NO BURNING SHALL BE PERMITTED ON THIS PROJECT.
13. BLASTING IS PROHIBITED ON THIS PROJECT.
14. WHEN EQUIPMENT ITEMS ARE INDICATED FOR DEMOLITION, ALL ANCILLARY UTILITIES, ELECTRICAL ITEMS, CONCRETE SUPPORTS AND STRUCTURAL STEEL SUPPORTS SHALL BE COMPLETELY REMOVED UNLESS INDICATED OTHERWISE. ALL THE ABOVE MENTIONED ITEMS MAY NOT BE INDICATED ON THE DRAWINGS. SITE VISIT PRIOR TO BID DATE IS RECOMMENDED TO QUANTIFY COMPLETE EXTENT OF EQUIPMENT DEMOLITION.
15. CONCRETE FLOOR SLABS UNDER DEMOLISHED CONCRETE EQUIPMENT PADS, THAT WILL BE EXPOSED IN THE FINISHED CONSTRUCTION SHALL BE PATCHED SMOOTH AND ANY DOWELS OR ANCHORS SHALL BE CUT OFF 2" BELOW THE SURFACE AND PATCHED SMOOTH. IF REQUIRED, EXISTING FLOOR SURFACE SHALL BE CHIPPED OR ROUGHENED AND PATCH APPLIED OVER BONDING AGENT.
16. ALL PIPING SHOWN AS BEING DEMOLISHED SHALL BE COMPLETELY REMOVED INCLUDING INSULATION, HANGERS, EXPANSION AND ANCHOR BOLTS AND PIPE SUPPORTS. CAP PIPES LEFT IN PLACE AS REQUIRED. CONTRACTOR SHALL REMOVE PIPE CONTENTS AS WELL WHICH MAY CONTAIN WATER, SLUDGE, WASTEWATER, ETC.
17. FLOORS, WALLS, AND CEILING SURFACES ARE TO BE CLEANED IN EACH AREA AFTER DEMOLITION IS COMPLETE. THE WALLS SHALL BE WET BRUSHED, SCRAPPED, SWEEP, ETC. AS REQUIRED TO REMOVE DIRT, LOOSE CRYSTAL, SCALE, RUST, AND DUST FROM SURFACES PRIOR TO PAINTING OF PIPING. FLOORS ARE TO BE POWER WASHED.
18. FLOOR DRAINS SHALL BE PROTECTED FROM DIRT AND DEBRIS.
19. PIPE, CONCRETE, ASPHALT, ETC. TO BE REMOVED AND REPLACED IS TO BE REPLACED IN KIND UNLESS NOTED OTHERWISE.
20. CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL MATERIALS GENERATED DURING DEMOLITION WORK CONFIRM WITH OWNER DEMOLITION ITEMS, PER NOTE 10.

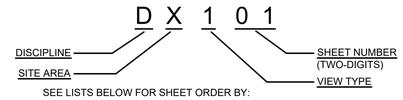
WATER MAIN GENERAL NOTES:

1. WATER MAIN AND SERVICE INSTALLATIONS SHALL BE PERFORMED IN ACCORDANCE WITH CITY OF KALAMAZOO STANDARD SPECIFICATIONS FOR WATER MAIN AND SERVICE INSTALLATION 2021.
2. WATER MAIN SHALL BE DUCTILE IRON PIPE (DIP), CLASS 52 TR FLEX WITH V-BIO ENCASEMENT BY CENTERING ON A FULL STICK OF PIPE.
3. MAXIMIZE DISTANCE BETWEEN WATER MAIN JOINTS AT ALL SEWER CROSSING AND STRUCTURES. CENTER FULL STICK PIPE AT ALL CROSSINGS.
4. PROVIDE A MINIMUM OF 18-INCHES OF SEPARATION VERTICALLY AT ALL SEWER CROSSINGS. A HORIZONTAL DISTANCE OF 10-FEET SHALL BE MAINTAINED FROM ALL SEWER MAIN.
5. INSTALL 2-INCH INSULATION IN BETWEEN WATER MAIN AND STORM SEWER AT ALL STORM CROSSINGS; 2-INCH INSULATION WHENEVER WATER MAIN IS IN BETWEEN 4 AND 5-FOOT BURY; 4-INCH INSULATION WHENEVER WATER MAIN IS IN BETWEEN 3 AND 4-FOOT BURY. DO NOT BURY WATER MAIN LESS THAN 3 FEET BELOW GRADE.
6. WATER MAIN AND/OR SERVICE ENCASEMENT IS REQUIRED WHENEVER CROSSING OR WITHIN 10-FEET OF CATHOLICALLY PROTECTED GAS MAIN(S) (AT ALL CROSSINGS ENCASE MINIMUM 10-FEET EACH SIDE OF CROSSING)

ABBREVIATIONS

A	
AB	ANCHOR BOLT
ABAN	ABANDON(ED)
ABBREV	ABBREVIATION
ABRSV	ABRASIVE
ADDM	ADDENDUM
ADH	ADHESIVE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AFS	ABOVE FINISHED SLAB
AHD	AHEAD
AL	ALUMINUM
ALT	ALTERNATE
AMP	AMPERE
AMT	AMOUNT
APRX	APPROXIMATE(LY)
ARCH	ARCHITECT(URAL)
ASPH	ASPHALT
ASSY	ASSEMBLY
A/C	AIR CONDITIONING
B	
BI	BLACK IRON
BITUM	BITUMINOUS OR BITUMASTIC
B/L	BASELINE
BLDG	BUILDING
BLK	BLOCK
BM	BENCH MARK
BOT	BOTTOM
BP	BASE PLATE
BRG	BEARING
C	
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CI	CAST IRON
CJ	CONSTRUCTION JOINT
CKT	CIRCUIT
C/L	CENTER LINE
CLF	CHAIN LINK FENCE
CLR	CLEAR OR CLEARANCE
CMU	CONCRETE MASONRY UNIT
CND	CONDUIT
CNR	CORNER
CO2	CARBON DIOXIDE
COL	COLUMN
COM	COMMON
CONC	CONCRETE
CONN	CONNECTION
CONSTR	CONSTRUCT(ION)
CONT	CONTINUOUS
CONTR	CONTRACT(OR)
COORD	COORDINATE
CSG	CASING
CY	CUBIC YARD
CYL	CYLINDER
C&G	CURB AND GUTTER
C/C	CENTER TO CENTER
D	
DAT	DATUM
DBL	DOUBLE
DC	DIRECT CURRENT
DEMO	DEMOLITION
DESC	DESCRIPTION
DET	DETAIL
DI	DUCTILE IRON
DIA	DIAMETER
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DIR	DIRECTION
DMH	DROP MANHOLE
D	DRAIN
DW	DRIVEWAY
DWG	DRAWING
E	
EA	EACH
ECC	ECCENTRIC
EF	EACH FACE
EFF	EFFLUENT
E/L	EASEMENT LINE
EL	ELEVATION
ELAST	ELASTOMERIC
ELEC	ELECTRICAL
EMER	EMERGENCY
EP	EDGE OF PAVEMENT
EPDM	ETHYLENE PROPYLENE DIENE MONOMER
EQUIP	EQUIPMENT
ESTM	EASEMENT
EW	EACH WAY
EXC	EXCAVATE
EXP	EXPANSION
EXST	EXISTING
EXST GR	EXISTING GRADE
EXT	EXTERIOR
F	
FD	FLOOR DRAIN
FDN	FOUNDATION
FHY	FIRE HYDRANT
FIG	FIGURE
FIN	FINISH(ED)
FIN FLR	FINISH FLOOR
FIN GR	FINISH GRADE
FL	FLUORIDE
FLG	FLANGE(D)
FLL	FLOW LINE
FLTR	FILTER
FM	FORCE MAIN
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FOOT OR FEET
G	
GA	GAUGE
GAL	GALLON(S)
GALV	GALVANIZED
GND	GROUND
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GPS	GALLONS PER SECOND
GR	GRADE
GRTG	GRATING
H	
HD	HEAVY-DUTY
HDR	HYDRAULIC
HGR	HANGER
HGT	HEIGHT
HORIZ	HORIZONTAL
HP	HORSEPOWER
HVAC	HEATING, VENTILATION, AND AIR CONDITIONING
HWL	HIGH WATER LEVEL
HWY	HIGHWAY
HZ	HERTZ
I	
ID	INSIDE DIAMETER
IN	INCH(ES)
INF	INFLUENT
INT	INTERSECTION
INTR	INTERIOR
INV	INVERT
IP	IRON PIPE
IPS	INTERNATIONAL PIPE STANDARD
IR	INTERNAL RECYCLE
IW	IRRIGATION WATER
J	
JB	JUNCTION BOX
JT	JOINT
K	
K	KIP (1,000 LB)
KV	KILOVOLT
KVA	KILOVOLT-AMPERE
KW	KILOWATT
KWH	KILOWATT-HOUR
L	
L	LEFT
LATL	LATERAL
LAV	LAVATORY
LEN	LENGTH
LB	POUND(S)
LF	LINEAR FEET
LP	LIGHT POLE
LVR	LOUVER
LWL	LOW WATER LEVEL
M	
M	METER
MAINT	MAINTAIN OR MAINTENANCE
MAN	MANUAL(LY)
MAS	MASONRY
MATL	MATERIAL
MAX	MAXIMUM
ME	MITERED END
MECH	MECHANICAL
MEG	MATCH EXISTING GRADE
MFR	MANUFACTURE(R)
MG	MILLION GALLONS
MGD	MILLION GALLONS PER DAY
MH	MANHOLE
MI	MILE(S)
MIN	MINIMUM, MINUTE(S)
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
ML	MIXED LIQUOR
MO	MASONRY OPENING
MON	MONUMENT
MPH	MILES PER HOUR
MPT	MALE PIPE THREAD
MS	MOTOR STARTER
MSP	MOTOR STARTER PANEL
MW	MANWAY
MWL	MEAN WATER LEVEL
MWP	MAXIMUM WORKING PRESSURE
N	
N	NORTH
NE	NORTHEAST
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NPF	NATIONAL PIPE THREAD
NPT	NATIONAL PIPE TAPER (THREAD)
NPW	NON-POTABLE WATER
NRS	NON-RISING SYSTEM
NTS	NOT TO SCALE
NW	NORTHWEST
N/A	NOT APPLICABLE
O	
OC	ON CENTER
OD	OUTSIDE DIAMETER
ODP	OPEN DRIP PROOF
OF	OUTSIDE FACE
OH	OVER HEAD
OHW	OVER HEAD WIRE
OPP	OPPOSITE
OPT	OPTIONAL
OR	OFFICIAL RECORDS
OSY	OUTSIDE SCREW AND YOKE
O&M	OPERATION AND MAINTENANCE
P	
PA	PROCESS AIR
PC	POINT OF CURVE
PCM	PERMANENT CONTROL MONUMENT
PI	POINT OF INTERSECTION
PL	PLATE
P/L	PROPERTY LINE
PNV	PINCH VALVE
POB	POINT OF BEGINNING
POJ	PUSH-ON JOINT
POL	POLYMER
PP	POWER POLE
PPD	POUNDS PER DAY
PPM	PARTS PER MILLION
PREFAB	PREFABRICATED
PRESS	PRESSURE
PRV	PRESSURE REDUCING VALVE
PRW	PROCESS WATER
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PVMT	PAVEMENT
PWR	POWER
Q	
Q	FLOW
QTY	QUANTITY
R	
RAD	RADIUS
RAS	RETURN ACTIVATED SLUDGE
RC	REINFORCED CONCRETE
RCB	REINFORCED CONCRETE BOX
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
REBAR	REINFORCING STEEL
REF	REFERENCE
REINF	REINFORCE(D)(ING)(MENT)
REM	REMOVE(ABLE)
REQ'D	REQUIRED
RF	RAISED FACE
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
RR	RAILROAD
RVT	RIVETED
R/W	RIGHT-OF-WAY
S	
SCFM	STANDARD CUBIC FEET PER MINUTE
SD	STORM DRAIN
SF	SQUARE FOOT OR FEET
SIG	SIGNAL
SIM	SIMILAR
SMH	SEWER MANHOLE
SPEC	SPECIFICATION
SPRT	SUPPORT
SQ	SQUARE
SST	STAINLESS STEEL
STA	STATION
STD	STANDARD
STK	STAKE
STL	STEEL
STR	STRAIGHT
STRUCT	STRUCTURAL
SURF	SURFACE
SYM	SYMBOL
SYMM	SYMMETRICAL
S/W	SIDEWALK
T	
TAN	TANGENT
TB	TOP OF BEAM
TBM	TEMPORARY BENCH MARK
TB-xx	TEST BORING-xx (e.g. TB-1)
TD	TRENCH DRAIN
TDH	TOTAL DYNAMIC HEAD
TE	TOTALLY ENCLOSED
TEFC	TOTALLY ENCLOSED FAN COOLED
TEL	TELEPHONE
TENV	TOTALLY ENCLOSED NON-VENTILATED
THD	THREAD(ED)
THK	THICK(NESS)
TLM	TELEMETRY
TOB	TOP OF BANK
TOC	TOP OF CURB
TOS	TOE OF SLOPE
TOT	TOTAL
TP	TELEPHONE POLE
TYP	TYPICAL
T&B	TOP AND BOTTOM
U	
UD	UNDERDRAIN
UG	UNDERGROUND
ULT	ULTIMATE
UON	UNLESS OTHERWISE NOTED
UGE	UNDERGROUND ELECTRIC
UTC	UNDERGROUND TELEPHONE CABLE
UTIL	UTILITY
V	
V	VOLT(S)
VAR	VARIES
VEL	VELOCITY
VFD	VARIABLE FREQUENCY DRIVE
VOL	VOLUME
W	
WH	WALL HYDRANT
WL	WATER LINE
WM	WATER MAIN
WS	WATER SURFACE
WSP	WELDED STEEL PIPE
WTP	WATER TREATMENT PLANT
W/	WITH
W/O	WITHOUT
X	
XFER	TRANSFER
Y	
YD	YARD(S)
YH	YARD HYDRANT
YR	YEAR(S) YR

SHEET NUMBERING & STRUCTURE DESIGNATION



SEE LISTS BELOW FOR SHEET ORDER BY: DISCIPLINE, AREA DESIGNATION, AND VIEW TYPE.

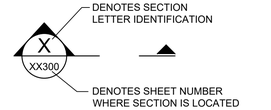
DISCIPLINE	
ABBREVIATION	DESCRIPTION
G	GENERAL
V	SURVEY
C	CIVIL
L	LANDSCAPING
S	STRUCTURAL
A	ARCHITECTURAL
F	FIRE PROTECTION
P	PLUMBING
D	PROCESS
M	MECHANICAL
E	ELECTRICAL
I	INSTRUMENTATION

AREA		
DESIGNATION	SHEET SERIES	DESCRIPTION (SEE SITE AREA KEY FOR LOCATION)
-	X-000	GENERAL DRAWINGS SCHEMATIC DRAWINGS SITE DRAWINGS YARD PIPING DRAWINGS
A	XA000	EXISTING PUMP STATION 14
B	XB000	EXISTING PUMP STATION 5
C	XC000	PUMP STATION 5 & 14 BUILDING
D	XD000	BACKWASH TANK
E	XE000	CHEMICAL BUILDING
F	XF000	WELL CONDOS
Z	XZ000	DETAILS

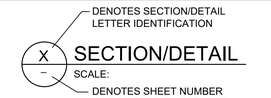
VIEW TYPE		
TYPE	SHEET SERIES	DESCRIPTION
0	000	GENERAL
1	100	PLAN VIEWS
2	200	ELEVATIONS
3	300	SECTIONS
4	400	LARGE-SCALE VIEWS
5	500	DETAILS
6	600	SCHEDULES, DIAGRAMS, AND CONTROLS
8	800	3D PERSPECTIVES, ISOMETRICS, AND PHOTOGRAPHS
9	900	DEMOLITION

REFERENCE SYMBOLS

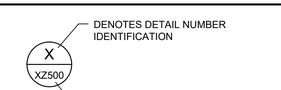
SECTION REFERENCE



SECTION/ DETAIL TITLE



DETAIL REFERENCE



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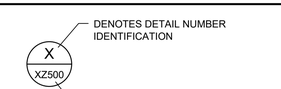

TETRA TECH
www.tetratech.com
1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
	05/01/25	ISSUED FOR BIDS

BY

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14
WATER AND TRANSMISSION MAIN, CONTRACT 1
GENERAL NOTES

PROJ:	200-19743-24012
DESN:	M. TEITSMA
DRWN:	N. KARLL
CHKD:	

G-004

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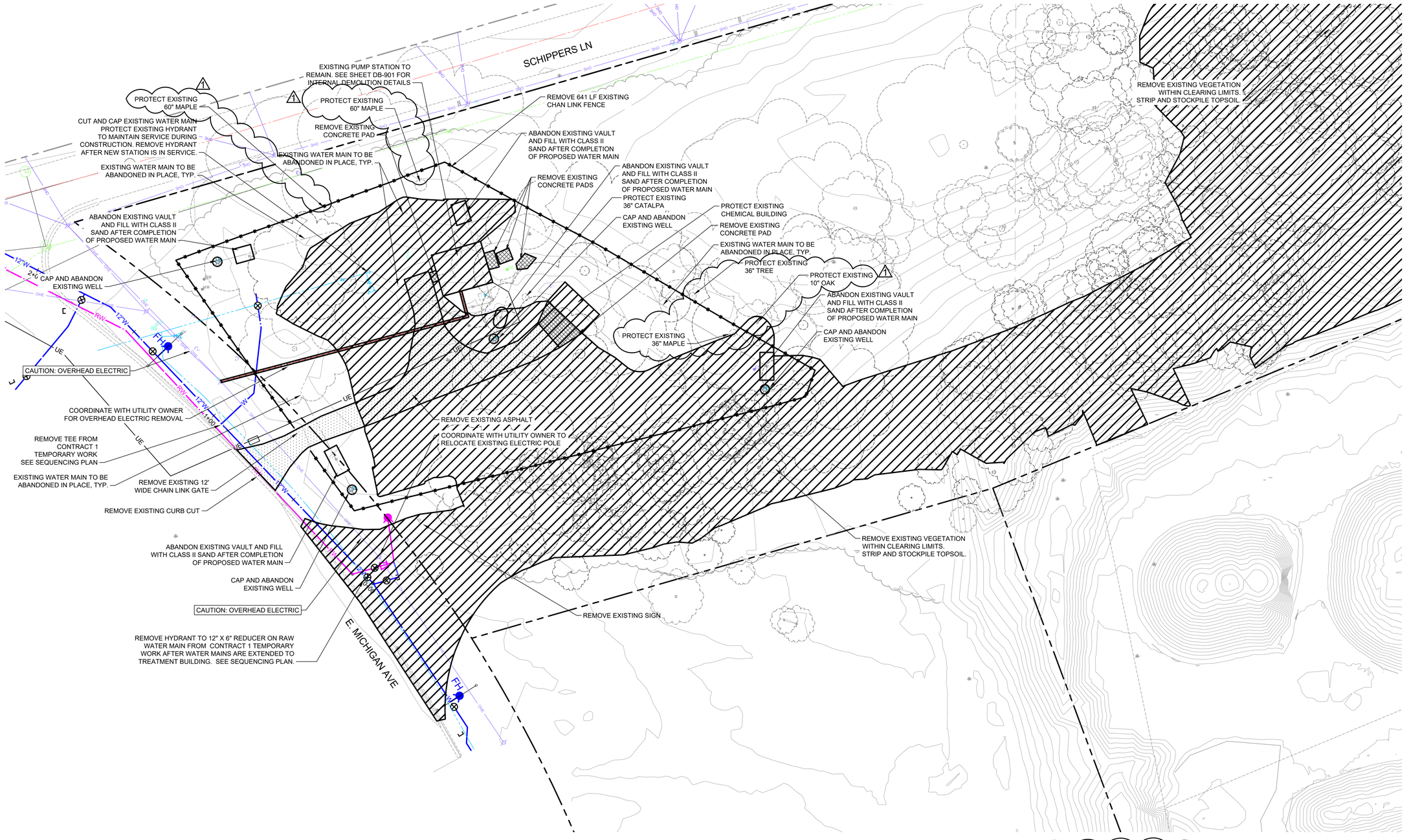
Bar Measures 1 inch, otherwise drawing not to scale

4/28/2025 10:57:59 AM - C:_ADVACCDOCS\TETRA TECH INC\200-19743-24012 KZOO PS5 AND PS14\PROJECT FILES\CAD\SHEETFILES\CONTRACT 1\G-001 GENERAL NOTES-C1.DWG - TROTTERKARLL, NIKI



NOTES

1. EXCESS SPOILS AND RUBBLE TO BE DISPOSED OF AT 301 NAZARETH ROAD, KALAMAZOO MI. AS DIRECTED BY THE CITY OF KALAMAZOO.
2. CONTRACTOR TO PROTECT ALL TREES OUTSIDE OF DISTURBANCE LIMITS.

SCALE: 1" = 20'

Bar Measures 1 inch, otherwise drawing not to scale

TETRA TECH
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ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
1	05/01/25	ISSUED FOR BID'S
	05/12/25	ADDENDUM NO. 1

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

PUMP STATION 5 & 14 BUILDING DEMOLITION - WEST

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-201

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CHICAGO AVE

SCHIPPERS LN

S 89°11'23" E
428.03'

N 83°31'14" E
110.08'

S 6°31'11" W
234.00'

N 32°57'42" W
158.00'

N 81°50'54" W
72.84'

S 69°31'45" W
102.48'

N 89°13'46" W
195.00'

PROTECT EXISTING
7" WALNUT

PROTECT EXISTING
10" WALNUT

PROTECT EXISTING
17" OAK

PROTECT EXISTING
8" MULBERRY

PROTECT EXISTING
13" WALNUT

PROTECT EXISTING
20" MULBERRY

REMOVE EXISTING VEGETATION
WITHIN CLEARING LIMITS.
STRIP AND STOCKPILE TOPSOIL.

REMOVE EXISTING VEGETATION
WITHIN CLEARING LIMITS.
STRIP AND STOCKPILE TOPSOIL.

NOTES

1. EXCESS SPOILS AND RUBBLE TO BE DISPOSED OF AT 301 NAZARETH ROAD, KALAMAZOO MI. AS DIRECTED BY THE CITY OF KALAMAZOO.
2. CONTRACTOR TO PROTECT ALL TREES OUTSIDE OF DISTURBANCE LIMITS.

0 10' 20' 40'
SCALE: 1" = 20'

N

Bar Measures 1 inch, otherwise drawing not to scale

TETRA TECH
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ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR
SITE PLAN
REVIEW
05-12-2025

MARK	DATE	DESCRIPTION
1	05/01/25	ISSUED FOR BIDS
	05/12/25	ADDENDUM NO. 1

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING DEMOLITION - EAST

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-202

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PR 24' WIDE DBL. SWING MANUAL GATE WITH KNOX BOX, ATTACH SIGN CONTAINING PROPERTY ADDRESS TO GATE. SEE ARCHITECTURAL SPECIFICATIONS FOR CONTENT. INSTALL 'NO TRESPASSING' SIGN

CHICAGO AVE

PR. GRAVEL MAINTENANCE DRIVE

PR. GRAVEL PARKING FOR EX. SAN. PUMP STATION

PR. 4' DIA. STORM STRUCTURE WITH BEE HIVE STRUCTURE

CL OF 1' WIDE FLAT BOTTOM SWALE

5'x5' CONCRETE PAD AT DOOR

CONC. HVAC PAD, COORDINATE WITH MECHANICAL DRAWINGS FOR FINAL SIZE

PROTECT EXISTING WETLAND

SCHIPPERS LN

CONC. HVAC PAD COORDINATE WITH MECHANICAL DRAWINGS FOR FINAL SIZE

FIRE DEPARTMENT CONNECTION WITH STROBE AND HORN, COORDINATE WITH ARCHITECTURAL PLANS FOR FINAL FDC LOCATION

24.0'

25' WETLAND & WATER RESOURCES SETBACK

PR. 21AA AGGREGATE DRIVE

PR. NEW WELL LOCATION AND BUILDING, COORDINATE WITH ARCHITECTURAL DRAWINGS

PR. DETENTION BASIN #2

PR. LIGHT POLE WITH 2' DIA. CONC. BASE

POST AND PANEL SIGN, COORDINATE WITH ARCH. DRAWINGS

7.33'

CHEMICAL BUILDING FF = 776.50'

10.0'

60.66 LF MODIFIED CURB

TOP OF BASIN

BOTTOM OF BASIN

PR 4' DIA. STORM STRUCTURE WITH CURB INLET AND ADS BARRACUDA MAX MODEL S5 TREATMENT DEVICE OR APPROVED EQUAL.

212.0 LF MDOT TYPE F4 MODIFIED CURB AND GUTTER

STATION 5 &14 BUILDING FF = 776.50'

PR. 4' DIA. STORM STRUCTURE WITH FLAT GRATE CASTING

EX. PUMP STATION #5

PR. 21AA AGGREGATE DRIVE

PROTECT EX. CHEMICAL BUILDING

PR 2' DIA. STORM STRUCTURE WITH BEEHIVE CASTING

3' SECURE ACCESS GATE

26.0'

29.50'

PR. 4' DIAMETER STORM STRUCTURE WITH FLAT GRATE CASTING

POST INDICATOR VALVE

PR. BACKFLOW/DOOR PREVENTER

PR. SANITARY MANHOLE

18 - 6" CONC. BOLLARD, 4' O.C.

30.00'

PR. 4' DIAMETER STORM MANHOLE

PR. 1' WIDE CONCRETE RETAINING WALL WITH 4' RAIL

138 LF OF 6' TALL AMERISTAR STEEL PANEL DECORATIVE FENCE ALONG MICHIGAN AVE. FRONTAGE

HEAVY DUTY HMA PAVEMENT

PR. 4' DIA. STORM STRUCTURE WITH FLAT GRATE CASTING

621.5 LF MODIFIED CURB

PR. 6' C.L. FENCE VINYL COATED WITH 3 BARBED WIRE STRANDS AT TOP

PR. 4' DIA. STORM STRUCTURE WITH CURB INLET

PR. DETENTION BASIN #1

PR. TYPE F4 CURB AND GUTTER, TYP.

PR. NEW WELL LOCATION AND BUILDING

+/- 234' CL SHIPPERS LN. TO CL DRIVE

B.C. R50.0'

COORDINATE WITH UTILITY PROVIDER FOR FINAL POWER POLE LOCATION

PR. 20' DBL. SWING MANUAL GATE

PR. 2' DIA. STORM STRUCTURE WITH BEEHIVE CASTING

PR. LIGHT POLE WITH 2' DIA. CONC. BASE

PR. SANITARY MANHOLE

PR. 4' DIA. DETENTION OUTLET

PR. LIGHT POLE WITH 2' DIA. CONC. BASE

32.0' B.C. TO B.C.

PR. GENERATOR ON CONCRETE PAD, COORDINATE WITH MECHANICAL DRAWINGS

PR. 4' DIA. STORM STRUCTURE WITH CURB INLET

PR. 4' DIA. STRUCTURE WITH ADS BARRACUDA MAX MODEL S4 TREATMENT DEVICE, OR APPROVED EQUAL.

PR. 54" CONCRETE ANTENNA BASE, COORDINATE WITH ELECTRICAL DRAWINGS.

PR. NEW WELL LOCATION AND BUILDING, COORDINATE WITH ARCHITECTURAL DRAWINGS

B.C. R65.0'

PR. GATE CONTROLLER WITH KNOX BOX

PR. 26' AUTOMATIC SLIDE GATE. ATTACH SIGN CONTAINING PROPERTY ADDRESS TO GATE. SEE ARCHITECTURAL SPECIFICATIONS FOR CONTENT. INSTALL 'NO TRESPASSING' SIGN

PR. LIGHT POLE WITH 2' DIA. CONC. BASE

HEAVY DUTY HMA PAVEMENT

PR. 4' DIA. STORM STRUCTURE WITH CURB INLET

E. MICHIGAN AVE

N

0 20' 40' 80'

SCALE: 1" = 40'

TETRA TECH

www.tetratech.com

1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108

PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION	BY
1	05/12/25	ADDENDUM NO. 1	

CITY OF KALAMAZOO, MICHIGAN

PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING SITE PLAN - OVERALL

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-203

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Bar Measures 1 inch, otherwise drawing not to scale

SCHIPPERS LN

PR. 21AA AGGREGATE DRIVE

PROTECT EX. SANITARY PUMP STATION AND PIPING

PROTECT EX. WETLAND

25' WETLAND & WATER RESOURCES SETBACK

PR. 10'X14' STD. RIP RAP PAD AT DETENTION OVERFLOW

PR. FES 3

PR. FES 2

PR. GRAVEL MAINTENANCE DRIVE

PR. 5'X10' STD. RIP RAP PAD AT STORM OUTLET

PR. 5'X10' STD. RIP RAP PAD AT STORM OUTLET

PR. FES 1

PR. 10' WIDE MANUAL GATE

PR. DETENTION BASIN 2
VOL. = 10,000 CFT

B.C. R69.50'

B.C. R124.50'

PR. 6' C.L. FENCE VINYL COATED WITH 3 BARBED WIRE STRANDS AT TOP

PROTECT EX. P.S. #5 BUILDING

EX. PUMP STATION #5

PROTECT EX. HYDRANT AND WATER MAIN.

PR. 6' C.L. FENCE VINYL COATED WITH 3 BARBED WIRE STRANDS AT TOP

PR. CONC. PAD

9.0'

18.23'

PR. 21AA AGGREGATE DRIVE

PROTECT EX. CHEMICAL BUILDING

PR. NEW WELL LOCATION AND BUILDING, COORDINATE WITH ARCHITECTURAL DRAWINGS.

PR. CHLORINE INJECTION BUILDING

5.0'

10.0'

PR. CONC. PAD

PR 4' DIA. STORM STRUCTURE WITH CURB INLET AND ADS BARRACUDA MAX MODEL S5 TREATMENT DEVICE OR APPROVED EQUAL.

3.50'

26.0'

3.03'

B.C. R237.0'

621.5 LF MODIFIED CURB

B.C. R263.00'

PR. 6' C.L. FENCE VINYL COATED WITH 3 BARBED WIRE STRANDS AT TOP

138 LF OF 6' TALL AMERISTAR STEEL PANEL DECORATIVE FENCE ALONG MICHIGAN AVE. FRONTAGE

PR. NEW WELL LOCATION AND BUILDING, COORDINATE WITH ARCHITECTURAL DRAWINGS

PR. NEW WELL LOCATION AND BUILDING

PR. 2' DIA. STORM STRUCTURE WITH BEEHIVE CASTING

PR. 3' GATE

16.0'

25.3'

MATCH EX. CURB AND GUTTER ALIGNMENT AT E. MICHIGAN AVE.

PR. NEW WELL LOCATION AND BUILDING, COORDINATE WITH ARCHITECTURAL DRAWINGS.

COORDINATE WITH UTILITY PROVIDER FOR FINAL POWER POLE LOCATION

PR. 4' DIA. STORM STRUCTURE WITH CURB INLET

PR. GATE CONTROLLER WITH KNOX BOX

PR. 20' DBL. SWING MANUAL GATE

PR. 26' AUTOMATIC SLIDE GATE.
ATTACH SIGN CONTAINING PROPERTY ADDRESS TO GATE.
SEE ARCHITECTURAL SPECIFICATIONS FOR CONTENT.
INSTALL 'NO TRESPASSING' SIGN

EX. PROPERTY LINE

PR 4' DIA. STORM STRUCTURE WITH CURB INLET

E. MICHIGAN AVE

MATCH EX. CURB AND GUTTER ALIGNMENT AT E. MICHIGAN AVE.

WV FH WV

HEAVY DUTY HM

PR. SAI

0 10' 20' 40'
SCALE: 1" = 20'

TETRA TECH
1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003
www.tetratech.com

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MARK	DATE	DESCRIPTION
1	05/12/25	ADDENDUM NO. 1
	05/1/25	ISSUED FOR BIDS

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING SITE PLAN - WEST

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-204

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Bar Measures 1 inch, otherwise drawing not to scale

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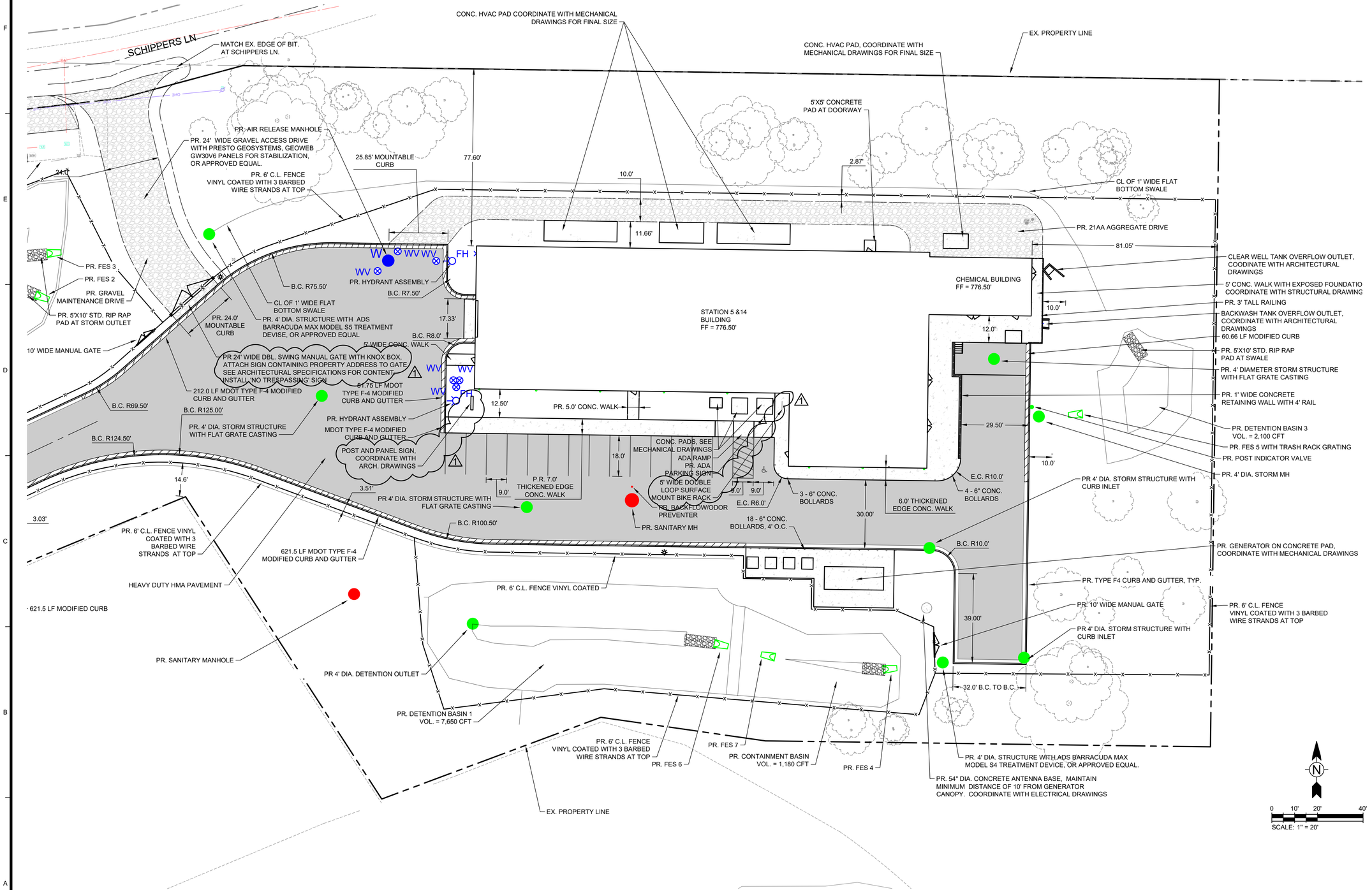

TETRA TECH
www.tetratech.com
1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
1	05/01/25	ISSUED FOR BIDS
	05/12/25	ADDENDUM NO. 1

BY

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING SITE PLAN - EAST

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-205

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Bar Measures 1 inch, otherwise drawing not to scale

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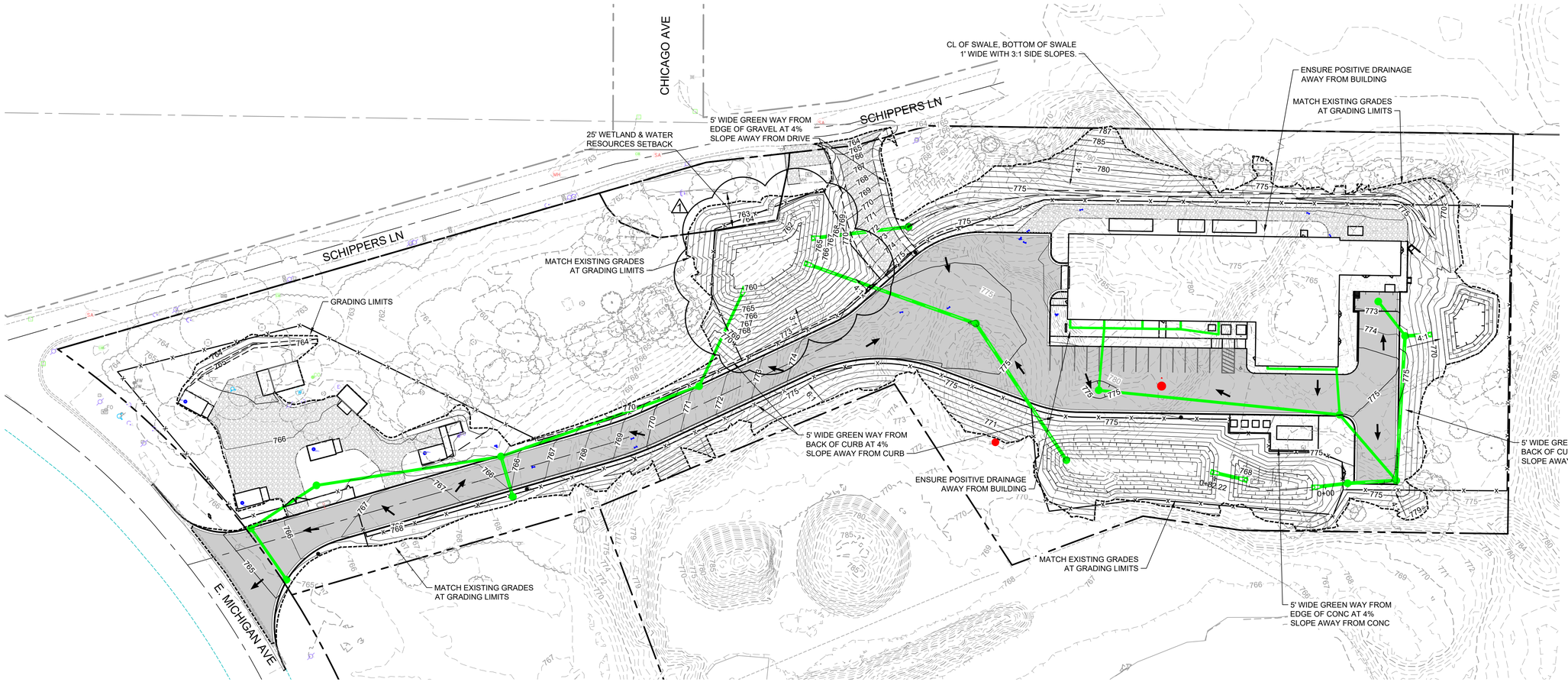

NOTES:
1. DETENTION BASIN SIDE SLOPES NOT TO EXCEED 3'H:1'V.

TETRA TECH
www.tetratech.com
1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
1	05/01/25	ISSUED FOR BIDS
	05/12/25	ADDENDUM NO. 1

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING GRADING - OVERALL

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-206

Bar Measures 1 inch, otherwise drawing not to scale

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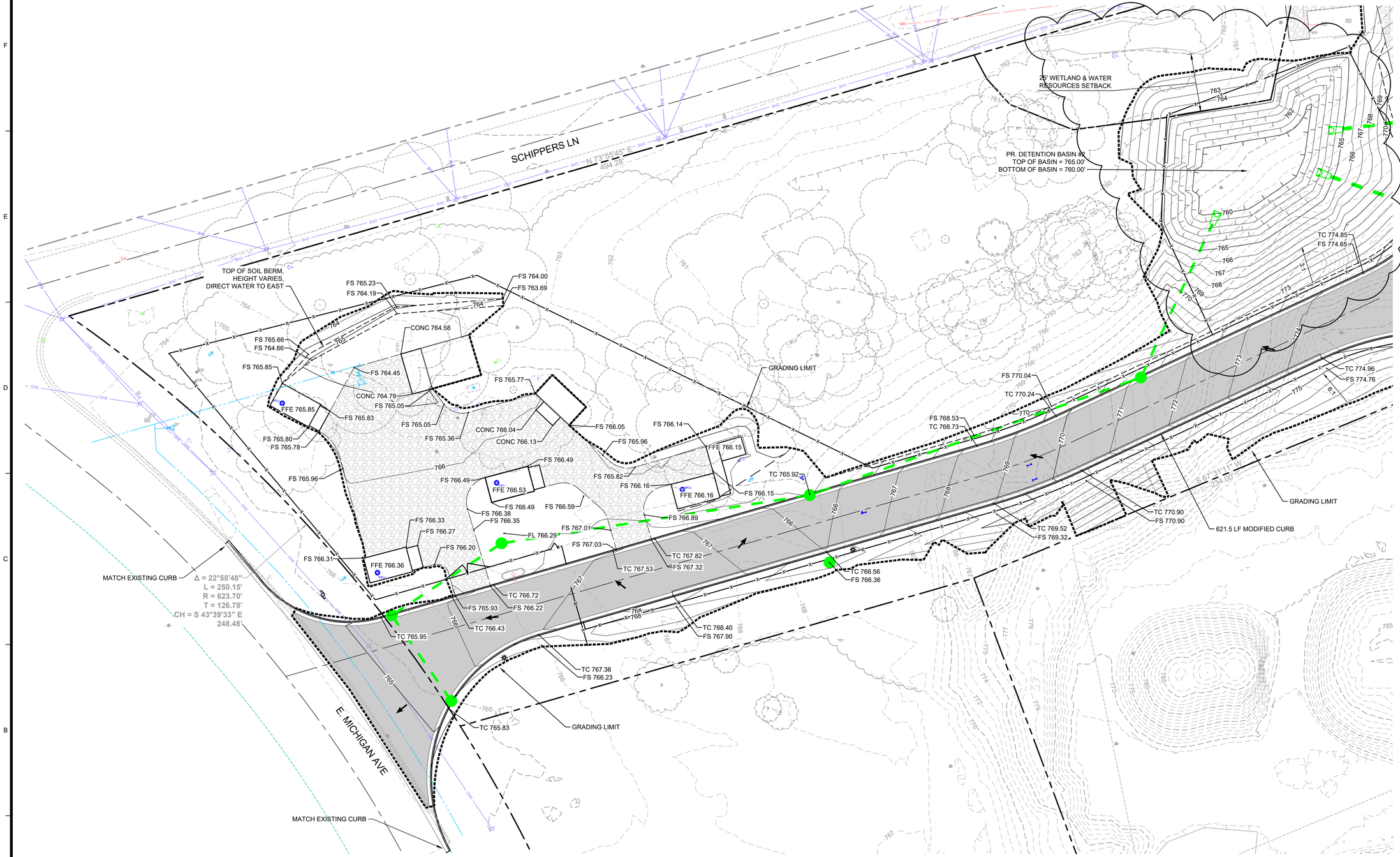

NOTES:
1. DETENTION BASIN SIDE SLOPES NOT TO EXCEED 3'H:1'V.

SCALE: 1" = 20'

TETRA TECH
www.tetratech.com
1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
1	06/01/25	ISSUED FOR BIDS
	05/12/25	ADDENDUM NO. 1

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING GRADING - WEST

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-207

Bar Measures 1 inch, otherwise drawing not to scale

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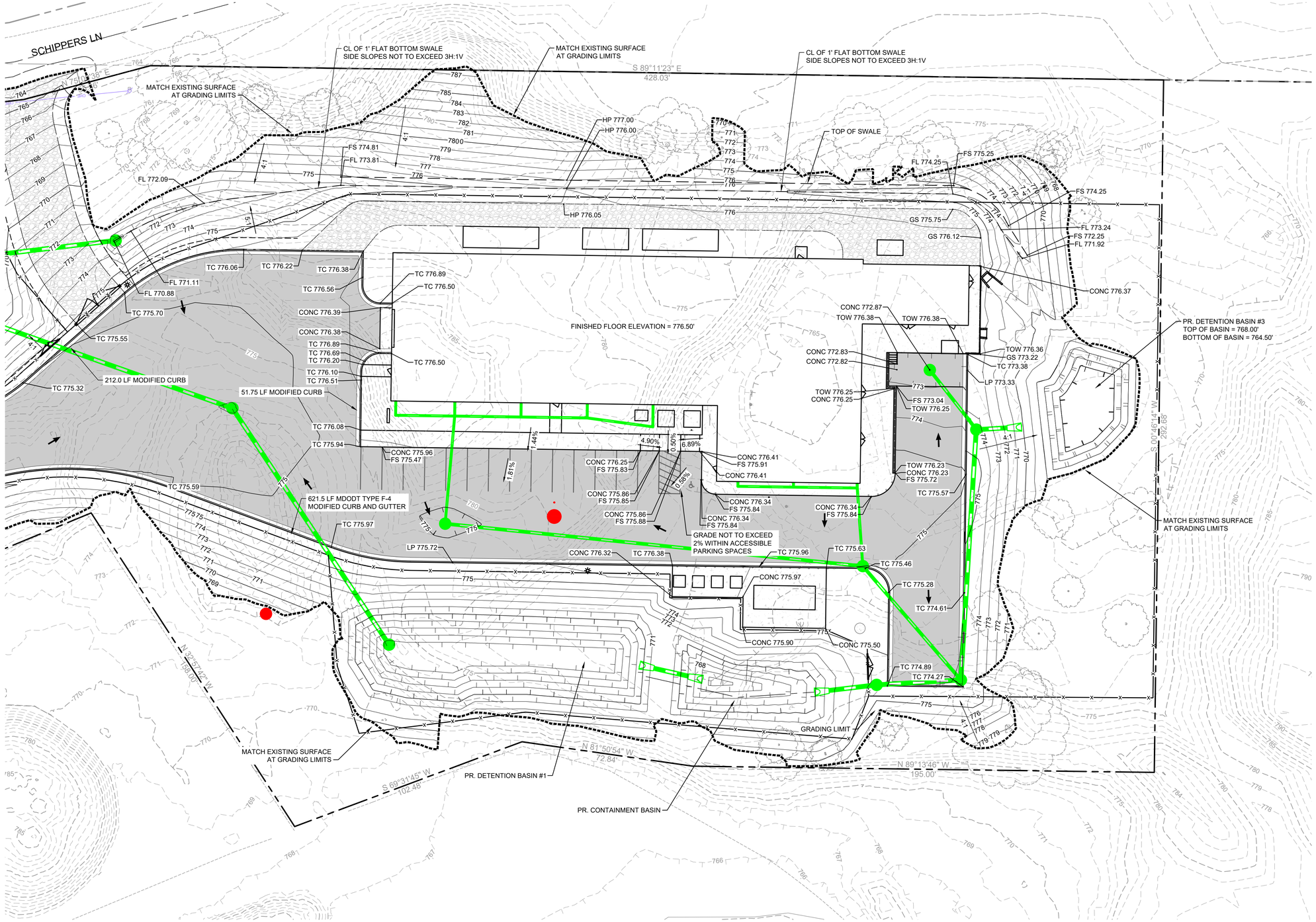

NOTES:
1. DETENTION BASIN SIDE SLOPES NOT TO EXCEED 3'H:1'V.

SCALE: 1" = 20'

Bar Measures 1 inch, otherwise drawing not to scale

TETRA TECH
www.tetratech.com
1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR
SITE PLAN
REVIEW
05-12-2025

MARK	DATE	DESCRIPTION	BY
1	05/01/25	ISSUED FOR BIDS	
	05/12/25	ADDENDUM NO. 1	

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING GRADING - EAST

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-208

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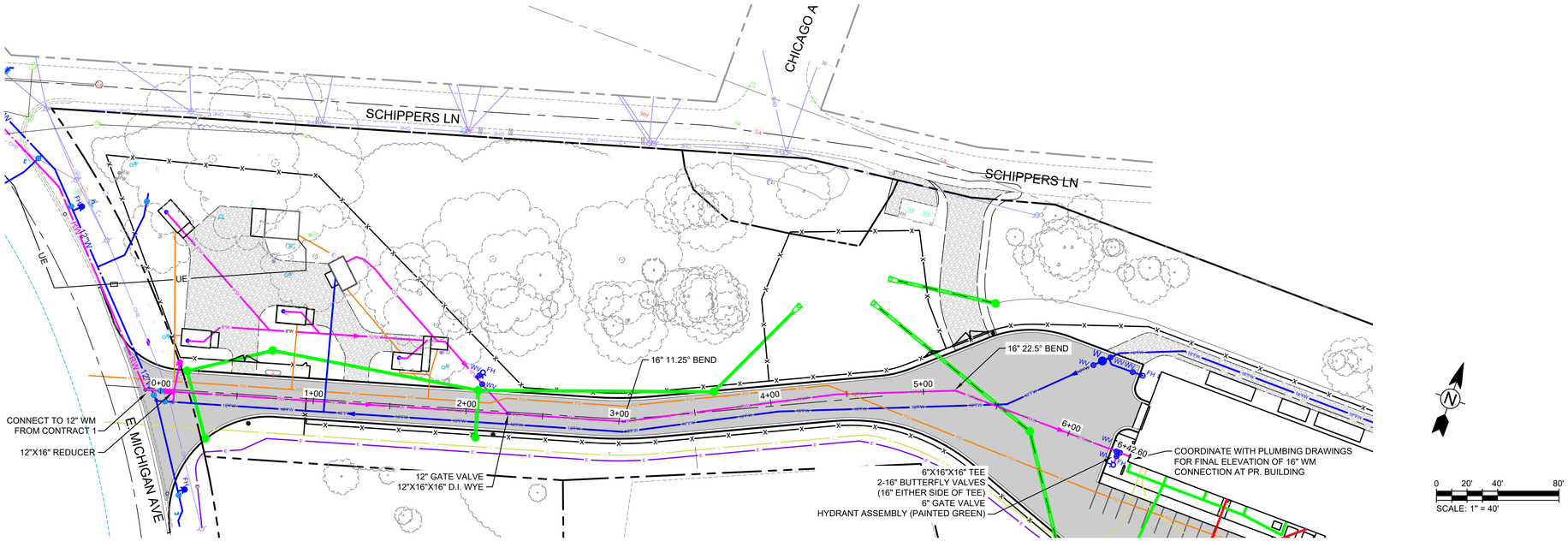

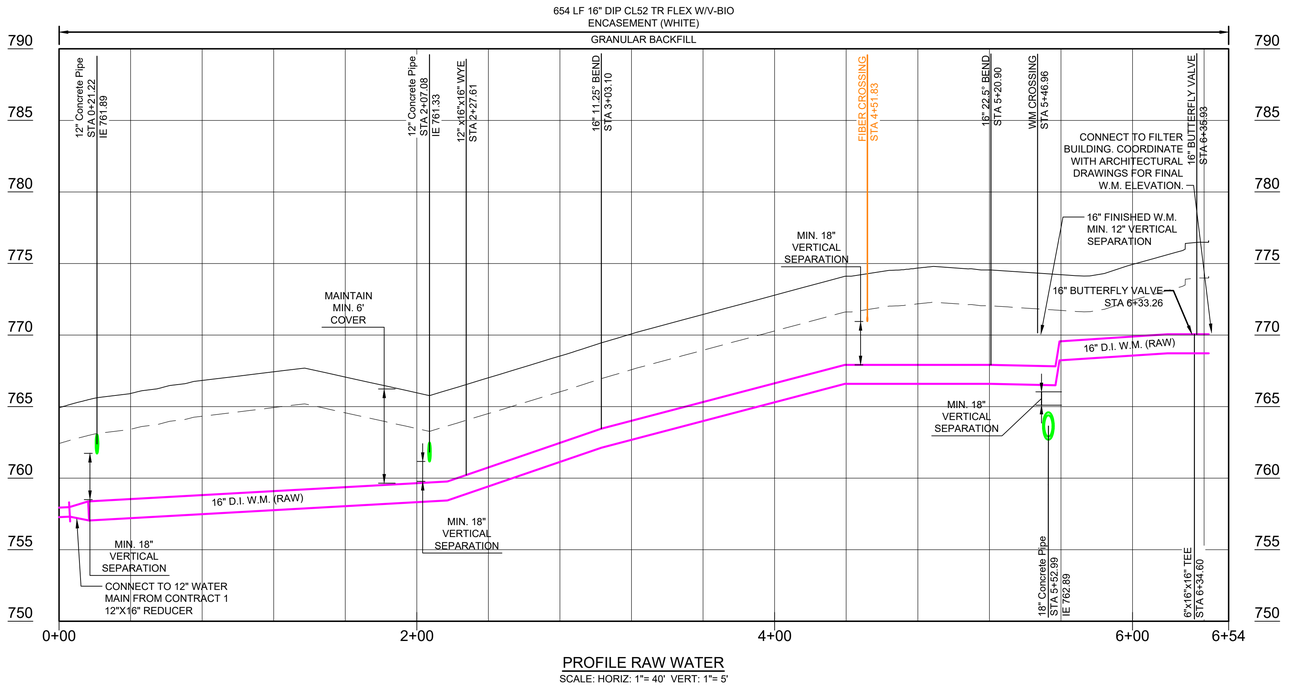

PROFILE RAW WATER
SCALE: HORIZ: 1"= 40' VERT: 1"= 5'

NOTES
1. ENCASE ALL DISTRIBUTION (FINISHED) WATER MAIN IN BLUE V-BIO ENCASEMENT.
2. ENCASE ALL RAW WATER MAIN IN WHITE V-BIO ENCASEMENT.

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ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR
SITE PLAN
REVIEW
05-12-2025

MARK	DATE	DESCRIPTION
	05/01/25	ISSUED FOR BIDS

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

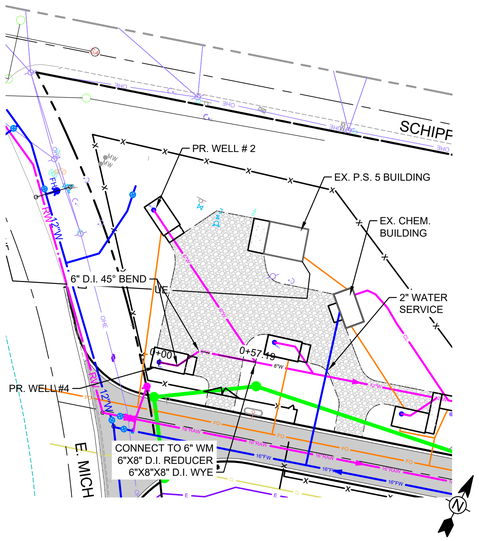
STATION 5 & 14 BUILDING WATER MAIN - RAW

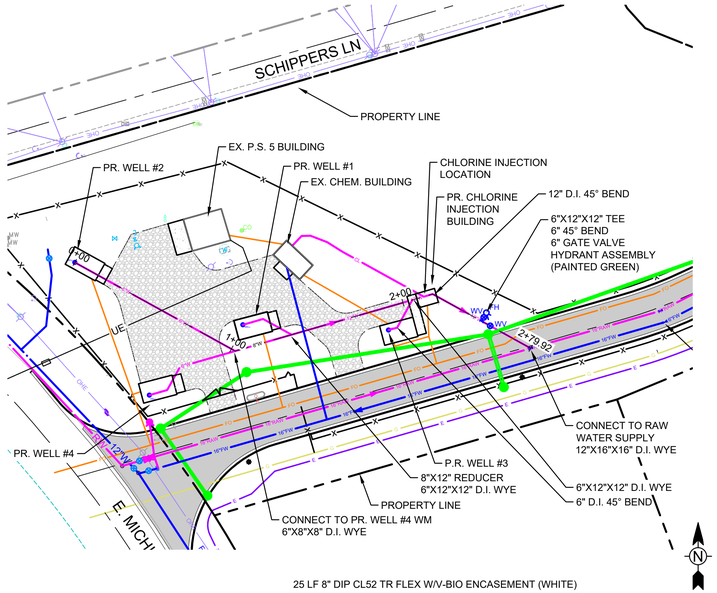
PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

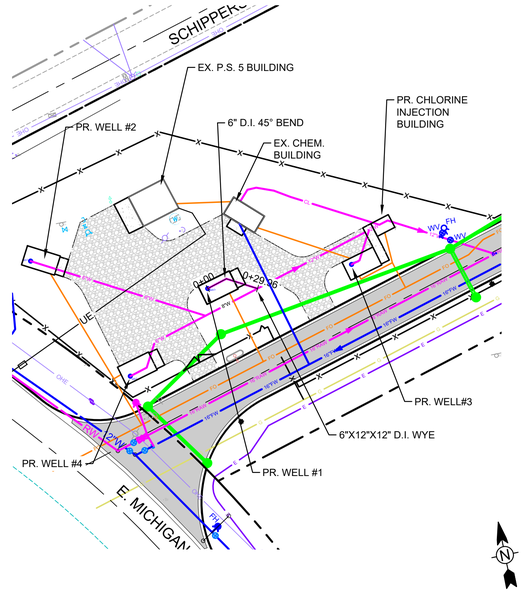
C-209

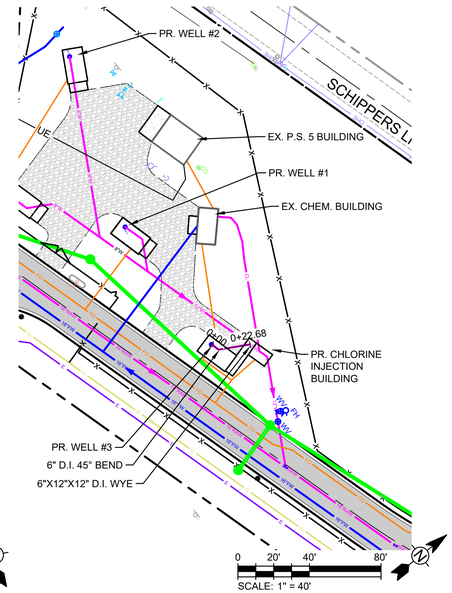
5/12/2025 11:34:26 AM - C:_ADACCDOCS\TETRA TECH INC\200-19743-24012 KZOO PS5 AND PS14\PROJECT FILES\CAD\SHEETFILES\C-209 WATER MAIN.DWG - SMITH, ADAM4

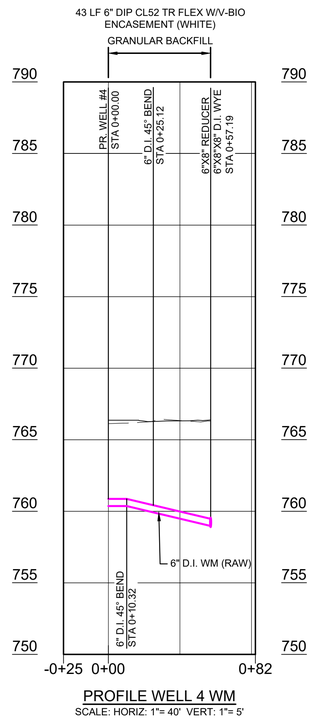
Bar Measures 1 inch, otherwise drawing not to scale





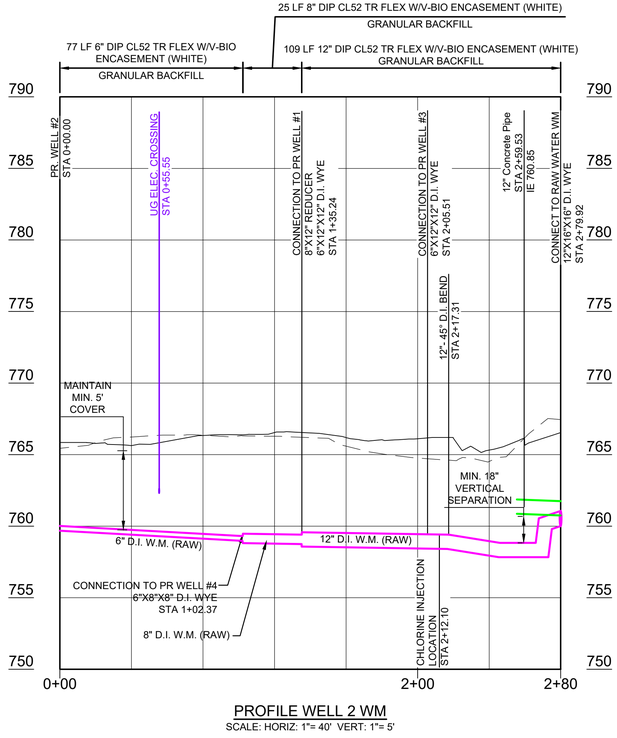






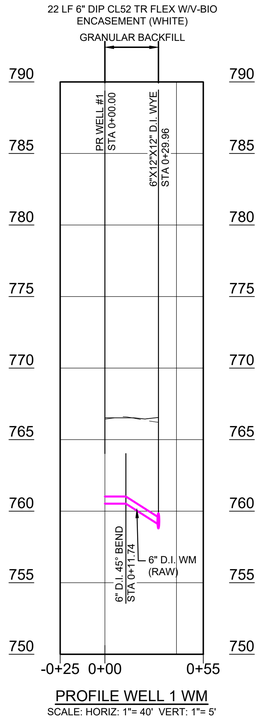
PROFILE WELL 4 WM

SCALE: HORIZ: 1"= 40' VERT: 1"= 5'



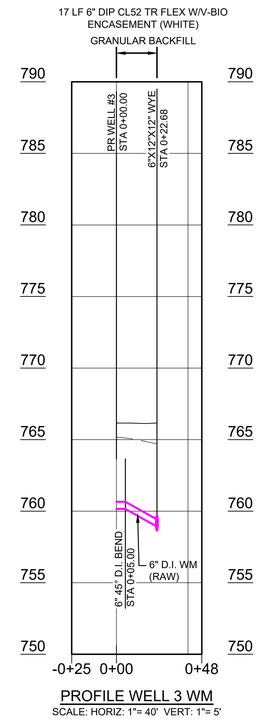
PROFILE WELL 2 WM

SCALE: HORIZ: 1"= 40' VERT: 1"= 5'



PROFILE WELL 1 WM

SCALE: HORIZ: 1"= 40' VERT: 1"= 5'



PROFILE WELL 3 WM

SCALE: HORIZ: 1"= 40' VERT: 1"= 5'

NOTES
1. ENCASE ALL DISTRIBUTION (FINISHED) WATER MAIN IN BLUE V-BIO ENCASEMENT.
2. ENCASE ALL RAW WATER MAIN IN WHITE V-BIO ENCASEMENT.

TETRA TECH

www.tetratech.com
1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
	05/01/25	ISSUED FOR BIDS

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING
WATER MAIN - WELLS

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-210

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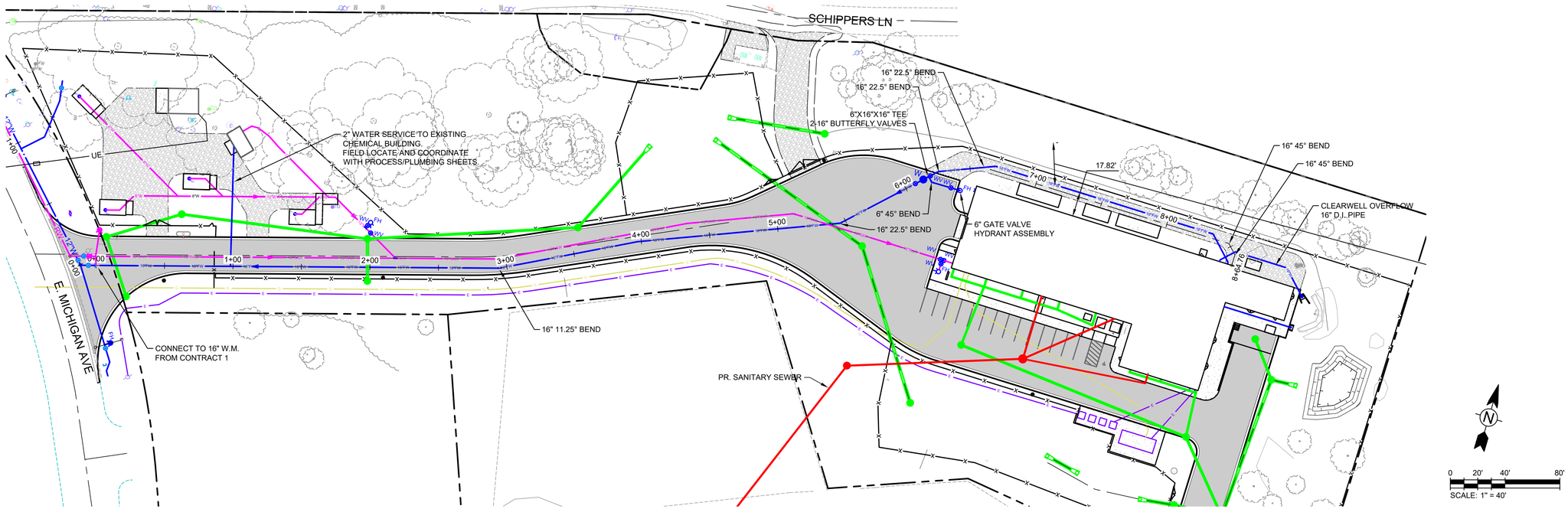

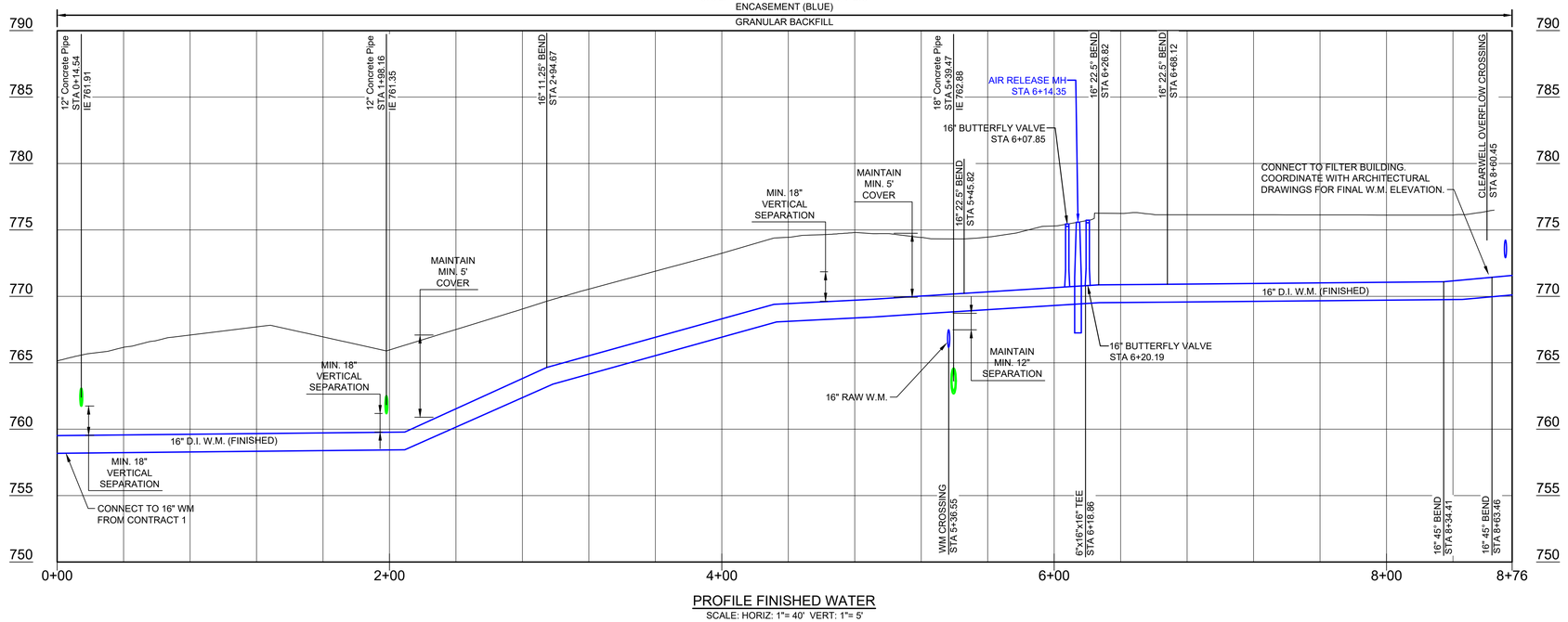

PROFILE FINISHED WATER

SCALE: HORIZ: 1"= 40' VERT: 1"= 5'

NOTES

1. ENCASE ALL DISTRIBUTION (FINISHED) WATER MAIN IN BLUE V-BIO ENCASEMENT.
2. ENCASE ALL RAW WATER MAIN IN WHITE V-BIO ENCASEMENT.

TETRA TECH
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ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
	05/07/25	ISSUED FOR BIDS

CITY OF KALAMAZOO, MICHIGAN

PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING WATER MAIN - FINISHED

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-211

Bar Measures 1 inch, otherwise drawing not to scale

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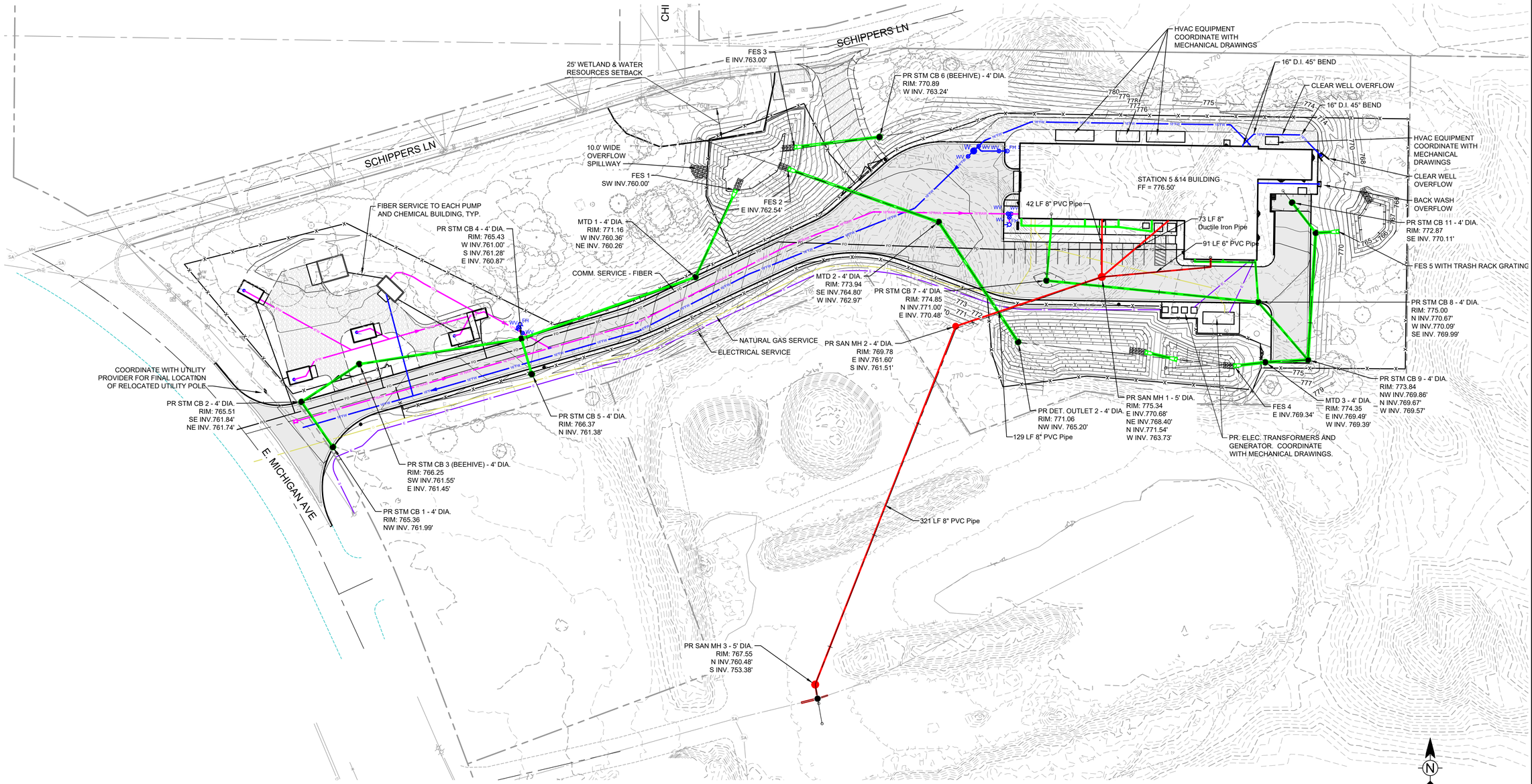

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ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
	05/01/25	ISSUED FOR BIDS

BY

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING UTILITIES - OVERALL

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

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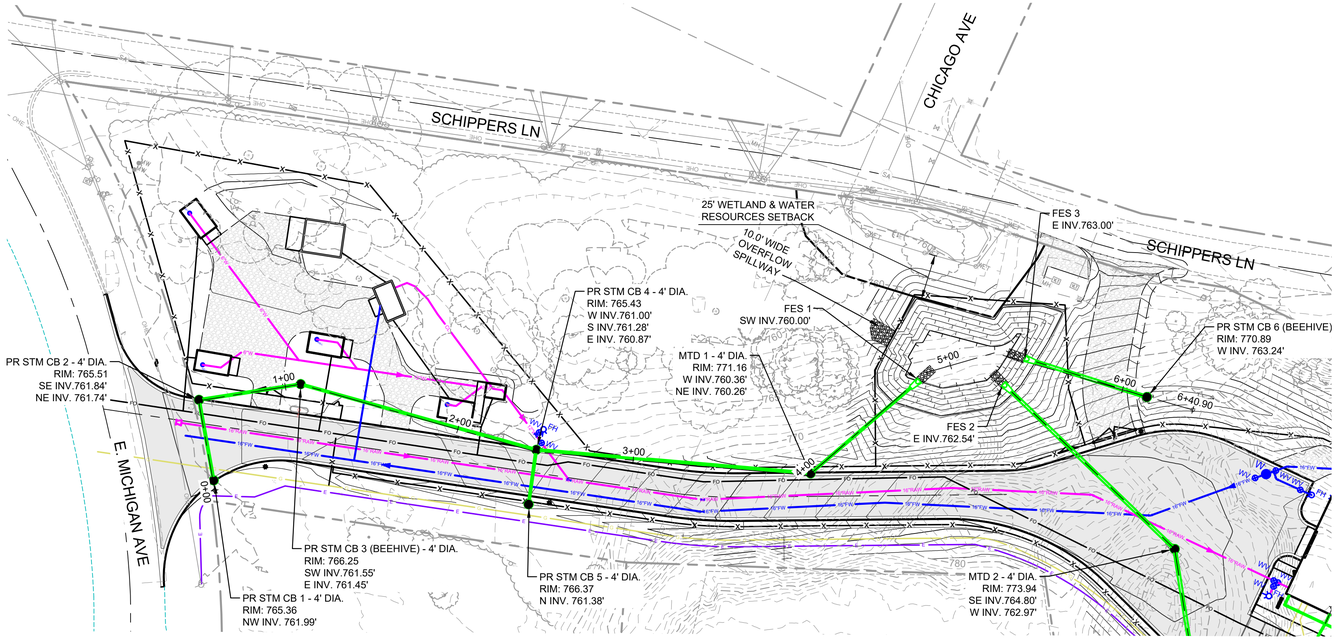
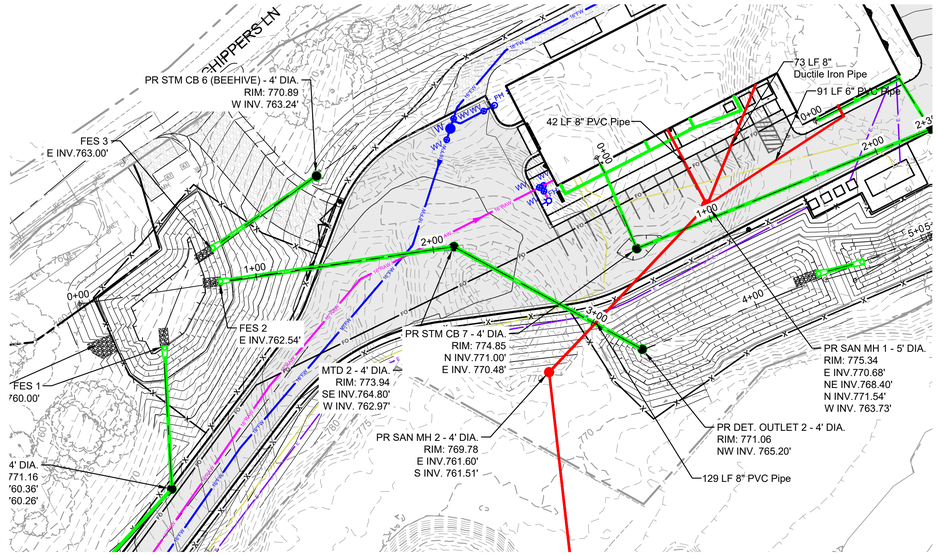
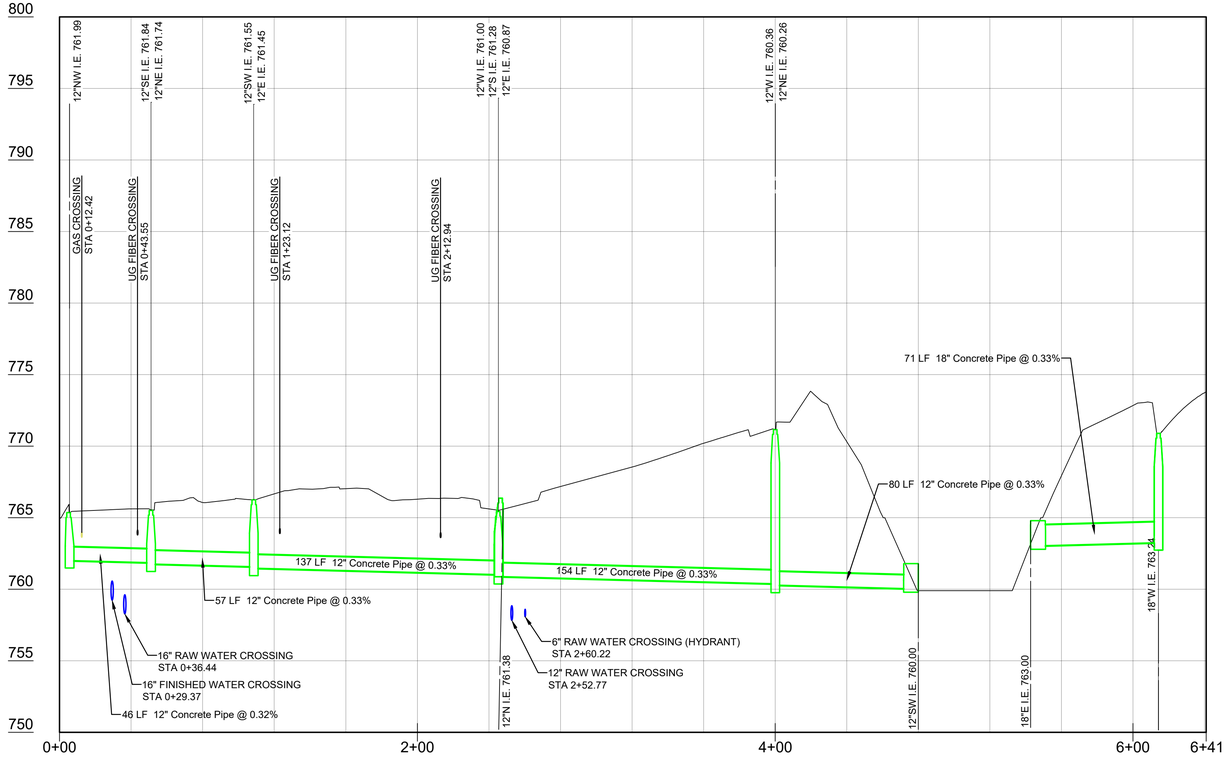
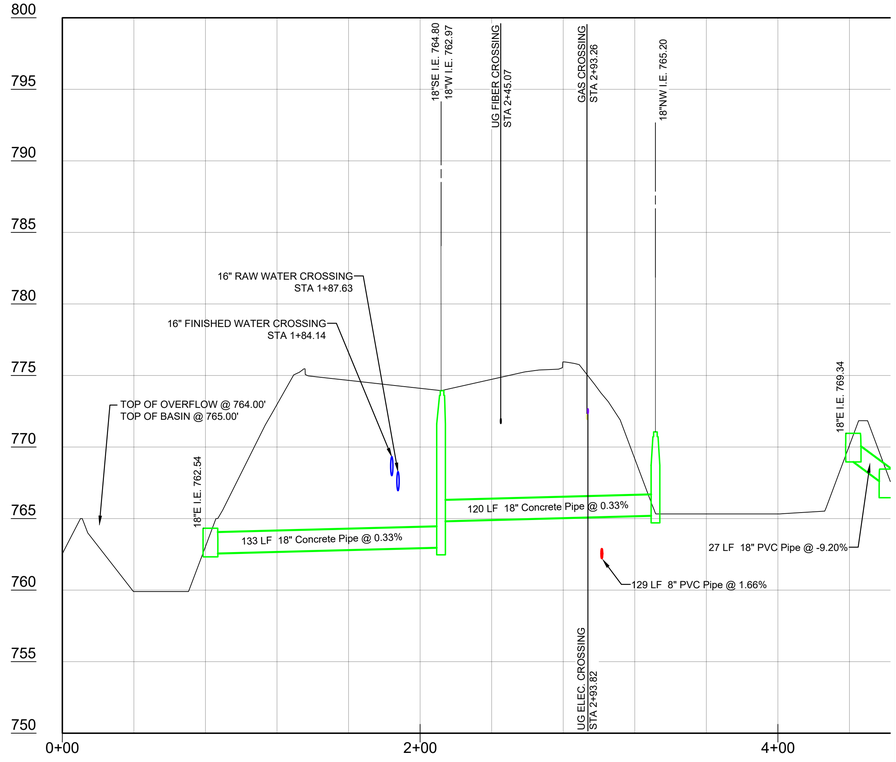






PROFILE ENTRANCE CB TO SWALE COLLECTOR CB

SCALE: HORIZ: 1"= 40' VERT: 1"= 5'



PROFILE CENTRAL BASIN OUTLET TO WEST BASIN

SCALE: HORIZ: 1"= 40' VERT: 1"= 5'

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ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION	BY
	05/07/25	ISSUED FOR BIDS	

CITY OF KALAMAZOO, MICHIGAN

PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING UTILITIES - STORMWATER PROFILES

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-213

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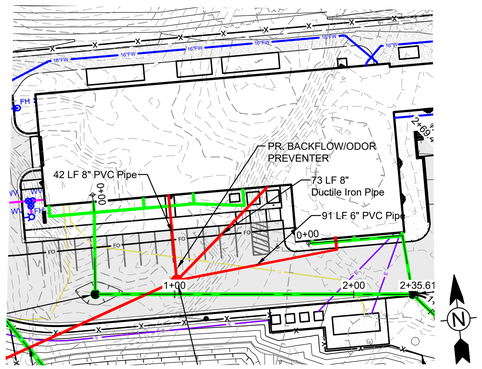
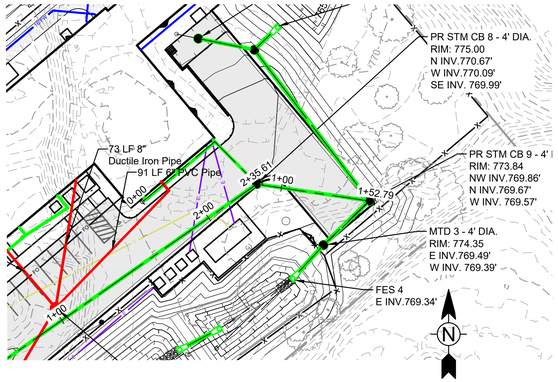
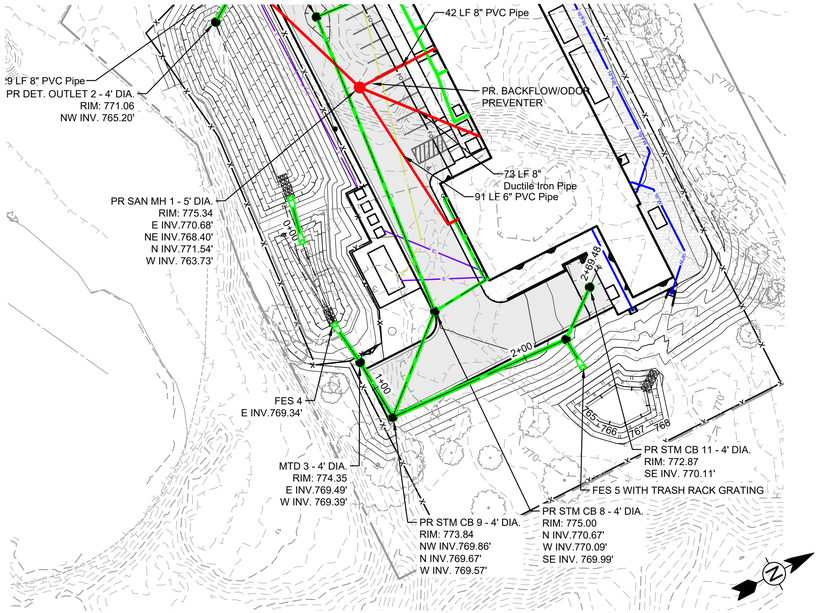
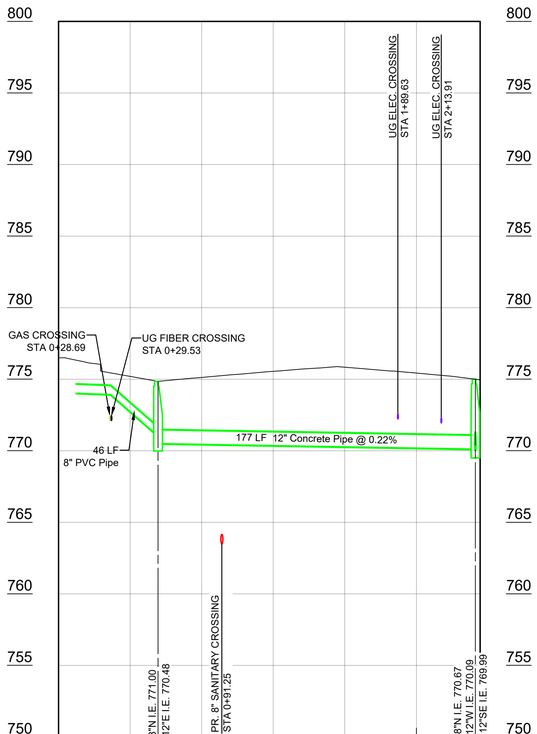


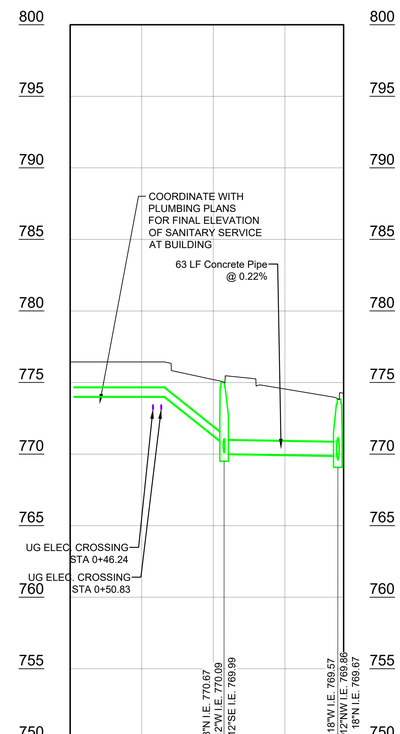






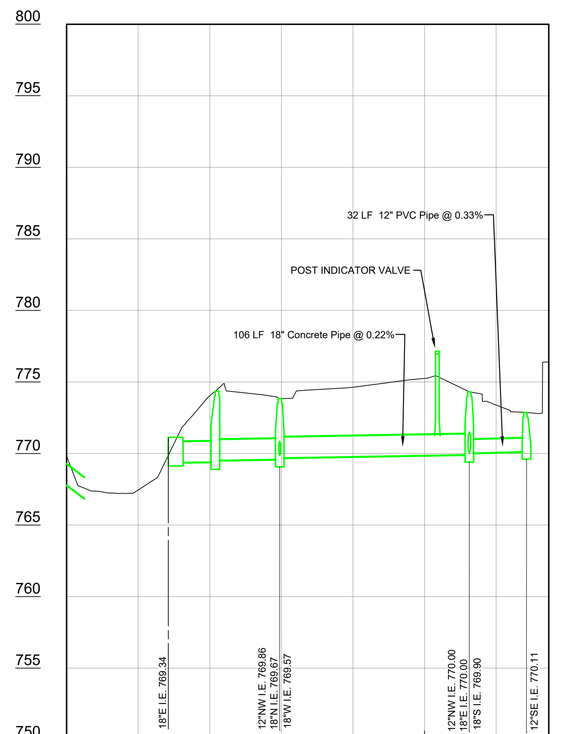
PROFILE WEST ROOF DRAIN COLLECTORS TO CB

SCALE: HORIZ: 1"= 40' VERT: 1"= 5'



PROFILE EAST ROOF DRAIN COLLECTORS TO CB

SCALE: HORIZ: 1"= 40' VERT: 1"= 5'



PROFILE LOADING DOCK TO BASIN

SCALE: HORIZ: 1"= 40' VERT: 1"= 5'

0 20' 40' 80'

SCALE: 1" = 40'

Bar Measures 1 inch, otherwise drawing not to scale

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MARK	DATE	DESCRIPTION
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BY

CITY OF KALAMAZOO, MICHIGAN

PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING UTILITIES - STORMWATER PROFILES

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
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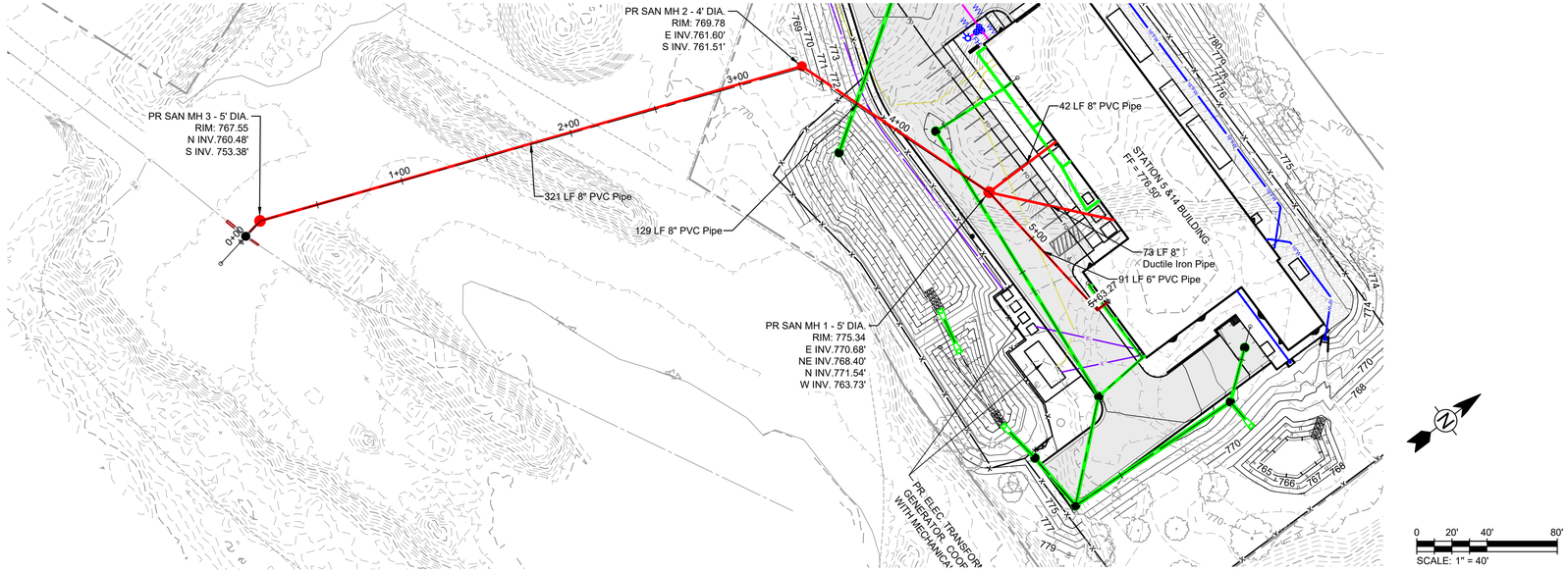

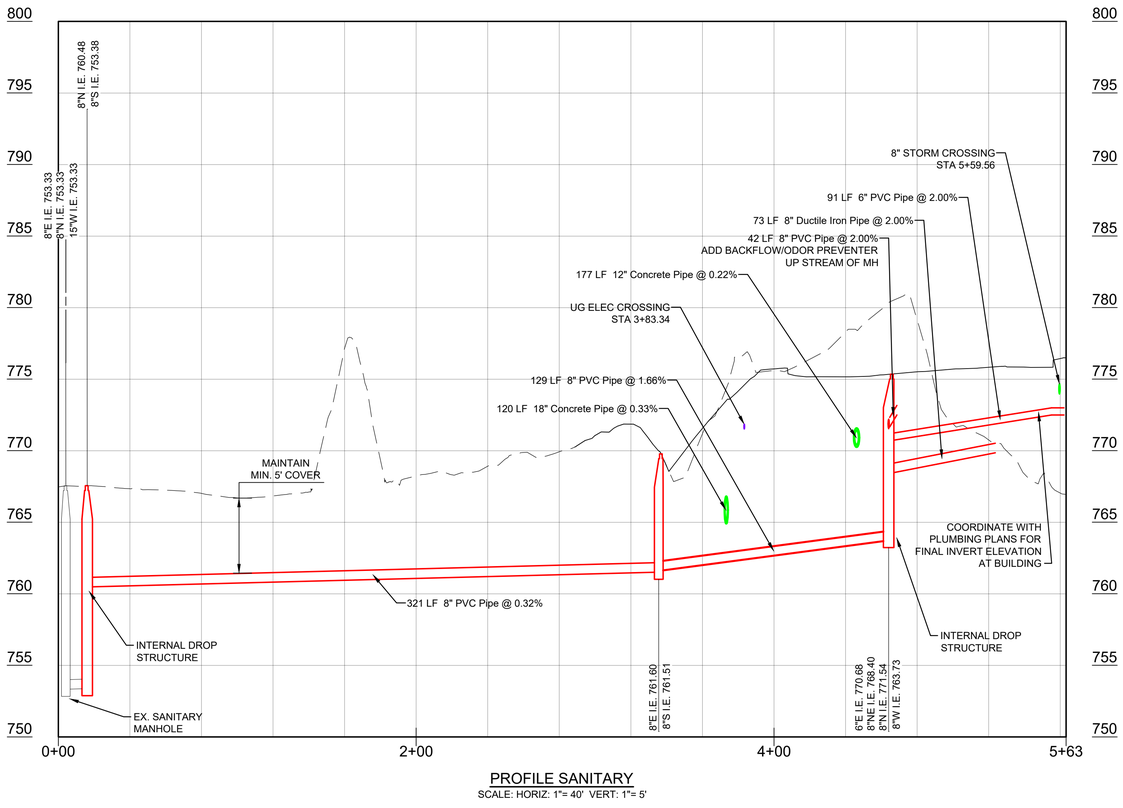

PROFILE SANITARY
SCALE: HORIZ: 1"= 40' VERT: 1"= 5'

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ISSUED FOR
SITE PLAN
REVIEW
05-12-2025

MARK	DATE	DESCRIPTION	BY
	05/01/25	ISSUED FOR BIDS	

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING
UTILITIES - SANITARY PROFILE

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

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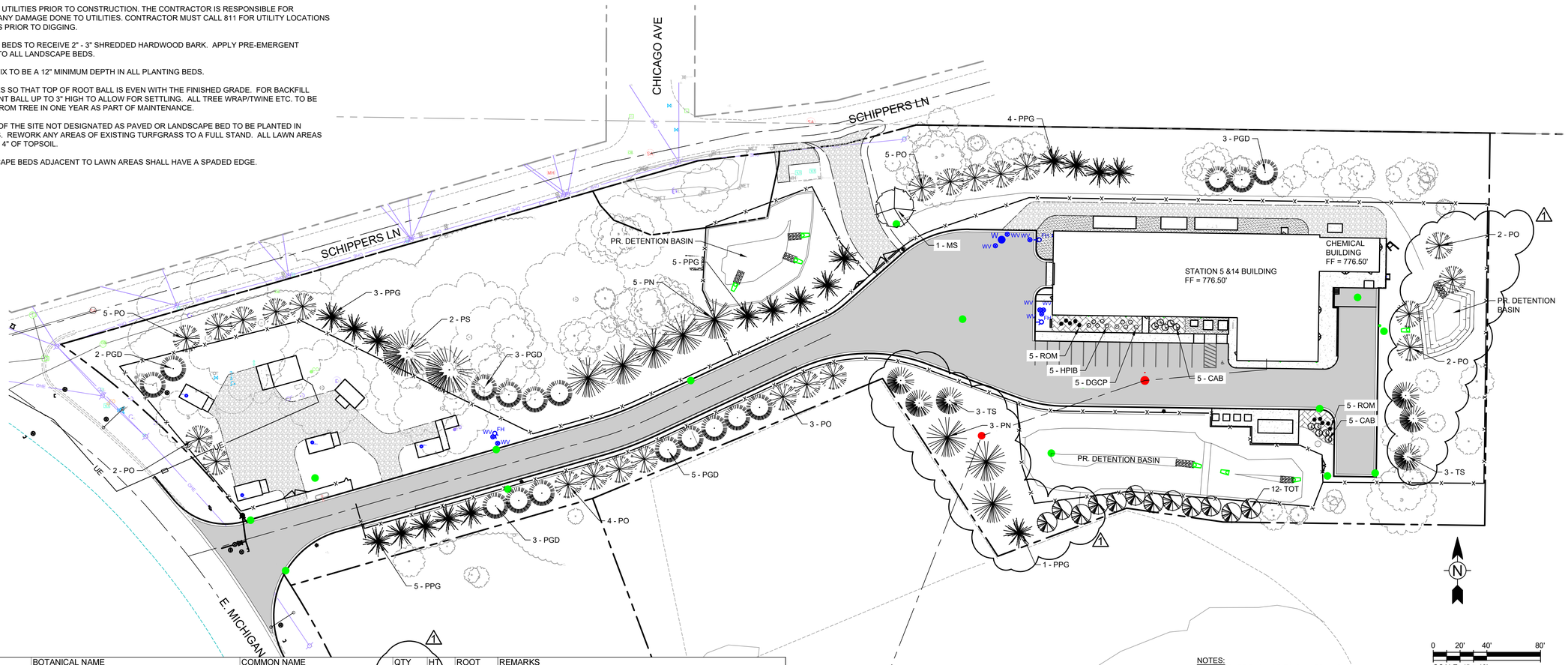
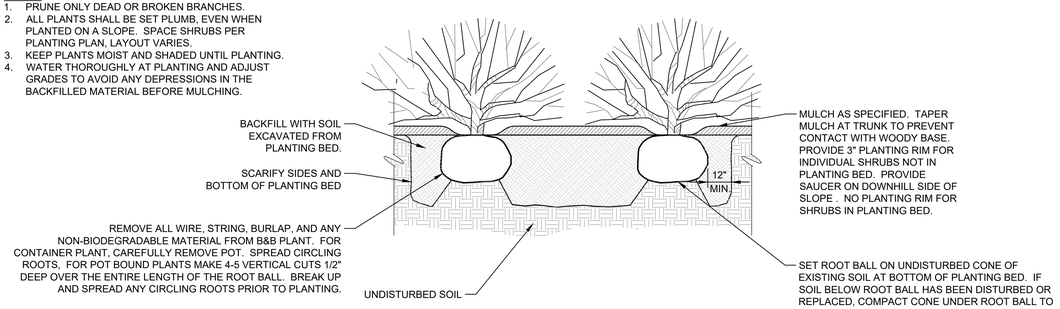
NOTES:
1. LOCATE ALL UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY DAMAGE DONE TO UTILITIES. CONTRACTOR MUST CALL 811 FOR UTILITY LOCATIONS THREE DAYS PRIOR TO DIGGING.
2. LANDSCAPE BEDS TO RECEIVE 2" - 3" SHREDDED HARDWOOD BARK. APPLY PRE-EMERGENT HERBICIDE TO ALL LANDSCAPE BEDS.
3. PLANTING MIX TO BE A 12" MINIMUM DEPTH IN ALL PLANTING BEDS.
4. PLANT TREES SO THAT TOP OF ROOT BALL IS EVEN WITH THE FINISHED GRADE. FOR BACKFILL AREAS, PLANT BALL UP TO 3" HIGH TO ALLOW FOR SETTLING. ALL TREE WRAP/TWINE ETC. TO BE REMOVED FROM TREE IN ONE YEAR AS PART OF MAINTENANCE.
5. ALL AREAS OF THE SITE NOT DESIGNATED AS PAVED OR LANDSCAPE BED TO BE PLANTED IN TURFGRASS. REWORK ANY AREAS OF EXISTING TURFGRASS TO A FULL STAND. ALL LAWN AREAS TO RECEIVE 4" OF TOPSOIL.
6. ALL LANDSCAPE BEDS ADJACENT TO LAWN AREAS SHALL HAVE A SPADED EDGE.

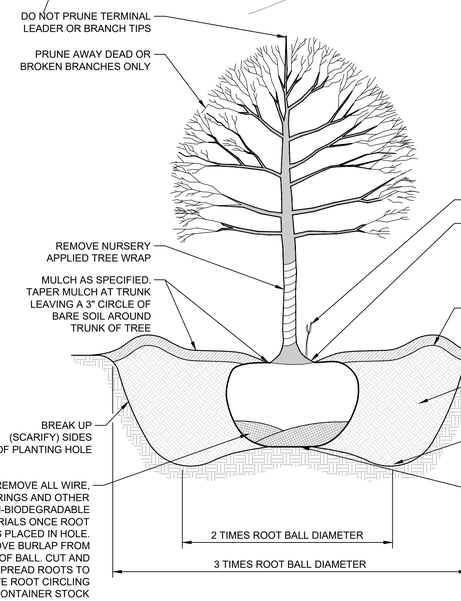


CODE	BOTANICAL NAME	COMMON NAME	QTY	HT	ROOT	REMARKS
EVERGREEN TREES						
PGD	PICEA GLAUCA 'DENSATA'	BLACK HILLS SPRUCE	17	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
PO	PICEA OMORIKA	SERBIAN SPRUCE	23	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
PPG	PICEA PUNGENS 'GLAUCA'	COLORADO BLUE SPRUCE	18	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
PN	PINUS NIGRA	AUSTRIAN PINE	8	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
PS	PINUS STROBUS	EASTERN WHITE PINE	2	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
TOT	THUJA OCCIDENTALIS 'TECHNY'	TECHNY AMERICAN ARBORVITAE	12	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
TS	TSUGA CANADENSIS	CANADIAN HEMLOCK	6	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
ORNAMENTAL TREES						
MS	MAGNOLIA X SOULANGIANA	SAUCER MAGNOLIA	1	8'	B&B	MULTI-STEM, 4-5 STEMS MINIMUM
SHRUBS						
CAB	CORNUS ALBA 'BAILHALO'	IVORY HALO DOGWOOD	10		#5	6'-0" ON CENTER
DGCP	DEUTZIA GRACILIS 'CHARDONNARY PEARLS'	CHARDONNAY PEARLS DETZIA	5		#3	3'-0" ON CENTER
HPIB	HYDRANGEA PANICULATA 'ILVOBO' BOBO	BOBO HYDRANGEA	5		#3	6'-0" ON CENTER
ROM	RHODODENDRON 'OLGA MEZITT'	OLGA MEZITT RHODODENDRON	10		#3	6'-0" ON CENTER

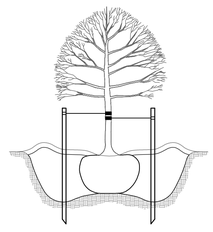
NOTES:
1. PRUNE ONLY DEAD OR BROKEN BRANCHES.
2. ALL PLANTS SHALL BE SET PLUMB, EVEN WHEN PLANTED ON A SLOPE. SPACE SHRUBS PER PLANTING PLAN, LAYOUT VARIES.
3. KEEP PLANTS MOIST AND SHADED UNTIL PLANTING.
4. WATER THOROUGHLY AT PLANTING AND ADJUST GRADES TO AVOID ANY DEPRESSIONS IN THE BACKFILLED MATERIAL BEFORE MULCHING.



SHRUB PLANTING DETAIL
NO SCALE



NOTES:
1. MINIMIZE DAMAGE TO BALLED AND BURLAP ROOT BALLS DURING PLANTING.
2. SET TREE VERTICAL REGARDLESS OF FINISH GRADE SLOPE.
3. FORM 3" TO 4" HIGH WATERING RING WITH SOIL AND COVER WITH MULCH AS SHOWN.
4. BACKFILL HOLE HALF FULL OF NATIVE SOIL AND NO AMENDMENTS. TAMP SOIL TO STABILIZE ROOT BALL. FINISH BACKFILLING AND TAMP AGAIN. TREES OF 3" CALIPER OR LARGER SHOULD BE BACKFILLED AND TAMPED IN 3 EQUAL LEVELS.
5. WATER ONLY AFTER PLANTING IS COMPLETED.



DO NOT STAKE UNLESS IN HEAVY CLAY SOILS OR WINDY CONDITIONS ARE DETERMINED BY LANDSCAPE ARCHITECT. IF STAKING IS REQUIRED:
1. STAKE WITH 2X2 HARDWOOD STAKES OR APPROVED METAL POST DRIVEN INTO SOIL OUTSIDE OF ROOT BALL, (3) PER TREE.
2. SECURE TO TREE USING 1" 'CHAINLOCK' OR LANDSCAPE ARCHITECT APPROVED TREE TIE MATERIAL. SECURE TREE TIE MATERIAL TO STAKE PER MANUFACTURER'S RECOMMENDATIONS. LOOP TIE AROUND TREE TO PROVIDE 1" SLACK FOR TRUNK GROWTH.
3. REMOVE ALL STAKING MATERIAL AFTER (1) YEAR

TREE PLANTING DETAIL
NO SCALE

TETRA TECH
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ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
1	05/07/25	ADDENDUM NO. 1
	05/01/25	ISSUED FOR BIDS

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING LANDSCAPE PLAN - OVERALL

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-216

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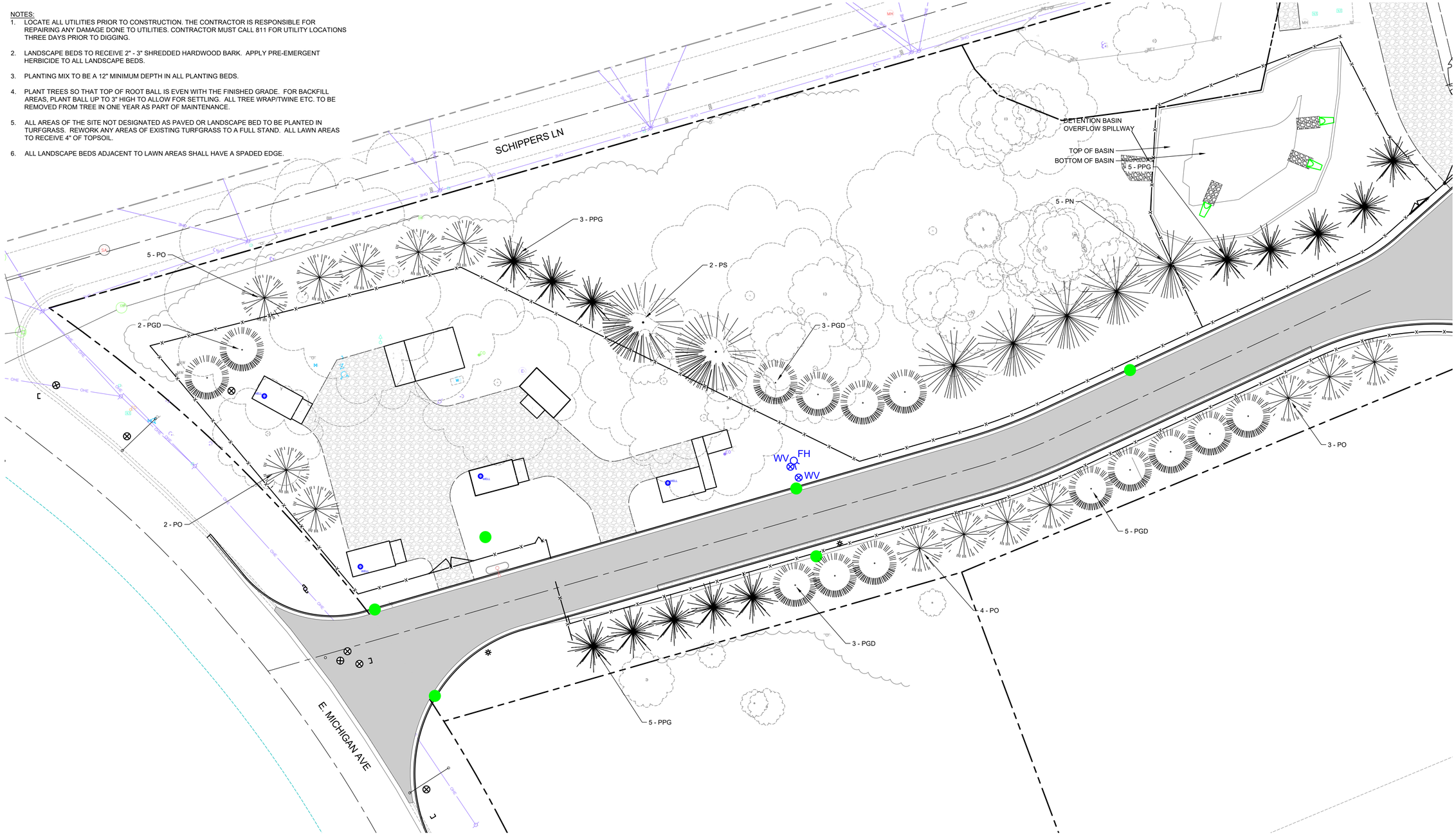
NOTES:

1. LOCATE ALL UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY DAMAGE DONE TO UTILITIES. CONTRACTOR MUST CALL 811 FOR UTILITY LOCATIONS THREE DAYS PRIOR TO DIGGING.
2. LANDSCAPE BEDS TO RECEIVE 2" - 3" SHREDDED HARDWOOD BARK. APPLY PRE-EMERGENT HERBICIDE TO ALL LANDSCAPE BEDS.
3. PLANTING MIX TO BE A 12" MINIMUM DEPTH IN ALL PLANTING BEDS.
4. PLANT TREES SO THAT TOP OF ROOT BALL IS EVEN WITH THE FINISHED GRADE. FOR BACKFILL AREAS, PLANT BALL UP TO 3" HIGH TO ALLOW FOR SETTLING. ALL TREE WRAP/TWINE ETC. TO BE REMOVED FROM TREE IN ONE YEAR AS PART OF MAINTENANCE.
5. ALL AREAS OF THE SITE NOT DESIGNATED AS PAVED OR LANDSCAPE BED TO BE PLANTED IN TURFGRASS. REWORK ANY AREAS OF EXISTING TURFGRASS TO A FULL STAND. ALL LAWN AREAS TO RECEIVE 4" OF TOPSOIL.
6. ALL LANDSCAPE BEDS ADJACENT TO LAWN AREAS SHALL HAVE A SPADED EDGE.



CODE	BOTANICAL NAME	COMMON NAME	QTY	HT	ROOT	REMARKS
EVERGREEN TREES						
PGD	PICEA GLAUCA 'DENSATA'	BLACK HILLS SPRUCE	14	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
PO	PICEA OMORIKA	SERBIAN SPRUCE	14	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
PPG	PICEA PUNGENS 'GLAUCA'	COLORADO BLUE SPRUCE	13	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
PN	PINUS NIGRA	AUSTRIAN PINE	5	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
PS	PINUS STROBUS	EASTERN WHITE PINE	2	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
TOT	THUJA OCCIDENTALIS 'TECHNY'	TECHNY AMERICAN ARBORVITAE	0	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
TS	TSUGA CANADENSIS	CANADIAN HEMLOCK	0	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
ORNAMENTAL TREES						
MS	MAGNOLIA X SOULANGIANA	SAUCER MAGNOLIA	0	8'	B&B	MULTI-STEM, 4-5 STEMS MINIMUM
SHRUBS						
CAB	CORNUS ALBA 'BAILHALO'	IVORY HALO DOGWOOD	0		#5	6'-0" ON CENTER
DGCP	DEUTZIA GRACILIS 'CHARDONNARY PEARLS'	CHARDONNAY PEARLS DETZIA	0		#3	3'-0" ON CENTER
HPIB	HYDRANGEA PANICULATA 'ILVOBO' BOBO	BOBO HYDRANGEA	0		#3	6'-0" ON CENTER
ROM	RHODODENDRON 'OLGA MEZITT'	OLGA MEZITT RHODODENDRON	0		#3	6'-0" ON CENTER

TETRA TECH
www.tetratech.com
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ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
	05/01/25	ISSUED FOR BIDS
1	05/12/25	ADDENDUM NO. 1

BY

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING LANDSCAPE PLAN - WEST

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-217

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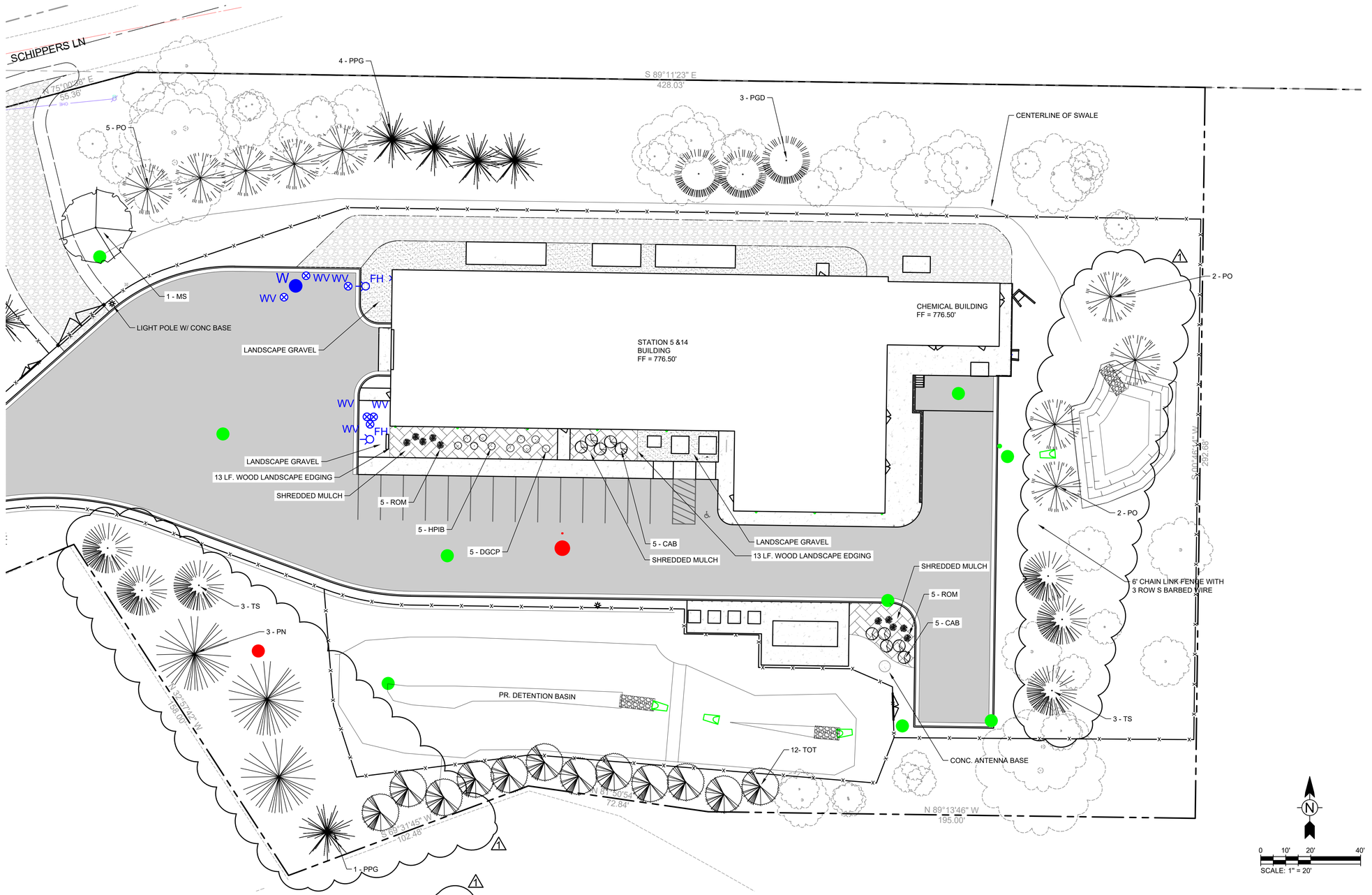

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PPG	PICEA PUNGENS 'GLAUCA'	COLORADO BLUE SPRUCE	5	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
PN	PINUS NIGRA	AUSTRIAN PINE	3	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
PS	PINUS STROBUS	EASTERN WHITE PINE	0	8'	B&B	SINGLE STRAIGHT TRUNK, SPECIMENT QUALITY
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MS	MAGNOLIA X SOULANGIANA	SAUCER MAGNOLIA	1	8'	B&B	MULTI-STEM, 4-5 STEMS MINIMUM
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DGCP	DEUTZIA GRACILIS 'CHARDONNARY PEARLS'	CHARDONNAY PEARLS DETZIA	5		#3	3'-0" ON CENTER
HPIB	HYDRANGEA PANICULATA 'ILVOBO' BOBO	BOBO HYDRANGEA	5		#3	6'-0" ON CENTER
ROM	RHODODENDRON 'OLGA MEZITT'	OLGA MEZITT RHODODENDRON	10		#3	6'-0" ON CENTER

NOTES:

1. LOCATE ALL UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY DAMAGE DONE TO UTILITIES. CONTRACTOR MUST CALL 811 FOR UTILITY LOCATIONS THREE DAYS PRIOR TO DIGGING.
2. LANDSCAPE BEDS TO RECEIVE 2" - 3" SHREDDED HARDWOOD BARK. APPLY PRE-EMERGENT HERBICIDE TO ALL LANDSCAPE BEDS.
3. PLANTING MIX TO BE A 12" MINIMUM DEPTH IN ALL PLANTING BEDS.
4. PLANT TREES SO THAT TOP OF ROOT BALL IS EVEN WITH THE FINISHED GRADE. FOR BACKFILL AREAS, PLANT BALL UP TO 3" HIGH TO ALLOW FOR SETTLING. ALL TREE WRAP/TWINE ETC. TO BE REMOVED FROM TREE IN ONE YEAR AS PART OF MAINTENANCE.
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ISSUED FOR
SITE PLAN
REVIEW
05-12-2025

MARK	DATE	DESCRIPTION
1	05/12/25	ADDENDUM NO. 1

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING
LANDSCAPE PLAN - EAST

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

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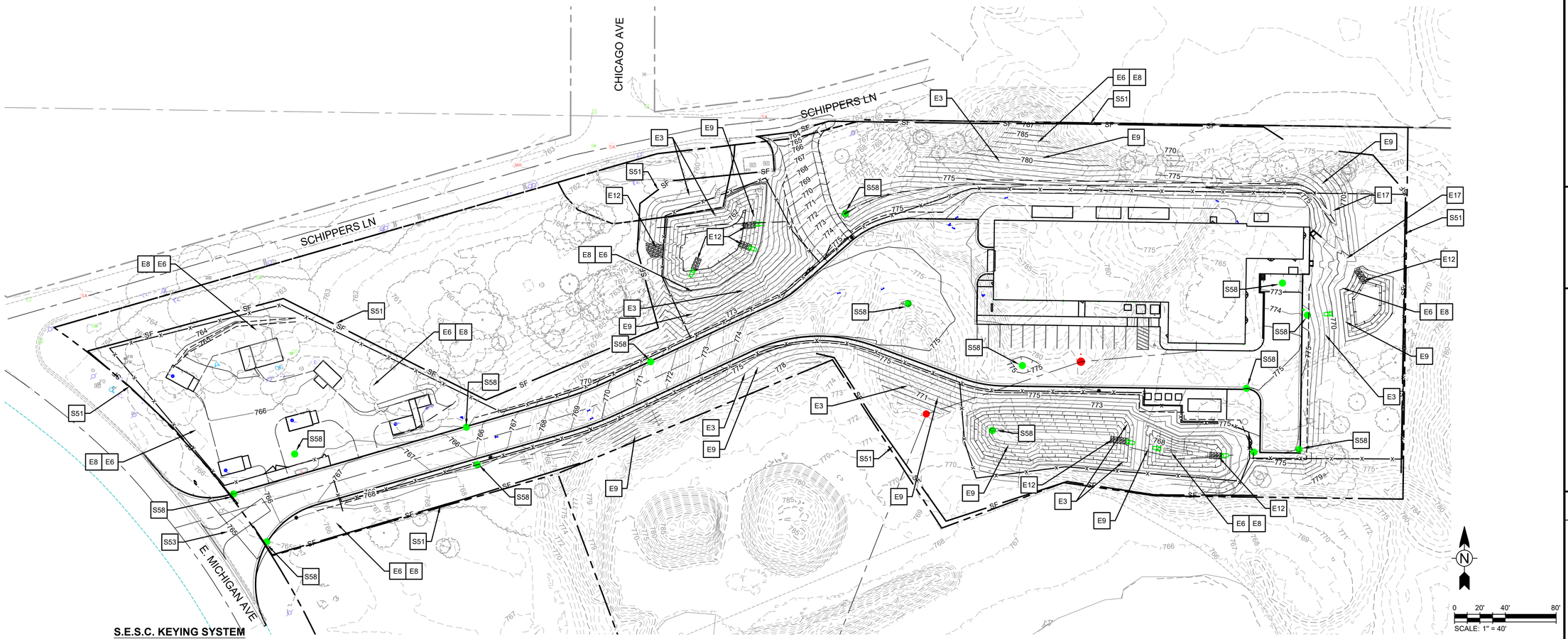
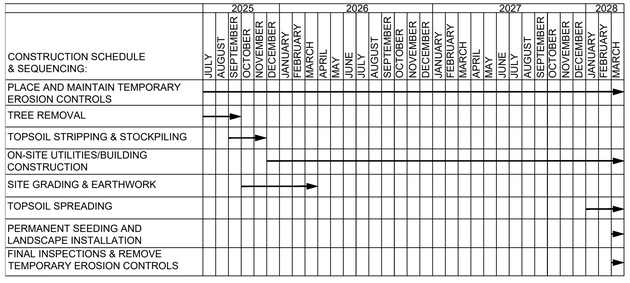


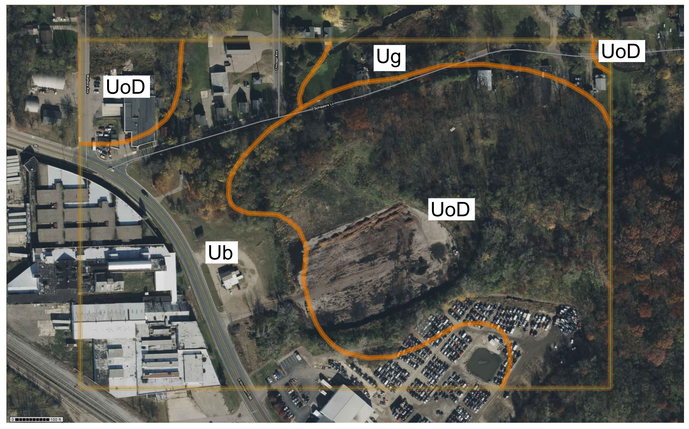
S.E.S.C. KEYING SYSTEM
ESTIMATED AREA WITHIN EARTH DISTURBANCE LIMITS

3.36 ACRES

KEY	BEST MANAGEMENT PRACTICES	WHERE USED
	EROSION CONTROLS	
E3	SLOPE ROUGHENING AND SCARIFICATION	Where created grades cause increased erosive velocities. Promotes infiltration and reduces runoff velocity.
E6	MULCH	For use in areas subject to erosive surface flows or severe wind or on newly seeded areas.
E8	PERMANENT SEEDING	Stabilization method utilized on sites where earth change has been completed (final grading attained).
E9	MULCH BLANKET	On exposed slopes, newly seeded areas, new ditch bottoms, or areas subject to erosion.
E12	RIPRAP	Use along shorelines, waterways, or where concentrated flows occur. Slows velocity, reduces sediment load, and reduces erosion.
E17	CELLULAR CONFINEMENT SYSTEMS	Used on steep slopes and high velocity channels.
S51	SILT FENCE	Use adjacent to critical areas, to prevent sediment laden sheet flow from entering these areas.
S58	INLET PROTECTION - FABRIC DROP	Use at stormwater inlets, especially at construction sites.
S53	STABILIZED CONSTRUCTION ACCESS	Used at every point where construction traffic enters or leaves a construction site

SESC SCHEDULE & SEQUENCING





SOILS MAP

PER THE KALAMAZOO COUNTY SOILS SURVEY, ONSITE SOILS CONSIST OF:

Ub - URBAN LAND

Ug - URBAN LAND - GLENDORA COMPLEX

UoD - URBAN LAND - OSHEMO COMPLEX, 12 TO 25 PERCENT SLOPES

NOTES:
1. ALL DISTURBED AREAS TO BE PROTECTED WITH TEMPORARY SEED MIX UNTIL FINAL GRADE IS ESTABLISHED AND PERMANENT SEEDING CAN OCCUR.
2. SEE SHEET C-505 FOR SESC DETAILS

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ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
	05/01/25	ISSUED FOR BIDS

CITY OF KALAMAZOO, MICHIGAN

PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

PUMP STATION 5 & 14 SOIL EROSION AND SEDIMENTATION CONTROL PLAN

PROJ: 200-19743-24012
DESN: D. WARREN
DRWN: A.SMITH
CHKD:

C-219

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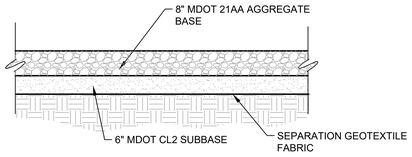
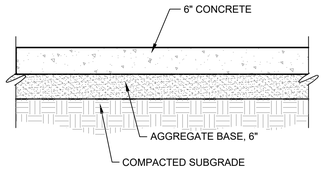


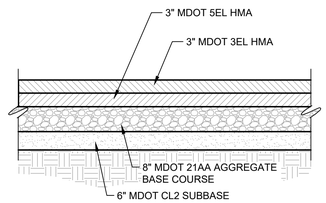
21AA AGGREGATE DRIVE SECTION

NO SCALE



TYPICAL CONCRETE DRIVE SECTION

NO SCALE

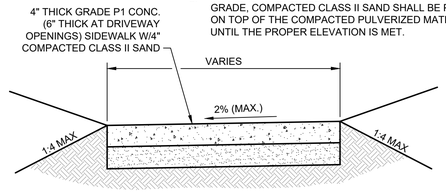


HEAVY DUTY HMA PAVEMENT SECTION

NO SCALE

NOTES:

1. IF GRADE CUT RESULTS IN LESS THAN 4" THICK OF COMPACTED PULVERIZED MATERIAL (EXISTING PAVEMENT BASE) THEN MATERIAL SHALL BE REMOVED AND REPLACED W/#4" CLASS II SAND.
2. IN AREAS WHERE FILL WILL BE REQUIRED TO MEET GRADE, COMPACTED CLASS II SAND SHALL BE PLACED ON TOP OF THE COMPACTED PULVERIZED MATERIAL UNTIL THE PROPER ELEVATION IS MET.



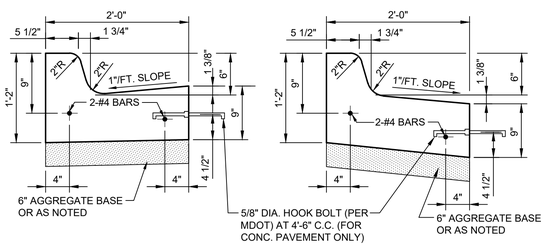
SIDEWALK DETAIL

SCALE: NONE



RAISED SIDEWALK AT PARKING

SCALE: NONE



MDOT DETAIL - R-30-E

TYPE F3 AS SHOWN
TYPE F4 LANE TIES OMITTED

MDOT DETAIL - R-30-E (MODIFIED)

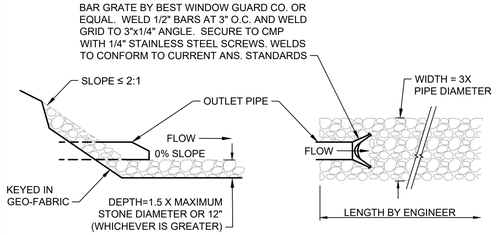
TYPE F3 AS SHOWN
TYPE F4 LANE TIES OMITTED

NOTE: TYPE F4 TYPICAL UNLESS OTHERWISE NOTED ON CONTRACT DRAWINGS.

CONCRETE CURB & GUTTER

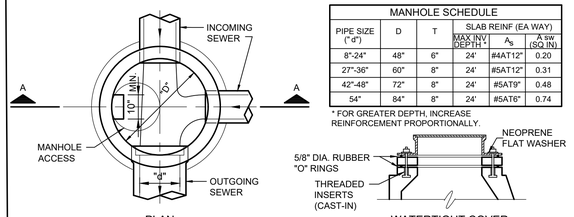
NO SCALE

PIPE DIAMETERS 15" AND LARGER TO HAVE ANIMAL GUARDS INSTALLED. GALVANIZED BAR GRATE BY BEST WINDOW GUARD CO. OR EQUAL. WELD 1/2" BARS AT 3" O.C. AND WELD GRID TO 3"x1/4" ANGLE. SECURE TO CMP WITH 1/4" STAINLESS STEEL SCREWS. WELDS TO CONFORM TO CURRENT ANS. STANDARDS



RIP-RAP

NO SCALE

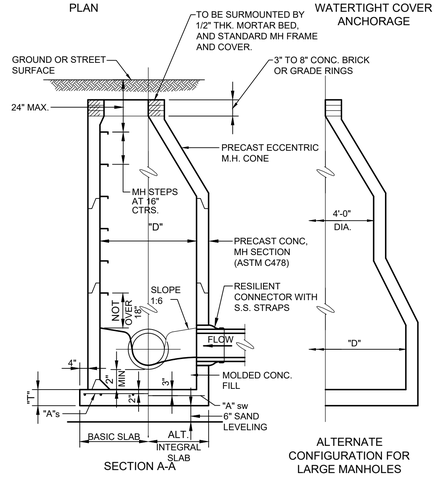


PLAN

MANHOLE SCHEDULE					
PIPE SIZE ("d")	D	T	SLAB REINF (EA WAY)		
			MAX INV.* DEPTH *	A_s	A sw (SQ IN)
8"-24"	48"	6"	24'	#4AT12"	0.20
27"-36"	60"	8"	24'	#5AT12"	0.31
42"-48"	72"	8"	24'	#5AT9"	0.48
54"	84"	8"	24'	#5AT6"	0.74

* FOR GREATER DEPTH, INCREASE REINFORCEMENT PROPORTIONALLY.

WATERTIGHT COVER ANCHORAGE



SECTION A-A

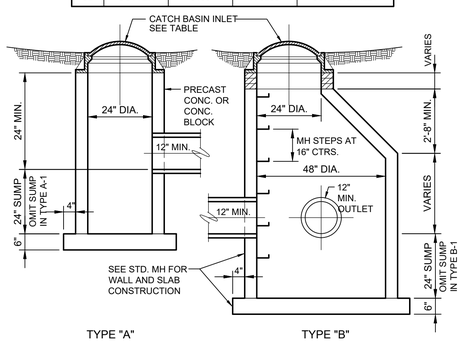
ALTERNATE CONFIGURATION FOR LARGE MANHOLES

NOTES:
1. ALL SANITARY MANHOLES (MH) TO BE PRECAST REINFORCED CONCRETE WITH PREMIUM JOINTS. SEE SPECIFICATIONS FOR BASE SLAB AND PIPE OPENINGS AND CONNECTIONS.
2. MANHOLE CONES SHALL BE THE ECCENTRIC TYPE.
3. PROVIDE 6" OF COMPACTED GRANULAR MAT'L UNDER ALL PRECAST CONCRETE BASE SLABS.
4. STANDARD MH FRAMES AND COVER AS SPECIFIED. USE SOLID SELF-SEALING COVER FOR SANITARY SEWERS.
5. WATERTIGHT MH FRAME AND COVER AS SPECIFIED.

STANDARD SANITARY MANHOLE

NO SCALE

MANHOLE FRAME & COVER & CATCH BASIN INLETS				
TYPE	LOCATION	MANUFACTURER OR EQUAL		TYPE OF COVER OR INLET
		EAST JORDAN	NEENAH	
MH	ALL	1040	R-1916 F1	SANITARY-SOLID SELF-SEALING, STORM-VENTED
CB	TYPE A CURB	7000-T1-M1	R-3070	FLAT GRATE WITH VERT. OPEN BACK
CB	TYPE B CURB	7065-T1-M1	R-3034-B	FLAT GRATE WITH ROLL BACK
CB	PAVEMENT/ SHOULDER	1020-M1	R-2060-D	FLAT GRATE
CB	OPEN AREA	1020-01	R-2560-D	BEEHIVE GRATE 4" HIGH
CB	GUTTER	5100	R-3238	CONCAVE INLET



TYPE "A"

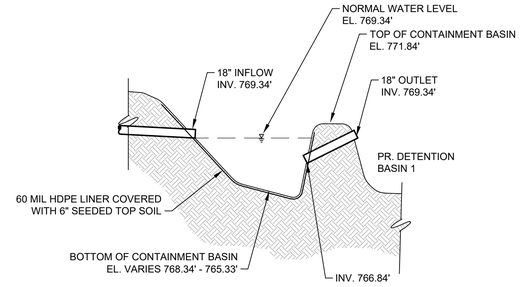
NOTE: TYPE A-1 EQUAL TO TYPE "A" EXCLUDING 24" SUMP BUT ADD ON BOTTOM CONC. FILLET.

TYPE "B"

NOTE: TYPE B-1 EQUAL TO TYPE "B" EXCLUDING 24" SUMP BUT ADD ON BOTTOM CONC. FILLET.

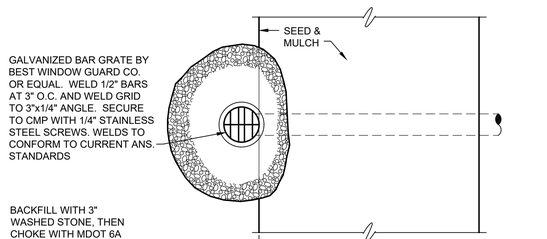
CATCH BASINS

NO SCALE

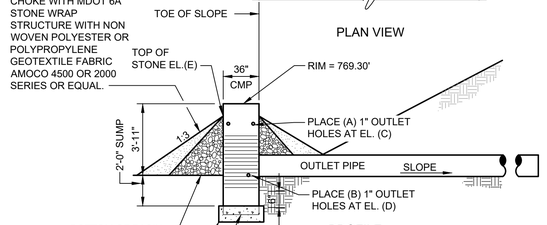


CONTAINMENT BASIN OUTLET PIPE

NO SCALE



PLAN VIEW



PROFILE

BASIN 1	
(A)	2
(B)	1
(C)	768.53'
(D)	765.40'
(E)	768.80'

NOTES:
1. SEE PLANS FOR OUTLET PIPE SIZE, TYPE, LENGTH AND INVERT ELEVATIONS.
2. SEE PLANS FOR BOTTOM OF BASIN ELEVATION.
3. EXTREME CARE MUST BE EXERCISED TO ENSURE THAT THE OUTLET HOLES IN THE STANDPIPE DO NOT BECOME CLOGGED WITH SEDIMENT.

SEDIMENTATION BASIN OUTLET

NO SCALE

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ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
	05/01/25	ISSUED FOR BIDS

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

PUMP STATION 5 & 14 CIVIL - DETAILS

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-501

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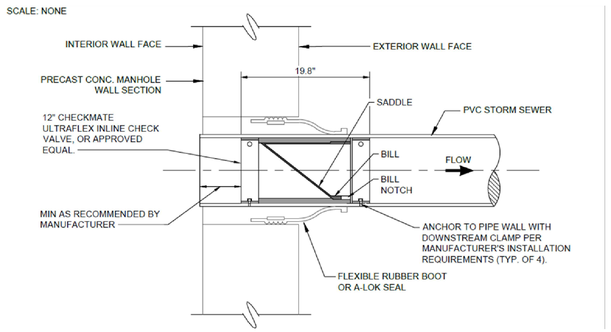
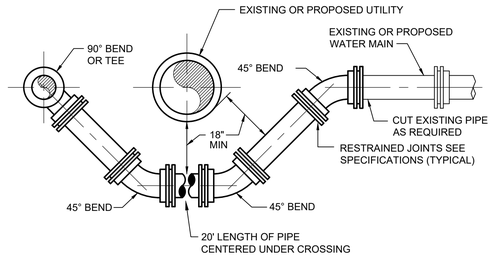


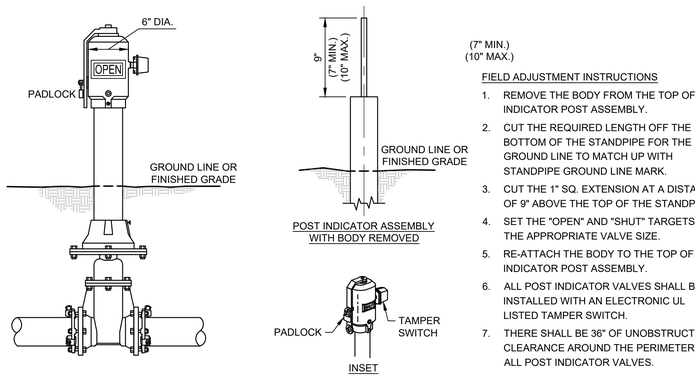
BACKFLOW/ODOR PREVENTER

SCALE: NONE



WATER MAIN RELOCATION AT UTILITY CROSSING

NO SCALE



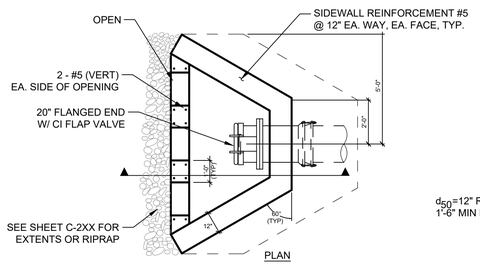
(7" MIN.)
(10" MAX.)

FIELD ADJUSTMENT INSTRUCTIONS

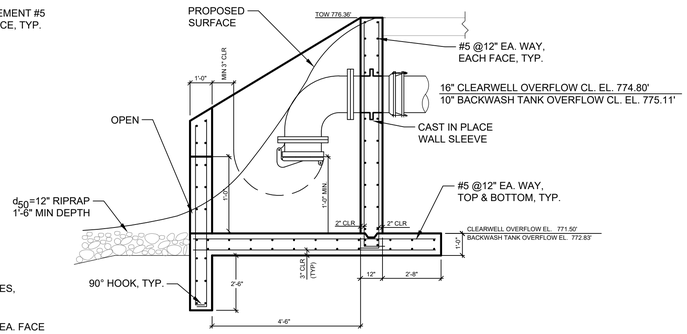
1. REMOVE THE BODY FROM THE TOP OF THE INDICATOR POST ASSEMBLY.
2. CUT THE REQUIRED LENGTH OFF THE BOTTOM OF THE STANDPIPE FOR THE GROUND LINE TO MATCH UP WITH STANDPIPE GROUND LINE MARK.
3. CUT THE 1" SQ. EXTENSION AT A DISTANCE OF 9" ABOVE THE TOP OF THE STANDPIPE.
4. SET THE "OPEN" AND "SHUT" TARGETS FOR THE APPROPRIATE VALVE SIZE.
5. RE-ATTACH THE BODY TO THE TOP OF THE INDICATOR POST ASSEMBLY.
6. ALL POST INDICATOR VALVES SHALL BE INSTALLED WITH AN ELECTRONIC UL LISTED TAMPER SWITCH.
7. THERE SHALL BE 36" OF UNOBSTRUCTED CLEARANCE AROUND THE PERIMETER OF ALL POST INDICATOR VALVES.

POST INDICATOR VALVE

NO SCALE



REINFORCEMENT AROUND OPENING

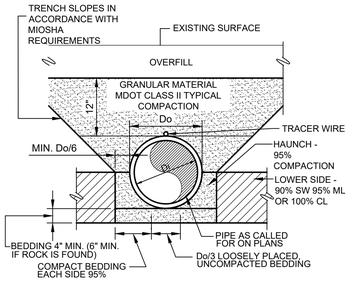


SECTION

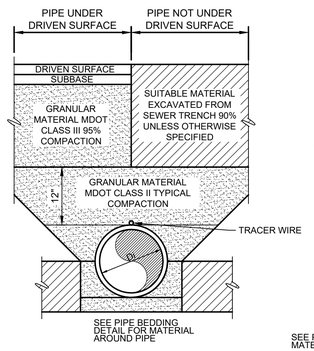
OVERFLOW HEADWALL DETAIL

SCALE: NONE

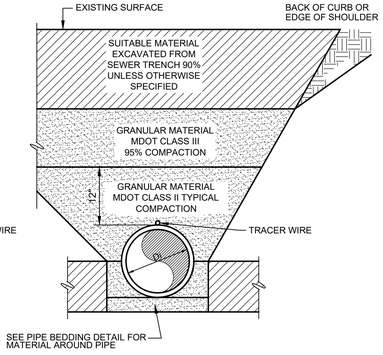
NOTES:
1. COMPACTION PRESENTED AS MINIMUM STANDARD PROCTOR VALUES.
2. MATERIALS AROUND THERMOPLASTIC PIPE WITH DIAMETER < 6 INCHES SHALL PASS 0.5 INCH SIEVE, MATERIALS AROUND OTHER PIPES SHALL PASS 1.5 INCH SIEVE.
3. DRIVEN SURFACE IS DRIVEWAY, PARKING AREA, ROAD BED OR SHOULDER.
4. UTILITY TRENCHES LOCATED WITHIN A MDOT ROW SHALL CONFORM TO MDOT STANDARD DETAIL R-83.
5. FOR ALL EXCAVATION WITHIN THE WETLAND LIMITS THE TOP TWO FEET OF TOP SOIL SHOULD BE STOCKPILED ON SITE AND SHALL BE REPLACED IN THE SAME LOCATION.
6. 12-INCHES WITHIN WATER MAIN SHALL BE BEDDED WITH MDOT CLASS IIIA GRANULAR MATERIAL
7. MDOT 6A TO BE USED FOR PIPE BEDDING FOR PVC SEWER PIPES AND IN AREAS WITH HIGH WATER TABLE



PIPE BEDDING



PIPE UNDER/NOT UNDER DRIVEN SURFACE

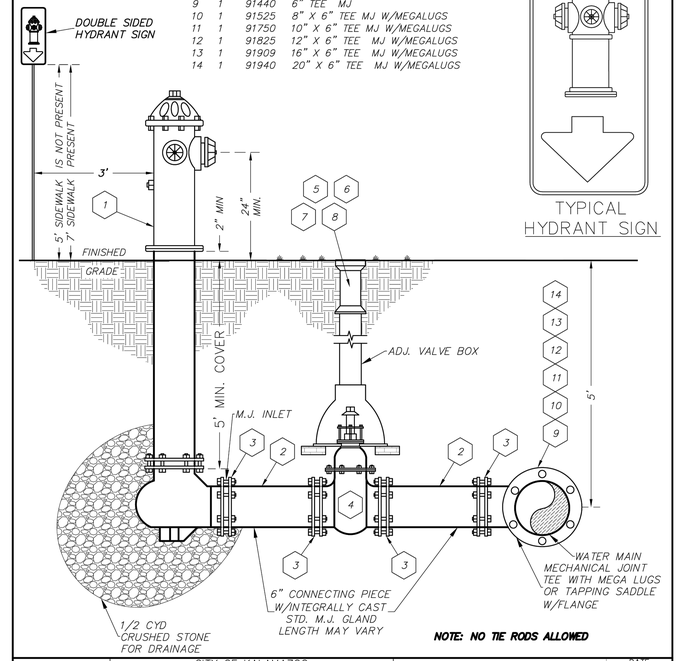


PIPE WITHIN INFLUENCE OF DRIVEN SURFACE

TRENCH EXCAVATION & PIPE BEDDING

ITEM	QTY.	#	DESCRIPTION
1	1	39887	6" HYDRANT W/CARROLL DRAIN
2	2	70000	CONNECTING PIECE (13")
3	4	33801	6" GASKET (MJ)
4	1	96696	6" GATE VALVE (MJ)
5	1	08550	VALVE BOX BOTTOM
6	1	08520	VALVE BOX TOP SECTION
7	1	08500	VALVE BOX RING CASTING
8	1	08490	VALVE BOX COVER
9	1	91440	6" TEE MJ
10	1	91525	8" X 6" TEE MJ W/MEGALUGS
11	1	91750	10" X 6" TEE MJ W/MEGALUGS
12	1	91825	12" X 6" TEE MJ W/MEGALUGS
13	1	91909	16" X 6" TEE MJ W/MEGALUGS
14	1	91940	20" X 6" TEE MJ W/MEGALUGS

WA-1-D



TYPICAL HYDRANT SIGN

CITY OF KALAMAZOO
Department Of Public Services

TYPICAL FIRE HYDRANT & GATE VALVE DETAIL

RECOMMENDED BY _____ DATE
APPROVED BY _____
APPROVED BY _____
ACCEPTED BY _____

TETRA TECH
1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003
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ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
	05/07/25	ISSUED FOR BIDS

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

PUMP STATION 5 & 14
CIVIL - DETAILS

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-502

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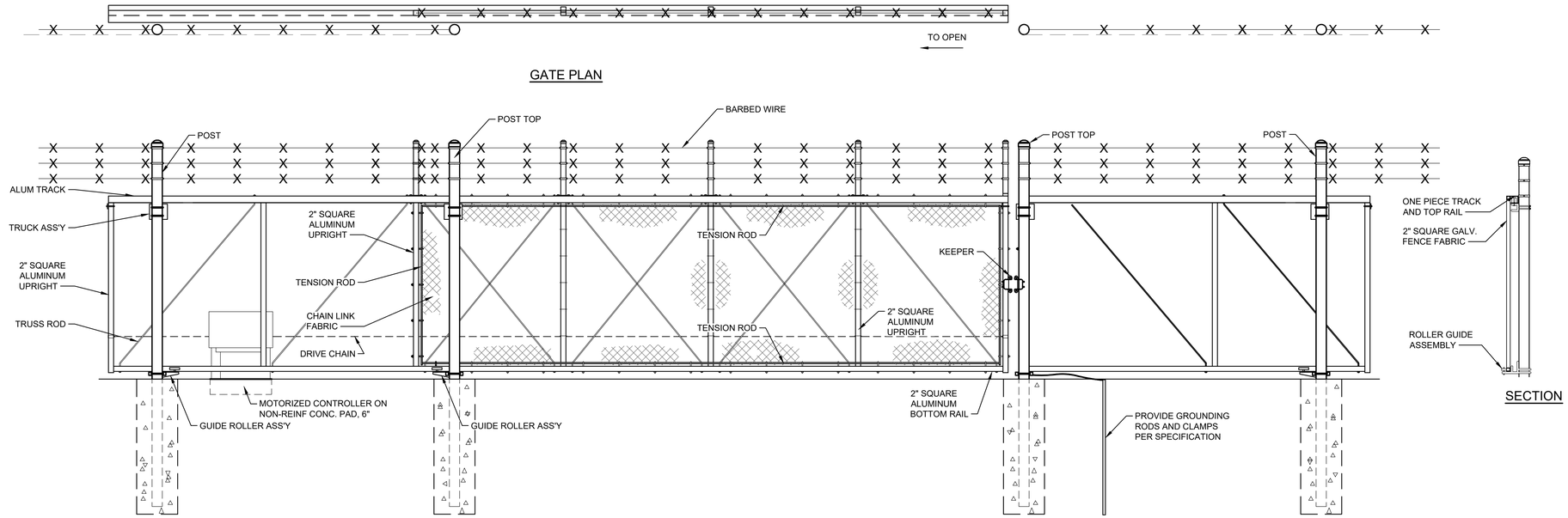


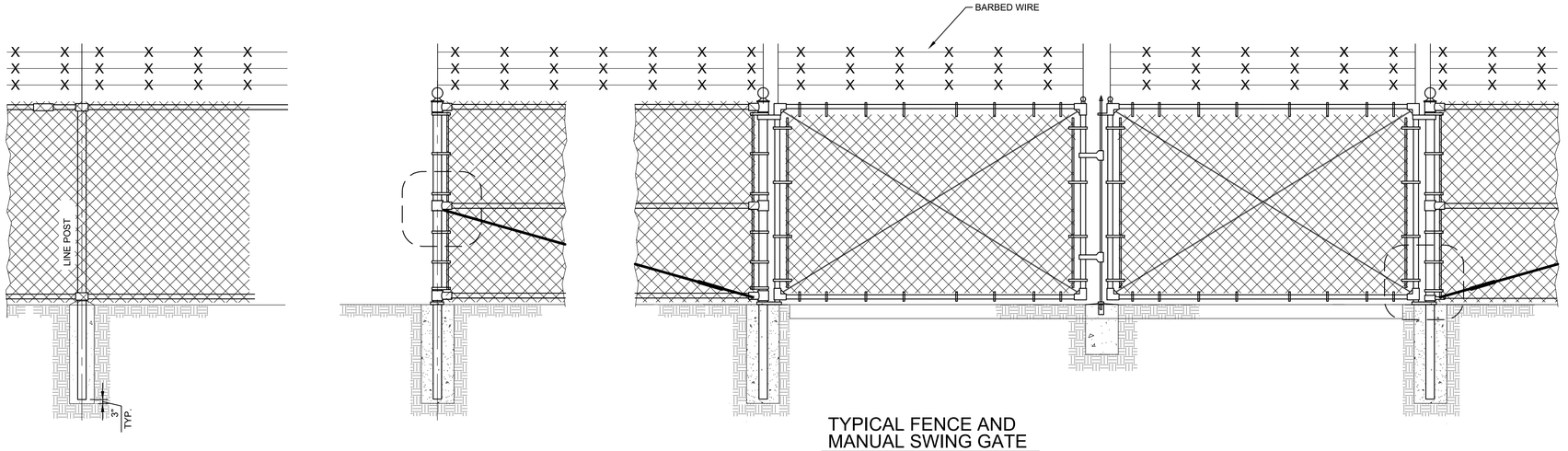
GATE OPENING	OVERHANG	FABRIC AREA	LENGTH
27'-0"	13'-6"	27'-0"	40'-6"

NOTES:

1. ALL CHAIN LINK FENCING SHALL BE OF: AN APPROVED DESIGN, MANUFACTURED OF VINYL COATED STEEL, AND CONFORM TO THE REQUIREMENTS OF THE CURRENT STANDARD SPECIFICATIONS.
2. FENCE FABRIC SHALL BE SECURELY FASTENED TO UPRIGHTS USING METAL BANDS OR WIRES SPACED NOT MORE THAT 1'-0" APART. THE WIRE SHALL NOT BE LESS THAN 12-GAGE.
3. TOP AND BOTTOM SALVAGES OF FENCE FABRIC SHALL HAVE A KNUCKLED FINISH.
4. POSTS AND GATE FRAMES SHALL MEET THE SPECIFIED NOMINAL WEIGHTS PER LFT AND CORRESPONDING A.S.T.M. SPECIFICATIONS SHOWN IN THE CURRENT STANDARD SPECIFICATIONS.
5. SEE ELECTRICAL PLANS AND SPECIFICATIONS FOR ADDITIONAL INSTALLATION DETAILS.

SLIDE GATE DETAIL

NO SCALE



TYPICAL FENCE AND MANUAL SWING GATE

SCALE: N.T.S.

NOTES

1. ALL CONCRETE POST BASES SHALL BE CONCRETE CLASS 2,500 WITH 28 DAY COMPRESSIVE STRENGTH AT 2,500 PSI, AND 12" MIN. DIAMETER.
2. ALL POSTS SHALL BE SPACED AT 10' MAXIMUM INTERVALS UNLESS OTHERWISE SHOWN ON THE DRAWINGS OR DIRECTED BY THE ENGINEER.
3. TOP RAIL AND BOTTOM TENSION WIRES SHALL BE PLACED WITHIN THE LIMITS OF THE FIRST FULL FABRIC WEAVE.
4. ALL CHAIN LINK FABRIC SHALL BE 2" MESH, 9 GAUGE WIRE, HOT-DIP GALVANIZED AFTER FABRICATION AND VINYL COATED WITH COLOR AS DIRECTED BY THE OWNER.
5. PIPE USED SHALL BE ASTM A120, SCHEDULE 40 STEEL PIPE.
6. CHANGES IN FENCE ALIGNMENT OF 30 DEGREE OR MORE WILL BE CONSIDERED CORNERS, AND CORNER POST SHALL BE INSTALLED.
7. CHAIN LINK FENCE AND GATE PANELS TO BE FITTED WITH VINYL SLATS WITH COLOR AS DIRECTED BY THE OWNER.
8. WHERE FOOTING IS INSTALLED IN CONCRETE SURFACE AREA, CORE DRILL HOLE IN SURFACE.
9. PROVIDE LATCHES FOR SINGLE AND DOUBLE GATES AS SPECIFIED.

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ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
	05/01/25	ISSUED FOR BIDS

BY

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

PUMP STATION 5 & 14 CIVIL - DETAILS

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-503

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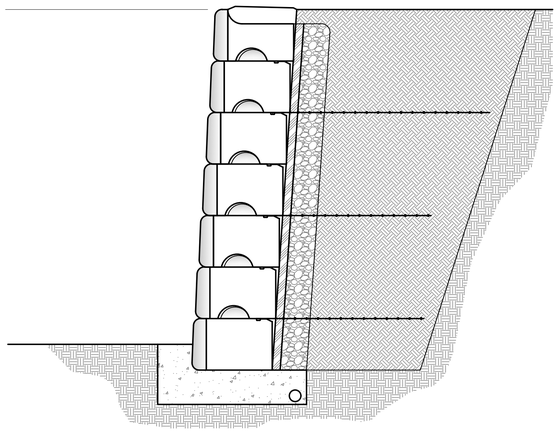
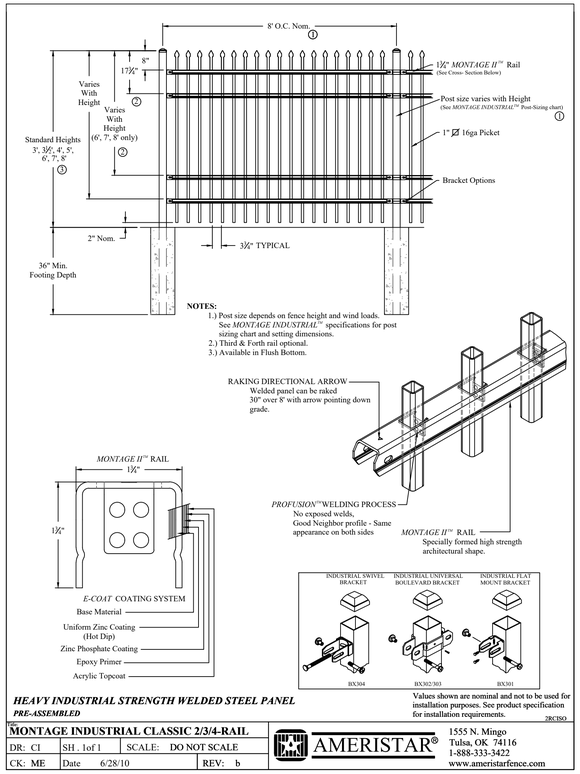


MODULAR BLOCK WALL SECTION

NO SCALE



HEAVY INDUSTRIAL STRENGTH WELDED STEEL PANEL
PRE-ASSEMBLED

Values shown are nominal and not to be used for installation purposes. See product specification for installation requirements.

2RCISO

MONTAGE INDUSTRIAL CLASSIC 2/3/4-RAIL		
DR: CI	SH . 1of 1	SCALE: DO NOT SCALE
CK: ME	Date 6/28/10	REV: b

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Tulsa, OK 74116
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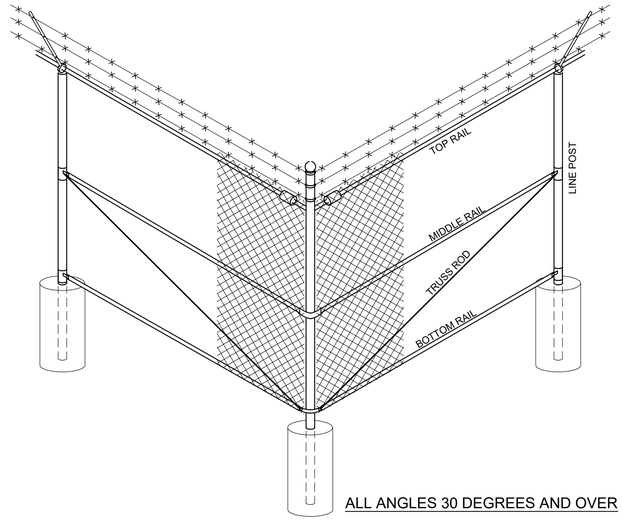
MEMBER											
BRACE OR RAIL				LINE POST				END, CORNER AND PULL POST		GATE POST		GATE OPENING
ROUND		HIGH COLUMN		ROUND		HIGH COLUMN		ROUND		ROUND		
OD	WEIGHT #/FT	SIZE	WEIGHT #/FT	OD	WEIGHT #/FT	SIZE	WEIGHT #/FT	OD	WEIGHT #/FT	OD	WEIGHT #/FT	
1 5/8"	2.27			2 3/8"	3.65			2 7/8"	5.79	4"	5.79	<4' - 10'

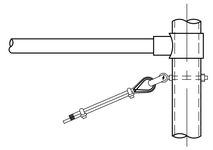


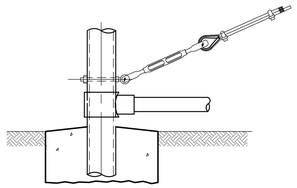
ALL ANGLES 30 DEGREES AND OVER

CROSS BRACING DETAIL

NO SCALE

PLAN VIEW





TRUSS AND BRACE DETAIL

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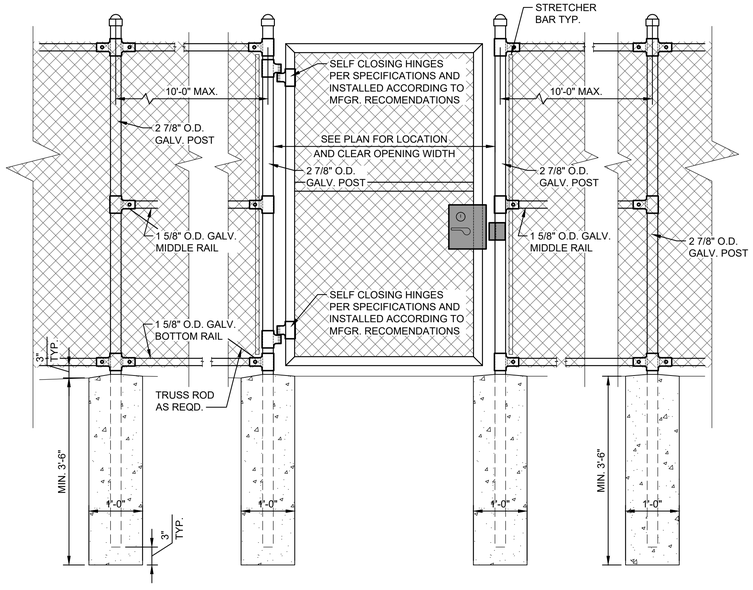

SECURE ACCESS GATE DETAIL

NO SCALE

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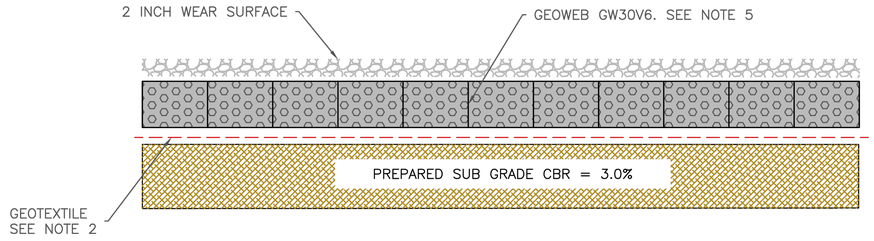
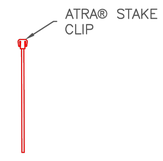
2. Provide a minimujm 8 oz. non-woven geotextile separation layer and install per Manufacturer recommendations including overlaps based on sub grade CBR.
3. The GEOWEB panels shall be connected with ATRA® keys at each interleaf and end to end connection.
4. Provide ATRA Anchors to keep panels open for infill as required.
5. GEOWEB infill shall be crushed aggregate with maximum size of 2.0 inches. Overfill the GEOWEB panels and compact to provide a minimum 2-inch wear surface. Limit the drop of infill to prevent panel distortion.
6. Refer to the GEOWEB Load Support Installation Guide for installation procedures.





ATRA ANCHOR



ATRA KEY

PRESTO GEOSYSTEMS
STRENGTH. FROM THE GROUND UP.
REYNOLDS PRESTO PRODUCTS, INC
670 NORTH POPLAR STREET
APPLETON, WI 54914
920-736-1342
WWW.PRESTOGEO.COM

PR25235 SLOPED ACCESS GEOWEB LOAD SUPPORT

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DATE	APRIL 16, 2025	FILE NAME	SHEET 1
SCALE	NTS	SHEET	1 OF 1

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ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
	05/01/25	ISSUED FOR BIDS

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

PUMP STATION 5 & 14 CIVIL - DETAILS

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-504

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E8 - PERMANENT SEEDING

WHEN
TO FINALIZE STABILIZATION OF TEMPORARY SEEDING AREAS OR WHEN AN AREA NEEDS PERMANENT STABILIZATION FOLLOWING COMPLETION OF CONSTRUCTION. ALSO, USED WHEN VEGETATIVE ESTABLISHMENT CAN CORRECT EXISTING SOIL EROSION OR SEDIMENTATION PROBLEM WITHIN 5 DAYS OF FINAL GRADE.

WHY
TO STABILIZE SOIL AND PREVENT OR REDUCE SOIL EROSION/SEDIMENTATION PROBLEMS FROM DEVELOPING.

WHERE
USED ON CONSTRUCTION AND EARTH CHANGE SITES WHICH REQUIRE PERMANENT VEGETATIVE STABILIZATION.

HOW
1. REVIEW SESC PLAN AND CONSTRUCTION PHASING TO IDENTIFY AREAS IN NEED OF PERMANENT VEGETATIVE STABILIZATION.
2. SELECT PERENNIAL GRASS AND GROUND COVER FOR PERMANENT COVER.
3. SEED MIXES VARY. HOWEVER, THEY SHOULD CONTAIN NATIVE SPECIES.
4. SEED MIXES SHOULD BE SELECTED THROUGH CONSULTATION WITH A CERTIFIED
5. SEED PROVIDER AND WITH CONSIDERATION OF SOIL TYPE, LIGHT, MOISTURE, USE APPLICATIONS AND NATIVE SPECIES CONTENT. SOIL TESTS SHOULD BE PERFORMED TO DETERMINE THE NUTRIENT AND PH LEVELS IN THE SOIL. THE PH MAY NEED TO BE ADJUSTED TO BETWEEN 6.5 AND 7.0.
6. PREPARE A 3-5" DEEP SEEDBED, WITH THE TOP 3-4" CONSISTING OF TOPSOIL.
7. SLOPES STEEPER THAN 1:3 SHOULD BE ROUGHENED.
8. APPLY SEED AS SOON AS POSSIBLE AFTER SEEDBED PREPARATION. SEED MAY BE BROADCAST BY HAND, HYDROSEEDING, OR BY USING MECHANICAL DRILLS.
9. MULCH IMMEDIATELY AFTER SEEDING.
10. DORMANT SEED MIXES ARE FOR USE AFTER THE GROWING SEASON, USING SEED WHICH LIES DORMANT IN THE WINTER AND BEGINS GROWING AS SOON AS SITE CONDITIONS BECOME FAVORABLE.
11. PROTECT SEEDED AREAS FROM PEDESTRIAN OR VEHICULAR TRAFFIC.
12. DIVERT CONCENTRATED FLOWS AWAY FROM THE SEEDED AREA UNTIL VEGETATION IS ESTABLISHED.

MAINTENANCE
INSPECT WEEKLY AND WITHIN 24 HOURS FOLLOWING EACH RAIN EVENT IN THE FIRST FEW MONTHS FOLLOWING INSTALLATION TO BE SURE SEED HAS GERMINATED AND PERMANENT VEGETATIVE COVER IS BEING ESTABLISHED. ADD SUPPLEMENTAL SEED AS NECESSARY.

LIMITATIONS

- SEEDS NEED ADEQUATE TIME TO ESTABLISH.
- MAY NOT BE APPROPRIATE IN AREAS WITH FREQUENT TRAFFIC.
- SEEDED AREAS MAY REQUIRE IRRIGATION DURING DRY PERIODS.
- SEEDING SUCCESS IS SITE SPECIFIC, CONSIDER MULCHING OR SODDING WHEN NECESSARY

PLANTING ZONES	LOWER PENINSULA (SOUTH OF T22N) ZONE 1	LOWER PENINSULA (NORTH OF T22N) ZONE 2	UPPER PENINSULA ZONE 3
SEEDING WINDOW PERMANENT SEEDING	4/15 - 10/10	5/1 - 10/1	5/1 - 9/20
SEEDING WINDOW DORMANT SEEDING	11/15 - FREEZE	11/1 - FREEZE	11/1 - FREEZE

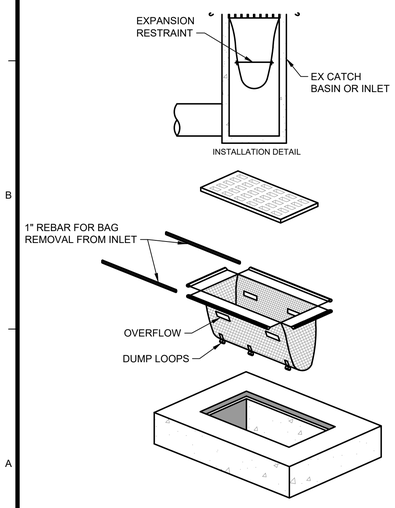
(Source: Adapted from MDOT 2020 Standard Specifications for Construction)

	ZONE 1 LOWER PENINSULA (SOUTH OF US-10)	ZONE 2 LOWER PENINSULA (NORTH OF US-10)	ZONE3 UPPER PENINSULA
SEEDING DATES: (WITH IRRIGATION OR MULCH)	4/1 - 8/1	5/1 - 9/20	5/1 - 9/10
SEEDING DATES: (WITHOUT IRRIGATION OR MULCH)	5/1 - 9/20 OR 8/10 - 10/1	5/1 - 8/10 OR 8/10 - 9/20	5/1 - 6/15 OR 8/10 - 9/20
DORMANT SEEDING DATES	11/1 - FREEZE	10/25 - FREEZE	10/25 - FREEZE

(Source: Adapted from USDA NRCS Technical Guide #342 (1999)

* DORMANT SEEDING IS FOR USE IN THE LATE FALL AFTER THE SOIL TEMPERATURE REMAINS CONSISTENTLY BELOW 50° F, PRIOR TO THE GROUND FREEZING. THIS PRACTICE IS APPROPRIATE IF CONSTRUCTION ON A SITE IS COMPLETED IN THE FALL BUT THE SEED WAS NOT PLANTED PRIOR TO RECOMMENDED SEEDING DATES. NO SEED GERMINATION WILL TAKE PLACE UNTIL SPRING. A COOL SEASON ANNUAL GRASS MAY BE ADDED IN AN ATTEMPT TO HAVE SOME FALL GROWTH.

- MULCH MUST BE USED WITH DORMANT SEED.
- DO NOT SEED WHEN THE GROUND IS FROZEN OR SNOW COVERED.
- DO NOT USE A DORMANT SEED MIX ON GRASSED WATERWAYS.



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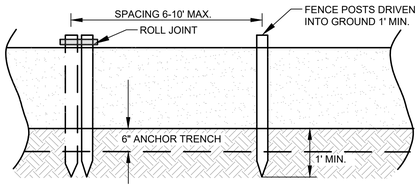
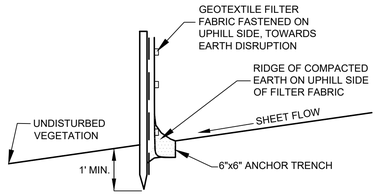
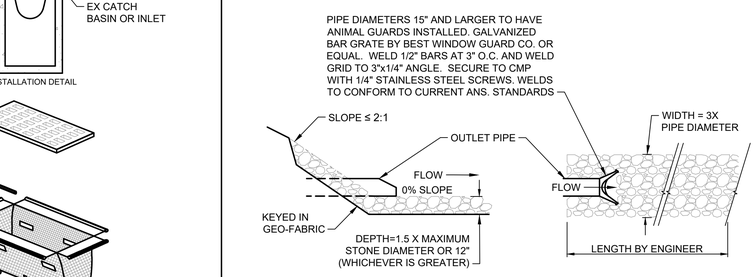




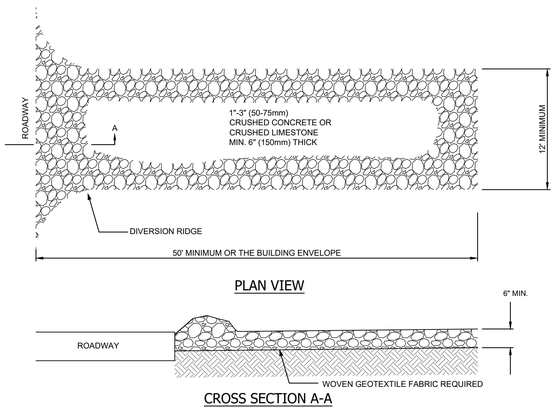
S51 SILT FENCE

SESC NOTES

1. CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE CITY OF KALAMAZOO ENGINEERING DEPARTMENT AND THE CONTRACT DOCUMENTS.
2. CONTRACTOR REQUIRED TO PROVIDE CERTIFIED STORM WATER OPERATOR. INSPECTION REPORTS TO BE SUBMITTED AFTER EACH RAIN EVENT.
3. CONTRACTOR SHALL SUBMIT A NOTICE OF COVERAGE FROM EGLE FOR THE SITE PRIOR TO THE START OF CONSTRUCTION.
4. ALL APPLICABLE SOIL EROSION AND SEDIMENTATION CONTROL MEASURES WILL BE INSTALLED PRIOR TO OR IN CONJUNCTION WITH THE START OF CONSTRUCTION AND REMAIN IN EFFECT UNTIL AREAS ARE STABILIZED.
5. CONTRACTOR/BUILDER WILL INSTRUCT ALL TRUCK DRIVERS TO CLEAN SOIL-MATERIALS FROM TIRES IN FRONT OF THE STREET, PAVED PARKING LOT AND DRIVE AISLES. SOIL WILL THEN BE REMOVED IMMEDIATELY FROM THE EXISTING PAVEMENT BY CONTRACTOR/BUILDER. STREETS MUST BE KEPT CLEAN.
6. PERMANENT SOIL EROSION CONTROL MEASURES SHALL BE REQUIRED FOR ALL AREAS DISTURBED DUE TO CONSTRUCTION, SEEDING SHALL COMMENCE WITHIN 5 DAYS OF FINAL GRADING. THE CONTRACTOR SHALL AT NO ADDITIONAL COST, RE-SEED AREAS WHERE GERMINATION FAILS TO TAKE PLACE.
7. DAILY INSPECTION SHALL BE MADE BY THE CONTRACTORS TO DETERMINE THE EFFECTIVENESS OF EROSION AND SEDIMENT CONTROL WORK, AND ANY NECESSARY REPAIRS SHALL BE MADE WITHOUT DELAY.
8. EROSION AND SEDIMENTATION FROM WORK ON THIS SITE SHALL BE CONTAINED ON THE SITE AND NOT ALLOWED TO COLLECT ON ANY OFF-SITE AREAS OR IN WATERWAYS. WATERWAYS INCLUDE BOTH MAN MADE OPEN DITCHES, STREAMS, STORM DRAINS, LAKES AND PONDS.
9. EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE PLACED PRIOR TO OR AS THE FIRST STEP IN CONSTRUCTION. SEDIMENT CONTROL PRACTICES WILL BE APPLIED AS A PERIMETER DEFENSE AGAINST ANY TRANSPORTING OF SILT OFF THE SITE.
10. CONTRACTOR SHALL APPLY TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES AS REQUIRED AND AS DIRECTED ON THESE PLANS. CONTRACTOR SHALL REMOVE TEMPORARY MEASURES AS SOON AS PERMANENT STABILIZATION OF SLOPES, DITCHES, AND OTHER EARTH CHANGES HAS BEEN ACCOMPLISHED.
11. PERMANENT SOIL EROSION CONTROL MEASURES FOR ALL SLOPES, CHANNELS, DITCHES OR ANY DISTURBED LAND AREA SHALL BE COMPLETED WITHIN 5 CALENDAR DAYS AFTER FINAL GRADING OR WITHIN SEEDING DATES AS LISTED. WHEN IT IS NOT POSSIBLE TO PERMANENTLY STABILIZE A DISTURBED AREA AFTER AN EARTH CHANGE HAS BEEN COMPLETED OR WHERE SIGNIFICANT EARTH CHANGE ACTIVITY CEASES. TEMPORARY SOIL EROSION CONTROL MEASURES SHALL BE IMPLEMENTED WITHIN 30 CALENDAR DAYS. ALL TEMPORARY SOIL EROSION CONTROL MEASURES SHALL BE MAINTAINED UNTIL PERMANENT SOIL EROSION CONTROL MEASURES ARE IMPLEMENTED. ALL PERMANENT SOIL EROSION MEASURES WILL BE IMPLEMENTED AND ESTABLISHED BEFORE A CERTIFICATE OF COMPLIANCE IS ISSUED. ALL MUD OR DIRT TRACKED ONTO THE ROAD FROM THIS SITE, DUE TO CONSTRUCTION SHALL BE PROMPTLY REMOVED BY THE CONTRACTOR.
12. CONTINUED MAINTENANCE OF PERMANENT SOIL EROSION MEASURES SHALL REMAIN THE RESPONSIBILITY OF THE OWNER.
13. THE CONTRACTOR SHALL HAVE A POWERED BROOM OR OTHER MECHANICAL SWEEPING DEVICE CAPABLE OF REMOVING DEBRIS FROM THE PAVED SURFACES THAT ARE THE RESULT OF THEIR OPERATIONS. THE PAVED ROADWAYS IN AND AROUND THE WORK AREA(S) SHALL BE SWEPT AT THE END OF EACH WORK DAY AND AT TIMES DURING THE DAY WHERE SPILLED SOILS ON THE PAVEMENT PRESENT A DUST NUISANCE OR OTHERWISE ADVERSELY AFFECT THE SAFE OPERATION OF THE ROADWAY.
14. CONTRACTOR SHALL KEEP SOIL MOIST WHERE WIND COULD CAUSE EROSION IN SANDY SOILS.



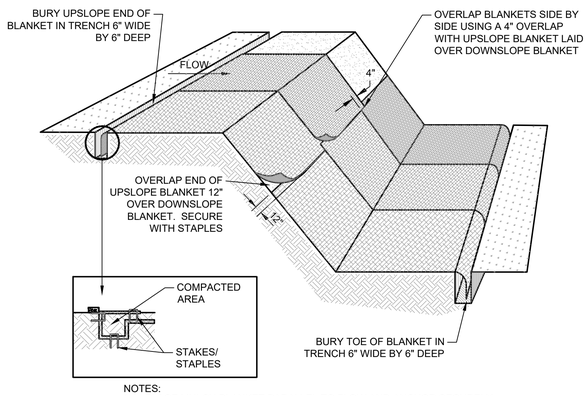
RIP-RAP
NO SCALE



NOTES:

1. ESTABLISH STABILIZED CONSTRUCTION ENTRANCE PRIOR TO THE INITIATION OF SITE CONSTRUCTION ACTIVITIES.
2. CARE SHOULD BE TAKEN TO PREVENT MATERIAL MOVEMENT INTO ADJACENT WETLANDS/WATERBODIES.
3. CARE SHOULD BE TAKEN TO MAINTAIN EXISTING ROADSIDE DRAINAGE VIA CULVERT INSTALLATION, WITH SEDIMENT SUMP PLACED DOWNFLOW OF CULVERT.

S53 GRAVEL ACCESS APPROACH



NOTES:
1. PLACE MULCH BLANKET PARALLEL TO FLOW AND ANCHOR SECURELY.
2. WHEN BLANKETS ARE USED IN FLOWING DITCH, BLANKETS SHOULD NOT OVERLAP IN DITCH CENTER PARALLEL TO FLOW.
3. STAPLES INSTALLED/SECURED ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
4. WHERE POSSIBLE, CONSTRUCT WITH BIODEGRADABLE MATERIAL.

E9 MULCH BLANKET

TETRA TECH
www.tetratech.com
1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION
	05/01/25	ISSUED FOR BIDS

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

PUMP STATION 5 & 14
CIVIL - DETAILS

PROJ:	200-19743-24012
DESN:	D. WARREN
DRWN:	A. SMITH
CHKD:	

C-505

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Bar Measures 1 inch, otherwise drawing not to scale

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SHEET NOTES AND LEGEND

1. ID NUMBERS GIVEN ARE FROM PREVIOUS TREE SURVEY BY WIGHTMAN.
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   - 4.1. 2 EASTERN WHITE PINE (PINUS STROBUS)
   - 4.2. 12 AMERICAN ARBORVITAE (THUJA OCCIDENTALIS)

TREE TO STAY

TREE TO BE REMOVED OR HAS BEEN REMOVED

N

0 10' 20' 40'

SCALE: 1" = 20'

Bar Measures 1 inch, otherwise drawing not to scale

TETRA TECH
www.tetratech.com
1136 OAK VALLEY DRIVE, SUITE 100
ANN ARBOR, MI 48108
PHONE: (734) 665-6000 FAX: (734) 213-3003

ISSUED FOR SITE PLAN REVIEW 05-12-2025

MARK	DATE	DESCRIPTION	BY
	05/01/25	ISSUED FOR BIDS	

CITY OF KALAMAZOO, MICHIGAN

PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

PUMP STATION 5 & 14 BUILDING TREE REMOVAL

PROJ: 200-19743-24012
DESN: -
DRWN: -
CHKD:

C-990

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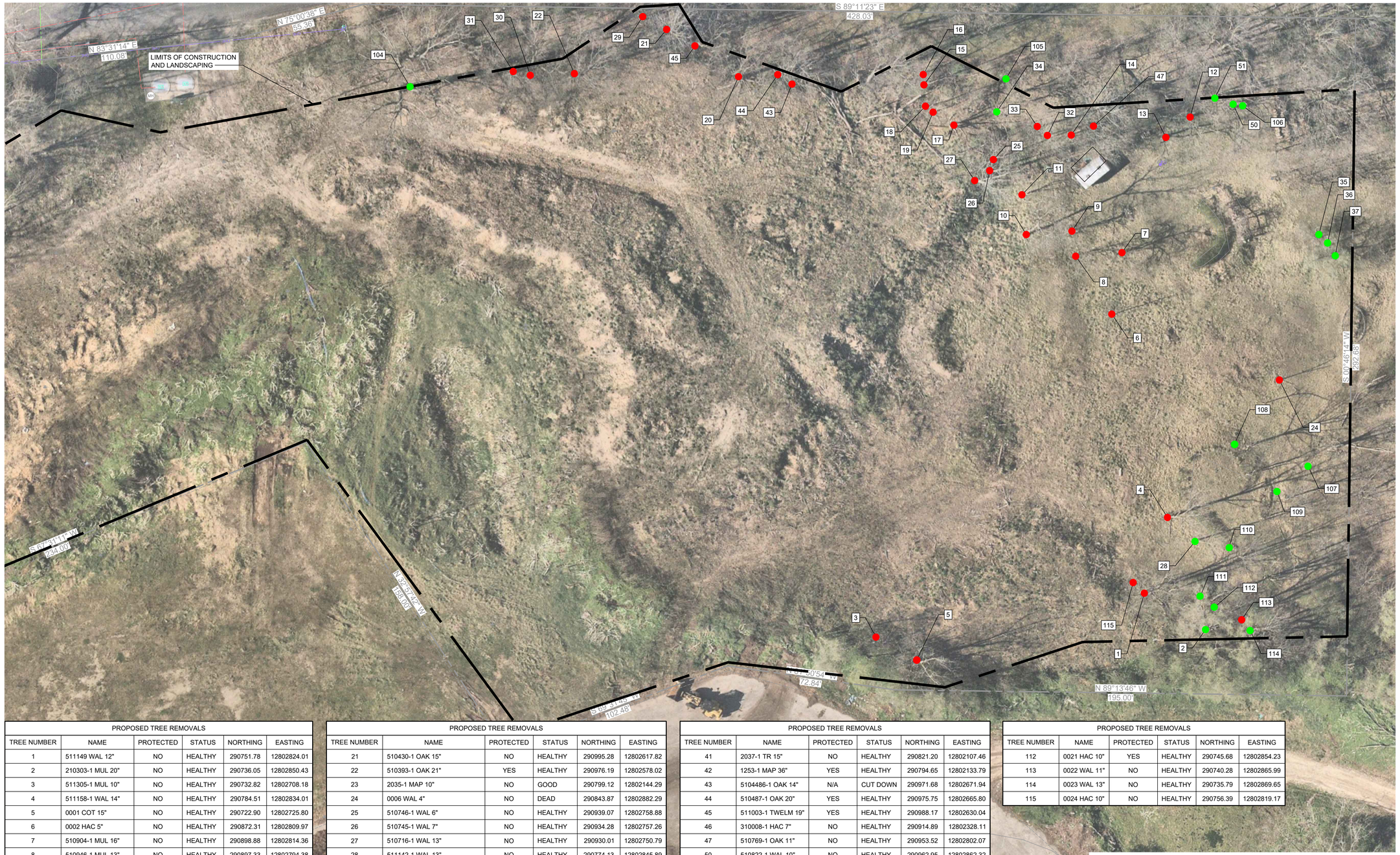

PROPOSED TREE REMOVALS					
TREE NUMBER	NAME	PROTECTED	STATUS	NORTHING	EASTING
1	511149 WAL 12"	NO	HEALTHY	290751.78	12802824.01
2	210303-1 MUL 20"	NO	HEALTHY	290736.05	12802850.43
3	511305-1 MUL 10"	NO	HEALTHY	290732.82	12802708.18
4	511158-1 WAL 14"	NO	HEALTHY	290784.51	12802834.01
5	0001 COT 15"	NO	HEALTHY	290722.90	12802725.80
6	0002 HAC 5"	NO	HEALTHY	290872.31	12802809.97
7	510904-1 MUL 16"	NO	HEALTHY	290898.88	12802814.36
8	510946-1 MUL 13"	NO	HEALTHY	290897.33	12802794.38
9	510944-1 TWMUL 14"	NO	HEALTHY	290908.16	12802792.78
10	510800-1 WAL 10"	NO	HEALTHY	290906.69	12802773.06
11	0003 MUL 10"	NO	50% DEAD	290923.87	12802771.18
12	510806-1 WAL 12"	NO	HEALTHY	290957.42	12802843.78
13	510805-1 CHE 10"	NO	HEALTHY	290948.66	12802833.34
14	510770-1 HAC 6"	NO	HEALTHY	290949.64	12802792.46
15	510679-1 ELM 9"	NO	HEALTHY	290971.34	12802728.87
16	510678-1 ELM 7"	NO	HEALTHY	290975.80	12802728.57
17	510743-1 CHE 9"	NO	DEAD	290953.94	12802741.83
18	0004 ELM 4"	NO	HEALTHY	290962.12	12802729.57
19	0005 ELM 5"	NO	HEALTHY	290959.54	12802732.83
20	510482-1 OAK 21"	YES	HEALTHY	290974.89	12802648.86

PROPOSED TREE REMOVALS					
TREE NUMBER	NAME	PROTECTED	STATUS	NORTHING	EASTING
21	510430-1 OAK 15"	NO	HEALTHY	290995.28	12802617.82
22	510393-1 OAK 21"	YES	HEALTHY	290976.19	12802578.02
23	2035-1 MAP 10"	NO	GOOD	290799.12	12802144.29
24	0006 WAL 4"	NO	DEAD	290843.87	12802882.29
25	510746-1 WAL 6"	NO	HEALTHY	290939.07	12802758.88
26	510745-1 WAL 7"	NO	HEALTHY	290934.28	12802757.26
27	510716-1 WAL 13"	NO	HEALTHY	290930.01	12802750.79
28	511142-1 WAL 13"	NO	HEALTHY	290774.13	12802845.89
29	510425-1 CHE 19"	YES	DEAD	291000.80	12802607.52
30	510396-1 OAK 7"	NO	HEALTHY	290975.47	12802558.97
31	1000010-1 OAK 17"	YES	HEALTHY	290977.12	12802551.61
32	510772-1 HAC 6"	NO	HEALTHY	290949.50	12802782.18
33	510792-1 OAK 12"	NO	HEALTHY	290953.38	12802777.81
34	510708 MUL 6"	NO	HEALTHY	290959.68	12802760.30
35	0007 MUL 7"	NO	HEALTHY	290906.70	12802899.36
36	0008 MUL 7"	NO	HEALTHY	290903.05	12802903.10
37	0009 MUL 9"	NO	HEALTHY	290897.53	12802906.42
38	2018 MAP 48"	YES	REMOVED	290797.99	12802164.28
39	UNKNOWN TREE AND SIZE 10	UNKNOWN	CUT DOWN	290815.46	12802129.58
40	2036-1 TR 38"	YES	90% DEAD	290810.74	12802116.18

PROPOSED TREE REMOVALS					
TREE NUMBER	NAME	PROTECTED	STATUS	NORTHING	EASTING
41	2037-1 TR 15"	NO	HEALTHY	290821.20	12802107.46
42	1253-1 MAP 36"	YES	HEALTHY	290794.65	12802133.79
43	5104486-1 OAK 14"	N/A	CUT DOWN	290971.68	12802671.94
44	510487-1 OAK 20"	YES	HEALTHY	290975.75	12802665.80
45	511003-1 TWELM 19"	YES	HEALTHY	290988.17	12802630.04
46	310008-1 HAC 7"	NO	HEALTHY	290914.89	12802328.11
47	510769-1 OAK 11"	NO	HEALTHY	290953.52	12802802.07
50	510822-1 WAL 10"	NO	HEALTHY	290962.95	12802862.32
51	510822-1 OAK 17"	YES	HEALTHY	290965.59	12802854.45
101	0010 CAT 33"	NO	HEALTHY	290811.44	12802041.45
102	0011 MAP 52"	YES	HEALTHY	290856.90	12801997.90
103	0012 MAP 52"	YES	50% DEAD	290845.36	12801955.15
104	0013 OAK 32"	YES	HEALTHY	290970.40	12802507.14
105	0014 MUL 12"	NO	50% DEAD	290973.86	12802764.26
106	0015 WAL 7"	NO	HEALTHY	290962.22	12802866.50
107	0016 WAL 22"	YES	DEAD	290806.65	12802894.72
108	0017 WAL 12"	NO	50% DEAD	290816.17	12802862.95
109	0018 WAL 10"	NO	50% DEAD	290795.74	12802881.27
110	0019 WAL 9"	NO	HEALTHY	290771.45	12802860.53
111	0020 OAK 9"	NO	HEALTHY	290750.35	12802848.23

PROPOSED TREE REMOVALS					
TREE NUMBER	NAME	PROTECTED	STATUS	NORTHING	EASTING
112	0021 HAC 10"	YES	HEALTHY	290745.68	12802854.23
113	0022 WAL 11"	NO	HEALTHY	290740.28	12802865.99
114	0023 WAL 13"	NO	HEALTHY	290735.79	12802869.65
115	0024 HAC 10"	NO	HEALTHY	290756.39	12802819.17

SHEET NOTES AND LEGEND

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TREE TO STAY
TREE TO BE REMOVED

N

0 10' 20' 40'
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1136 OAK VALLEY DRIVE, SUITE 100
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ISSUED FOR SITE PLAN REVIEW
05-12-2025

MARK	DATE	DESCRIPTION	BY
	05/01/25	ISSUED FOR BIDS	

CITY OF KALAMAZOO, MICHIGAN
PUMP STATION 5 & 14 RECONSTRUCTION, CONTRACT 2

STATION 5 & 14 BUILDING TREE REMOVAL

PROJ: 200-19743-24012
DESN: -
DRWN: -
CHKD:

C-991

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THE CITY OF Kalamazoo
Community Planning & Economic Development
245 N Rose St • Suite 100 • Kalamazoo, MI 49007
(269) 337-8000 • www.kalamazoocity.org

SUPPLEMENTAL SITE PLAN REVIEW APPLICATION

FOR NATURAL FEATURES PROTECTION

For projects located within the Natural Features Protection (NFP) Overlay District, separate site plan approval is required before the full site plan can be approved. This review is done either by the NFP Review Board or administratively by staff to verify conformance with NFP Overlay District zoning code (Chapter 50, NFP). The NFP Overlay District map can be found on the City's GIS mapping website (select "Planning & Zoning" layer and make sure "NFP Overlay" is clicked on).

The NFP Supplemental Application must be completed and submitted with the regular Site Plan Review Application and checklists. The NFP Review Board meets monthly to review and approve applications. City staff can assist in scheduling a project at an upcoming NFP Review Board meeting. While the review process offers some flexibility, projects often seek NFP approval between the Pre-Application meeting and regular Site Plan Review meeting.

Section I. Project & Applicant Information

All projects must complete Section I. If the project will not impact any natural features on the site, and does not trigger additional stormwater controls or treatment, applicants should sign and submit Section I only. Staff will review and determine if the application can be approved administratively.

Section II. Natural Features Checklist & Attachments

For projects proposing improvements or changes to the site that impact natural features, change grading, or involve work in or near NFP setbacks, Sections II and III must be completed. Section II identifies which natural features are present and standards apply. Section III will assist you in determining what documentation and additional plan sets are needed for a complete application. Once a complete application is submitted to the City, the project will be scheduled for the next available NFP Review Board meeting and an application fee of $110 will apply.

QUESTIONS

Contact the NFP staff liaison with any questions about your NFP Supplemental Application at (269) 337-8045 or development@kalamazoocity.org .

THE CITY OF Kalamazoo
Community Planning & Economic Development
245 N Rose St • Suite 100 • Kalamazoo, MI 49007
(269) 337-8000 • www.kalamazoocity.org

SECTION I. PROJECT AND APPLICANT INFORMATION

Please provide all of the project and applicant information requested below. Include the date of your regular site plan review meeting, if one has been scheduled or already taken place.

APPLICANT NAME:	(first) ERIC	(last) SAJTAR	
APPLICANT ADDRESS:	415 (number)	STOCKBRIDGE AVE (street name)	
	(city) KALAMAZOO	(state) MI	(Zip) 49001
APPLICANT EMAIL:	sajtare@kalamazoocity.org	**PHONE:**	269-491-3882
PARCEL ADDRESS/PIN:	2045 E. MICHIGAN AVE/ PIN: 06-14-476-002		
PROJECT DESCRIPTION:	NEW WATER TREATMENT FACILITIES FOR THE EXISITNG PUMP STATION NO. 5 AND ASSOCIATED APPURTENANCES.		
OWNER NAME: *(if different)*	(first) CITY OF KALAMAZOO	(last) Public Services-Water Resour	
HAS REGULAR SITE PLAN REVIEW MEETING OCCURRED?	☐ Yes ☒ No	**DATE OF SITE PLAN REVIEW MEETING:**	

NFP APPLICATION REQUIRED?

Is the project limited to interior work only with no exterior ground changes or increase in impervious coverage?	
☐ **YES**	If YES, Sections II & III of this application are not needed. Sign below & submit only this page with your site plan review or permit application.
☑ **NO**	If NO, proceed to Sections II & III. Do **NOT** sign below.

By signing below, the applicant certifies that no natural features will be disturbed as part of this project.

Print name: Only sign if No is selected above

Signature: Eric Sajtar Digitally signed by Eric Sajtar DN: C=US, E=sajtare@kalamazoocity.org, O=City of Kalamazoo, OU=Senior Civil Engineer - Water Resources, CN=Eric Sajtar Date: 2025.05.13 14:19:31-04'00'

Date: _____

SECTION II. NFP SITE PLAN CHECKLIST & ATTACHMENTS

Use the checklist to determine what documentation and addition plans sets must be prepared for this application. All plan sets, maps, and additional information must be attached to this application to be considered complete. If you checked "no" to certain NFP items in questions 1-7 in Section II, record "N/A" on the checklist.

REQUIRED: NFP SITE PLAN SET

All applications must include separate sheets in the plan set showing the following:

1. Existing conditions map showing an inventory of all protected natural features and any associated natural features setbacks with distances (use checklist below)

2. Future development plan overlaid onto the existing conditions and natural features inventory; indicate where and to what extent protected natural features will be disturbed, removed, altered, or impacted in any way and which natural features will be protected during and after construction

   Future development plan must include:

   - **Boundary with extent of re-grading**, construction, or site preparation activities
   - **All existing and new building footprints** (mark whether existing buildings will be removed or maintained)
   - **New and existing parking** surfaces or structures, sidewalks, trails, and other impervious or semi-impervious surfaces including decks, patios, viewing platforms, etc. (list proposed surface materials and whether existing surfaces will be maintained or removed)
   - **Proposed location of fencing and screening**, whether permanent, natural, or construction silt fencing and/or natural feature protection fencing (with specifications)
   - **Stormwater facilities** showing boundary of ground disturbance, grading or construction activities, if located near natural features
   - **New utilities** and/or relocation of existing utilities showing corridors that could impact natural features

3. Landscape plan detailing the minimum elements needed to meet zoning code requirements and all proposed additional landscaping elements or features (include table with species name)

4. Any additional plans or tables detailing which natural features will be restored or replaced after construction, if required (e.g., riparian buffer installation or slope restoration plan may be required under certain circumstances when the ordinance allows changes within these protected areas)

WETLANDS	Present:	Included on page #:	Notes:
Mark existing wetland boundaries with notes about wetland conditions. *Attach a copy of EGLE permit or permit application for work impacting Part 303 wetlands regulated by the State.*	■ Yes ☐ No	C-202	see sheet
WATER RESOURCES	**Present:**	**Included on page #:**	**Notes:**
Mark the location of all water resources on the parcel and those within 25 feet of the parcel boundaries. *Attach a copy of EGLE permit or permit application for work impacting Part 301 waters regulated by the State.*	■ Yes ☐ No	C-203 / C-204	SEE SHEET
Show required setbacks with dimensions; describe existing or future ground cover within riparian setbacks.		C-213	SEE SHEET
TREES	**Present:**	**Included on page #:**	**Notes:**
Mark the location of all "protected" trees that are proposed to be removed and those that will remain and require protection fencing.	■ Yes ☐ No	C-990 / C-991	SEE SHEET
Include a table with species name, size (DBH and height), and condition of "protected" trees that are proposed to be removed and list replacement tree information.		C-991	SEE SHEET
Provide a note with justification for removal.		N/A	TO FACILITATE
WOODLANDS	**Present:**	**Included on page #:**	**Notes:**
Delineate the boundary of all woodlands on the parcel noting where woodlands likely extend onto adjacent parcels.	☐ Yes ■ No	N/A	N/A
Mark all areas of woodland that will be retained and removed (i.e., cleared).		N/A	N/A
Include a table or note with the required preservation ratio (based on existing woodland coverage), percentage proposed to be removed, and rationale for selecting area for removal.		N/A	N/A
SLOPES	**Present:**	**Included on page #:**	**Notes:**
Provide a slope analysis that shows the boundaries of all "protected" slopes and mark the required setback(s).	☐ Yes ■ No	N/A	N/A
Include a note with co-existing feature that triggers "protected" slope status (e.g., wooded, within 500 ft of water resource.		N/A	N/A

NATURAL HERITAGE AREAS	Present:	
Is an MNFI* rare species review required? *Parcels can be pre-screened using the City's GIS website, click on the "Planning & Zoning" layer and "NFP Overlay" layer; then click on parcel and see MNFI status.*	☒ Yes ☐ No	
If an MNFI rare species review is required, attach the resulting report.		

*Michigan Natural Features Inventory (MNFI) Rare Species Reviews can be requested at: https://mnfi.anr.msu.edu/services/rare-species-reviews

ACCEPTED DATA SOURCES & ANALYSIS

All data sources, analysis, and professionals are subject to approval by the City Planner according to Chapter 50-6.2. The following guidance may be useful when selecting a professional or methodology for inventorying natural features.

1. **WETLANDS**
   - Wetland delineation report performed by a qualified consultant including a map denoting delineated boundary of all wetlands, OR
   - Most recent US Fish & Wildlife Service's National Wetlands Inventory boundary (State of Michigan mapper: https://www.michigan.gov/egle/about/organization/water-resources/wetlands/inventory-maps)

2. **PROTECTED TREE IDENTIFICATION**
   - May be performed by an qualified professional (including ISA Certified Arborist or similar); a full tree inventory is not required if all necessary information can be obtained and communicated using another survey, inventory, or site assessment methodology

3. **WOODLANDS**
   - A qualified professional, such as an ISA Certified Arborist, landscape architect, or license engineer may perform a desktop analysis or field survey to delineate woodlands
   - When a variances is being requests to remove more woodland cover than is allowed under the preservation ration, the following is required
     - Woodland assessment report with determination that the Trees per Area (TPA) meets the NFP definition of a woodland and mapped delineation of woodland
     - Woodland assessment report with a determination that Basal Area is equivalent to the TPA in the NFP definition and meets definition of a woodland and mapped delineation of woodland
     - In addition to determination of whether stand of trees meets NFP definition of a woodland, assessment must include information on general species diversity,
     -

composition of species, any notable trees (either notable species or size), invasive species composition, and general health and age observations of tree stand

4. **PROTECTED SLOPES**
   - Topographic survey performed in the field by a qualified consultant to delineate areas of a slope with grade of 20% or greater
   - Desktop analysis performed using U.S. Geological Survey digital topographic maps, LIDAR, digital elevation map, or equivalent data showing 2’ intervals or finer resolution, performed by a qualified consultant or engineer

MICHIGAN STATE UNIVERSITY | Extension

Anna Crandall, PE
Assistant City Engineer
Water Resources Division
City of Kalamazoo

April 7, 2023

Re: Rare Species Review #3442 – Drinking Water Treatment Plant Expansion, City of Kalamazoo, Kalamazoo County, MI.

Hello:

The location for the proposed project was checked against known localities for rare species and unique natural features, which are recorded in the Michigan Natural Features Inventory (MNFI) natural heritage database. This continuously updated database is a comprehensive source of existing data on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. Records in the database indicate that a qualified observer has documented the presence of special natural features. The absence of records in the database for a site may mean that the site has not been surveyed. The only way to obtain a definitive statement on the status of natural features is to have a competent biologist perform a complete field survey.

Under Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection, "a person shall not take, possess, transport, …fish, plants, and wildlife indigenous to the state and determined to be endangered or threatened," unless first receiving an Endangered Species Permit from the Michigan Department of Natural Resources (MDNR), Wildlife Division. Responsibility to protect endangered and threatened species is not limited to the lists below. Other species may be present that have not been recorded in the database.

Although several at-risk species have been documented within 1.5 miles of the proposed activity it is unlikely that adverse impacts will occur. This response reflects a desktop review of the database and MNFI cannot fully evaluate this project without visiting the area. MNFI offers several levels of Rare Species Reviews, including field surveys which I would be happy to discuss with you.

Sincerely,

Michael A. Sanders

Michael A. Sanders
Environmental Review Specialist/Zoologist
Michigan Natural Features Inventory

MSU EXTENSION

Michigan Natural Features Inventory

PO Box 13036
Lansing MI 48901

(517) 284-6200
Fax (517) 373-9566

mnfi.anr.msu.edu

MSU is an affirmative-action, equal-opportunity employer.

Comments for Rare Species Review #3442:

It is important to note that it is the applicant's responsibility to comply with both state and federal threatened and endangered species legislation. Therefore, if a state listed species occurs at a project site, and you think you need an endangered species permit please contact: Casey Reitz, DNR-Wildlife Division, 517-284-6210, or ReitzC@michigan.gov. If a federally listed species is involved and, you think a permit is needed, please contact Jessica Pruden, U.S. Fish and Wildlife Service, East Lansing office, 517-351-8316, or Jessica_Pruden@fws.gov.

NOTE: special concern species and natural communities are not protected under endangered species legislation, but efforts should be taken to minimize any or all impacts. Please consult MNFI's Rare Species Explorer for additional information on Michigan's rare plants and animals.

Table 1: Occurrences of threatened and endangered species within 1.5 miles of project site

ELCAT	SNAME	SCOMNAME	USESA	SPROT	G_RANK	S_RANK	FIRSTOBS	LASTOBS	EORANK
Animal	*Clonophis kirtlandii*	Kirtland's snake		E	G2	S1	1879	1879-07-11	H
Animal	*Cyclonaias tuberculata*	Purple wartyback		T	G5	S2	1981-08-31	1981-08-31	H
Animal	*Falco peregrinus*	Peregrine falcon		E	G4	S3	2010	2020	A
Animal	*Alasmidonta viridis*	Slippershell		T	G4G5	S2S3	2017	2017	E
Plant	*Silphium integrifolium*	Rosinweed		T	G5	S2	1947	1999-10-08	CD
Plant	*Berula erecta*	Cut-leaved water parsnip		T	G4G5	S2	1947	1947	H
Plant	*Asclepias hirtella*	Tall green milkweed		T	G5	S2	2001-06-04	2001-06-04	D
Plant	*Panax quinquefolius*	Ginseng		T	G3G4	S2S3	1838-07-27	1838-07-27	H

Comments for Table 1:

No concerns as occurrences are Historic and/or far removed from project footprint.

Table 2: Occurrences of special concern species/natural features within 1.5 miles of project site

ELCAT	SNAME	SCOMNAME	USESA	SPROT	G_RANK	S_RANK	FIRSTOBS	LASTOBS	EORANK
Animal	*Alasmidonta marginata*	Elktoe		SC	G4	S3?	2000-07	2018-07-19	E
Animal	*Sphaerium fabale*	River fingernail clam		SC	G5	SNR			H
Animal	*Lasmigona costata*	Flutedshell		SC	G5	SNR	2000-08-01	2000-08-01	E
Animal	*Terrapene carolina carolina*	Eastern box turtle		SC	G5T5	S2S3	1999-08-10	1999-08-10	H?
Animal	*Pandion haliaetus*	Osprey		SC	G5	S4	2017	2020	E
Animal	*Bombus affinis*	Rusty-patched bumble bee	LE	SC	G2	SH	1963-07-25	1975-07-12	H
Animal	*Bombus affinis*	Rusty-patched bumble bee	LE	SC	G2	SH	1963-08-12	1963-08-12	H
Animal	*Bombus pensylvanicus*	American bumble bee		SC	G3G4	S1	1963-05-30	1965-08-09	H
Animal	*Bombus pensylvanicus*	American bumble bee		SC	G3G4	S1	1963-08-12	1963-08-12	H
Animal	*Bombus auricomus*	Black and gold bumble bee		SC	G5	S2	1960-07-04	1960-07-04	H
Animal	*Bombus auricomus*	Black and gold bumble bee		SC	G5	S2	1963-08-02	1963-08-02	H
Animal	*Pleurobema sintoxia*	Round pigtoe		SC	G4G5	S3	2018-08-14	2018-08-14	E
Animal	*Utterbackia imbecillis*	Paper pondshell		SC	G5	S2S3	2018-08-14	2018-08-14	E
Animal	*Lithobates palustris*	Pickerel frog		SC	G5	S3S4	1911-08-30	1911-08-30	H
Animal	*Alasmidonta marginata*	Elktoe		SC	G4	S3?	2019-07-17	2019-07-17	E

Animal	*Lasmigona costata*	Flutedshell		SC	G5	SNR	2019-07-17	2019-07-17	E
Animal	*Pleurobema sintoxia*	Round pigtoe		SC	G4G5	S3	2019-07-17	2019-07-17	E
Animal	*Venustaconcha ellipsiformis*	Ellipse		SC	G4	S3	2019-07-17	2019-07-17	E
Animal	*Utterbackia imbecillis*	Paper pondshell		SC	G5	S2S3	2019-07-17	2019-07-17	E
Animal	*Lasmigona costata*	Flutedshell		SC	G5	SNR	2017	2017	E
Animal	*Alasmidonta marginata*	Elktoe		SC	G4	S3?	2017	2017	E
Animal	*Venustaconcha ellipsiformis*	Ellipse		SC	G4	S3	1929-09-09	1929-09-09	H
Plant	*Angelica venenosa*	Hairy angelica		SC	G5	S3	1947	1947-07-26	H
Plant	*Arnoglossum plantagineum*	Prairie indian-plantain		SC	G4G5	S3	1838	1838-07-25	H
Plant	*Collinsia verna*	Blue-eyed Mary		SC	G5	SNR	1838-08-27	1877-05-06	H

Comments for Table 2:

No concerns as occurrences are Historic and/or far removed from project footprint.

Codes to Accompany Occurrence Tables:

State Protection Status Code Definitions (SPROT)
E: Endangered
T: Threatened
SC: Special concern

Federal Protection Status Code Definitions (USESA)
LE = listed endangered
LT = listed threatened
LELT = partly listed endangered and partly listed threatened
PDL = proposed delist
E(S/A) = endangered based on similarities/appearance
PS = partial status (federally listed in only part of its range)
C = species being considered for federal status

Global Heritage Status Rank Definitions (GRANK)
The priority assigned by NatureServe's national office for data collection and protection based upon the element's status throughout its entire world-wide range. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.
G1 = critically imperiled globally because of extreme rarity (5 or fewer occurrences range-wide or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2 = imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3: Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g. a single western state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.
G4: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
Q: Taxonomy uncertain

State Heritage Status Rank Definitions (SRANK)
The priority assigned by the Michigan Natural Features Inventory for data collection and protection based upon the element's status within the state. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.
S1: Critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state.
S2: Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.
S3: Rare or uncommon in state (on the order of 21 to 100 occurrences).
S4 = apparently secure in state, with many occurrences.
S5 = demonstrably secure in state and essentially ineradicable under present conditions.
SX = apparently extirpated from state.

Element Occurrence (EO) ranks refer to the viability or ecological integrity of the occurrence; they provide an assessment of the likelihood that if current conditions prevail the EO will persist for a defined period of time, typically 20-100 years

Here are the EO Codes:

A - Excellent estimated viability/ecological integrity

A? - Possibly excellent estimated viability/ecological integrity

AB - Excellent or good estimated viability/ecological integrity

AC - Excellent, good, or fair estimated viability/ecological integrity

B - Good estimated viability/ecological integrity

B? - Possibly good estimated viability/ecological integrity

BC - Good or fair estimated viability/ecological integrity

BD - Good, fair, or poor estimated viability/ecological integrity

C - Fair estimated viability/ecological integrity

C? - Possibly fair estimated viability/ecological integrity

CD - Fair or poor estimated viability/ecological integrity

D - Poor estimated viability/ecological integrity

D? - Possibly poor estimated viability/ecological integrity

E - Verified extant (viability/ecological integrity not assessed)

F - Failed to find

F? - Possibly failed to find

H - Historical

H? - Possibly historical

X - Extirpated

X? - Possibly extirpated

U - Unrankable

NR - Not ranked

Stormwater Calculations Worksheet

PRE-DEVELOPMENT CONDITIONS

Surface Cover	Runoff Coefficient, C	Area of Surface Cover (ft^2)
Lawns	0.1	
Forest	0.15	41,010
Gardens	0.25	
Meadow	0.3	
Gravel	0.6	
Brick/Pavers	0.8	
Asphalt/Concrete	0.9	
Roofs	0.9	
Total Site Size (ft^2)		41,010
Total Site Size (acres)		0.94
Runoff Coefficient (weighted average)		0.15
Flow Rate (ft^3/s): 1 year - 30 minute event		0.23
Runoff Volume (ft^3): 2 year - 24 hour event		1,318
Runoff Volume (ft^3): 10 year - 24 hour event		1,867
Treatment Volume = Site Area x 0.083 ft	Standard 1	
i = 1.65 inches/hour for Treatment (1 year - 0.5 hour)	Standard 1	
i = 0.108 inches/hour for Storage (2 year - 24 hour)	Standard 2, 3, 7	
i = 0.153 inches/hour for Storage (10 year - 24 hour)	Standard 3, 7 NFP	

POST-DEVELOPMENT CONDITIONS

Surface Cover	Runoff Coefficient, C	Area of Surface Cover (ft^2)
Lawns	0.1	7,080
Forest	0.15	
Gardens	0.25	
Meadow	0.3	
Gravel	0.6	
Brick/Pavers	0.8	
Asphalt/Concrete	0.9	18,390
Roofs	0.9	15,540
Total Site Size (ft^2)		41,010
Total Site Size (acres)		0.94
Runoff Coefficient (weighted average)		0.76
Flow Rate (ft^3/s): 1 year - 30 minute event		1.18
Runoff Volume (ft^3): 2 year - 24 hour event		6,693
Runoff Volume (ft^3): 10 year - 24 hour event		9,482
Required Treatment Volume (ft^3)		3,418
Required Treatment Flow Rate (ft^3/s)		1.18
Required Storage Volume (ft^3): 2 year - 24 hour		5,375
Required Storage Volume (ft^3): 10 year - 24 hour		7,615

***Rational Method Used for All Calculations, where Q = CiA (unless stated otherwise)**

***Instructions: Input the areas (ft^2) of the site for each type of surface cover**

***For determining required detention/retention volumes, Pre-Development Conditions shall be 100% forested with a 50% allowance for existing impervious coverage (example: if a site is 100% impervious, existing conditions shall be 50% forested and 50% impervious).**

UNIFORM STORMWATER STANDARD 1: WATER QUALITY TREATMENT VOLUME & MTD WORKSHEET

**Applies to Sites ≥ 0.5 Acres and Large Parking Lots with ≥ 20 Spaces and/or > 6,000 ft^2

*** If not NJCAT Verified and NJDEP Certified, provide further documentation for the proposed BMPs

List All Proposed Treatment BMPs below and Show Locations on the Plans				
Proposed Treatment BMP	**NJCAT Verified?**	**NJDEP Certified?**	**Maximum Treatment Volume, ft^3**	**Maximum Treatment Flow Rate, ft^3/s**
ADS Barracuda Max Model S4				1.52
Proposed Total Treatment Volume and Flow Rate			**0**	**1.52**
Required Treatment Volume and Flow Rate from Stormwater Calculations Worksheet			**3,418**	**1.18**
Difference Between Required and Proposed Treatment Volume and Flow Rate				-0.34
Are Volume and Flow Rate Requirements Met? If difference is greater than zero, NO			**NO**	**YES**

*****Attach this form and supporting documentation for selected BMPs to the Storm Water Calculations Worksheet*****

UNIFORM STORMWATER STANDARD 2: CHANNEL PROTECTION VOLUME WORKSHEET

**Applies to Sites where Standard 2, 3 and 7 apply **10-year 24 hour is for Standard 3, 7 and NFP Sites

***Detention and Retention BMPs shall drain between runoff events

List All Proposed Detention/Retention BMPs below and Show Locations on the Plans	
Proposed Detention/Retention BMP	**Volume Detained/Retained, ft^3**
Detention Pond	7,700
Proposed Total Volume	**7,700**
Required Storage Volume (ft^3): 2 year - 24 hour	**5,375**
Difference Between Required and Proposed Volume	-2,325
Is Sufficient Volume Retained/Detained? If difference is greater than zero, NO	**YES**
Required Storage Volume (ft^3): 10 year - 24 hour	**7,615**
Difference Between Required and Proposed Volume	-85
Is Sufficient Volume Retained/Detained? If difference is greater than zero, NO	**YES**

*****Attach this form and supporting documentation for selected BMPs to the Storm Water Calculations Worksheet*****

Stormwater Calculations Worksheet

PRE-DEVELOPMENT CONDITIONS

Surface Cover	Runoff Coefficient, C	Area of Surface Cover (ft^2)
Lawns	0.1	
Forest	0.15	34,720
Gardens	0.25	
Meadow	0.3	
Gravel	0.6	
Brick/Pavers	0.8	
Asphalt/Concrete	0.9	
Roofs	0.9	
Total Site Size (ft^2)		34,720
Total Site Size (acres)		0.80
Runoff Coefficient (weighted average)		0.15
Flow Rate (ft^3/s): 1 year - 30 minute event		0.20
Runoff Volume (ft^3): 2 year - 24 hour event		1,116
Runoff Volume (ft^3): 10 year - 24 hour event		1,580
Treatment Volume = Site Area x 0.083 ft	Standard 1	
i = 1.65 inches/hour for Treatment (1 year - 0.5 hour)	Standard 1	
i = 0.108 inches/hour for Storage (2 year - 24 hour)	Standard 2, 3, 7	
i = 0.153 inches/hour for Storage (10 year - 24 hour)	Standard 3, 7 NFP	

POST-DEVELOPMENT CONDITIONS

Surface Cover	Runoff Coefficient, C	Area of Surface Cover (ft^2)
Lawns	0.1	13,410
Forest	0.15	
Gardens	0.25	
Meadow	0.3	
Gravel	0.6	7,350
Brick/Pavers	0.8	
Asphalt/Concrete	0.9	12,210
Roofs	0.9	1,750
Total Site Size (ft^2)		34,720
Total Site Size (acres)		0.80
Runoff Coefficient (weighted average)		0.53
Flow Rate (ft^3/s): 1 year - 30 minute event		0.69
Runoff Volume (ft^3): 2 year - 24 hour event		3,923
Runoff Volume (ft^3): 10 year - 24 hour event		5,558
Required Treatment Volume (ft^3)		2,893
Required Treatment Flow Rate (ft^3/s)		0.69
Required Storage Volume (ft^3): 2 year - 24 hour		2,808
Required Storage Volume (ft^3): 10 year - 24 hour		3,978

***Rational Method Used for All Calculations, where Q = CiA (unless stated otherwise)**

***Instructions: Input the areas (ft^2) of the site for each type of surface cover**

***For determining required detention/retention volumes, Pre-Development Conditions shall be 100% forested with a 50% allowance for existing impervious coverage (example: if a site is 100% impervious, existing conditions shall be 50% forested and 50% impervious).**

UNIFORM STORMWATER STANDARD 1: WATER QUALITY TREATMENT VOLUME & MTD WORKSHEET

**Applies to Sites ≥ 0.5 Acres and Large Parking Lots with ≥ 20 Spaces and/or > 6,000 ft^2

*** If not NJCAT Verified and NJDEP Certified, provide further documentation for the proposed BMPs

List All Proposed Treatment BMPs below and Show Locations on the Plans				
Proposed Treatment BMP	**NJCAT Verified?**	**NJDEP Certified?**	**Maximum Treatment Volume, ft^3**	**Maximum Treatment Flow Rate, ft^3/s**
ADS Barracuda Max Model S5				3.40
Proposed Total Treatment Volume and Flow Rate			**0**	**3.40**
Required Treatment Volume and Flow Rate from Stormwater Calculations Worksheet			**2,893**	**0.69**
Difference Between Required and Proposed Treatment Volume and Flow Rate				-2.71
Are Volume and Flow Rate Requirements Met? If difference is greater than zero, NO			**NO**	**YES**

*****Attach this form and supporting documentation for selected BMPs to the Storm Water Calculations Worksheet*****

UNIFORM STORMWATER STANDARD 2: CHANNEL PROTECTION VOLUME WORKSHEET

**Applies to Sites where Standard 2, 3 and 7 apply **10-year 24 hour is for Standard 3, 7 and NFP Sites

***Detention and Retention BMPs shall drain between runoff events

List All Proposed Detention/Retention BMPs below and Show Locations on the Plans	
Proposed Detention/Retention BMP	**Volume Detained/Retained, ft^3**
Retention Pond	7,400
Proposed Total Volume	**7,400**
Required Storage Volume (ft^3): 2 year - 24 hour	**2,808**
Difference Between Required and Proposed Volume	-4,592
Is Sufficient Volume Retained/Detained? If difference is greater than zero, NO	**YES**
Required Storage Volume (ft^3): 10 year - 24 hour	**3,978**
Difference Between Required and Proposed Volume	-3,422
Is Sufficient Volume Retained/Detained? If difference is greater than zero, NO	**YES**

*****Attach this form and supporting documentation for selected BMPs to the Storm Water Calculations Worksheet*****

Stormwater Calculations Worksheet

PRE-DEVELOPMENT CONDITIONS

Surface Cover	Runoff Coefficient, C	Area of Surface Cover (ft^2)
Lawns	0.1	
Forest	0.15	54,250
Gardens	0.25	
Meadow	0.3	
Gravel	0.6	
Brick/Pavers	0.8	
Asphalt/Concrete	0.9	
Roofs	0.9	
Total Site Size (ft^2)		54,250
Total Site Size (acres)		1.25
Runoff Coefficient (weighted average)		0.15
Flow Rate (ft^3/s): 1 year - 30 minute event		0.31
Runoff Volume (ft^3): 2 year - 24 hour event		1,743
Runoff Volume (ft^3): 10 year - 24 hour event		2,469
Treatment Volume = Site Area x 0.083 ft		Standard 1
i = 1.65 inches/hour for Treatment (1 year - 0.5 hour)		Standard 1
i = 0.108 inches/hour for Storage (2 year - 24 hour)		Standard 2, 3, 7
i = 0.153 inches/hour for Storage (10 year - 24 hour)		Standard 3, 7 NFP

POST-DEVELOPMENT CONDITIONS

Surface Cover	Runoff Coefficient, C	Area of Surface Cover (ft^2)
Lawns	0.1	
Forest	0.15	41,010
Gardens	0.25	
Meadow	0.3	
Gravel	0.6	
Brick/Pavers	0.8	
Asphalt/Concrete	0.9	13,240
Roofs	0.9	
Total Site Size (ft^2)		54,250
Total Site Size (acres)		1.25
Runoff Coefficient (weighted average)		0.33
Flow Rate (ft^3/s): 1 year - 30 minute event		0.68
Runoff Volume (ft^3): 2 year - 24 hour event		3,870
Runoff Volume (ft^3): 10 year - 24 hour event		5,483
Required Treatment Volume (ft^3)		4,521
Required Treatment Flow Rate (ft^3/s)		0.68
Required Storage Volume (ft^3): 2 year - 24 hour		2,127
Required Storage Volume (ft^3): 10 year - 24 hour		3,013

***Rational Method Used for All Calculations, where Q = CiA (unless stated otherwise)**

***Instructions: Input the areas (ft^2) of the site for each type of surface cover**

***For determining required detention/retention volumes, Pre-Development Conditions shall be 100% forested with a 50% allowance for existing impervious coverage (example: if a site is 100% impervious, existing conditions shall be 50% forested and 50% impervious).**

UNIFORM STORMWATER STANDARD 1: WATER QUALITY TREATMENT VOLUME & MTD WORKSHEET

**Applies to Sites ≥ 0.5 Acres and Large Parking Lots with ≥ 20 Spaces and/or > 6,000 ft^2

*** If not NJCAT Verified and NJDEP Certified, provide further documentation for the proposed BMPs

List All Proposed Treatment BMPs below and Show Locations on the Plans				
Proposed Treatment BMP	**NJCAT Verified?**	**NJDEP Certified?**	**Maximum Treatment Volume, ft^3**	**Maximum Treatment Flow Rate, ft^3/s**
ADS Barracuda Max Model S5				3.40
Proposed Total Treatment Volume and Flow Rate			**0**	**3.40**
Required Treatment Volume and Flow Rate from Stormwater Calculations Worksheet			**4,521**	**0.68**
Difference Between Required and Proposed Treatment Volume and Flow Rate				-2.72
Are Volume and Flow Rate Requirements Met? If difference is greater than zero, NO			**NO**	**YES**

*****Attach this form and supporting documentation for selected BMPs to the Storm Water Calculations Worksheet*****

UNIFORM STORMWATER STANDARD 2: CHANNEL PROTECTION VOLUME WORKSHEET

**Applies to Sites where Standard 2, 3 and 7 apply **10-year 24 hour is for Standard 3, 7 and NFP Sites

***Detention and Retention BMPs shall drain between runoff events

List All Proposed Detention/Retention BMPs below and Show Locations on the Plans	
Proposed Detention/Retention BMP	**Volume Detained/Retained, ft^3**
Retention Pond	7,400
Proposed Total Volume	**7,400**
Required Storage Volume (ft^3): 2 year - 24 hour	**2,127**
Difference Between Required and Proposed Volume	-5,273
Is Sufficient Volume Retained/Detained? If difference is greater than zero, NO	**YES**
Required Storage Volume (ft^3): 10 year - 24 hour	**3,013**
Difference Between Required and Proposed Volume	-4,387
Is Sufficient Volume Retained/Detained? If difference is greater than zero, NO	**YES**

*****Attach this form and supporting documentation for selected BMPs to the Storm Water Calculations Worksheet*****

Stormwater Calculations Worksheet

PRE-DEVELOPMENT CONDITIONS

Surface Cover	Runoff Coefficient, C	Area of Surface Cover (ft^2)
Lawns	0.1	
Forest	0.15	112,310
Gardens	0.25	
Meadow	0.3	
Gravel	0.6	
Brick/Pavers	0.8	
Asphalt/Concrete	0.9	
Roofs	0.9	
Total Site Size (ft^2)		112,310
Total Site Size (acres)		2.58
Runoff Coefficient (weighted average)		0.15
Flow Rate (ft^3/s): 1 year - 30 minute event		0.64
Runoff Volume (ft^3): 2 year - 24 hour event		3,609
Runoff Volume (ft^3): 10 year - 24 hour event		5,112
Treatment Volume = Site Area x 0.083 ft		Standard 1
i = 1.65 inches/hour for Treatment (1 year - 0.5 hour)		Standard 1
i = 0.108 inches/hour for Storage (2 year - 24 hour)		Standard 2, 3, 7
i = 0.153 inches/hour for Storage (10 year - 24 hour)		Standard 3, 7 NFP

POST-DEVELOPMENT CONDITIONS

Surface Cover	Runoff Coefficient, C	Area of Surface Cover (ft^2)
Lawns	0.1	32,390
Forest	0.15	41,010
Gardens	0.25	
Meadow	0.3	
Gravel	0.6	10,960
Brick/Pavers	0.8	
Asphalt/Concrete	0.9	26,220
Roofs	0.9	1,750
Total Site Size (ft^2)		112,330
Total Site Size (acres)		2.58
Runoff Coefficient (weighted average)		0.37
Flow Rate (ft^3/s): 1 year - 30 minute event		1.56
Runoff Volume (ft^3): 2 year - 24 hour event		8,813
Runoff Volume (ft^3): 10 year - 24 hour event		12,485
Required Treatment Volume (ft^3)		9,361
Required Treatment Flow Rate (ft^3/s)		1.56
Required Storage Volume (ft^3): 2 year - 24 hour		5,204
Required Storage Volume (ft^3): 10 year - 24 hour		7,372

***Rational Method Used for All Calculations, where Q = CiA (unless stated otherwise)**

***Instructions: Input the areas (ft^2) of the site for each type of surface cover**

***For determining required detention/retention volumes, Pre-Development Conditions shall be 100% forested with a 50% allowance for existing impervious coverage (example: if a site is 100% impervious, existing conditions shall be 50% forested and 50% impervious).**

UNIFORM STORMWATER STANDARD 1: WATER QUALITY TREATMENT VOLUME & MTD WORKSHEET

**Applies to Sites ≥ 0.5 Acres and Large Parking Lots with ≥ 20 Spaces and/or > 6,000 ft^2

*** If not NJCAT Verified and NJDEP Certified, provide further documentation for the proposed BMPs

List All Proposed Treatment BMPs below and Show Locations on the Plans				
Proposed Treatment BMP	**NJCAT Verified?**	**NJDEP Certified?**	**Maximum Treatment Volume, ft^3**	**Maximum Treatment Flow Rate, ft^3/s**
ADS Barracuda Max Model S3 (#1)	**No**	**No**		0.85
ADS Barracuda Max Model S4 (#2)	**No**	**No**		1.52
Proposed Total Treatment Volume and Flow Rate			**0**	**2.37**
Required Treatment Volume and Flow Rate from Stormwater Calculations Worksheet			**9,361**	**1.56**
Difference Between Required and Proposed Treatment Volume and Flow Rate				-0.81
Are Volume and Flow Rate Requirements Met? If difference is greater than zero, NO			**NO**	**YES**

*****Attach this form and supporting documentation for selected BMPs to the Storm Water Calculations Worksheet*****

UNIFORM STORMWATER STANDARD 2: CHANNEL PROTECTION VOLUME WORKSHEET

**Applies to Sites where Standard 2, 3 and 7 apply **10-year 24 hour is for Standard 3, 7 and NFP Sites

***Detention and Retention BMPs shall drain between runoff events

List All Proposed Detention/Retention BMPs below and Show Locations on the Plans	
Proposed Detention/Retention BMP	**Volume Detained/Retained, ft^3**
Retention Pond	7,400
Proposed Total Volume	**7,400**
Required Storage Volume (ft^3): 2 year - 24 hour	**5,204**
Difference Between Required and Proposed Volume	-2,196
Is Sufficient Volume Retained/Detained? If difference is greater than zero, NO	**YES**
Required Storage Volume (ft^3): 10 year - 24 hour	**7,372**
Difference Between Required and Proposed Volume	-28
Is Sufficient Volume Retained/Detained? If difference is greater than zero, NO	**YES**

*****Attach this form and supporting documentation for selected BMPs to the Storm Water Calculations Worksheet*****

TREE NO.	EASTING	NORTHING	TREE SPECIES	DBH(IN)	PROTECTED	REMOVING	CONDITION
1	12802822.65	290754.73	Black Walnut	12.3	No	Yes	Healthy
2	12802849.07	290739.00	Mulberry	20	No	No	Healthy
3	12802681.59	290738.34	Mulberry	9.5	No	Yes	Healthy
4	12802832.65	290787.46	Black Walnut	13.9	No	Yes	Healthy
5	12802724.45	290725.85	Cottonwood	14.7	No	Yes	Healthy
6	12802808.61	290875.26	Hackberry	4.9	No	Yes	Healthy
7	12802813.01	290901.83	Mulberry	15.9	No	Yes	Healthy
8	12802793.02	290900.28	Mulberry	12.8	No	Yes	Healthy
9	12802791.42	290911.11	Mulberry	13.8	No	Yes	Healthy
10	12802771.70	290909.64	Black Walnut	11.6	No	Yes	Healthy
11	12802769.83	290926.82	Mulberry	9.5	No	Yes	Half dead
12	12802842.42	290960.37	Black Walnut	11.8	No	Yes	Healthy
13	12802831.98	290951.61	Black Cherry	9.8	No	Yes	Healthy
14	12802791.10	290952.59	Hackberry	5.8	No	Yes	Healthy
15	12802727.51	290974.29	American Elm	8.7	No	Yes	Healthy
16	12802727.22	290978.74	American Elm	7	No	Yes	Healthy
17	12802740.47	290956.89	Black Cherry	9.6	No	Yes	Dead
18	12802728.21	290965.07	American Elm	4	No	Yes	Healthy
19	12802731.48	290962.49	American Elm	5	No	Yes	Healthy
20	12802647.50	290977.84	Red Oak	20.9	Yes	Yes	Healthy
21	12802616.46	290998.22	Red Oak	14.8	No	Yes	Healthy
22	12802576.66	290979.14	Red Oak	20.9	Yes	Yes	Healthy
23	12802142.93	290802.06	Black Maple	12	No	No	Good
24	12802880.93	290846.82	Black Walnut	4.4	No	Yes	Dead
25	12802757.52	290942.02	Black Walnut	6.1	No	Yes	Healthy
26	12802755.90	290937.23	Black Walnut	6.4	No	Yes	Healthy
27	12802749.43	290932.96	Black Walnut	12.8	No	Yes	Healthy
28	12802844.53	290777.08	Black Walnut	8.5	No	No	Healthy
29	12802606.16	291003.75	Black Cherry	18.7	Yes	Yes	Dead
30	12802557.61	290978.42	Red Oak	6.8	No	Yes	Healthy
31	12802550.25	290980.06	Red Oak	16.9	Yes	Yes	Healthy
32	12802780.82	290952.45	Hackberry	6.1	No	Yes	Healthy
33	12802776.45	290956.33	Red Oak	11.3	No	Yes	Healthy
34	12802758.94	290962.63	Mulberry	6.2	No	No	Healthy
35	12802898.00	290909.65	Mulberry	6.5	No	No	Healthy
36	12802894.61	290896.32	Mulberry	6.3	No	No	Healthy
37	12802905.06	290900.48	Mulberry	9.1	No	No	Healthy
38	12802162.93	290800.94	Maple	48	N/A	N/A	Missing
39	12802128.22	290818.40	Unknown 10	N/A	N/A	N/A	Cut down
40	12802114.82	290813.69	Catalpa	36	No	No	90% dead
41	12802106.11	290824.15	Mulberry	14.3	No	Yes	Healthy

TREE NO.	EASTING	NORTHING	TREE SPECIES	DBH(IN)	PROTECTED	REMOVING	CONDITION
42	12802132.43	290797.60	Catalpa	29	No	No	Healthy
43	12802670.58	290974.63	Oak	N/A	N/A	N/A	Cut down
44	12802664.44	290978.70	Red oak	18.4	Yes	Yes	Healthy
45	12802628.68	290991.12	American Elm	18.7	Yes	Yes	Healthy
46	12802326.75	290917.84	Hackberry	6.5	No	Yes	Healthy
47	12802800.71	290956.47	Red Oak	11	No	Yes	Healthy
50	12802860.97	290965.90	Black Walnut	9.8	No	No	Healthy
51	12802853.09	290968.54	Red Oak	16.8	Yes	No	Healthy
101	12802041.45	290811.44	Catalpa	33	No	No	Healthy
102	12801997.90	290856.90	Silver Maple	51.9	Yes	No	Healthy
103	12801955.15	290845.36	Silver Maple	51.7	Yes	No	Half dead
104	12802507.14	290970.40	Red Oak	31.9	Yes	No	Healthy
105	12802764.26	290973.86	Mulberry	12	No	No	Half dead
106	12802866.50	290962.23	Black Walnut	6.8	No	No	Healthy
107	12802894.72	290806.65	Black Walnut	21.5	Yes	No	Dead
108	12802862.95	290816.17	Black Walnut	11.4	No	No	Half dead
109	12802881.27	290795.74	Black Walnut	9.6	No	No	Half dead
110	12802860.53	290771.45	Black Walnut	8.3	No	No	Healthy
111	12802848.23	290750.35	Red Oak	8.3	No	No	Healthy
112	12802854.23	290745.68	Hackberry	9.3	Yes	No	Healthy
113	12802865.99	290740.28	Black Walnut	10.7	No	Yes	Healthy
114	12802869.65	290735.79	Black Walnut	13.2	No	No	Healthy
115	12802819.17	290756.39	Hackberry	9.3	Yes	Yes	Healthy

PROPOSED TREES TO REMOVE	**37**
PROPOSED PROTECTED TREES TO REMOVE	7
TREES REMOVED < 6"	5
TREES REMOVED ≤ 6" < 18"	27
TREES REMOVED ≤18" < 36"	5
TREES REMOVED ≤18" < 36"	0

CITY OF KALAMAZOO, MICHIGAN

RESOLUTION NO. 24-

RESOLUTION ADOPTING A FINAL PROJECT PLAN FOR WATER SYSTEM IMPROVEMENTS AND DESIGNATING AN AUTHORIZED PROJECT REPRESENTATIVE

Minutes of a regular meeting of the City Commission of the City held on May 20, 2024, at 7:00 o'clock p.m., local time.

PRESENT, Commissioners:

ABSENT, Commissioners:

WHEREAS, the City of Kalamazoo recognizes the need to make improvements to its existing water treatment and distribution system; and

WHEREAS, the City of Kalamazoo authorized Prein&Newhof, Inc. to prepare a Project Plan, which recommends the replacement of existing lead/galvanized water services, improvements to water supply Stations 5&14, and water main extensions in Richland and Ross Townships; and

WHEREAS, said Project Plan was presented at public meetings held on April 17, 2023 for the lead service line replacements, on April 15, 2024 for the Richland/Ross extensions, and April 23, 2024 for the Station upgrades. All public comments have been considered and addressed.

NOW THEREFORE BE IT RESOLVED, that the City of Kalamazoo formally adopts said Project Plan and agrees to implement the replacement of existing lead/galvanized water services, improvements to water supply Stations 5&14, and water main extensions in Richland and Ross Townships in the City of Kalamazoo Water System.

BE IT FURTHER RESOLVED, that the City Engineer, a position currently held by James J. Baker, P.E., is designated as the authorized representative for all activities associated with the project referenced above, including the submittal of said Project Plan as the first step in applying to the State of Michigan for a Drinking Water Revolving Fund Loan to assist in the implementation of the selected alternatives.

The above resolution was offered by _____ and seconded by _____.

AYES, Commissioners:

NAYS, Commissioners:

ABSTAIN, Commissioners:

RESOLUTION DECLARED ADOPTED.

CERTIFICATE

The foregoing is a true and complete copy of a resolution adopted by the City Commission of the City of Kalamazoo at a regular meeting held on May 20, 2024. Public notice was given and the meeting was conducted in compliance with the Michigan Open Meetings Act (PA 267 of 1976) as amended by PA 254 of 2020. Minutes of the meeting will be available as required by the Act.

_____

Scott A. Borling, City Clerk

Drinking Water State Revolving Fund Project Planning Document

City of Kalamazoo FY 2025
Drinking Water Project Planning Document

Prepared for
City of Kalamazoo

May 2024

2240278

1 INTRODUCTION

The City of Kalamazoo is submitting this Fiscal Year 2025 Drinking Water Revolving Fund application for three individual project areas.

CHAPTER 1: Resubmittal of the previously approved FY2024 project plan which included Lead Service Replacements for Fiscal Years 2024-2028 (EGLE Project Number 7810-01).

CHAPTER 2: Proposed water pump station upgrades to Stations 5 & 14 in the City of Kalamazoo water system.

CHAPTER 3: Water main extensions in Richland and Ross Townships to provide potable water to areas affected by PFAS contamination.

This project plan is structured to provide three individual plan chapters, one for each of the proposed project areas. Because the areas and populations impacted are different for each project, each was treated as a stand-alone project when considering alternatives, impacts, and public communication. Additionally, the station upgrades and water main extensions are intended to be separately permitted given the nature of the proposed improvements.

The entire three area project plan of the proposed lead service replacements, station upgrades, and watermain extensions is estimated to cost $110,264,000. If the entire project plan is DWRF loan funded with an estimated 2.5 % interest rate for a 20 year period, the expected annual debt service for the proposed project based on the DWRF loan criteria will be approximately $7,039,600 per year.

With the current number of 73,440 REU in the entire water system, the potential debt service and added O&M cost associated with the improvements, there will be a usage cost increase of approximately $106.00 per year per REU.

The Project Plan Resolution and the Overburdened Calculation are included in the document prior to the individual project chapters as both cover the entire project plan of the three compiled project areas.

Project Plan Resolution

CITY OF KALAMAZOO

RESOLUTION NO. _____

A RESOLUTION ADOPTING A **FINAL PROJECT PLAN FOR WATER SYSTEM IMPROVEMENTS** AND **DESIGNATING AN AUTHORIZED PROJECT REPRESENTATIVE**

Minutes of a regular meeting of the Kalamazoo City Commission held on May 20, 2024 at 7:00 p.m., local time, in the City Commission Chambers at City Hall, 241 W. South Street.

PRESENT, Commissioners:

ABSENT, Commissioners:

WHEREAS, the City of Kalamazoo recognizes the need to make improvements to its existing water treatment and distribution system; and

WHEREAS, the City of Kalamazoo authorized Prein&Newhof, Inc. to prepare a Project Plan, which recommends the replacement of existing lead/galvanized water services, improvements to water supply Stations 5&14, and water main extensions in Richland and Ross Townships; and

WHEREAS, said Project Plan was presented at public meetings held on April 17, 2023 for the lead service line replacements, on April 15, 2024 for the Richland/Ross extensions, and April 23, 2024 for the Station upgrades. All public comments have been considered and addressed.

NOW THEREFORE BE IT RESOLVED, that the City of Kalamazoo formally adopts said Project Plan and agrees to implement the replacement of existing lead/galvanized water services, improvements to water supply Stations 5&14, and water main extensions in Richland and Ross Townships in the City of Kalamazoo Water System.

BE IT FURTHER RESOLVED, that the City Engineer, a position currently held by James J. Baker, P.E., is designated as the authorized representative for all activities associated with the project referenced above, including the submittal of said Project Plan as the first step in applying to the State of Michigan for a Drinking Water Revolving Fund Loan to assist in the implementation of the selected alternatives.

The above resolution was offered by _____ and supported by _____.

AYES, Commissioners:
NAYS, Commissioners:

ABSTAIN, Commissioners:

RESOLUTION DECLARED ADOPTED

CERTIFICATE

The foregoing is a true and complete copy of a resolution adopted by the City Commission of the City of Kalamazoo at a regular meeting held on May 20, 2024. Public notice was given and the meeting was conducted in compliance with the Michigan Open Meetings Act (PA 267 of 1976). Minutes of the meeting will be available as required by the Act.

_____

City Clerk

Overburdened Calculation

Overburdened and Significantly Overburdened Calculation Worksheet

2. Median Annual Household Income (blended if necessary)	$60,624		
3. Taxable Value Per Capita (blended if necessary)	$32,779		
4. Amount of anicipated debt - FY25 SRF loan only	$110,264,000		
Terms	20		
Rate	2.50%		
New Annual debt from SRF loan	$7,073,119		
5. Annual Payments on existing debt	$8,649,102		
6. Total OM&R	$30,561,522		
7. Number of REUs	73440		
Total Annual Cost	$46,283,743		
Annual User Cost	$630		
MAHI Threshold $ Amount	**$606**		
Loan Threshold $ Amount	$82,800,723		**Result**
125% of Federal Poverty MAHI	$39,000	**Significantly Overburdened**	**NO**
Lowest 10% TVPC	$16,634	**Significantly Overburdened**	**NO**
Lowest 20% TVPC	$23,778	**Overburdened without calculation needed**	**NO**
Michigan MAHI	**$66,986**	**Overburdened with calculation**	**YES**

Drinking Water State Revolving Fund Project Chapter 1 – Resubmittal of FY24 Multi-Year Project Plan for Lead Service Replacements

1 INTRODUCTION

In Fiscal Year 2024, the City of Kalamazoo submitted a multi-year DWSRF project plan that was approved by EGLE. The projects slated for FY2024 were funded under DWSRF Project Number 7810-01. A copy of that agreement is in Appendix A.

This FY2025 Project Plan includes the continuation of the previously submitted and approved FY24 DWSRF Project Plan for Non-copper water service replacements.

Table 1, from the FY24 PP, indicates the number of service replacements planned for the multi-year project.

Fiscal Year	2024	2025	2026	2027	2028
Services	2,500	1,700	1,500	1,200	1,100

2 BACKGROUND

The FY25 service area can be seen in Figure 1. The current population of the FY25 project area is 7,567. Based on the population projections from the 2022 City of Kalamazoo Water Reliability Study, the 2044 projected population for the project area is 8,444. The area is currently nearly fully developed and land use is not expected to change.

3 SCHEDULE FOR DESIGN AND CONSTRUCTION

Milestone	Date
Hold Public Meeting	April 2024
Submit Final Project Plan to EGLE	June 2024
Receive Funding Determination	September 2024
User Charge System Approved	January 2025
Plans and Specifications Approved	May 2025
Bid Advertisement	May 2025
Receive Construction Bids	June 2025
EGLE Order of Approval	August 2025
Begin Construction	April 2026
Construction Completed	October 2027

4 COST SUMMARY

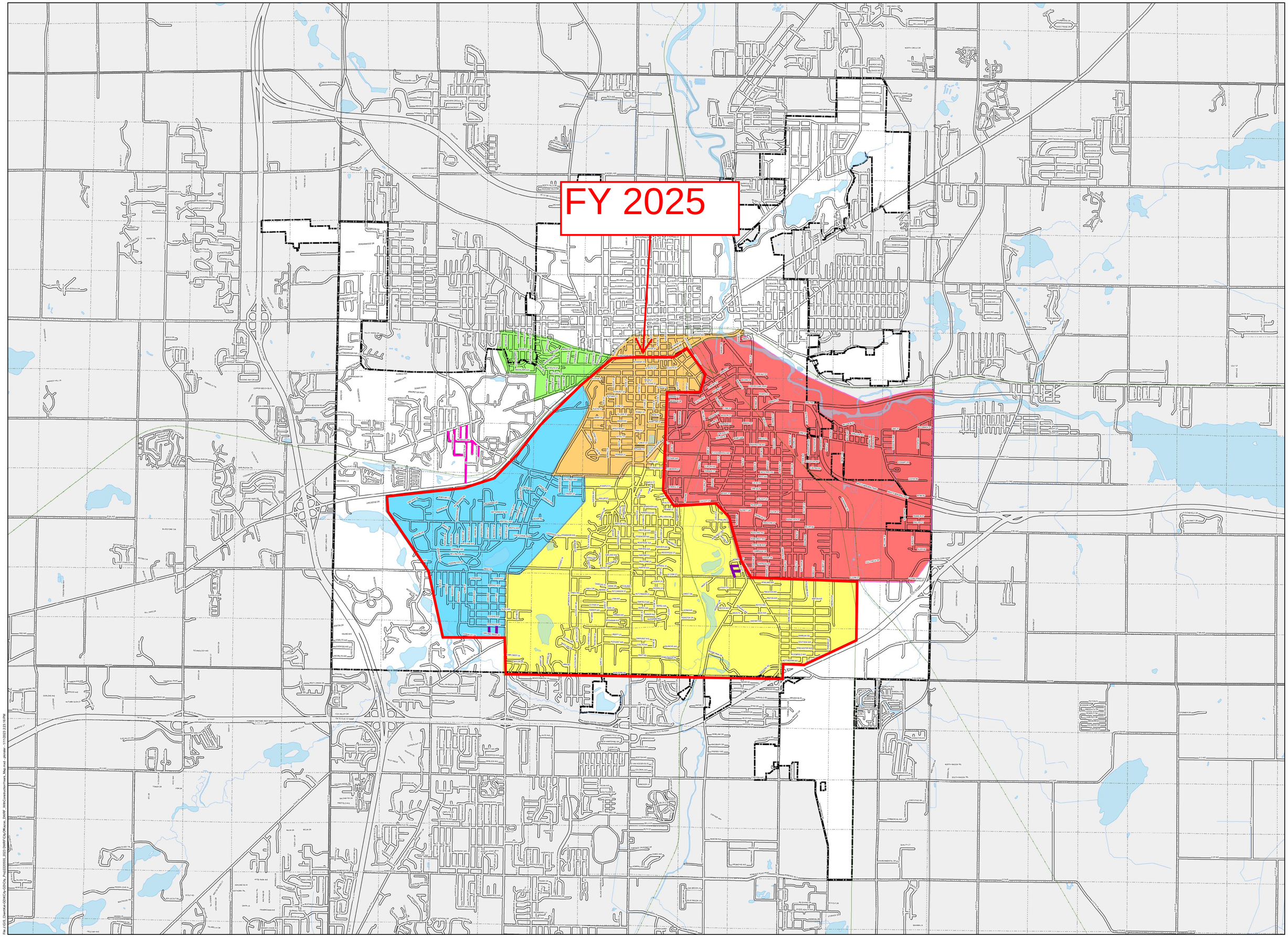
The City of Kalamazoo has performed additional investigations for non-copper services in the FY25 project area bringing the total number of services to be replaced down to 1,300.

A revised cost estimate for FY25 service replacements can be found in Appendix B.

Based on a project cost of $13,000,000, a project loan funded at 2.5% for 20 years would require an annual payment of $829,960. Given the calculated number of 73,440 Residential Equivalent Units in the system, the anticipated annual cost of $11.30/REU is anticipated for the FY25 Non-copper service replacement project.

Figures

Figure 1 Map of Proposed Project Area



LEGEND

DWRF Construction Years

- FY 2024
- FY 2025
- FY 2026
- FY 2027
- FY 2028
- Lining Project
- Various Streets Project (2025)
- City of Kalamazoo Limits

0 1,000 2,000 4,000 6,000 Feet

Scale: 1" = 2,000'

City of Kalamazoo

Kalamazoo County, Michigan

Water Distribution System

DWRF Construction Year Map

Prein&Newhof

January 2023

2220555

Appendices

Appendix A FY24 DWRF Agreement
Appendix B Project Area Cost Estimate

Appendix A

FY24 DWRF AGREEMENT

Michigan Department of Environment, Great Lakes, and Energy (EGLE)
Drinking Water State Revolving Fund (DWSRF) Project Milestone
Schedule for 4th Quarter Financing in Fiscal Year 2024
Anticipated Loan Closing on August 28, 2024

Applicant Name: City of Kalamazoo

Project Number: 7810-01

Project Description: Water Main Replacement and Lining and Lead Service Line Replacement

Milestone	By No Later Than
EGLE Comments on Project Plan Submittal	01/12/2024
Submittal of Answers to EGLE Comments	02/02/2024
Equivalency Federal Cross-cutter Approvals	02/02/2024
Publication of Environmental Assessment (EA)	04/24/2024
Public Notice Clearance	05/24/2024
EGLE Approval of Project Plan	05/24/2024
Submittal of Draft Plans & Specifications	01/19/2024
EGLE Comments on Draft Plans & Specifications	02/23/2024
Submittal of Final Plans & Specifications	04/03/2024
Issuance of Construction Permit	05/17/2024
EGLE Approval of Plans & Specifications	05/24/2024
Submittal of DWSRF Application Part I	05/15/2024
Submittal of DWSRF Application Part II	05/15/2024
Submittal of DWSRF Application Part III (including Resolution of Tentative Contract Award)	07/08/2024
Publication of Bid Advertisement	05/24/2024
Opening of Bids	06/26/2024
Resolution of Tentative Contract Award by Governing Body	07/05/2024
EGLE Order of Approval	08/07/2024

As the authorized representative for this project, I understand that failure to adhere to this schedule may result in the bypass of this project and the assignment of funds reserved for it to other projects on Michigan's Project Priority List in accordance with the provisions of Section 5406 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

As the authorized representative for this project, I understand that failure to adhere to this schedule may result in the deferral of EGLE action on this project until a subsequent fiscal year.

Accepted on 11/29/2023 By: James J. Baker, PE
Applicant's Authorized Representative

Accepted on 11/29/2023 By: Valorie White
Project Manager, Finance Division
Water Infrastructure Funding and Financing Section

Approved on 11/29/2023 By: Eric Pocan
Unit Supervisor, Finance Division
Water Infrastructure Funding and Financing Section

Appendix B

PROJECT AREA COST ESTIMATE

City of Kalamazoo
FY 2025 Non-copper Water Service Replacements

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED PRICE
1	Mobilization	1	LS	$100,000.00	$100,000.00
2	Water Service Potholing	850	EA	$605.00	$514,250.00
3	Water Service - Long	500	EA	$3,369.01	$1,684,507.00
4	Water Service - Short	500	EA	$2,237.38	$1,118,689.00
5	Water Service - Yard	1000	EA	$2,609.50	$2,609,497.00
6	Water Service - Private	45	EA	$3,575.00	$160,875.00
7	Ford Box	45	EA	$1,595.00	$71,775.00
8	2" Service	4	EA	$4,950.00	$19,800.00
9	Copper Tubing, Additional Length, 2"	100	FT	$93.50	$9,350.00
10	2" Meter Vault	1	EA	$7,425.00	$7,425.00
11	Abandon Blind	400	EA	$522.50	$209,000.00
12	Plumber	2200	HR	$214.50	$471,900.00
13	Sidewalk Remove & Replace	45,000	SF	$9.35	$420,750.00
14	Curb Remove & Replace	10,000	LF	$51.23	$512,270.00
15	Road or Driveway Remove & Replace COK (Exhibit A)	7,700	SY	$95.82	$737,821.70
16	Road or Driveway Remove & Replace COK Winter (Exhibit B)	3700	SY	$129.37	$478,672.70
17	Road or Driveway Remove & Replace RCKC (Exhibit C)	130	SY	$36.30	$4,719.00
18	HMA Driveway Remove & Replace	350	SY	$89.05	$31,165.75
19	Stamp Concrete	370	SY	$217.23	$80,374.36
20	Traffic Control	1	LS	$400,000.00	$400,000.00
21	HMA 13A	500	TON	$259.88	$129,937.50
22	HMA, MDOT 4E	1100	TON	$259.88	$285,862.50
23	HMA, MDOT 5E	1350	TON	$158.13	$213,468.75
24	Milling, 2"	250	SY	$2.53	$632.50
25	Milling, 1.5"	5000	SY	$1.21	$6,050.00
26	Gravel Driveway, 8" 22A	100	SY	$34.65	$3,465.00
27	Water Filter	1300	EA	$26.40	$34,320.00
28	Meter Setting	1300	EA	$623.98	$811,167.50
29	Curb Valve	10	EA	$220.00	$2,200.00
30	Curb Box	10	EA	$247.50	$2,475.00
31	Miscellaneous Repair Allowance	1	LS	$10,000.00	$10,000.00
TOTAL BID:					$11,142,420.26
Total w/ 25% Contingency:					$13,928,025.33

Drinking Water State Revolving Fund Project
Chapter 2 – Stations 5 & 14 Upgrades

2025 Drinking Water State Revolving Fund Project Plan

Pump Station 5 and 14 Upgrades







DWSRF Project Number: To Be Determined

May 2024

TETRA TECH

2025 Drinking Water State Revolving Fund Project Plan

PUMP STATIONS 5 AND 14 UPGRADES

DWSRF Project Number: To Be Determined
May 2024

PRESENTED TO

City of Kalamazoo
Department of Public Services
1415 North Harrison Street
Kalamazoo, MI 49007

PRESENTED BY

Tetra Tech
3497 Coolidge Road
East Lansing, MI 48823

P +1-517-316-3930
F +1-517-484-8140
tetratech.com

TETRA TECH

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APPENDICES

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
ATS	Automatic Transfer Switch
DNR	Michigan Department of Natural Resources
DWSRF	Drinking Water State Revolving Fund
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EPA	United States Environmental Protection Agency
FEMA	United States Federal Emergency Management Agency
FWS	United States Fish and Wildlife Service
GAC	Granular Activated Carbon
gpm	Gallons per Minute
LSL	Lead Service Line
MCL	Maximum Contaminant Level
MDOT	Michigan Department of Transportation
MG	Million Gallons
MGD	Million Gallons per Day
mg/L	Milligrams per Liter
MNFI	Michigan Natural Features Inventory
NREPA	Natural Resources and Environmental Protection Act
O&M	Operations and Maintenance
PFAS	Per- and Polyfluoroalkyl Substances
PO_4	Phosphate
PPT	Parts per Trillion
psi	Pounds per Square Inch
SHPO	State Historical Preservation Office
SRF	State Revolving Fund
USEPA	United States Environmental Protection Agency
WIFFS	Water Infrastructure Funding and Financing Section
WPS	Well Pump Station
WTP	Water Treatment Plant

1.0 SUMMARY AND RECOMMENDATIONS

1.1 SUMMARY

The City submitted an intent to apply for Fiscal Year 2025 Drinking Water State Revolving Fund (DWSRF) financing to fund pump stations 5 and 14 upgrades. The DWSRF provides financial assistance in the form of low interest loans to assist water suppliers meet the requirements of the Safe Drinking Water Act. The current interest rate for Fiscal Year 2024 loans is 2.5% for a 20-year loan. Interest rates may change for Fiscal Year 2025.

The DWSRF program requires a Project Plan to be submitted to Michigan Department of Environment, Great Lakes, and Energy (EGLE) by June 1, 2024, in order to be on the project priority list for Fiscal Year 2025 (October 1, 2024, to September 30, 2025). The City's Project Plan was prepared using the *DWSRF Project Plan Preparation Guidance Manual* with assistance from the EGLE Water Infrastructure Funding and Financing Section (WIFFS).

1.2 RECOMMENDATIONS

The City's drinking water system was reviewed to evaluate existing and projected future conveyance and treatment capacities, the condition of major equipment and facilities, and operations and maintenance tasks. The Project Plan details the project recommended for implementation within the next five years. This project is recommended because it improves the existing infrastructure and protects human health. The total opinion of cost to implement the recommended alternative is $51.3 million. The proposed project is summarized as follows:

Project 1, Pump Stations 5 and 14 Upgrades

Project 1 proposes to upgrade Pump Stations 5 and 14 with additional water treatment to remove iron and PFAS to meet regulatory standards. The existing pump stations do not currently have a way to remove these pollutants. Water treatment is recommended to remove levels of iron and per- and polyfluoroalkyl substances (PFAS) that may negatively impact human health if not treated.

2.0 PROJECT BACKGROUND

The City's drinking water needs are based on comprehensive reviews of its water system and other planning information. This Project Plan was developed using the information presented in the following reports:

- *DWSRF Project Plan for City of Kalamazoo*, May 2023
- *Kalamazoo Water System Capacity Study*, April 2022
- *Water System Reliability Study, December 2022*
- *Water Asset Management Plan, December 2017*
- *Kalamazoo Master Plan*, October 2017

2.1 DELINEATION OF STUDY AREA

The existing service area includes all of the City and portions of the cities of Parchment and Portage as well as Kalamazoo, Comstock, Cooper, Oshtemo, Texas, Pavillion, and Richland Townships. The City has almost 200,000 customers in the 170 square mile service area. The study area includes a portion of the existing service area from Spring Valley Drive to Schippers Lane along Henson, Junction, Trimble, and Wallace Avenues. ***Figure 2-1*** shows the study area.

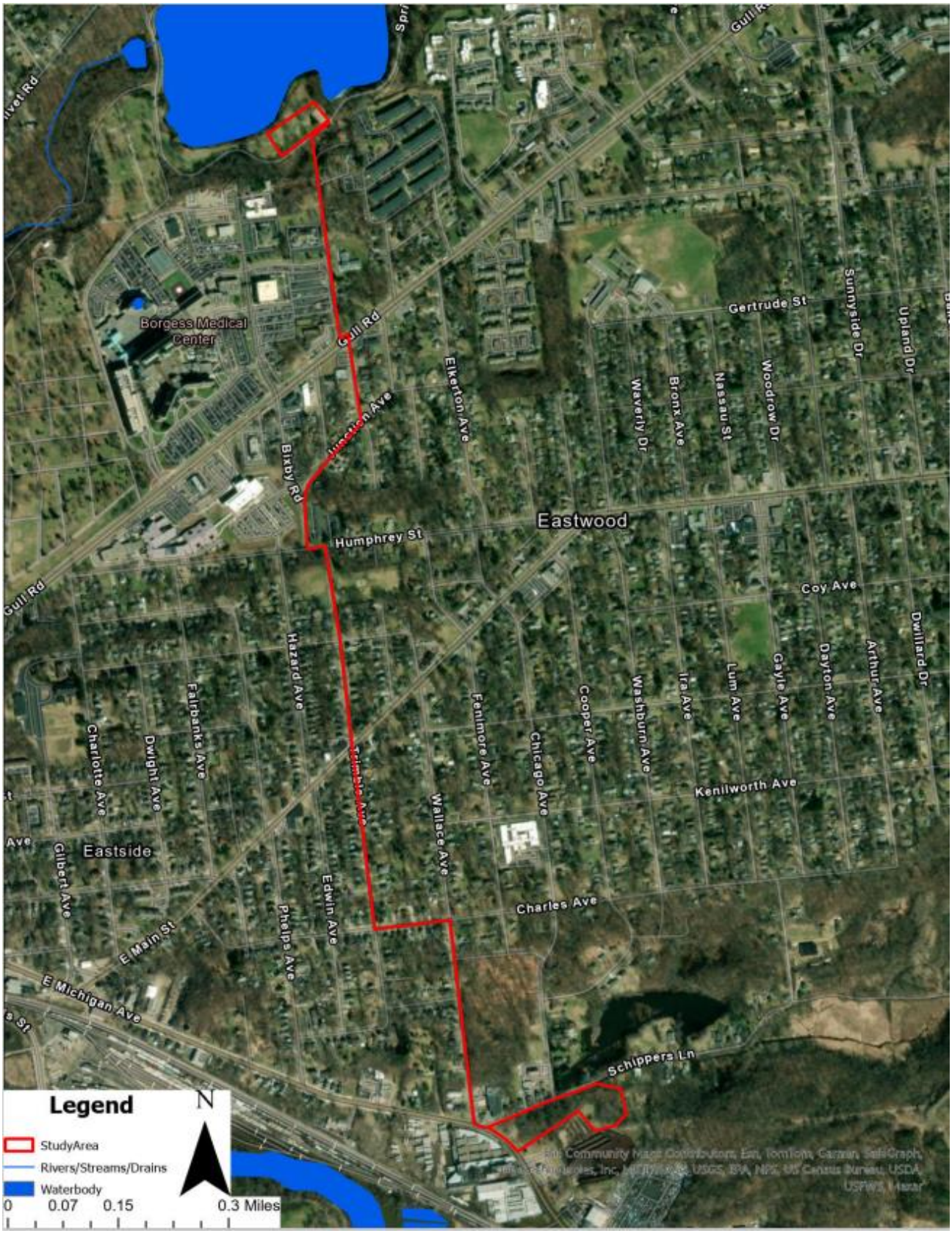
2.2 POPULATION PROJECTIONS

The City's population declined between 2010 and 2020, but the City projects the population will increase by 0.5 percent per year during the planning period. ***Table 2-1*** summarizes population projections for the entire City and the water service area, which includes additional cities and townships.

Table 2-1. Population Projections

Year	Kalamazoo Service Area	City of Kalamazoo
2010 Census	-	74,262
2020 Census	196,292	73,598
2022 U.S. Census Bureau Estimate	-	72,873
2024 projection	200,247	73,604
2029 projection	205,304	75,462
2044 projection	221,252	83,378

Figure 2-1. Study Area Map



2.3 EXISTING ENVIRONMENT EVALUATION

2.3.1 Cultural and Historic Resources

Orbis Environmental Consulting conducted a historical evaluation which is included in Appendix A. There are no anticipated impacts to any historical, archeological, or cultural resources. Additional evaluation for potential resources will be completed during the design phase.

2.3.2 Air Quality

National Ambient Air Quality Standards are health-based standards set by the United States Environmental Protection Agency (USEPA). The City is in attainment for carbon dioxide, lead, nitrogen dioxide, particulate matter, sulfur dioxide, and ozone. The project is not anticipated to negatively impact the air quality.

2.3.3 Wetlands

Wetlands are located north of Spring Valley Drive along Spring Valley Lake and along Schippers Lane in the study area. Wetlands are within the project limits at Schippers Lane and a delineation was completed. The delineation is included in the basis of design from Wightman in Appendix G. The necessary permit will be obtained and impacts to wetlands will be minimized and/or mitigated. ***Figure 2-2*** shows wetlands from the National Wetland Inventory within the study area.

2.3.4 Great Lakes Shorelands, Coastal Zones, and Coastal Management Areas

There are no coastal zones within the study area.

2.3.5 Floodplains

There are no floodplains within the study area. ***Figure 2-3*** shows the 100-year floodplains from FEMA within the surrounding area.

2.3.6 Natural or Wild and Scenic Rivers

There are no designated Michigan Natural Rivers listed by the Michigan Department of Natural Resources (DNR) or National Wild and Scenic Rivers listed by the United States Fish and Wildlife Service (FWS) within the study area.

2.3.7 Major Surface Waters

The Kalamazoo River and Portage Creek are within the service area, but not the study area. No project work will impact any major surface waters.

Figure 2-2. Wetlands Map

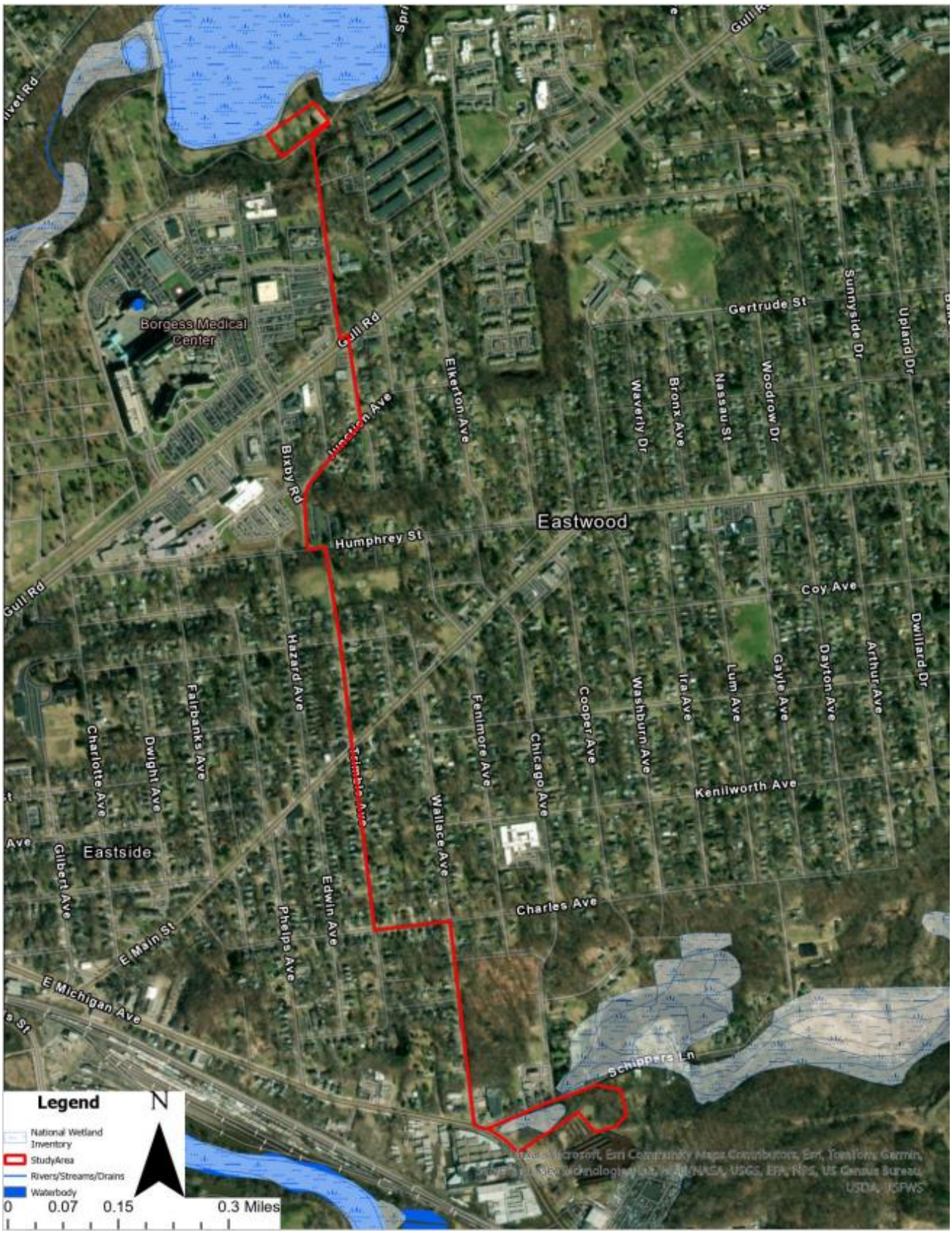
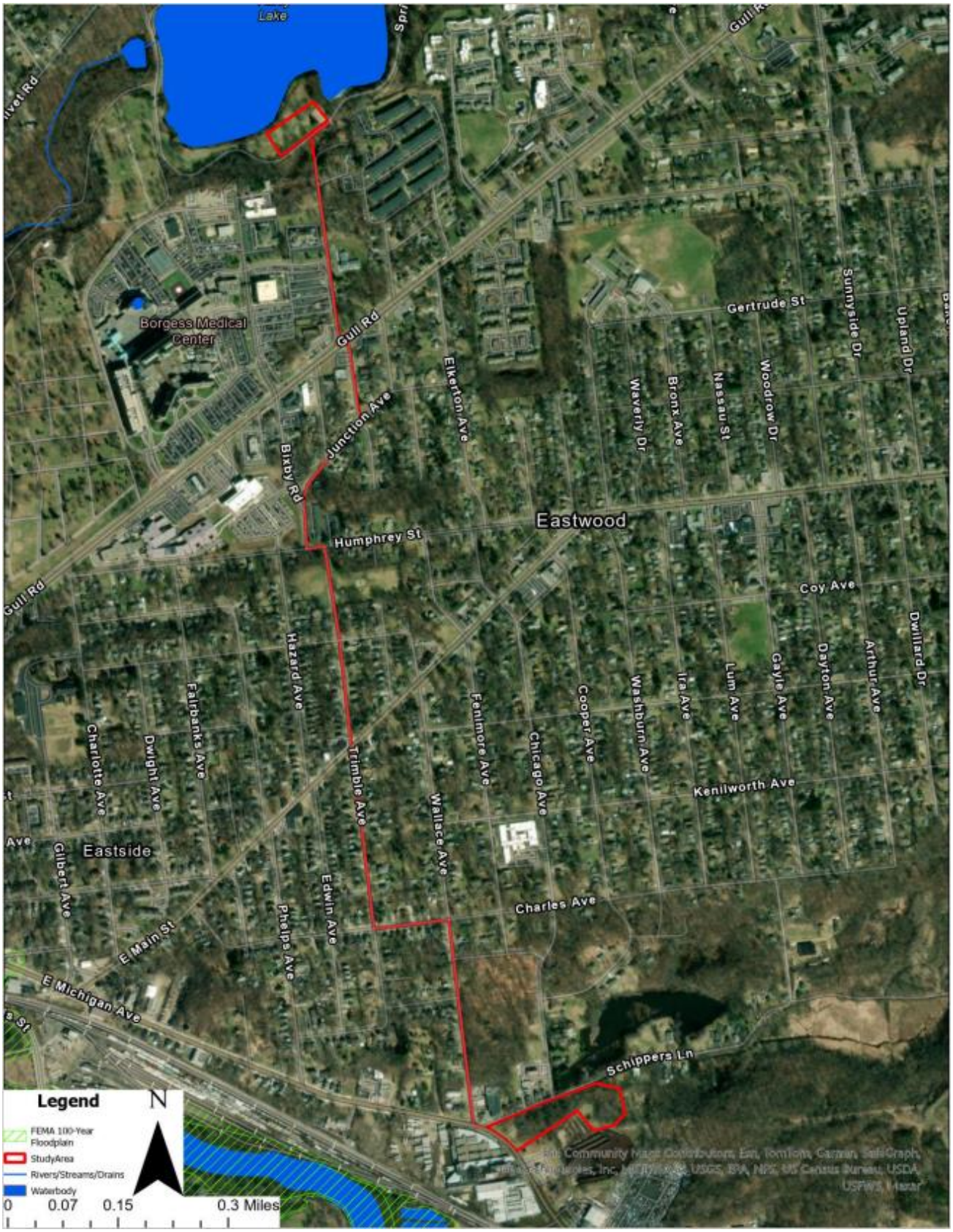


Figure 2-3. Floodplain Map



2.3.8 Topography

Some topography changes are expected within the project scope for grading at Station 5. ***Figure 2-4*** includes the existing topography of the study area.

2.3.9 Geology

No proposed geology changes or dewatering are included within the project scope.

2.3.10 Soil Types

Soil within the study area is mostly sand and gravel. No removal or additional soil is anticipated outside of the study area. Appendix B includes a map of the existing soil types in the project area.

2.3.11 Agricultural Resources

The proposed project is in a residential area and not anticipated to be constructed near farmland.

2.3.12 Recreational Areas

The study area includes a park along Spring Valley Lake. Impacts to local recreational areas will be minimized as much as possible.

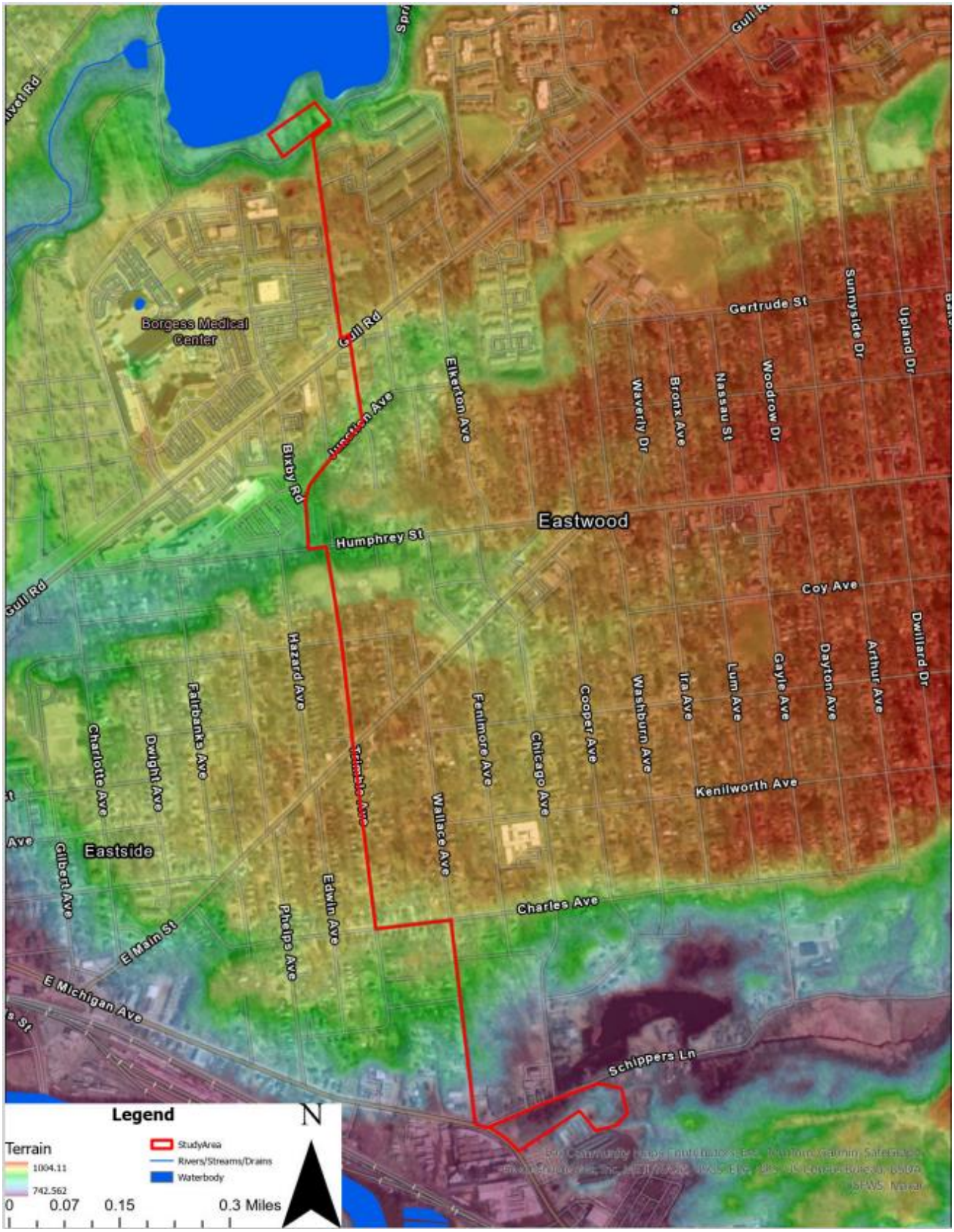
2.3.13 Fauna and Flora

The existing plant and animal species are typical to urbanized areas. No habitat for animals of economic or sport value is within the study area. Appendix C contains the *Orbis Threatened and Endangered Species Desktop Review* with correspondence from applicable environmental agencies.

Project work located in already-developed areas where there is minimal habitat present for threatened and endangered species is expected to have “no effect” on the listed species, their habitats, or proposed or designated critical habitat.

Project work in undeveloped areas around PS 5 and 14 may impact local wildlife and plants. During the design phase, additional reviews will be made to determine if the habitat or species will be impacted. If there are any concerns, appropriate actions will be taken to avoid these areas and/or mitigate any disturbance so that the species are protected.

Figure 2-4. Topography Map



2.4 EXISTING SYSTEM

The City operates and maintains its own water distribution system for its residents and surrounding municipalities. The *Water System Capacity Study* provides details on the City's drinking water system.

2.4.1 Water Supply, Pump Stations, and Treatment

The system is supplied by 90 groundwater wells which are operated by 13 well pump stations (WPS). WPS 2, 17, and 18 are not in use due to water quality concerns. ***Table 2-2*** modified from the *Water System Capacity Study* provides a summary of the well pump stations.

Water treatment is provided at each WPS. The water may be treated depending on the well by chlorination, fluoridation, addition of phosphate for corrosion control, air stripping and aeration for volatile organic compound removal, and iron and manganese removal. All the active well pump stations are equipped to treat water with chlorination, fluoridation, and phosphate addition. WPS 1 and 11 are also set up for air stripping as well as iron and manganese removal.

Table 2-2. Summary of Well Pump Stations

WPS	Station Name	Number of Wells	Total Well Capacity (gpm)	Number of Pumps	Firm Pumping Capacity (gpm)	Station Capacity Total Pumping Capacity (gpm)
1	Central Water Treatment Plant	6	9,000	4	7,500	7,500
2+	Born Court	1	2,000	1	0	1,300
3/7	Balch Street	7	3,100	2	1,900	3,800
4	Maple Street	8	4,000	3	2,200	2,200
5	Schippers Lane	4	1,400	1	0	1,200
8	East Kilgore Road	5	2,350	1	0	2,400
9	West Kilgore Road	12	4,400	3	3,200	3,200
11	Kendal Avenue	7	2,350	2	1,800	1,800
12	DeHaan	4	1,600	1	0	1,200
14	Spring Valley	5	1,750	1	0	1,600
17+	Konkle Avenue	1	500	1	0	500
18+	Emerald Drive	2	1,250	2	500	1,250
22	Colony Farm	6	3,300	1	2,200	4,400
24	Atwater	16	9,700	4	9,600	9,600

WPS	Station Name	Number of Wells	Total Well Capacity (gpm)	Number of Pumps	Firm Pumping Capacity (gpm)	Station Capacity Total Pumping Capacity (gpm)
25	Campbell	9	4,550	3	3,350	4,500
39	Morrow Lake	1	2,600	2	1,300	2,600

[+]Station is decommissioned.

2.4.2 Storage Tanks

The City has 10 storage tanks with a total storage volume of 18.95 MG, which are listed in ***Table 2-3*** with their locations, years constructed, types, and volumes. The *Water System Capacity Study* provides further details about the storage tanks.

Table 2-3. Summary of Storage Tanks

Location	Year Constructed	Type	Volume (MG)
Edgemoor	1939	Elevated	0.75
Siesta	2019	Elevated	2.50
Gull Road	1982	Elevated	1.50
Mount Olivet	1955	Elevated	0.50
Parchment	1973	Elevated	0.20
Stadium Drive	2005	Elevated	1.50
6th Street South	2005	Elevated	1.00
6th Street North	2023	Elevated	1.50
Beech	2007	Elevated	2.50
Blakeslee	1932	Below Ground	7.00

2.4.3 Booster and Bleeder Stations

The City operates 16 booster and bleeder stations to adequately distribute water to all 11 pressure districts. ***Table 2-4*** from the *Water System Capacity Study* provides a summary of the booster and bleeder stations.

Table 2-4. Summary of Booster and Bleeder Stations

	Station Name	Type	Boost (gpm)	Firm Boost (gpm)	Number of Pumps	Bleed (gpm)
6	Parker	Booster/Bleeder	2,400	0	1	700
10	East Main	Booster/Bleeder	2,000	0	1	1,000
11A	Kendall	Booster	1,600	500	4	-

	Station Name	Type	Boost (gpm)	Firm Boost (gpm)	Number of Pumps	Bleed (gpm)
21	Miller Road	Bleeder	-	-	-	1,400
23	Gull Road	Booster/Bleeder	1,000	0	1	650
26	North Westnedge Avenue	Bleeder	-	-	-	750
27	North 28th Street	Booster/Bleeder	750	0	1	500
28	Beech	Booster/Bleeder	1,600	800	2	800
29	9th Street	Booster	1,600	800	2	-
30	Siesta	Bleeder	-	-	-	2,400
31	Prairie	Booster	3,200	1,600	2	-
32	Almena	Bleeder	-	-	-	2,500
33	33rd Street	Bleeder	-	-	-	1,300
34	KL Avenue	Bleeder	-	-	-	2,500
35	KL Avenue – US131	Booster/Bleeder	1,000	0	3	750
36	West Main	Bleeder	-	-	-	5,700
40	Q Avenue	Booster	1,630	630	4	-
41	West Main/Josaine	Bleeder	-	-	-	8,800
42	Spanish	Bleeder	-	-	-	3100
43	East G Avenue	Bleeder	-	-	-	3100
44	Park Avenue	Bleeder	-	-	-	3100
60	Mt Olivet & Riverview	Bleeder	-	-	-	100
62	Big Rock	Bleeder	-	-	-	100

2.4.4 Water Distribution System

The City owns over 800 miles of water main, almost entirely cast or ductile iron, and with diameters ranging in size from 2- to 30-inch. The oldest water mains that are still in use were constructed in 1887.

2.4.5 Residuals Handling

Treatment processes and residual handling at the Water Treatment Plant are not being changed. Therefore, there are no negative impacts associated with residuals.

2.4.6 Water Meter and Reading Infrastructure

The City maintains an active water efficiency program to minimize water loss, maintain accurate records, and maximize revenue. Water meter testing and replacement is included in the program. A replacement schedule with refurbished or new meters is set up for meters every 10 years in residential areas or 3 years in commercial and industrial areas.

2.4.7 Design Capacity

Table 2-5 summarizes the recent and projected future demands for Pump Stations 5 and 14. The *Water Reliability Study* provides details on the demand development.

Table 2-5. Recent and Projected Future Demand

	Demand (MGD) Stations 5 and 14		
	2022	2027	2042
Average Day Demand	0.88	0.90	0.95
Maximum Day Demand	2.80	1.67	1.76
Peak Hour Demand	4.20	2.51	2.64

2.5 SUMMARY OF PROJECT NEED

2.5.1 Compliance with Drinking Water Standards

The City's water system is not in compliance with EPA drinking water standards for PFAS. Station 14 is in exceedance of the newly established EPA regulations with 4.2 parts per trillion (ppt) out of a maximum contaminant level of 4.0 ppt. The proposed project will ensure compliance with drinking water standards and reduce the risk of any potential non-compliance by addressing water quality concerns of PFAS and iron concentrations.

2.5.2 Orders of Enforcement Actions

There are two ongoing enforcement orders against the City. An Administrative Consent Order was issued December 3, 2020 for the *Water System Capacity Study.* There are also ongoing corrosion control upgrades following an enforcement order to complete system-wide corrosion control optimization.

2.5.3 Water Quality

The City has documented water quality problems of detectable PFAS and iron concentrations at pump stations 5 and 14 as described in Section 2.5.1. The proposed project is expected to provide water quality benefits by adding water treatment for iron and PFAS removal at those pump stations.

2.5.4 Projected Needs for the Next 20 Years

Project needs for the next 20 years beyond those listed in the Project Plan are documented in the *Water System Reliability Study*. Future needs are primarily related to maintaining existing infrastructure, replacing old, undersized water main and constructing new water main to connect existing mains for improved water quality and distribution.

2.6 EXPLORATORY WELL INVESTIGATIONS/WELL SITE SELECTION/TEST WELL DRILLING PROCEDURES

No new water supply wells are included in the proposed project.

3.0 ANALYSIS OF ALTERNATIVES

The alternatives analysis examines the project objectives, constraints, and cost-effectiveness over a 20-year planning period.

3.1 NO ACTION

No action would retain the existing, aging infrastructure. Not treating the raw water from PS 5 and 14 will negatively impact future water quality leading to non-compliance with state and federal regulations.

3.2 OPTIMUM PERFORMANCE OF EXISTING FACILITIES

The existing water system is performing as well as it can and additional staffing, staff training, and operational changes are not likely to improve the performance of the system because the primary concerns are related to the condition of the infrastructure. Therefore, this alternative was not considered further.

3.3 REGIONALIZATION

There are no regional alternatives since the City of Kalamazoo water system is the regional system.

3.4 CONSTRUCTION ALTERNATIVES

3.4.1 Pump Station 5 and 14 Upgrades

3.4.1.1 Alternative 1, Pump Station 5 and 14 Consolidated WTP

Alternative 1 proposes the implementation of a single consolidated 3,000-gpm capacity water treatment plant near PS 5. This facility would treat the combined flows from PS 5 (1,400 gpm) and from PS 14 (1,600 gpm), which is located approximately 1.3-miles north of proposed plant site. Improvements and upgrades to the pumps and treatment processes at each station are included in alternative 1 as well as a new 9,000-feet raw water transmission main to convey flows from PS 14. Details of these improvements, including a summary of the treatment processes the plant will be equipped, with are outlined below:

- **Upgrades to Well Pumps (PS 5 and 14):** The existing well pumps at both pump stations need replacement due to their age. The existing wells will be cleaned and inspected for leaks. Consequently, all wells at these stations will undergo replacement with new units having similar flow rates to the existing pumps, ensuring enhanced performance. The recommendation involves installing a total of four replacement well pumps at PS 5 and five well pumps at PS 14. These replacements are designed to efficiently handle the rated capacities of 1,400 gpm at PS 5 and 1,600 gpm at PS 14. Dedicated well pump houses will be constructed to house these newly installed replacement pumps.
- **Booster Pumps Upgrades (PS 5 and PS 14)**: At PS 14, the current configuration includes a single horizontal split case booster pump, rated at 1600 gpm flow and 180 feet head. The recommendation is to replace this existing horizontal split case booster pump with two new vertical turbine pumps rated at 1600 gpm each rated at 120-feet of head. The pump type is recommended to be vertical turbine pumps instead of the horizontal split case pumps due to space constraints at the existing PS 14 building. The purpose of these pumps is to convey flow from PS 14 to PS 5 for further treatment before pumping into distribution system. The total head (120-feet) calculated for pumping is explained in detail in the next section. The new pumps will be on variable frequency drives to account for pumping with flow and head variations. This

arrangement ensures a firm capacity of 1600 gpm with the one pump out of service. The existing pump will be demolished, and new pumps will be housed in the existing PS 14 building.

Pump Station 5 improvements within this alternative include four new high-service pumps; three pumps are rated at 1,500 gpm each, and one rated at 700 gpm. These high-service pumps will be housed in a pump room located in a new treatment building at PS 5. This new facility will house all the recommended treatment processes for PS 5. This arrangement ensures a firm capacity of 3,700 gpm with the largest pump out of service.

- **New transmission main from PS 14 to PS 5**

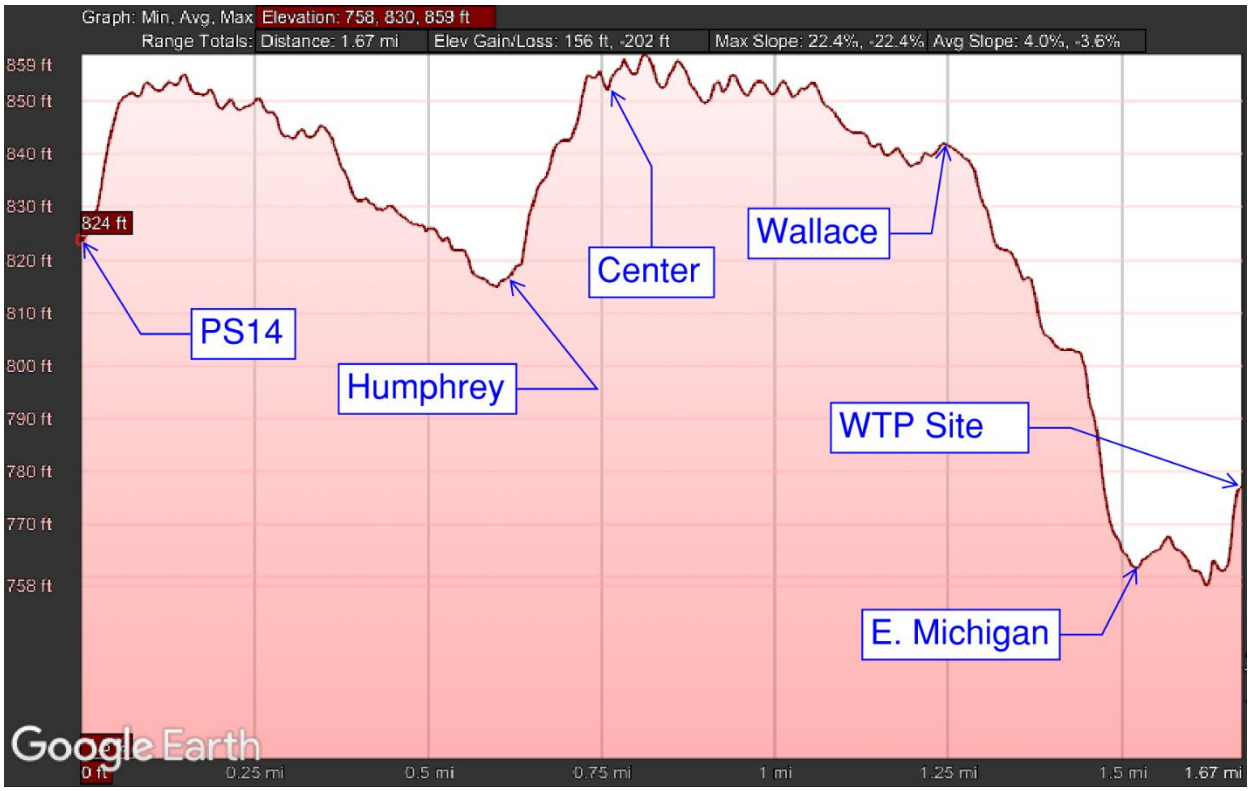
  As mentioned above, a new raw transmission main will be required to convey a flow rate of 1,600 gpm from PS 14 to the proposed consolidated treatment plant. PS 14 is located south of Spring Lake within the Spring Valley Park property. PS 5 and the plant site are located near the corner of E. Michigan Ave and Schippers Lane. A fairly direct alignment is possible routing the water main within public road rights-of-ways totaling approximately 9,000-feet. ***Figure 2-1*** shows the proposed transmission line.

  The proposed alignment is routed from PS 14 along Henson Ave to Junction Ave, where it shifts west to Humphrey St. There it jogs east 150-feet to Trimble Ave and continues south, crossing Main St to Charles Ave. At Charles Ave, the alignment again jogs east to Wallace Ave. Wallace Ave intersects E. Michigan Ave near Schippers Lane. The plant site is approximately 660-feet east on Schippers from the corner of E. Michigan Ave and Schippers Lane. Most of the alignment can be installed via open cut construction, however, jack and bore crossings may be required at Gull Rd and Main St. The main will likely be under the pavement and would require a minimum of one lane of pavement replacement. The final alignment may vary from this and will be based on the best route available while maintaining the required separation from existing water distribution mains and storm and sanitary sewer lines.

  The profile of this route is presented in ***Figure 3-1*** below with PS 14 being on the left and the WTP site on the right. Spring Valley Park is a regionally depressed area compared to the immediately surrounding grade, as indicated by the initial immediate 25-feet change in elevation from 824-feet to 850-feet. From there it is a gradual downhill slope to the low point of 815-feet at Humphrey St. There is a sharp incline along Trimble Ave to Center St, where the profile generally levels off to Charles Ave and across to Wallace Ave. At Wallace, the profile drops steeply, dropping 80-feet in elevation in a quarter mile.

  The 10-States Standards stipulate a minimum pressure of 20 psi at ground level at all points is required. Therefore, a static head of 60-feet is required. A 12-inch diameter pipe would result in velocities of 4.5-feet per second at 1,600 gpm and friction losses of 55-feet to reach Wallace, where a pressure control valve would be located to regulate pressures the remaining distance. The pumps would see a total dynamic head of 115 to 120-feet of head at 1,600 gpm. Combination air / vacuum valves will also be required at points along the transmission main.

Figure 3-1. Transmission Main Route Elevation Profile



- **Treatment Plant Processes at PS 5**

  Figure 3-2**Error! Reference source not found.** shows the proposed water treatment plant layout at PS 5.

  - **Groundwater Oxidation:** Water from the well pumps will be pumped into water holding tanks. Prior to reaching these holding tanks, chlorine will be injected into the well water. Chlorine feed rates shall be determined as required to oxidize iron and manganese removal levels in the raw water at a combined flow capacity of 3000-gpm.
  - **Oxidation/Detention Tanks:** The raw water to which chlorine has been added will be pumped into one of two water holding tanks. This step provides extended detention time and allows for complete oxidation of dissolved iron and manganese present in the groundwater supply. This pre-filtration process occurs before the water undergoes pressure filtration. Additionally, the presence of Oxidation/Detention Basins contributes to improved process efficiency and pump control. Two 24-feet diameter and 13-feet tall oxidation/detention tanks are proposed to handle the combined flow from PS 5 and 14. These tanks will be located on the site outside of the new pump and treatment building.
  - **Pre-Filter Oxidation:** Greensand filters require "oxidizing conditions" within the filters to effectively reduce and capture remaining soluble iron and manganese on filter media. It is considered beneficial to minimize chlorine residuals from the detention basin and Greensand Pressure Filters to reduce adsorption capacity impacts on granular activated carbon (GAC). Therefore, "tweaking" of chlorine residual prior to the Greensand Pressure Filters will enhance process control and operation flexibility.
  - **Booster/High Service Pumps:** The pressure of the water in the oxidation/detention tanks will be raised by a set of booster/high service pumps. These pumps will provide the pressure to

overcome the losses through the greensand filters and GAC contactors and provide the necessary pressure to enter the distribution system. A set of 4 pumps will be provided, three with a capacity of 1,500 gpm each and one with a capacity of 700 gpm, to provide a firm capacity of 3,700 gpm.

- **Pressure Filters (Greensand Filters):** Analysis of groundwater sampling data spanning from 2017 to 2019, as detailed in the Wightman Basis of Design report, has identified elevated levels of iron and manganese surpassing the secondary Maximum Contaminant Levels (MCLs). To address this, Greensand filters will be employed with the specific goal of reducing iron and manganese concentrations to levels below the secondary MCLs. This approach meets regulatory standards and also prevents potential fouling of GAC filters by iron and manganese particulates. A total of eight 12-feet diameter cylindrical type pressure filters are proposed to handle the combined flow of 3000 gpm from PS 5 and 14. These filters will be located in the treatment building.
- **PFAS Treatment (GAC Adsorption):** Analysis of individual well sampling data for Station 5 in 2020, as outlined in the Wightman Basis of Design report, shows elevated levels of PFAS compounds like Perfluorooctanoic Acid (PFOA), Perfluorooctane Sulfonic Acid (PFOS), Perfluorohexane Sulfonic Acid (PFHxS), Perfluorobutane Sulfonic Acid (PFBS), and Perfluorohexanoic Acid (PFHxA). These concentrations were observed to be approaching or exceeding the proposed EPA regulatory maximum contaminant levels.

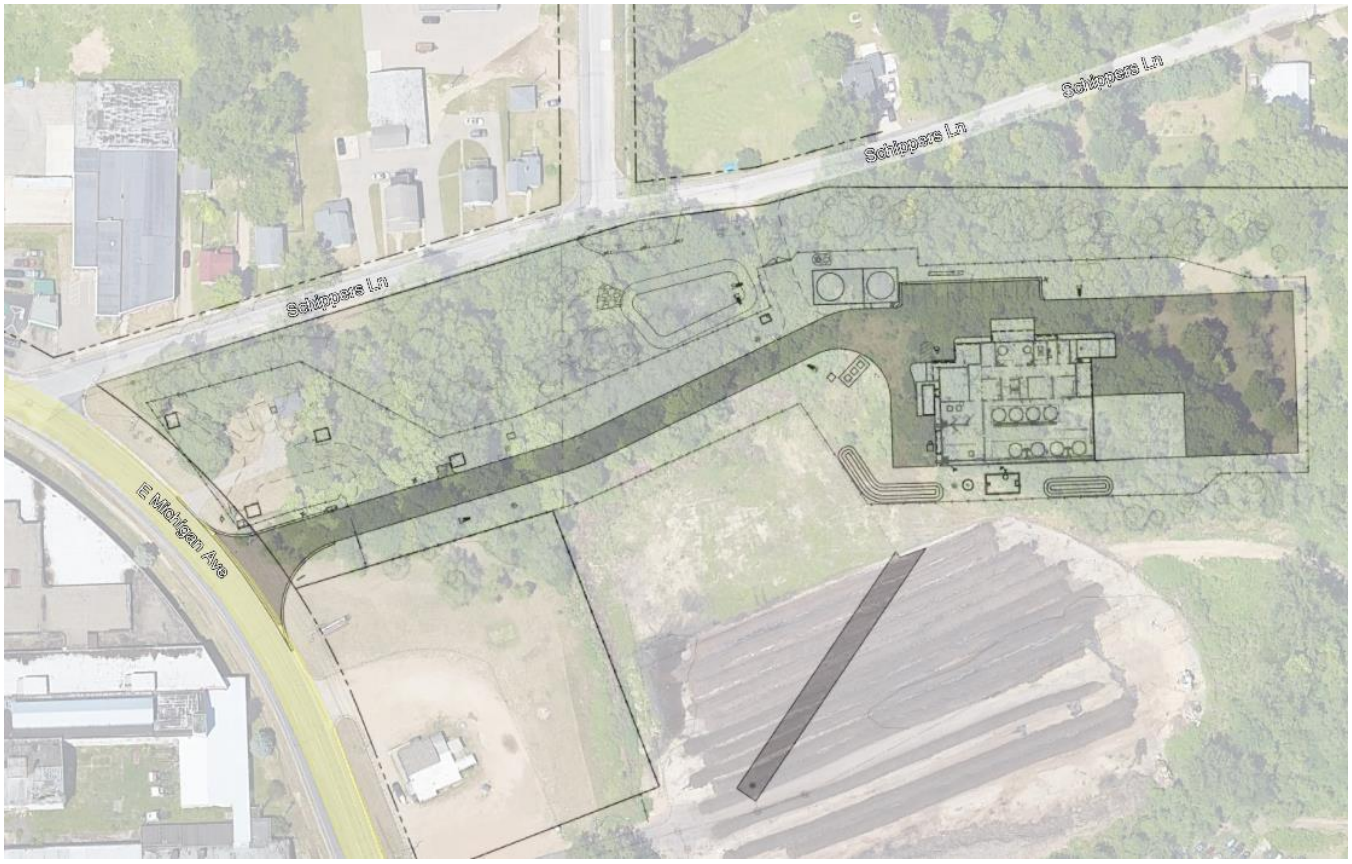
  Similarly, well sampling data at station 14 showed detected concentration levels for PFOS that were slightly above the proposed EPA regulatory maximum contaminant levels.

  To address, the recent PFAS compounds detected, GAC filters will be installed after the removal of iron and manganese through Greensand filters, to effectively eliminate PFAS substances from the water. This process aims to reduce PFAS levels to below the Michigan drinking water MCLs established for PFAS and the proposed USEPA regulations. Thus, for the combined flow of 3000 gpm, four trains of 12-feet diameter lead-lag configuration of GAC adsorption contactors are recommended. This results in a total of eight vessels with two vessels per train.
- **Backwash Holding Tank:** The greensand filter and GAC adsorption filters will require periodic backwashing, where water is reversed through the filter media to eliminate accumulated particles and rejuvenate the filters' efficiency. The backwash holding tank will serve as a reservoir to store water utilized during the backwashing operation for both greensand and GAC adsorption filters. Assuming a backflow rate of 1000 gpm and a detention time of 40 mins, the required backwash tank volume needed is 40,000 gallons. Thus, a belowground 40,000 gallon tank is provided in the site with approximate dimensions of 20-feet by 30-feet area with an approximate depth of 10-feet.
- **Final Disinfection: The** majority of iron and manganese will be removed through the oxidation and greensand pressure filtration system. In addition to PFAS, the GAC adsorption system will also reduce total organic carbon (TOC) concentrations. To complete the treatment process, chlorine will be introduced into the finished water as a final disinfection step. This addition of chlorine will serve as a disinfectant and also ensure the maintenance of a minimum residual chlorine concentration throughout the distribution system. Based on a chlorine demand of 2 mg/L and a total of 3000 gpm, a total feed of 72 pounds per day of chlorine injection is required.
- **Corrosion Control:** The city has been feeding sodium hexametaphosphate at their existing pump station which acts as a sequestering agent for iron, manganese, and calcium as well as a corrosion control measure. Currently, the City is changing to a liquid corrosion control chemical for ease of application and to provide a higher level of corrosion control against lead and other

metallic components in the distribution system. This alternative presents a similar strategy of using orthophosphate storage and feed systems for corrosion control. Based on the target orthophosphate dose of 4 mg/L as phosphate (PO_4), the design dosage value is determined to be 5.5 mg/L as PO_4 at the injection point. For the combined flow of 3000 gpm, a total feed of 200 pounds per day of blended orthophosphate injection is required.

- **Fluoridation:** Fluoridation is a public health measure aimed at preventing tooth decay and improving dental health in communities. This alternative includes fluoridation using Hydrofluorosilicic Acid storage and feed to provide a design dose of 0.99 mg/L to maintain minimum fluoride levels in the distribution system. For the combined flow of 3000 gpm, a total feed of 36 pounds per day of Hydrofluorosilicic Acid injection is required.
- **New Pump and Treatment Building:** A new approximately 21,000 square foot building, is proposed at the site to serve as a dedicated Pump and Treatment Building. The new treatment facilities shall be located east of the existing well field site with access from East Michigan Ave on land currently owned by the City. This facility is designed to accommodate various components crucial to the water treatment process. There is dedicated space within this building allocated for high-service pumps, pressure filters, GAC adsorption filters, chemical feed systems, chemical feed storage, an electrical room, and other areas essential for the operation and maintenance of the water treatment system.
- **Standby Power** A full load natural gas standby generator with ATS is recommended for station 5 and 14 as an emergency standby power source to maintain station operations during power outages.

Figure 3-2. Treatment Plant Footprint at PS 5



3.4.1.2 Alternative 2, Individual WTPs at Pump Station 5 and 14

Alternative 2 proposes the construction of two water treatment plants, with the first one being a 1,600 gallons per minute (gpm) WTP located at PS 14, and the second one being a 1,400 gpm WTP at PS5. ***Figure 3-2*****Error! Reference source not found.** shows the proposed site layout at PS 5. ***Figure 3-3*****Error! Reference source not found.** shows the proposed site layout at PS 14.

A. Station 14 Upgrades

- **Well Pumps Upgrades:** Station 14 consists of 5 vertical turbine well pumps in service. These pumps need replacement due to their age. The existing wells will be cleaned and inspected for leaks. Consequently, all wells will undergo replacement with new units having similar flow rates to the existing pumps, ensuring enhanced performance. The recommendation under this alternative involves installing a total of five well pumps with a firm capacity of 1600 gpm. Dedicated well pump houses will be constructed to house these newly installed replacement pumps.
- **Booster Pumps Upgrades:** At PS 14, the current configuration includes a single horizontal split case booster pump, rated at 1600 gpm flow and 180 feet head. The recommendation is to replace this existing horizontal split case booster pump with two new horizontal split case pumps rated at 1600 gpm each rated at 240-feet of head. This arrangement ensures a firm capacity of 1600 gpm with the one pump out of service. The purpose of these pumps is to effectively continue the existing production capacity of PS 14. The existing pump at the current PS 14 building will be decommissioned. Due to spatial constraints in the existing pump building at PS 14, the new pump will be housed in a new treatment building. This new building is designed to house the booster pumps and various other process components for water treatment at this station. Additional costs associated with land acquisition will be considered, given the limited space near the current building.
- **New Pump and Treatment Building:** A new building measuring approximately 110 feet by 140 feet, is proposed at the site to serve as a dedicated Pump and Treatment Building. This facility is designed to accommodate various components crucial to the water treatment process. There is dedicated space within this building allocated for high-service pumps, pressure filters, GAC adsorption filters, chemical feed systems, chemical feed storage, an electrical room, and other areas essential for the operation and maintenance of the water treatment system. There is space for the facility in the existing park near PS14, however, due to the community impacts this would have, land acquisition costs for a separate parcel nearby were included.
- **Groundwater Oxidation:** This process will be similar to the description outlined in alternative 1. Chlorine feed rates shall be determined to feed chlorine required for iron and manganese removal levels at the individual flow of 1,600 gpm for PS 14.
- **Oxidation/Detention Basins:** This process will be similar to the description outlined in alternative 1. One 24-feet diameter and 16-feet tall oxidation/detention tank is proposed to handle the individual flow of 1,600 gpm for PS 14. This tank will be located on the site outside the new pump and treatment building.
- **Pre-Filter Oxidation:** This process will be similar to the description outlined in alternative 1.
- **Pressure Filters:** This process will be similar to the description outlined in alternative 1. A total of four 14-feet diameter cylindrical type pressure filters are proposed to handle the flow of 1600 gpm for PS 14. These filters will be located in the new treatment building.
- **PFAS Treatment (GAC Adsorption):** As mentioned in alternative 1, station 14 well sampling data showed significant PFOS levels exceeding the proposed EPA MCLs. Thus, for this alternative, GAC adsorption filters are recommended. The individual PS 14 station flow of 1600 gpm required two

trains of 12-feet diameter lead-lag configuration of GAC Adsorption filters. This results in a total of four vessels with two lead-lag vessels per train.

- **Backwash Holding Tank:** This alternative includes a backwash holding tank for the backwash flow storage from the greensand filters and the GAC filters. Assuming a backflow rate of 400 gpm and a detention time of 40 mins, the required backwash tank volume needed is 16,000 gallons. Thus, a belowground 20,000 gallon tank is provided at the site with approximate dimensions of 20-feet by 15-feet area with an approximate depth of 10-feet.
- **Final Disinfection** This process will be similar to the description outlined in alternative 1. Based on the chlorine demand of 2 mg/L and for the PS 14 flow of 1600 gpm, a total feed of 38 pounds per day of chlorine injection is required.
- **Corrosion Control** This process will be similar to the description outlined in alternative 1 Based on the target orthophosphate dose of 4 mg/L as PO_4, the design dosage value is determined to be 5.5 mg/L as PO_4 at the injection point. Thus, a total feed of 110 pounds per day of blended orthophosphate injection is required for 1600 gpm flow for PS 14.
- **Fluoridation** This process will be similar to the description outlined in alternative 1. Based on the target Hydrofluorosilicic Acid demand of 0.99 mg/L, a total feed of 20 pounds per day of Hydrofluorosilicic Acid injection is required for 1600 gpm flow for PS 14.
- **Standby Power** A full load natural gas standby generator with ATS is recommended for station 14 as an emergency standby power source to maintain station operations during power outages.

Figure 3-3. Treatment Plant Footprint at PS 14



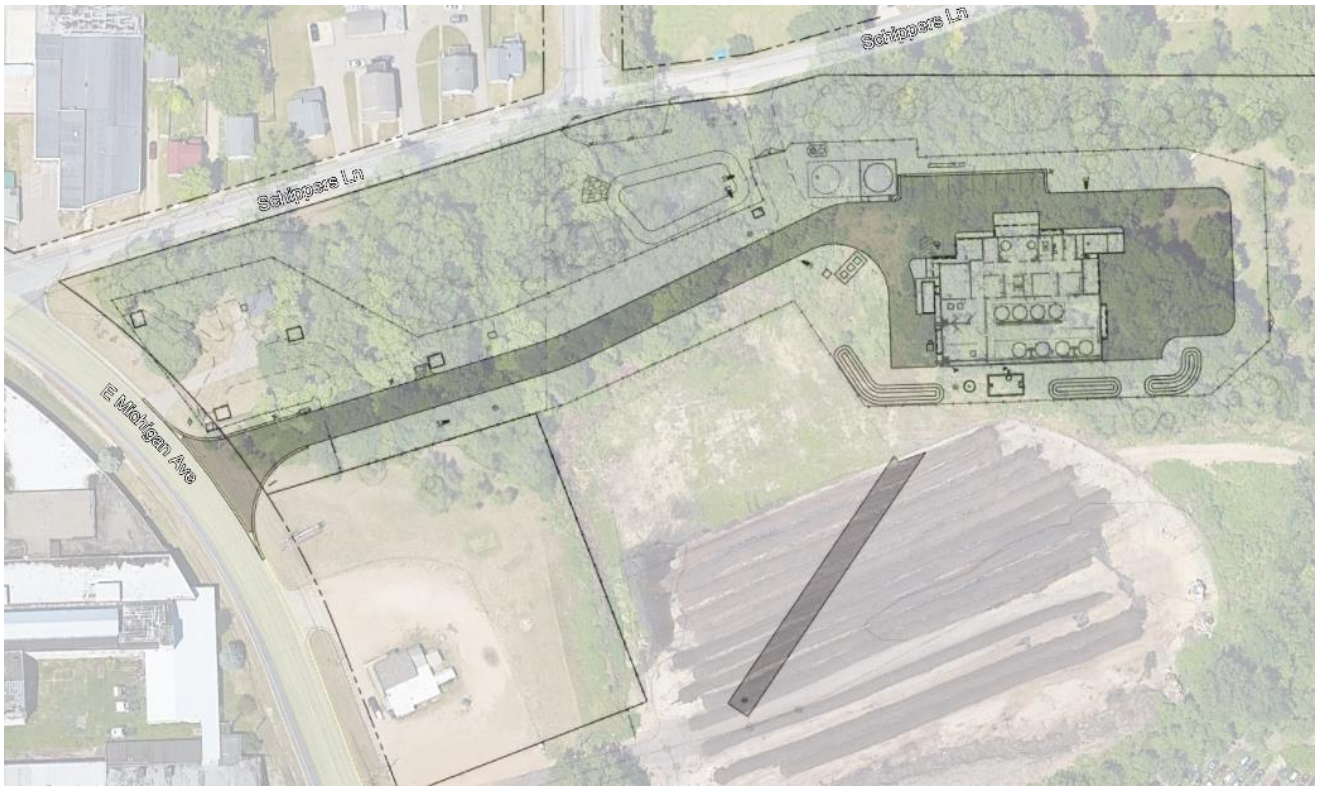
B. Station 5 Upgrades

- **Well Pumps Upgrades** Station 5 consist of four 350 gpm vertical turbine well pumps. These pumps need replacement due to their age. The existing wells will be cleaned and inspected for leaks. Consequently, all wells will undergo replacement with new units having similar flow rates to the existing pumps, ensuring enhanced performance. The recommendation under this alternative involves installing a total of four well pumps for a total capacity of 1,400 gpm. Dedicated well pump houses will be constructed to house these newly installed replacement pumps.

- **Booster Pumps** Although the status will currently be upgraded to pump 1,400 gpm flow from the wells, a higher booster pumping capacity is provided. For this alternative, it is recommended to install three new horizontal split case booster/high service pumps: two pumps rated at 1400 gpm each and one at 800 gpm. This brings up a firm capacity of 2200 gpm even with the largest pump out of service when needed. The new pumps will be housed in a new treatment building. This new building is designed to house the booster pumps and various other process components for water treatment at this station. The booster pumps will be sized to boost pressure to go through the filters and GAC contactors and then provide the necessary pressure for the distribution system.

- **Groundwater Oxidation** This process will be similar to the description outlined in alternative 1. Chlorine feed rates shall be determined to feed chlorine required iron and manganese removal levels at the individual flow of 1,400 gpm for PS 5.
- **Oxidation/Detention Basins** This process will be similar to the description outlined in alternative 1. One 24-feet diameter and 16-feet tall oxidation/detention tank is proposed to handle the total flow of 1,400 gpm for PS 5. This tank will be located on the site outside the pump and treatment building.
- **Pre-Filter Oxidation** This process will be similar to the description outlined in alternative 1.
- **Pressure Filters** This process will be similar to the description outlined in alternative 1. A total of four 12-feet diameter cylindrical type pressure filters are proposed to handle the flow of 1400 gpm for PS 5. These filters will be located in the new pump and treatment building.
- **PFAS Treatment (GAC Adsorption)** As mentioned in alternative 1, the analysis of individual well sampling data for Station 5 in 2020, as outlined in the Wightman Basis of Design report, shows elevated levels of PFAS compounds. Thus, for this alternative, GAC adsorption filters are recommended. The PS 5 station flow of 1400 gpm requires two trains of 12-feet diameter lead-lag configuration of GAC Adsorption filters. This results in a total of four vessels with two vessels per train.
- **Backwash Holding Tank:** This alternative includes a backwash holding tank for the backwash flow storage from the greensand filters and the GAC filters. Assuming a backwash flow rate of 400 gpm and a detention time of 40 mins, the required backwash tank volume needed is 16,000. Thus, a below ground 20,000 gallon tank is provided in the site with approximate dimensions of 20-feet by 15-feet area with an approximate depth of 10-feet.
- **Final Disinfection** This process will be similar to the description outlined in alternative. Based on the chlorine demand of 2 mg/L and for the PS 5 flow of 1400 gpm, a total feed of 34 pounds per day of chlorine injection is required.
- **Corrosion Control** This process will be similar to the description outlined in alternative 1. Based on the target orthophosphate dose of 4 mg/L as PO_4, the design dosage is determined to be 5.5 mg/L as PO_4 at the injection point. Thus, a total feed of 100 pounds per day of blended orthophosphate injection is required for 1400 gpm flow for PS 5.
- **Fluoridation** This process will be similar to the description outlined in alternative 1. Based on the target Hydrofluorosilicic Acid dose of 0.99 mg/L, a total feed of 17 pounds per day of Hydrofluorosilicic Acid injection is required for 1400 gpm flow for PS 5.
- **New Pump and Treatment Building** A new building measuring approximately 110 feet by 140 feet, is proposed at the site to serve as a dedicated Pump and Treatment Building. The new treatment facilities shall be located east of the existing well field site with access from East Michigan Avenue on land currently owned by the City. This facility is designed to accommodate various components crucial to the water treatment process. There is dedicated space within this building allocated for booster/high-service pumps, pressure filters, GAC adsorption filters, chemical feed systems, chemical feed storage, an electrical room, and other areas essential for the operation and maintenance of the water treatment system.
- **Standby Power** A full load natural gas standby generator with ATS is recommended for station 5 as an emergency standby power source to maintain station operations during power outages.

Figure 3-4. Treatment Plant Footprint at PS 5



3.5 MONETARY EVALUATION

The monetary evaluation compares the present worth of the alternatives over a 20-year planning period. It does not include costs accrued before or during the Project Plan phase. The real discount rate used for the present worth analysis is 2.5 percent (from the United States Office of Management and Budget when the project planning began in December 2023). Appendix D includes the detailed cost opinions and present worth calculations with weighted useful life for each alternative.

3.5.1 Pump Station 5 and 14 Upgrades

Alternative 2 has a higher capital cost than Alternative 1 due to construction of two WTPs. Operations and maintenance costs include the cost to maintain the equipment, chemicals, energy consumption, and labor. ***Table 3-1*** provides the present worth of Project 1 Alternatives 1 and 2.

Table 3-1. Alternatives 1 and 2 Present Worth

Cost Category	Alternative 1	Alternative 2
Capital Cost	$51,304,000	$66,424,000
Present Worth of Salvage Value	($14,863,000)	($18,345,000)
Present Worth of Annual OM&R	$11,614,000	$14,561,000
Total Present Worth	**$45,055,000**	**$62,640,000**

3.6 ENVIRONMENTAL EVALUATION

The principal alternatives have potential environmental impacts which can be beneficial or adverse, short- or long-term, and reversible or irreversible. Both alternatives require work in undeveloped areas. The proposed water main for Alternative 1 will be placed within the existing right-of-way and will not have an impact on previously undisturbed land.

No cultural or historical resources, agricultural resources, coastal zones, floodplains, wild and scenic or natural rivers, or major surface waters will be impacted by either alternative as discussed in Section 2.3.

3.6.1 Recreational Areas

Recreational areas will be impacted by Alternative 2. Alternative 2 includes construction of treatment plants near Spring Valley Lake Park. Alternative 1 is the preferred alternative to minimize impacts to recreational areas.

3.6.2 Wetlands

Wetlands exist primarily along Spring Valley Lake and Schippers Lane. Both alternatives are expected to have wetlands present in the construction area. During the design phase of the project, all necessary permits will be obtained and impacts to wetlands will be minimized and/or mitigated. Alternative 1 is the preferred alternative to minimize impacts to wetlands since it is limited to one area.

3.6.3 Existing Plant and Animal Communities

Threatened or endangered species or their habitat may be affected by either alternative. During the design phase, additional reviews will be made to determine if the habitat or species will be impacted. If there are any concerns, appropriate actions will be taken to avoid these areas and/or mitigate any disturbance so that the species are protected. Alternative 1 is the preferred alternative to minimize impacts to wildlife since it is limited to one area.

3.7 TECHNICAL CONSIDERATIONS

The principal alternatives comply with Safe Drinking Water Act and are designed to meet the standard recommended guidelines established in the “Recommended Standards for Waterworks.” Sufficient pumping capacity to meet design flows, a minimum of two units for each treatment process, adequate storage volume, and stand-by power requirements were all met for each alternative considered. Technical considerations are detailed in Sections 3.4.1.

3.8 NEW/INCREASED WATER WITHDRAWALS

There is no proposed increase in water withdrawals associated with this project.

4.0 SELECTED ALTERNATIVE

The selected alternative includes the following project:

- **Project 1, Alternative 1**: A consolidated water treatment plant will be constructed near PS 5 with a transmission main pumping raw water from PS 14 for iron and PFAS treatment. This alternative has the lowest capital, operation and maintenance, and present worth costs. The project also minimizes potential negative impacts such as the loss of park land and wetlands at PS 14.

4.1 DESIGN PARAMETERS

The project will meet local and state water distribution standards while improving water quality. More information on the calculations and assumptions made for the design parameters are found in Section **Error! Reference source not found.**.

The selected alternative includes:

- A single consolidated 3,000-gpm capacity water treatment plant near PS 5 to treat the combined flows from PS 5 (1,400 gpm) and from PS 14 (1,600 gpm).
- Four replacement well pumps at PS 5 and five well pumps at PS 14 to handle the rated capacities of 1,400 gpm at PS 5 and 1,600 gpm at PS 14.
- Two new vertical turbine pumps rated at 1,600 gpm each rated at 120 feet of head with variable frequency drives at PS 14 to account for pumping with flow and head variations to convey water from PS 14 to PS 5 for treatment.
- Four new high-service pumps at PS 5 to handle incoming flow from PS 14; three with a capacity of 1,500 gpm each and one with a capacity of 700 gpm.
- 9,000 feet of 12-inch transmission main from PS 14 to PS 5.
- Treatment Plant Processes at PS 5
    - Groundwater oxidation.
    - Two 24-feet diameter and 13-feet tall oxidation/detention tanks.
    - Pre-filter oxidation.
    - Eight 14-feet diameter cylindrical type pressure filters.
    - Eight vessels with two vessels per train of 12-feet diameter lead-lag configuration of GAC adsorption filters.
    - A 40,000-gallon backwash holding tank with approximate dimensions of 40-feet by 30-feet area with an approximate depth of 10 feet.
    - Final Disinfection with a total feed of 72 pounds per day of chlorine injection.
    - Corrosion control with a design dosage valve of 5.5 mg/L (total feed of 200 pounds per day) of blended orthophosphate injection.
    - Fluoridation using hydrofluorosilicic acid storage and feed to maintain minimum fluoride levels of 0.99 mg/L (total feed of 200 pounds per day) in the distribution system.
    - A new pump and treatment building measuring approximately 170 feet by 140 feet.

4.2 USEFUL LIFE

The selected alternative is expected to have a useful life of 43 years.

4.3 WATER AND ENERGY EFFICIENCY

The selected alternative is the most energy efficient of the project alternatives because it consolidates water treatment operations to one area. This alternative does require pumping water from PS 14 to PS 5, which is an additional energy cost, but is less than maintaining two WTPs.

Water loss may become an issue for the transmission main but can be avoided with regular maintenance.

4.4 SCHEDULE FOR DESIGN AND CONSTRUCTION

Table 4-1 provides a proposed schedule for the Project Plan submittal. ***Table 4-2*** presents the anticipated funding schedule for the project proposed for implementation within five years.

Table 4-1. Proposed SRF Project Schedule

Task	Complete By
Public Meeting Notice	April 12, 2024
Place Draft Project Plan on Public Record	April 23, 2024
Formal Public Meeting	May 6, 2024
Commission Approval of Project Plan	May 20, 2024
Submit Final Project Plan to EGLE	June 1, 2024

Table 4-2. Anticipated Funding Schedule for Proposed Project

Project	SRF Fiscal Year
Project 1: Pump Stations 5 and 14 Upgrades	2025

4.5 COST SUMMARY

Table 4-3 lists the selected alternative for the project and the associated costs. Project 1 is fully eligible for SRF funding.

Table 4-3. Selected Alternative Cost Summary

Project	Project Cost	Present Worth	SRF Eligible	SRF Eligible Cost	Annual Equivalent Cost
Project 1: Pump Stations 5 and 14 Upgrades	$51,304,000	$48,055,000	100%	$51,304,000	$3,292,000

The costs for the project described herein will be paid for by user charges. ***Table 4-4*** shows the user charges calculated over the useful life of the project. The City intends to implement this project over a five-year period, so the rate increases also will be staged as the project proceeds. ***Table 4-2*** lists the planned construction years for each project,

Table 4-4 estimates the typical quarterly user charge per typical residential user in the City for each project.

The quarterly user charge in the last column is calculated per the following steps:

Column 2: SRF Eligible Project Cost

Column 3: Annual Debt Service = Project Cost times Capital Recovery Factor based on 20-year SRF loan at 2.5%

Column 4: Additional Annual O&M Cost

Column 5: Total Annual Cost

Column 6: Quarterly User Charge = Total Annual Cost/73,440 residential equivalent units/4 billing periods per year

Table 4-4. Estimated User Charge Summary

Column 1: Project	Column 2: SRF Project Cost	Column 3: Annual Debt Service = Col 2 x 0.06415	Column 4: Additional Annual O&M	Column 5: Total Annual Cost = Col 3 + Col 4	Column 6: Quarterly User Charge = Col 5/293,760
Project 1: Pump Stations 5 and 14 Upgrades	$51,304,000	$3,291,152	$745,000	$4,036,152	$13.69

4.6 IMPLEMETABILITY

The City Commission has the sole legal authority to implement the Project Plan. A copy of the resolution is provided in Appendix F.

The City's Department of Public Services maintains a full-time engineering staff and will implement the selected alternative with in-house engineering staff and assistance from engineering consultants. The City has the managerial capability and financial means to implement the selective alternatives.

5.0 ENVIRONMENTAL AND PUBLIC HEALTH IMPACTS

The anticipated environmental impacts resulting from the construction of the selected alternative include beneficial and adverse, short-term and long-term, and irreversible and irretrievable impacts.

5.1 DIRECT IMPACTS

5.1.1 Construction/Operational Impacts

Construction of the proposed facilities will be coordinated and sequenced to minimize disruptions to residential and natural areas.

The following impacts are anticipated:

- Tree removal: Tree removal will be needed for the new treatment facilities at WPS 5.
- Traffic patterns: Traffic may need to be stopped or redirected in project areas.
- Construction chemicals, dust, air emissions, and noise: Use of construction chemicals will follow safety procedures. Water will be used for dust control. Well maintained equipment will be used to minimize air emissions. Construction will occur during daylight on work weekdays to reduce noise unless significant traffic changes are required. If night work is necessary, proper permitting will be acquired.
- Groundwater/dewatering impacts and proximity to wetlands: Proper permitting will be acquired for dewatering and work near wetlands.
- Soil erosion: Soil erosion prevention will be implemented during excavation activities and the project area will be revegetated shortly after construction completion.

5.1.2 Social/Economic Impact

Short-term social and economic impacts may occur during the construction phase. Increased construction traffic may occur near the proposed project and reduced traffic capacity may create longer travel times. Most of the project is in residential or undeveloped areas, so reduced commercial activity to businesses within the project area is expected to be limited. The local economy may be stimulated for contractors and suppliers of the materials, labor, and equipment necessary to construct the project.

Increased user costs are a long-term negative impact.

5.2 INDIRECT IMPACTS

5.2.1 Changes in Development and the Associated Transportation Changes

There are no changes anticipated to development or transportation upon completion of the project. There may be temporary traffic disruptions during construction that will be managed with traffic control.

5.2.2 Changes in Land Use

Changes to land use are anticipated around PS 5. There will be tree removal to place the water treatment plant. The ground surface will be restored to existing conditions as much as possible with the new infrastructure.

5.2.3 Changes in Air or Water Quality due to Facilitated Development

There are no anticipated negative impacts to air or water quality. Upon completion of the project, water quality will be improved due to the additional treatment of iron and PFAS removal at WPS 5 and 14.

5.2.4 Changes to the Natural Setting or Sensitive Features Resulting from Secondary Growth

There are no anticipated changes to the natural setting or sensitive features resulting from secondary growth. Tree removal and ground disturbance activities will be scheduled during hibernation periods to avoid negative impacts to sensitive animals and plants.

5.2.5 Impacts of Community Aesthetics

The proposed treatment facility at WPS 5 may affect community aesthetics since it is undeveloped land with trees near a residential area. Any concerns regarding the impact on community aesthetics will be addressed during the public comment period.

5.2.6 Impacts on Cultural, Human, Social, and Economic Resources

The project will improve water quality for residents. Beneficial impacts include the creation of construction and equipment manufacturing related jobs, and local contractors will have an equal opportunity to bid on the construction contracts.

5.3 CUMULATIVE IMPACTS

5.3.1 Siltation

Siltation may occur during the construction phase of the project. Proper soil erosion and sedimentation control practices will be followed to reduce the impacts of siltation on surrounding areas.

5.3.2 Development

The project will not cause an increase in development. It is necessary to improve the performance of the existing system.

5.3.3 Multiple Projects

Construction will be completed with specified staging plans and seasonally between April 1 and October 15 to avoid significant traffic delays/detours for multiple years. If multiple projects are planned in the same vicinity of the selected alternative, an implementation plan will be used to coordinate projects and minimize disruptions to people and the natural environment.

5.3.4 Fiscal Impacts

The proposed project is necessary to improve water quality and maintain compliance with Michigan drinking water standards. The lowest cost alternative was selected to minimize negative fiscal impacts.

6.0 MITIGATION

6.1 SHORT-TERM, CONSTRUCTION-RELATED MITIGATION

The short-term adverse impacts caused by construction will be minimal and mitigatable, relative to the resulting long-term beneficial impacts. Short-term impacts include traffic disruption, dust, and noise.

Environmental disruption will occur during construction. Guidelines will be established for cover vegetation removal, dust reduction, traffic control, and accident prevention. Once construction is completed those short-term effects will end and the area will be returned to the original conditions, as practical.

The soil erosion impact will be mitigated through the contractor's compliance with a soil erosion and sedimentation control program, as required in Part 91 of Michigan Act 451, P.A. of 1994. The use of soil erosion and sedimentation controls, such as straw bales, sedimentation basins, and silt fence, will protect nearby waterways and local stormwater facilities.

Floodplain and wetland fill will require a compensating cut if the fill exceeds thresholds in Part 31 or Part 303 regulations, respectively. No impacts are expected to floodplains, but wetlands may be affected. Disturbance to wetlands will be minimized by limiting construction activities near wetlands as much as possible.

Impacts to threatened and endangered species will be minimized by removing trees and vegetation during inactive periods (October 1 to March 31). Design and construction will follow requirements for the protection of rare species.

Construction equipment will be maintained in good condition to decrease noise. The City's noise ordinance will limit construction times to avoid disturbing surrounding residential areas during evenings and weekends. Access roads will be swept to avoid tracking dirt onto public roads.

6.2 MITIGATION OF LONG TERM AND INDIRECT IMPACTS

No long-term negative impacts are anticipated. The long-term positive impacts include improved water quality.

7.0 PUBLIC PARTICIPATION

The City welcomes public participation in the planning process for transparency, to garner support for the project from the citizens, and accept comments on the Project Plan.

7.1 PUBLIC MEETING

The public meeting was held April 23, 2024, to review the work associated with the proposed Project Plan, including estimated user costs, and to receive comments and views of interested persons. A summary of the public meeting and attendance list is included in Appendix E.

7.1.1 Advertisement

A legal notice of the availability of this Project Plan for review to the public was placed online at the City's website for review by the public by April 12, 2024. In addition, copies were sent to the EGLE Water Infrastructure Financing Section and District Engineer for review.

7.1.2 Public Meeting Summary

A summary of the meeting presentation, public comments, attendees, and a final Project Plan was provided to the EGLE project manager for review.

The public meeting agenda covered the drinking water system problems targeted in the Project Plan, possible alternatives to each improvement, anticipated user costs and financing, and potential community impacts and mitigation.

7.1.3 Comments Received and Answered

No comments were received from the public.

7.2 ADOPTION OF PROJECT PLAN

The City Commission adopted the Project Plan on May 20, 2024. The signed Resolution of Adoption is included in Appendix F.

APPENDIX A: CITY OF KALAMAZOO HISTORICAL SITES

March 6, 2024
Match-E-Be-Nash-Shee-Wish Band of Pottawatomi Indians
2872 Mission Drive
Shelbyville, MI 49344
lakota.hobia@glt-nsn.gov
kaila.akina@glt-nsn.gov
shawn.mckenney@glt-nsn.gov

RE: **Notice and Opportunity to Comment**
City of Kalamazoo Water Main Installation

Lakota/Kaila/Shawn:

On behalf of the City of Kalamazoo, we are submitting the information noted below for the City of Kalamazoo Water Main Project for which we are completing a Section 106 review. This is required as part of the environmental review process associated with a State of Michigan Drinking Water State Revolving Fund (DWSRF) project. The City will be using the DWSRF funds to install water main in Kalamazoo Township.

We are proposing to install water main within Sections 11 and 14 in Township 2 South, Range 11 West. The work will include trenching for water main within the right of way. The project will involve disturbance to the surface within the right of way. A project map is attached.

We would appreciate your response within 30 days of this request, so that we might include the correspondence with the environmental application submittal and have time to respond to any questions you might have.

We appreciate your time to review this matter. If you need any additional information to complete your review, please feel free to contact me at (517) 316-3936, lauryn.roberts@tetratech.com.

Sincerely,

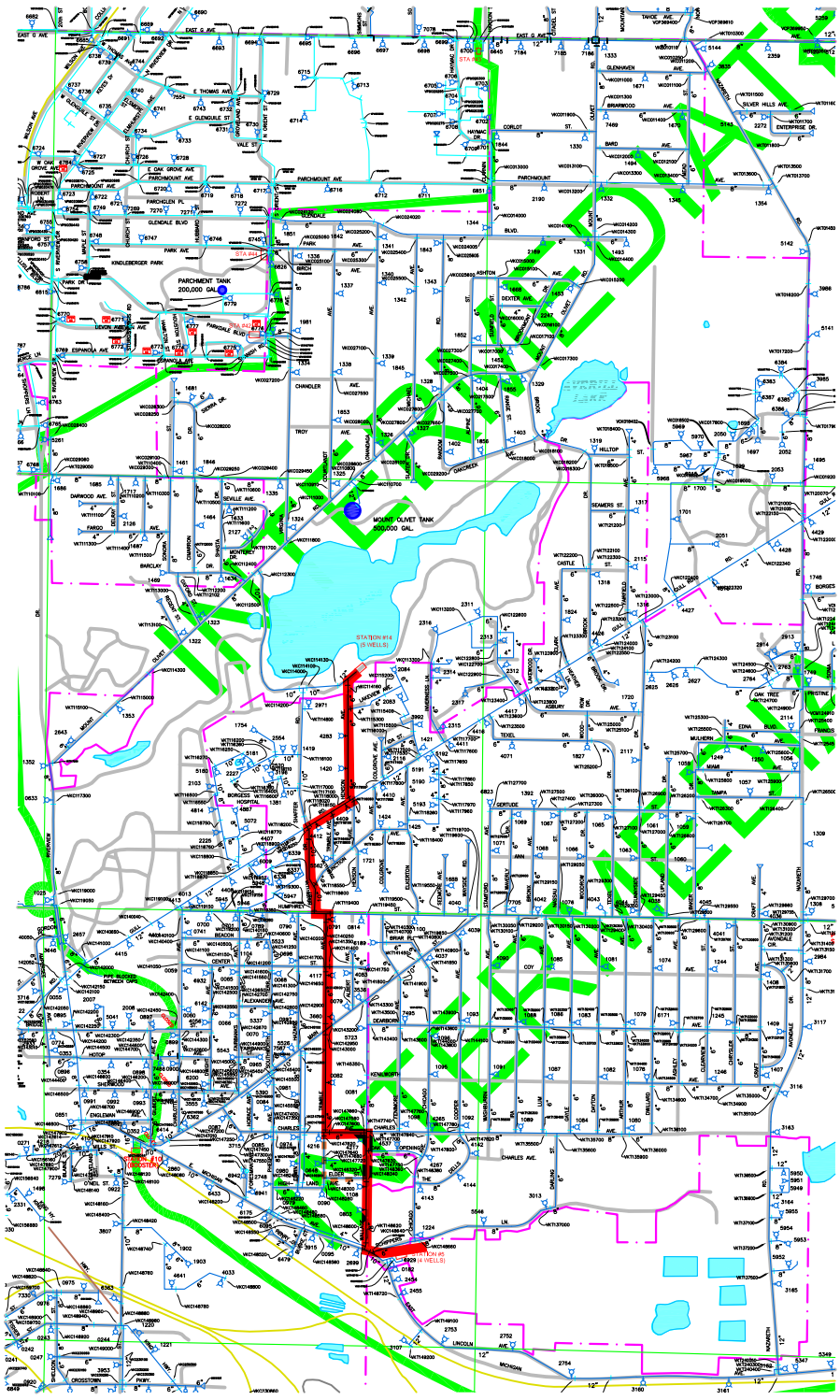
Tetra Tech

Lauryn Roberts

Enclosure: Project Location Map

Tetra Tech
3497 East Lansing, MI 48823
Tel +1-517-316-3930 | tetratech.com

CITY OF KALAMAZOO
WATER VALVES 1:2200
1/10/24



Roberts, Lauryn

From: J Ryan Duddleson <ryan@orbisec.com>
Sent: Thursday, April 11, 2024 9:43 AM
To: Brian Vilmont; Roberts, Lauryn; Cooperwasser, Victor
Subject: Fwd: Confirmation - Michigan SHPO Section 106 Consultation

⚠ **CAUTION:** This email originated from an external sender. Verify the source before opening links or attachments. ⚠

Hi everyone,

See the submission confirmation from MSHPO below for the Kalamazoo Station 5 and 14 DWSRF project. We recommended no change to the determination and no further work.

Ryan

---------- Forwarded message ---------
From: **Smartsheet Forms** <forms@app.smartsheet.com>
Date: Thu, Apr 11, 2024 at 9:40 AM
Subject: Confirmation - Michigan SHPO Section 106 Consultation
To: <rduddleson@orbisec.com>

Thank you for submitting your additional materials for Section 106 consultation with the Michigan State Historic Preservation Office. A copy is included below for your records.

Michigan SHPO Section 106 Consultation

Project ER Number	ER23-617
Project Name	City of Kalamazoo Waterline Improvement, FY 2024
Project County	Kalamazoo
Project Municipal Unit	Kalamazoo
Your Name and Agency	J Ryan Duddleson, Orbis Environmental Consulting
Your Email Address	rduddleson@orbisec.com

File Attachments

20240409_Cultural_Dekstop_Kalamazoo_Water_System_ER23-617.pdf (10533k)

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J Ryan Duddleson, M.A.
Senior Archaeologist

Phone (574) 635-1338
Cell (574) 303-7512
Address P.O. Box 10235, South Bend, Indiana 46680
Email rduddleson@orbisec.com
www.orbisec.com

APPLICATION FOR SHPO SECTION 106 CONSULTATION

For areas to be constructed FY2024

Submit one application for each project for which comment is requested. Consult the *Instructions for the Application for SHPO Section 106 Consultation Form* when completing this application.

Mail form, all attachments, and check list to: Michigan State Historic Preservation Office, 300 North Washington Square, Lansing, MI 48913

I. GENERAL INFORMATION

☒ New submittal

☐ More information relating to SHPO ER# SHPO Project #

☐ Submitted under a Programmatic Agreement (PA)

PA Name/Date: PA name/date, if applicable

a. **Project Name:** Kalamazoo Waterline Improvement
b. **Project Municipality**: City of Kalamazoo
c. **Project Address** (*if applicable*): Multiple
d. **County:** Kalamazoo

II. FEDERAL AGENCY INVOLVEMENT AND RESPONSE CONTACT INFORMATION

a. **Federal Agency:** Michigan Department of Environment, Great Lakes, and Energy (EGLE)
Contact Name: Jonathan M. Berman, State Revolving Fund Compliance Specialist
Contact Address: P.O. Box 30457 **City:** Lansing **State:** MI **Zip:** 48909-7957
Email: BermanJ@Michigan.gov
Specify the federal agency involvement in the project:
State Revolving Fund (EPA project for which EPA has delegated to EGLE for compliance)

b. **If HUD is the Federal Agency: 24 CFR Part 50 ☐ or Part 58 ☐**
Responsible Entity (RE): Name of the entity that is acting as the Responsible Entity
Contact Name: RE Contact name
Contact Address: RE mailing address **City:** RE city **State:** RE State **Zip:** RE zip code
RE Email: RE contact's email **Phone:** RE contact's phone #

c. **State Agency Contact (*if applicable*):** Michigan Department of Environment, Great Lakes, and Energy
Contact Name: Valorie White
Contact Address: PO Box 30457 **City:** Lansing **State:** MI **Zip:** 48909-7957
Email: WhiteV1@Michigan.gov **Phone:** 517-599-5879

d. **Applicant (if different than federal agency):** City of Kalamazoo
Contact Name: Anna Crandall, P.E.
Contact Address: 415 Stockbridge Ave. **City:** Kalamazoo **State:** MI **Zip:** 49001
Email: crandalla@kalamazoocity.org **Phone:** 269-337-8055

e. **Consulting Firm (if applicable):** Prein&Newhof
Contact Name: Brian Vilmont
Contact Address: 3355 Evergreen Drive NE **City:** Grand Rapids **State:** MI **Zip**: 49525
Email: bvilmont@preinnewhof.com Phone: 616-364-8491

III. PROJECT INFORMATION

a. **Project Location and Area of Potential Effect (APE)**

i. **Maps.** Please indicate all maps that will be submitted as attachments to this form.

☒Street map, clearly displaying the direct and indirect APE boundaries
☐Site map
☒USGS topographic map Name(s) of topo map(s): Kalamazoo, MI and Schoolcraft, MI
☒Aerial map
☐Map of photographs
☐Other: Identify type(s) of map(s)

ii. **Site Photographs**

iii. **Describe the APE:**

The APE for direct effects includes the construction limits within the selected streets in the city. The construction activities will be limited replacing existing waterlines in roadways. The waterlines extending to individual structures will be installed in the same place as the existing waterlines, without excavating trenches.

The APE for indirect effects includes the area immediately adjacent to the construction limits and includes temporary visual and noise effects from the replacement.

iv. **Describe the steps taken to define the boundaries of the APE:**
The APE for direct effects was defined by the extent of construction activities. The APE for indirect effects was defined as the extent of temporary visual and noise from construction activities because the proposed road improvement involves activities in the ground.

b. **Project Work Description**

Describe all work to be undertaken as part of the project:

Replacement of non-copper water service lines and replacement of existing water mains that heave reached the end of useful service life.

IV. IDENTIFICATION OF HISTORIC PROPERTIES

a. **Scope of Effort Applied**

i. **List sources consulted for information on historic properties in the project area** (including but not limited to SHPO office and/or other locations of inventory data).

MSHPO Records, Historic atlas maps

ii. Provide documentation of previously identified sites as attachments.
iii. **Provide a map** showing the relationship between the previously identified properties and sites, your project footprint and project APE.
iv. Have you reviewed existing site information at the SHPO: ☒Yes ☐ No
v. Have you reviewed information from non-SHPO sources: ☒Yes ☐ No

b. **Identification Results**

i. **Above-ground Properties**
A. Attach the appropriate Michigan SHPO Architectural Identification Form for each resource or site 50 years of age or older in the APE. Refer to the *Instructions for the Application for SHPO Section 106 Consultation Form* for guidance on this.
B. **Provide the name and qualifications of the person who made recommendations of eligibility for the above-ground identification forms.**

Name James L. Ingermann Heimlich **Agency/Consulting Firm:** Orbis Environmental Consulting

Is the individual a 36CFR Part 61 Qualified Historian or Architectural Historian ☒ Yes ☐ No

Are their credentials currently on file with the SHPO? ☒ Yes ☐ No

If NO attach this individual's qualifications form and resume.

ii. **Archaeology** (complete this section if the project involves temporary or permanent ground disturbance)

Submit the following information using attachments, as necessary.

A. **Attach Archaeological Sensitivity Map.**
B. **Summary of previously reported archaeological sites and surveys:**

See attached cultural resources desktop review

C. **Town/Range/Section or Private Claim numbers:** T02S R11W Sec 10, 15, 21, 22, 25, 27, 28, 29, 32, 33, and 36

D. **Width(s), length(s), and depth(s) of proposed ground disturbance(s):** Water Service work may disturb one 10'x10' x 6'deep area at the connection to the existing water main. Water main replacement may disturb a 10'wide by 6' deep excavation trench along the length of the water main.
E. **Will work potentially impact previously undisturbed soils?** ☐ Yes ☒ No

***If YES,* summarize new ground disturbance:**
Summary of new ground disturbance
F. **Summarize past and present land use:**

The project area contains existing waterlines slated for replacement.

G. **Potential to adversely affect significant archaeological resources**:

☒ Low ☐ Moderate ☐ High

For moderate and high potential, is fieldwork recommended? ☐ Yes ☐ No

Briefly justify the recommendation:

Justification for recommendation of fieldwork

H. **Has fieldwork already been conducted?** ☐ Yes ☒ No

If YES:
☐ Previously surveyed; refer to A. and B. above.
☐ Newly surveyed; attach report copies and provide full report reference here:
Full report reference

I. **Provide the name and qualifications of the person who provided the information for the Archaeology section:**

Name: J Ryan Duddleson **Agency/Firm:** Orbis Environmental Consulting
Is the person a 36CFR Part 61 Qualified Archaeologist? ☒ Yes ☐ No
Are their credentials currently on file with the SHPO? ☒ Yes ☐ No
If NO, attach this individual's qualifications form and resume.

Archaeological site locations are legally protected.

This application may not be made public without first redacting sensitive archaeological information.

V. IDENTIFICATION OF CONSULTING PARTIES

a. **Provide a list of *all* consulting parties,** including Native American tribes, local governments, applicants for federal assistance/permits/licenses, parties with a demonstrated interest in the undertaking, and public comment:

Prein& Newhof

b. **Provide a summary of consultation with consultation parties:**

Prein&Newhof provides water main design and construction document preparation for the project.

c. **Provide summaries of public comment and the method by which that comment was sought:**

Two public meetings and a noticed Public Hearing were held to receive public comment and provide presentation of all proposed project activities.

VI. DETERMINATION OF EFFECT

Guidance for applying the Criteria of Adverse Effect can be found in *the Instructions for the Application for SHPO Section 106 Consultation Form*.

a. **Basis for determination of effect**:

The records on file at the MSHPO show two archaeological sites within one mile of the project. Site 20KZ275 is an isolated artifact. The other sites (20KZ17/KZ26) are likely associated with a significant precontact occupation in Kalamazoo, however, this site has not been field verified and is in a heavily developed area in Kalamazoo. The project is unlikely to encounter intact archaeological deposits because of this substantial development.

The records list hundreds of historic structures and over twenty historic districts in Kalamazoo, including one historic district adjacent to one of the project segments - the Vine Area Historic District. While the cultural context shows extensive occupation of the region in and around Kalamazoo from precontact through historic periods, the proposed project is unlikely to affect significant intact archaeological resources or historic structures because project activities will be limited to replacing existing waterlines in roadways. The waterlines extending to individual structures will be installed in the same place as the existing waterlines, without excavating trenches (Figure 6). The project is adjacent to the NRHP listed Vine Area Historic District. Recent images show that historic structures are present, but the streets are modern asphalt paved.

Given that excavation is limited to replacing existing waterlines in the existing road, project activities remain consistent with the current use of the area and the project is unlikely to alter the significant aspects of this district that make it eligible for the NRHP. We recommend that no further work is necessary and determination of "No Historic Properties Affected" or "No Adverse Effect" is appropriate because the project is unlikely to affect intact archaeological deposits or significant historic structures or districts. However, if project plans change, additional work may be necessary.

b. **Determination of effect**

☒ **No historic properties will be affected**

☐ **Historic properties will be affected** and the project will (check one):

☐ have **No Adverse Effect** on historic properties within the APE.

☐ have an **Adverse Effect** on one or more historic properties in the APE and the federal agency, or federally authorized representative, will consult with the SHPO and other parties to resolve the adverse effect under 800.6.

☐ **More Information Needed:** We are initiating early consultation. A determination of effect will be submitted to the SHPO at a later date, pending results of survey.

Federally Authorized Signature: Jonathan M. Berman Date: 04/10/2023

Type or Print Name: Jonathan M. Berman

Title: State Revolving Fund Compliance Specialist

ATTACHMENT CHECKLIST

Identify any materials submitted as attachments to the form:

☐ Additional federal, state, local government, applicant, consultant contacts

☒ Maps of project location

Number of maps attached: 18

☒ Site Photographs – select photos

☒Map of photographs

☐ Plans and specifications

☒ Other information pertinent to the work description: Address list

☐ Documentation of previously identified historic properties

☐ Architectural Properties Identification Forms

☒ Map showing the relationship between the previously identified properties, your project footprint, and project APE

☐ Above-ground qualified person's qualification form and resume

☒ Archaeological sensitivity map

☐ Survey report

☐ Archaeologist qualifications and resume

☐ Other: Cultural Resources Destkop Review



J Ryan Duddleson <ryan@orbisec.com>

Confirmation - Michigan State Historic Preservation Office Section 106 Consultation

1 message

Smartsheet Forms <forms@app.smartsheet.com> Mon, Apr 10, 2023 at 10:25 AM
To: rduddleson@orbisec.com

Thank you for submitting your request for consultation under Section 106 of the National Historic Preservation Act of 1966, as amended. A copy is included below for your records.

If you have concerns about your submission or were not able to attach all of your documents, please contact Scott Slagor at SlagorS2@Michigan.gov.

Michigan State Historic Preservation Office Section 106 Consultation

Project Name:	Kalamazoo Waterline Development
Project Street Address:	Multiple
Project Municipal Unit:	City of Kalamazoo
Project County:	Kalamazoo
Federal Agency:	EGLE
Federal Agency Contact Name:	Jonathan M. Berman
Federal Agency Mailing Address (street, city, state, zip code):	PO Box 30457 Lansing, MI 48909-7957
Consultant/Applicant Name	Anna Crandall, P.E.
Consultant/Applicant Agency/Firm:	City of Kalamazoo
Consultant/Applicant Mailing Address:	415 Stockbridge Ave. Kalamazoo, MI 49001
Consultant/Applicant Phone Number:	269-337-8055
Consultant/Applicant Email Address:	crandalla@kalamazoocity.org

File Attachments

0_PN_Kalamazoo_Waterline_2024_Section 106 Application edited signed.pdf	(422k)
20230331_PN_Kalamazoo Water System 2024.pdf	(6977k)

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APPLICATION FOR SHPO SECTION 106 CONSULTATION

For areas to be constructed
FY2025-FY2028

Submit one application for each project for which comment is requested. Consult the *Instructions for the Application for SHPO Section 106 Consultation Form* when completing this application.

Mail form, all attachments, and check list to: Michigan State Historic Preservation Office, 300 North Washington Square, Lansing, MI 48913

I. GENERAL INFORMATION

☒ New submittal

☐ More information relating to SHPO ER# SHPO Project #

☐ Submitted under a Programmatic Agreement (PA)

PA Name/Date: PA name/date, if applicable

a. **Project Name:** Kalamazoo Waterline Improvement
b. **Project Municipality**: City of Kalamazoo
c. **Project Address** (*if applicable*): Multiple
d. **County:** Kalamazoo

II. FEDERAL AGENCY INVOLVEMENT AND RESPONSE CONTACT INFORMATION

a. **Federal Agency:** Michigan Department of Environment, Great Lakes, and Energy (EGLE)
Contact Name: Jonathan M. Berman, State Revolving Fund Compliance Specialist
Contact Address: P.O. Box 30457 **City:** Lansing **State:** MI **Zip:** 48909-7957
Email: BermanJ@Michigan.gov
Specify the federal agency involvement in the project:
State Revolving Fund (EPA project for which EPA has delegated to EGLE for compliance)

b. **If HUD is the Federal Agency: 24 CFR Part 50 ☐ or Part 58 ☐**
Responsible Entity (RE): Name of the entity that is acting as the Responsible Entity
Contact Name: RE Contact name
Contact Address: RE mailing address **City:** RE city **State:** RE State **Zip:** RE zip code
RE Email: RE contact's email **Phone:** RE contact's phone #

c. **State Agency Contact (*if applicable*):** Michigan Department of Environment, Great Lakes, and Energy
Contact Name: Valorie White
Contact Address: PO Box 30457 **City:** Lansing **State:** MI **Zip:** 48909-7957
Email: WhiteV1@Michigan.gov **Phone:** 517-599-5879

d. **Applicant (if different than federal agency):** City of Kalamazoo
Contact Name: Anna Crandall, P.E.
Contact Address: 415 Stockbridge Ave. **City:** Kalamazoo **State:** MI **Zip:** 49001
Email: crandalla@kalamazoocity.org **Phone:** 269-337-8055

e. **Consulting Firm (if applicable):** Prein&Newhof
Contact Name: Brian Vilmont
Contact Address: 3355 Evergreen Drive NE **City:** Grand Rapids **State:** MI **Zip**: 49525
Email: bvilmont@preinnewhof.com Phone: 616-364-8491

III. PROJECT INFORMATION

a. **Project Location and Area of Potential Effect (APE)**

i. **Maps.** Please indicate all maps that will be submitted as attachments to this form.

☒Street map, clearly displaying the direct and indirect APE boundaries
☐Site map
☒USGS topographic map Name(s) of topo map(s): Kalamazoo, MI, Kalamazoo SW, and Portage, MI
☒Aerial map
☐Map of photographs
☒Other: Identify type(s) of map(s)

ii. **Site Photographs**

iii. **Describe the APE:**

The APE for direct effects includes the construction limits within the selected streets in the city. The construction activities will be limited replacing existing waterlines in roadways. The waterlines extending to individual structures will be installed in the same place as the existing waterlines, without excavating trenches.

The APE for indirect effects includes the area immediately adjacent to the construction limits and includes temporary visual and noise effects from the replacement.

iv. **Describe the steps taken to define the boundaries of the APE:**
The APE for direct effects was defined by the extent of construction activities. The APE for indirect effects was defined as the extent of temporary visual and noise from construction activities because the proposed road improvement involves activities in the ground.

b. **Project Work Description**

Describe all work to be undertaken as part of the project:

Replacement of non-copper water service lines and replacement of existing water mains that heave reached the end of useful service life.

IV. IDENTIFICATION OF HISTORIC PROPERTIES

a. **Scope of Effort Applied**

i. **List sources consulted for information on historic properties in the project area** (including but not limited to SHPO office and/or other locations of inventory data).

MSHPO Records, Historic atlas maps

ii. Provide documentation of previously identified sites as attachments.
iii. **Provide a map** showing the relationship between the previously identified properties and sites, your project footprint and project APE.
iv. Have you reviewed existing site information at the SHPO: ☒Yes ☐ No
v. Have you reviewed information from non-SHPO sources: ☒Yes ☐ No

b. **Identification Results**

i. **Above-ground Properties**
A. Attach the appropriate Michigan SHPO Architectural Identification Form for each resource or site 50 years of age or older in the APE. Refer to the *Instructions for the Application for SHPO Section 106 Consultation Form* for guidance on this.
B. **Provide the name and qualifications of the person who made recommendations of eligibility for the above-ground identification forms.**

Name James L. Ingermann Heimlich **Agency/Consulting Firm:** Orbis Environmental Consulting

Is the individual a 36CFR Part 61 Qualified Historian or Architectural Historian ☒ Yes ☐ No

Are their credentials currently on file with the SHPO? ☒ Yes ☐ No

If NO attach this individual's qualifications form and resume.

ii. **Archaeology** (complete this section if the project involves temporary or permanent ground disturbance)

Submit the following information using attachments, as necessary.

A. **Attach Archaeological Sensitivity Map.**
B. **Summary of previously reported archaeological sites and surveys:**

See attached cultural resources desktop review

C. **Town/Range/Section or Private Claim numbers:** T02S R11W Sec 15, 16, 17, 20, 23, 22, 27, 28, 29, 30, 31, 32, 33, 34, 35, and 36

D. **Width(s), length(s), and depth(s) of proposed ground disturbance(s):** Water Service work may disturb one 10'x10' x 6'deep area at the connection to the existing water main. Water main replacement may disturb a 10'wide by 6' deep excavation trench along the length of the water main.
E. **Will work potentially impact previously undisturbed soils?** ☐ Yes ☒ No

***If YES,* summarize new ground disturbance:**
Summary of new ground disturbance
F. **Summarize past and present land use:**

The project area contains existing waterlines slated for replacement.

G. **Potential to adversely affect significant archaeological resources**:

☒ Low ☐ Moderate ☐ High

For moderate and high potential, is fieldwork recommended? ☐ Yes ☐ No

Briefly justify the recommendation:

Justification for recommendation of fieldwork

H. **Has fieldwork already been conducted?** ☐ Yes ☒ No

If YES:
☐ Previously surveyed; refer to A. and B. above.
☐ Newly surveyed; attach report copies and provide full report reference here:
Full report reference

I. **Provide the name and qualifications of the person who provided the information for the Archaeology section:**

Name: J Ryan Duddleson **Agency/Firm:** Orbis Environmental Consulting
Is the person a 36CFR Part 61 Qualified Archaeologist? ☒ Yes ☐ No
Are their credentials currently on file with the SHPO? ☒ Yes ☐ No
If NO, attach this individual's qualifications form and resume.

Archaeological site locations are legally protected.

This application may not be made public without first redacting sensitive archaeological information.

V. IDENTIFICATION OF CONSULTING PARTIES

a. **Provide a list of *all* consulting parties,** including Native American tribes, local governments, applicants for federal assistance/permits/licenses, parties with a demonstrated interest in the undertaking, and public comment:

Prein& Newhof

b. **Provide a summary of consultation with consultation parties:**

Prein&Newhof provides water main design and construction document preparation for the project.

c. **Provide summaries of public comment and the method by which that comment was sought:**

Two public meetings and a noticed Public Hearing were held to receive public comment and provide presentation of all proposed project activities.

VI. DETERMINATION OF EFFECT

Guidance for applying the Criteria of Adverse Effect can be found in *the Instructions for the Application for SHPO Section 106 Consultation Form*.

a. **Basis for determination of effect**:

The records on file at the MSHPO show 21 historic districts and five archaeological sites occur in one or more portions of the Project Area.

Many of the known archaeological sites are associated with a significant precontact and postcontact occupation in Kalamazoo, however, these sites have not been field verified and are in heavily developed areas in Kalamazoo. The project is unlikely to encounter intact archaeological deposits because of this substantial development.

The records list hundreds of historic structures and many historic districts in Kalamazoo, including 21 historic districts that occur within at least one of the portions of the Project Area. Eleven of these historic districts are listed in the NHRP. Given that excavation is limited to replacing existing waterlines in the existing road, project activities remain consistent with the current use of the area and the project is unlikely to alter the significant aspects of the listed historic districts. Construction activities should not affect buildings within the eligible and unevaluated districts. Buildings within the ineligible district have already been significantly altered.

While the cultural context shows extensive occupation of the region in and around Kalamazoo from precontact through postcontact periods, the proposed project is unlikely to affect significant intact archaeological resources or historic structures because project activities will be limited to replacing existing waterlines in roadways. The waterlines extending to individual structures will be installed in the same place as the existing waterlines, without excavating trenches.

We recommend that no further work is necessary and determination of "No Adverse Effect" is appropriate because the project is unlikely to affect intact archaeological deposits or significant historic structures or districts. However, if project plans change, additional work may be necessary.

b. **Determination of effect**

☐ **No historic properties will be affected**

☒ **Historic properties will be affected** and the project will (check one):

☒ have **No Adverse Effect** on historic properties within the APE.

☐ have an **Adverse Effect** on one or more historic properties in the APE and the federal agency, or federally authorized representative, will consult with the SHPO and other parties to resolve the adverse effect under 800.6.

☐ **More Information Needed:** We are initiating early consultation. A determination of effect will be submitted to the SHPO at a later date, pending results of survey.

Federally Authorized Signature: Jonathan M. Berman Date: 04/10/2023

Type or Print Name: Jonathan M. Berman

Title: State Revolving Fund Compliance Specialist

ATTACHMENT CHECKLIST

Identify any materials submitted as attachments to the form:

☐ Additional federal, state, local government, applicant, consultant contacts

☒ Maps of project location

Number of maps attached: 14

☐ Site Photographs – select photos

☐Map of photographs

☐ Plans and specifications

☐ Other information pertinent to the work description: Identify the type of materials attached

☐ Documentation of previously identified historic properties

☐ Architectural Properties Identification Forms

☒ Map showing the relationship between the previously identified properties, your project footprint, and project APE

☐ Above-ground qualified person's qualification form and resume

☒ Archaeological sensitivity map

☐ Survey report

☐ Archaeologist qualifications and resume

☐ Other: Cultural Resources Desktop Review



J Ryan Duddleson <ryan@orbisec.com>

Confirmation - Michigan State Historic Preservation Office Section 106 Consultation

1 message

Smartsheet Forms <forms@app.smartsheet.com> Mon, Apr 10, 2023 at 10:42 AM
To: rduddleson@orbisec.com

Thank you for submitting your request for consultation under Section 106 of the National Historic Preservation Act of 1966, as amended. A copy is included below for your records.

If you have concerns about your submission or were not able to attach all of your documents, please contact Scott Slagor at SlagorS2@Michigan.gov.

Michigan State Historic Preservation Office Section 106 Consultation

Project Name:	Kalamazoo Waterline Improvement
Project Street Address:	FY 2025_2028 on DWRF Construction Year Map
Project Municipal Unit:	City of Kalamazoo
Project County:	Kalamazoo
Federal Agency:	EGLE
Federal Agency Contact Name:	Jonathan M. Berman
Federal Agency Mailing Address (street, city, state, zip code):	PO Box 30457 Lansing, MI 48909-7957
Consultant/Applicant Name	Anna Crandall, P.E.
Consultant/Applicant Agency/Firm:	City of Kalamazoo
Consultant/Applicant Mailing Address:	415 Stockbridge Ave. Kalamazoo, MI 49001
Consultant/Applicant Phone Number:	269-337-8055
Consultant/Applicant Email Address:	crandalla@kalamazoocity.org

File Attachments

0_PN_Kalamazoo_Waterline_2025_2028_Section 106 Application edited signed.pdf (425k)

20230410_PN_Kalamazoo Water System 2025_ 2028.pdf (9170k)

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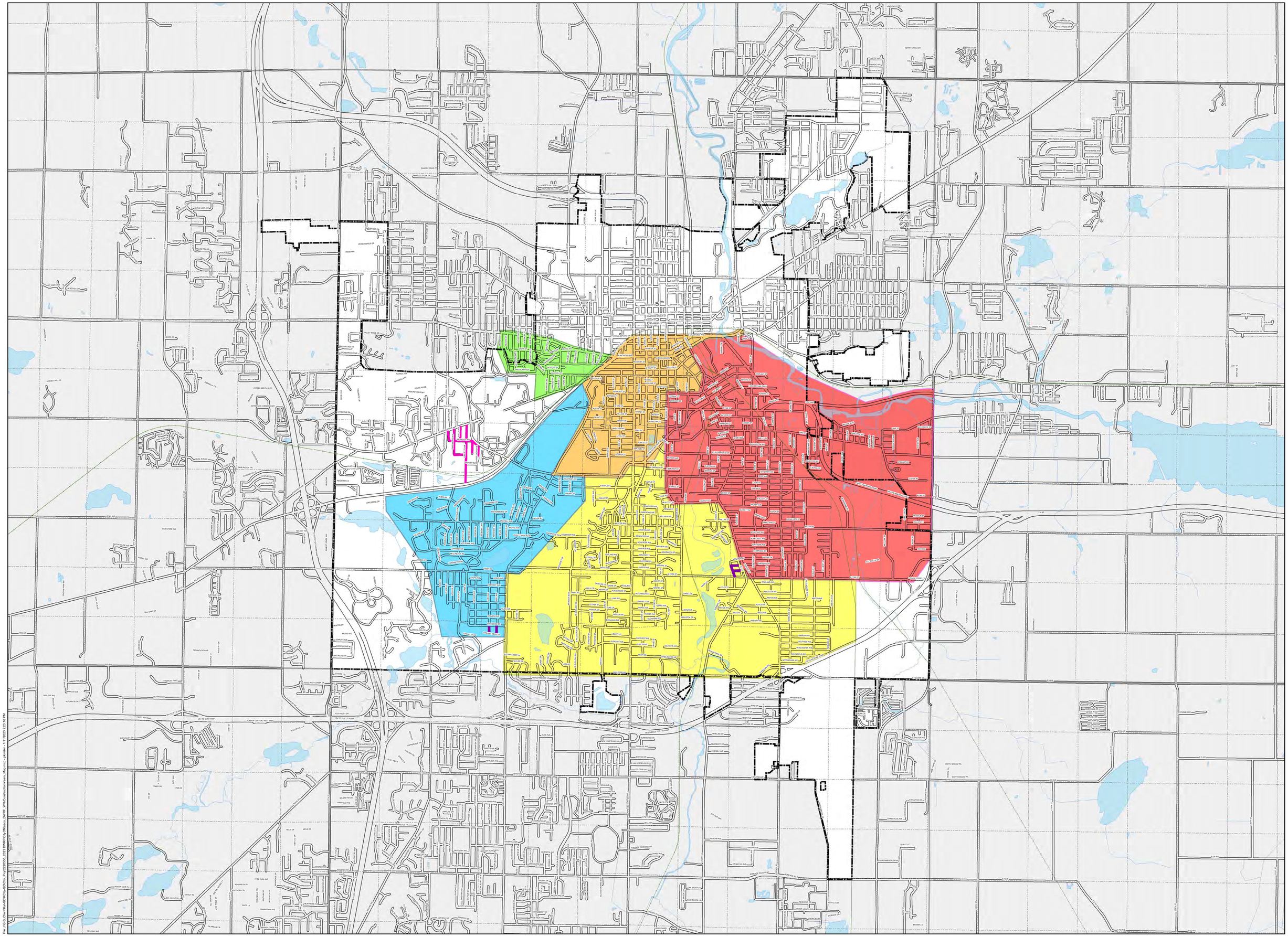


LEGEND

DWRF Construction Years

- FY 2024
- FY 2025
- FY 2026
- FY 2027
- FY 2028
- Lining Project
- Various Streets Project (2024)
- City of Kalamazoo Limits

0 1,000 2,000 4,000 6,000 Feet

Scale: 1" = 2,000'

City of Kalamazoo

Kalamazoo County, Michigan

Water Distribution System

DWRF Construction Year Map

Prein&Newhof

January 2023

2220555

APPENDIX B: SOILS MAP

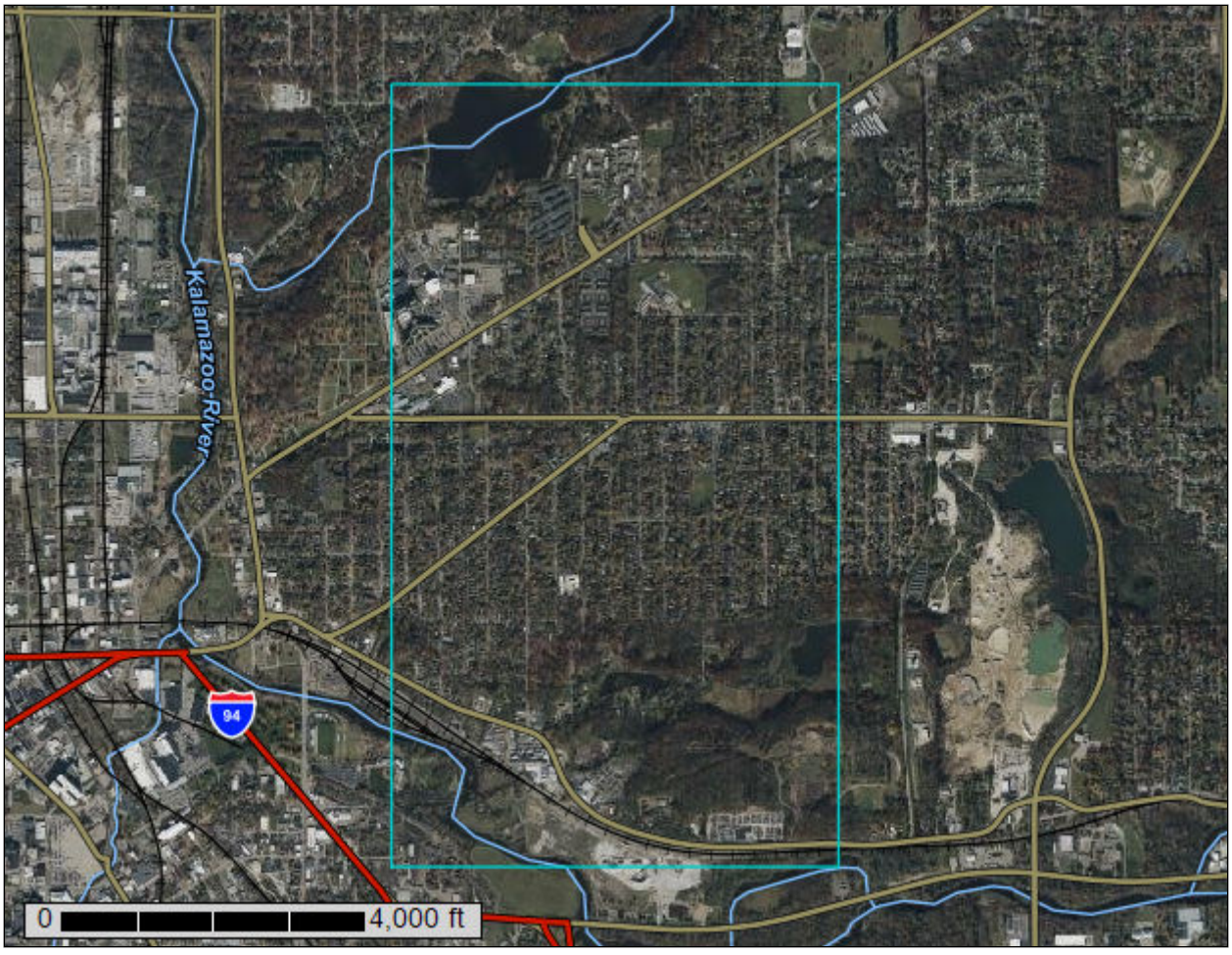
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Kalamazoo County, Michigan



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

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OsC—Oshtemo sandy loam, 6 to 12 percent slopes.....20
OsD—Oshtemo sandy loam, 12 to 18 percent slopes.....22
Ua—Udipsamments, level to steep.....24
Ub—Urban land.....24
Ug—Urban land-Glendora complex.....25
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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

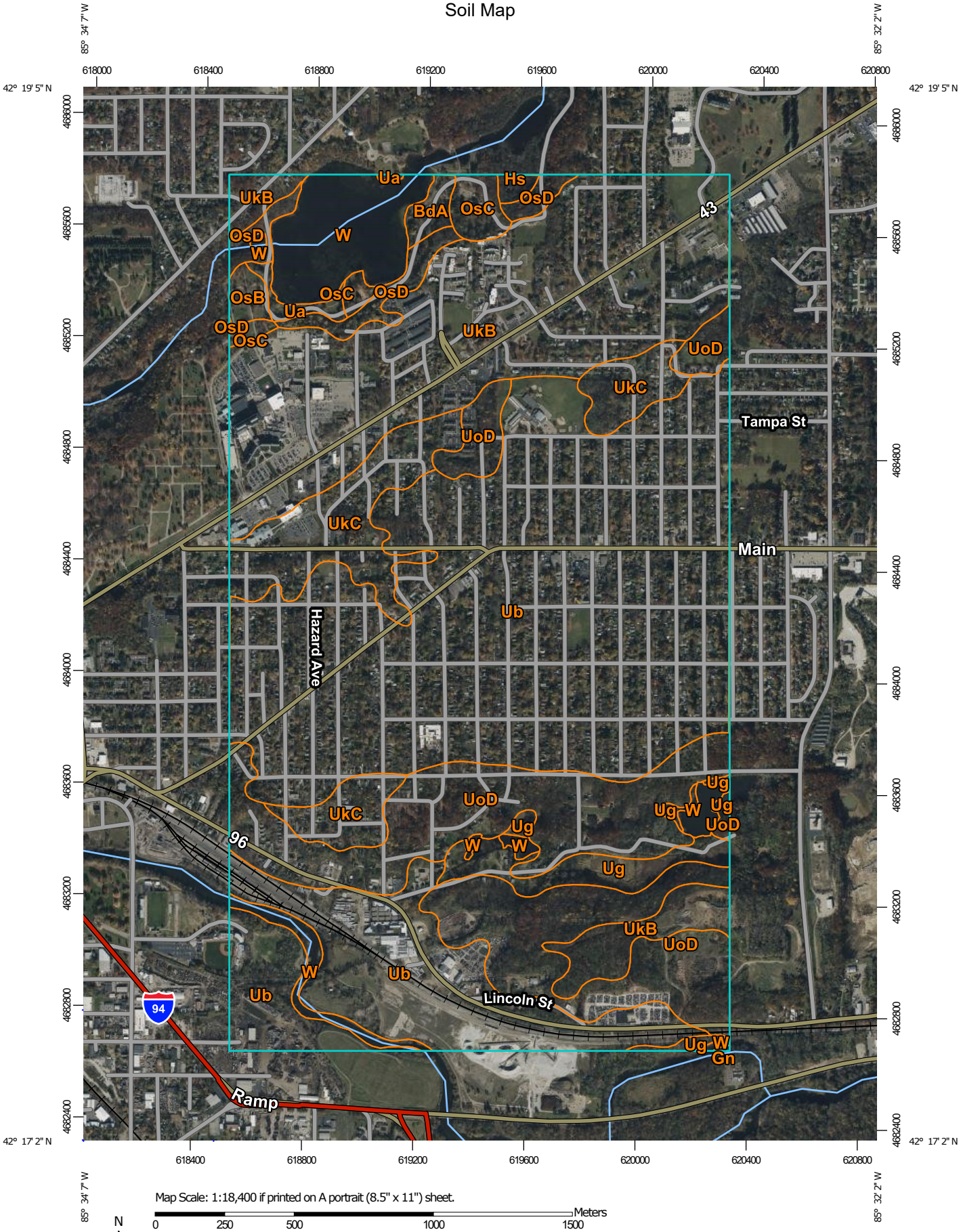
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


85° 34' 7" W
85° 32' 2" W
42° 19' 5" N
42° 17' 2" N
618000
618400
618800
619200
619600
620000
620400
620800
4686000
4685600
4685200
4684800
4684400
4684000
4683600
4683200
4682800
4682400
Ua
Hs
UkB
BdA
OsC
OsD
W
OsB
Ua
UkB
UoD
UkC
Tampa St
UoD
UkC
Main
Hazard Ave
Ub
UoD
UkC
Ug
W
Ug
UoD
96
Ug
UkB
UoD
W
Ub
Ub
94
Lincoln St
Ug
W
Gn
Ramp
43
Map Scale: 1:18,400 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0
250
500
1000
1500
Feet
0
500
1000
2000
3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kalamazoo County, Michigan
Survey Area Data: Version 18, Aug 25, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 4, 2022—Nov 7, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BdA	Brady sandy loam, 0 to 3 percent slopes	6.8	0.5%
Gn	Glendora sandy loam	0.2	0.0%
Hs	Houghton and Sebewa soils, ponded	2.9	0.2%
OsB	Oshtemo sandy loam, 0 to 6 percent slopes	6.3	0.4%
OsC	Oshtemo sandy loam, 6 to 12 percent slopes	15.7	1.1%
OsD	Oshtemo sandy loam, 12 to 18 percent slopes	23.1	1.6%
Ua	Udipsamments, level to steep	5.8	0.4%
Ub	Urban land	622.6	44.4%
Ug	Urban land-Glendora complex	31.9	2.3%
UkB	Urban land-Kalamazoo complex, 0 to 6 percent slopes	295.7	21.1%
UkC	Urban land-Kalamazoo complex, 6 to 12 percent slopes	97.4	6.9%
UoD	Urban land-Oshtemo complex, 12 to 25 percent slopes	226.1	16.1%
W	Water	67.6	4.8%
Totals for Area of Interest		**1,402.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion

of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Kalamazoo County, Michigan

BdA—Brady sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 68n2
Elevation: 600 to 1,200 feet
Mean annual precipitation: 30 to 36 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 140 to 150 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Brady and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brady

Setting

Landform: Outwash plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy outwash

Typical profile

Ap - 0 to 12 inches: sandy loam
Bt - 12 to 24 inches: sandy loam
2BC - 24 to 56 inches: loamy sand
2C - 56 to 68 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Available water supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: F098XA011MI - Moist Loamy Drift Plains
Hydric soil rating: No

Minor Components

Bronson

Percent of map unit: 10 percent

Landform: Flats on outwash plains
Ecological site: F098XA011MI - Moist Loamy Drift Plains
Hydric soil rating: No

Gn—Glendora sandy loam

Map Unit Setting

National map unit symbol: 68nb
Elevation: 600 to 1,000 feet
Mean annual precipitation: 30 to 36 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 140 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Glendora and similar soils: 87 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glendora

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Typical profile

A - 0 to 10 inches: sandy loam
C - 10 to 60 inches: stratified sand to loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Ecological site: F098XA004MI - Wet Floodplains
Hydric soil rating: Yes

Minor Components

Sebewa
Percent of map unit: 5 percent
Landform: Depressions on outwash plains
Ecological site: F098XA012MI - Wet Loamy Depressions
Hydric soil rating: Yes

Adrian
Percent of map unit: 4 percent
Landform: Depressions on lake plains
Ecological site: F098XA006MI - Mucky Depressions
Hydric soil rating: Yes

Houghton
Percent of map unit: 4 percent
Landform: Depressions
Ecological site: F098XA006MI - Mucky Depressions
Hydric soil rating: Yes

Hs—Houghton and Sebewa soils, ponded

Map Unit Setting
National map unit symbol: 68nf
Elevation: 360 to 1,000 feet
Mean annual precipitation: 30 to 36 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 140 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition
Houghton and similar soils: 45 percent
Sebewa and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Houghton

Setting
Landform: Depressions, outwash plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Herbaceous organic material

Typical profile
Oa1 - 0 to 10 inches: muck
Oa2 - 10 to 60 inches: muck

Properties and qualities
Slope: 0 to 1 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 23.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: A/D
Ecological site: F098XA006MI - Mucky Depressions
Hydric soil rating: Yes

Description of Sebewa

Setting

Landform: Outwash plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy over sandy and gravelly outwash

Typical profile

Ap - 0 to 11 inches: loam
Btg - 11 to 23 inches: clay loam
2Cg - 23 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 25 percent
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F098XA012MI - Wet Loamy Depressions
Hydric soil rating: Yes

Minor Components

Glendora

Percent of map unit: 3 percent
Landform: Flood plains
Ecological site: F098XA004MI - Wet Floodplains

Hydric soil rating: Yes

Adrian

Percent of map unit: 3 percent
Landform: Depressions on lake plains
Ecological site: F098XA006MI - Mucky Depressions
Hydric soil rating: Yes

Edwards

Percent of map unit: 3 percent
Landform: Depressions on lakebeds
Ecological site: F098XA006MI - Mucky Depressions
Hydric soil rating: Yes

Granby

Percent of map unit: 3 percent
Landform: Depressions on lake plains
Ecological site: F098XA020MI - Wet Sandy Drift Depressions
Hydric soil rating: Yes

Gilford

Percent of map unit: 3 percent
Landform: Depressions on outwash plains
Ecological site: F098XA012MI - Wet Loamy Depressions
Hydric soil rating: Yes

OsB—Oshtemo sandy loam, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2v2cd
Elevation: 710 to 1,010 feet
Mean annual precipitation: 30 to 41 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 140 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Oshtemo and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oshtemo

Setting

Landform: Outwash plains, outwash terraces, moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Loamy drift over calcareous sandy and gravelly drift

Typical profile

Ap - 0 to 8 inches: sandy loam
E - 8 to 13 inches: sandy loam
Bt - 13 to 36 inches: sandy loam
E and Bt - 36 to 55 inches: loamy sand
2C - 55 to 80 inches: gravelly sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 34 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F098XA015MI - Dry Loamy Drift Plains
Hydric soil rating: No

Minor Components

Brady

Percent of map unit: 3 percent
Landform: Outwash terraces, outwash plains, moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F098XA011MI - Moist Loamy Drift Plains
Hydric soil rating: No

Bronson

Percent of map unit: 3 percent
Landform: Outwash terraces, outwash plains, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F098XA011MI - Moist Loamy Drift Plains
Hydric soil rating: No

Spinks

Percent of map unit: 3 percent
Landform: Outwash terraces, outwash plains, moraines
Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F098XA014MI - Dry Sandy Drift Plains
Hydric soil rating: No

Gilford

Percent of map unit: 1 percent
Landform: Outwash terraces, outwash plains, moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Ecological site: F098XA012MI - Wet Loamy Depressions
Hydric soil rating: Yes

OsC—Oshtemo sandy loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2v2cf
Elevation: 740 to 1,030 feet
Mean annual precipitation: 30 to 41 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Farmland of local importance

Map Unit Composition

Oshtemo and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oshtemo

Setting

Landform: Moraines, outwash plains, outwash terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Loamy drift over calcareous sandy and gravelly drift

Typical profile

Ap - 0 to 8 inches: sandy loam
E - 8 to 13 inches: sandy loam
Bt - 13 to 36 inches: sandy loam
E and Bt - 36 to 55 inches: loamy sand
2C - 55 to 80 inches: gravelly sand

Properties and qualities

Slope: 6 to 12 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 34 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F098XA015MI - Dry Loamy Drift Plains
Hydric soil rating: No

Minor Components

Bronson

Percent of map unit: 3 percent
Landform: Moraines, outwash terraces, outwash plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F098XA011MI - Moist Loamy Drift Plains
Hydric soil rating: No

Brady

Percent of map unit: 3 percent
Landform: Moraines, outwash terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F098XA011MI - Moist Loamy Drift Plains
Hydric soil rating: No

Spinks

Percent of map unit: 3 percent
Landform: Moraines, outwash plains, outwash terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Ecological site: F098XA014MI - Dry Sandy Drift Plains
Hydric soil rating: No

Gilford

Percent of map unit: 1 percent
Landform: Moraines, outwash terraces, outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope

Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Ecological site: F098XA012MI - Wet Loamy Depressions
Hydric soil rating: Yes

OsD—Oshtemo sandy loam, 12 to 18 percent slopes

Map Unit Setting

National map unit symbol: 2w64x
Elevation: 760 to 1,030 feet
Mean annual precipitation: 30 to 41 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 140 to 230 days
Farmland classification: Farmland of local importance

Map Unit Composition

Oshtemo and similar soils: 89 percent
Minor components: 11 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oshtemo

Setting

Landform: Outwash plains, moraines, outwash deltas
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Loamy drift over calcareous sandy and gravelly drift

Typical profile

A - 0 to 7 inches: sandy loam
E - 7 to 12 inches: sandy loam
Bt - 12 to 35 inches: sandy loam
E and Bt - 35 to 54 inches: loamy sand
2C - 54 to 80 inches: gravelly sand

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 34 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0

Available water supply, 0 to 60 inches: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F098XA022MI - Loamy Slopes
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Minor Components

Plainfield

Percent of map unit: 5 percent
Landform: Outwash plains, moraines
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F098XA021MI - Sandy Slopes
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Hillsdale

Percent of map unit: 2 percent
Landform: Moraines
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F098XA022MI - Loamy Slopes
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Spinks

Percent of map unit: 2 percent
Landform: Moraines, outwash plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F098XA021MI - Sandy Slopes
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Brady

Percent of map unit: 2 percent
Landform: Moraines, outwash plains, outwash deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Ecological site: F098XA011MI - Moist Loamy Drift Plains
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Ua—Udipsamments, level to steep

Map Unit Setting

National map unit symbol: 68p3
Elevation: 740 to 1,000 feet
Mean annual precipitation: 30 to 36 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 140 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Udipsamments and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udipsamments

Setting

Landform: Outwash plains
Landform position (three-dimensional): Side slope
Down-slope shape: Concave, linear
Across-slope shape: Convex, linear
Parent material: Sandy drift

Typical profile

H1 - 0 to 60 inches: sand

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Ecological site: F098XA014MI - Dry Sandy Drift Plains
Hydric soil rating: No

Ub—Urban land

Map Unit Setting

National map unit symbol: 68p4
Mean annual precipitation: 30 to 36 inches

Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 140 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Ug—Urban land-Glendora complex

Map Unit Setting
National map unit symbol: 68p5
Elevation: 600 to 1,000 feet
Mean annual precipitation: 30 to 36 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 140 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 50 percent
Glendora and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glendora

Setting
Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Typical profile
A - 0 to 10 inches: sandy loam
C - 10 to 60 inches: stratified sand to loamy sand

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D

Ecological site: F098XA004MI - Wet Floodplains
Hydric soil rating: Yes

Minor Components

Adrian
Percent of map unit: 5 percent
Landform: Depressions on lake plains
Ecological site: F098XA006MI - Mucky Depressions
Hydric soil rating: Yes

Sebewa
Percent of map unit: 5 percent
Landform: Depressions on lake plains, depressions on outwash plains
Ecological site: F098XA012MI - Wet Loamy Depressions
Hydric soil rating: Yes

Houghton
Percent of map unit: 5 percent
Landform: Depressions
Ecological site: F098XA006MI - Mucky Depressions
Hydric soil rating: Yes

UkB—Urban land-Kalamazoo complex, 0 to 6 percent slopes

Map Unit Setting
National map unit symbol: 2w5m5
Elevation: 770 to 970 feet
Mean annual precipitation: 30 to 41 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 65 percent
Kalamazoo and similar soils: 30 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Properties and qualities
Slope: 0 to 6 percent
Depth to restrictive feature: 0 inches to manufactured layer

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Kalamazoo

Setting

Landform: Outwash plains, outwash terraces
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, tread
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Loess-influenced loamy outwash over sandy and gravelly outwash

Typical profile

Ap - 0 to 10 inches: loam
Bt1 - 10 to 27 inches: sandy clay loam
Bt2 - 27 to 35 inches: sandy loam
2BC - 35 to 52 inches: loamy sand
2C - 52 to 80 inches: gravelly sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 22 percent
Maximum salinity: Nonsaline (0.1 to 0.3 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F098XA015MI - Dry Loamy Drift Plains
Hydric soil rating: No

Minor Components

Spinks

Percent of map unit: 2 percent
Landform: Outwash plains, outwash terraces
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, tread
Down-slope shape: Convex, linear
Across-slope shape: Linear
Ecological site: F098XA014MI - Dry Sandy Drift Plains
Hydric soil rating: No

Bronson

Percent of map unit: 2 percent

Landform: Outwash plains, outwash terraces
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F098XA011MI - Moist Loamy Drift Plains
Hydric soil rating: No

Sleeth

Percent of map unit: 1 percent
Landform: Outwash plains, outwash terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Linear
Ecological site: F098XA011MI - Moist Loamy Drift Plains
Hydric soil rating: No

UkC—Urban land-Kalamazoo complex, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 68p7
Elevation: 400 to 1,360 feet
Mean annual precipitation: 30 to 36 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 140 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 50 percent
Kalamazoo and similar soils: 45 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Outwash plains
Landform position (two-dimensional): Backslope

Description of Kalamazoo

Setting

Landform: Outwash plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy over sandy outwash

Typical profile

Ap - 0 to 11 inches: loam
Bt - 11 to 38 inches: clay loam
2B - 38 to 55 inches: loamy coarse sand
2C - 55 to 60 inches: gravelly sand

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F098XA015MI - Dry Loamy Drift Plains
Hydric soil rating: No

Minor Components

Coloma

Percent of map unit: 3 percent
Landform: Knolls on outwash plains
Ecological site: F098XA014MI - Dry Sandy Drift Plains
Hydric soil rating: No

Sleeth

Percent of map unit: 2 percent
Landform: Drainageways on outwash plains
Ecological site: F098XA011MI - Moist Loamy Drift Plains
Hydric soil rating: No

UoD—Urban land-Oshtemo complex, 12 to 25 percent slopes

Map Unit Setting

National map unit symbol: 68p8
Elevation: 580 to 1,360 feet
Mean annual precipitation: 30 to 36 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 140 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 58 percent
Oshtemo and similar soils: 25 percent
Minor components: 17 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Outwash plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Convex

Description of Oshtemo

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy outwash

Typical profile

Ap - 0 to 9 inches: sandy loam
Bt - 9 to 29 inches: sandy loam
B - 29 to 69 inches: sand

Properties and qualities

Slope: 12 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: F098XA022MI - Loamy Slopes
Hydric soil rating: No

Minor Components

Coloma

Percent of map unit: 9 percent
Landform: Ridges on outwash plains
Landform position (two-dimensional): Backslope
Ecological site: F098XA021MI - Sandy Slopes

Hydric soil rating: No

Plainfield

Percent of map unit: 8 percent
Landform: Flats on outwash plains
Ecological site: F098XA014MI - Dry Sandy Drift Plains
Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX C: MICHIGAN NATURAL FEATURES INVENTORY

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Kalamazoo County, Michigan



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Local office

Michigan Ecological Services Field Office

(517) 351-2555
(517) 351-1443

2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360

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Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Indiana Bat Myotis sodalis Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat Myotis septentrionalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat Perimyotis subflavus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS

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Whooping Crane Grus americana No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/758	EXPN

Reptiles

NAME	STATUS
Eastern Massasauga (=rattlesnake) Sistrurus catenatus Wherever found This species only needs to be considered if any of the following conditions apply: • For all Projects:Project is within Tier1 Habitat • For all projects:Project is within Tier2 Habitat • For all Projects: Project is within EMR Range No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2202	Threatened

Insects

NAME	STATUS
Mitchell's Satyr Butterfly Neonympha mitchellii mitchellii Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8062	Endangered
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

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Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models

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detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover Pluvialis dominica This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Dec 1 to Aug 31
Black-billed Cuckoo Coccyzus erythropthalmus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Bobolink Dolichonyx oryzivorus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Canada Warbler Cardellina canadensis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10

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Cerulean Warbler Dendroica cerulea — Breeds Apr 22 to Jul 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/2974

Chimney Swift Chaetura pelagica — Breeds Mar 15 to Aug 25

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Eastern Whip-poor-will Antrostomus vociferus — Breeds May 1 to Aug 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Golden Eagle Aquila chrysaetos — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Golden-winged Warbler Vermivora chrysoptera — Breeds May 1 to Jul 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8745

Henslow's Sparrow Ammodramus henslowii — Breeds May 1 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3941

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Lesser Yellowlegs Tringa flavipes This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Red-headed Woodpecker Melanerpes erythrocephalus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird Euphagus carolinus This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Short-billed Dowitcher Limnodromus griseus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

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Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

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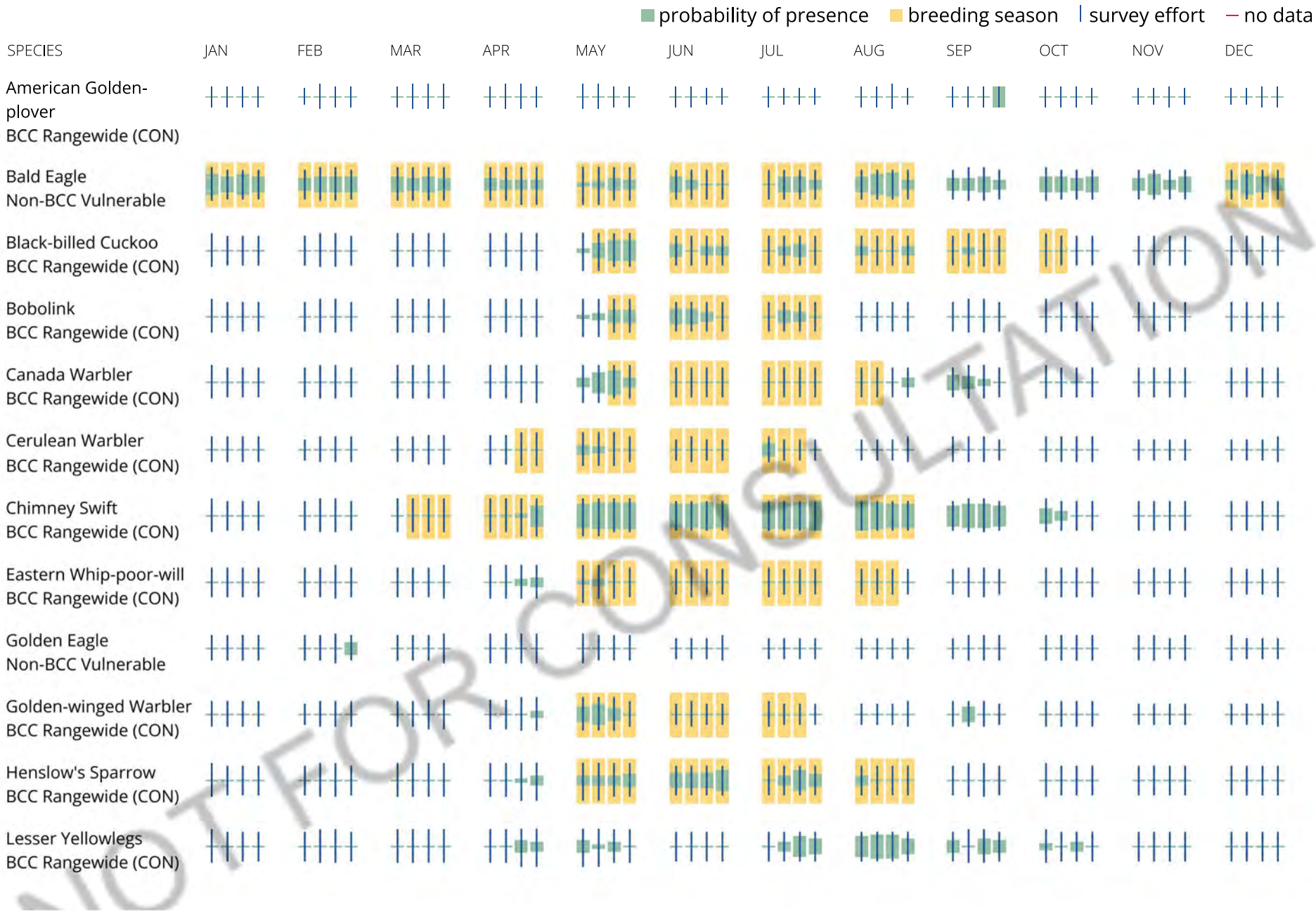
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



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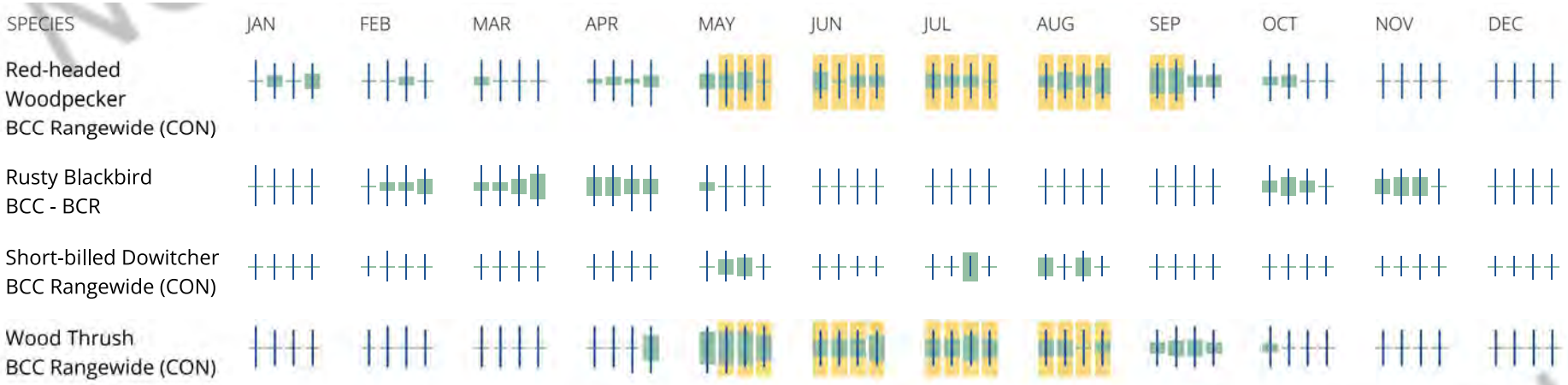

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

NOT FOR CONSULTATION

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

NOT FOR CONSULTATION

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

NOT FOR CONSULTATION

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

NOT FOR CONSULTATION

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
Phone: (517) 351-2555 Fax: (517) 351-1443

In Reply Refer To:
Project Code: 2023-0074609
Project Name: City of Kalamazoo FY2024 DWRF

April 26, 2023

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

Official Species List
The attached species list identifies any Federally threatened, endangered, proposed and candidate species that may occur within the boundary of your proposed project or may be affected by your proposed project. The list also includes designated critical habitat if present within your proposed project area or affected by your project. This list is provided to you as the initial step of the consultation process required under section 7(c) of the Endangered Species Act, also referred to as Section 7 Consultation.

Under 50 CFR 402.12(e) (the regulations that implement section 7 of the Endangered Species Act), the accuracy of this species list should be verified after 90 days. You may verify the list by visiting the IPaC website (https://ipac.ecosphere.fws.gov/) at regular intervals during project planning and implementation. To update an Official Species List in IPaC: from the My Projects page, find the project, expand the row, and click Project Home. In the What's Next box on the Project Home page, there is a Request Updated List button to update your species list. Be sure to select an "official" species list for all projects.

Consultation requirements and next steps
Section 7 of the Endangered Species Act of 1973 requires that actions authorized, funded, or carried out by Federal agencies not jeopardize Federally threatened or endangered species or adversely modify designated critical habitat. To fulfill this mandate, Federal agencies (or their designated non-Federal representative) must consult with the Fish and Wildlife Service if they determine their project may affect listed species or critical habitat.

There are two approaches to evaluating the effects of a project on listed species.

Approach 1. Use the All-species Michigan determination key in IPaC. This tool can assist you in making determinations for listed species for some projects. In many cases, the determination key

will provide an automated concurrence that completes all or significant parts of the consultation process. Therefore, we strongly recommend screening your project with the **All-Species Michigan Determination Key (Dkey)**. For additional information on using IPaC and available Determination Keys, visit https://www.fws.gov/media/mifo-ipac-instructions (and click on the attachment). Please carefully review your Dkey output letter to determine whether additional steps are needed to complete the consultation process.

Approach 2. Evaluate the effects to listed species on your own without utilizing a determination key. Once you obtain your official species list, you are not required to continue in IPaC, although in most cases using a determination key should expedite your review. If the project is a Federal action, you should review our section 7 step-by-step instructions before making your determinations: https://www.fws.gov/office/midwest-region-headquarters/midwest-section-7-technical-assistance. If you evaluate the details of your project and conclude "no effect," document your findings, and your listed species review is complete; you do not need our concurrence on "no effect" determinations. If you cannot conclude "no effect," you should coordinate/consult with the Michigan Ecological Services Field Office. The preferred method for submitting your project description and effects determination (if concurrence is needed) is electronically to EastLansing@fws.gov. Please include a copy of this official species list with your request.

For all **wind energy projects** and **projects that include installing communications towers that use guy wires**, please contact this field office directly for assistance, even if no Federally listed plants, animals or critical habitat are present within your proposed project area or may be affected by your proposed project.

Migratory Birds
Please see the "Migratory Birds" section below for important information regarding incorporating migratory birds into your project planning. Our Migratory Bird Program has developed recommendations, best practices, and other tools to help project proponents voluntarily reduce impacts to birds and their habitats. The Bald and Golden Eagle Protection Act prohibits the take and disturbance of eagles without a permit. If your project is near an eagle nest or winter roost area, see our Eagle Permits website at https://www.fws.gov/program/eagle-management/eagle-permits to help you avoid impacting eagles or determine if a permit may be necessary.

Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your consideration of threatened and endangered species during your project

planning. Please include a copy of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
(517) 351-2555

PROJECT SUMMARY

Project Code: 2023-0074609
Project Name: City of Kalamazoo FY2024 DWRF
Project Type: Distribution Line - Maintenance/Modification - Below Ground
Project Description: The project is for lead service line replacement and water main lining in the Kalamazoo Area water system. The project is scheduled for 2024 construction season.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.269793449999995,-85.58449642214381,14z



Counties: Kalamazoo County, Michigan

ENDANGERED SPECIES ACT SPECIES

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949 General project design guidelines: https://ipac.ecosphere.fws.gov/project/PZ4LMVWLBNHN5JH7M5YMOCPSAE/documents/generated/6982.pdf	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045 General project design guidelines: https://ipac.ecosphere.fws.gov/project/PZ4LMVWLBNHN5JH7M5YMOCPSAE/documents/generated/6983.pdf	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

BIRDS

NAME	STATUS
Whooping Crane *Grus americana* Population: U.S.A. (AL, AR, CO, FL, GA, ID, IL, IN, IA, KY, LA, MI, MN, MS, MO, NC, NM, OH, SC, TN, UT, VA, WI, WV, western half of WY) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/758	Experimental Population, Non-Essential

REPTILES

NAME	STATUS
Eastern Massasauga (=rattlesnake) *Sistrurus catenatus* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ For all Projects:Project is within Tier1 Habitat ▪ For all projects:Project is within Tier2 Habitat ▪ For all Projects: Project is within EMR Range Species profile: https://ecos.fws.gov/ecp/species/2202 General project design guidelines: https://ipac.ecosphere.fws.gov/project/PZ4LMVWLBNHN5JH7M5YMOCPSAE/documents/generated/5280.pdf	Threatened

INSECTS

NAME	STATUS
Mitchell's Satyr Butterfly *Neonympha mitchellii mitchellii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8062	Endangered
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover *Pluvialis dominica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Dec 1 to Aug 31

NAME	BREEDING SEASON
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Cerulean Warbler *Dendroica cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 22 to Jul 20
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere
Golden-winged Warbler *Vermivora chrysoptera* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Henslow's Sparrow *Ammodramus henslowii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3941	Breeds May 1 to Aug 31
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

NAME	BREEDING SEASON
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

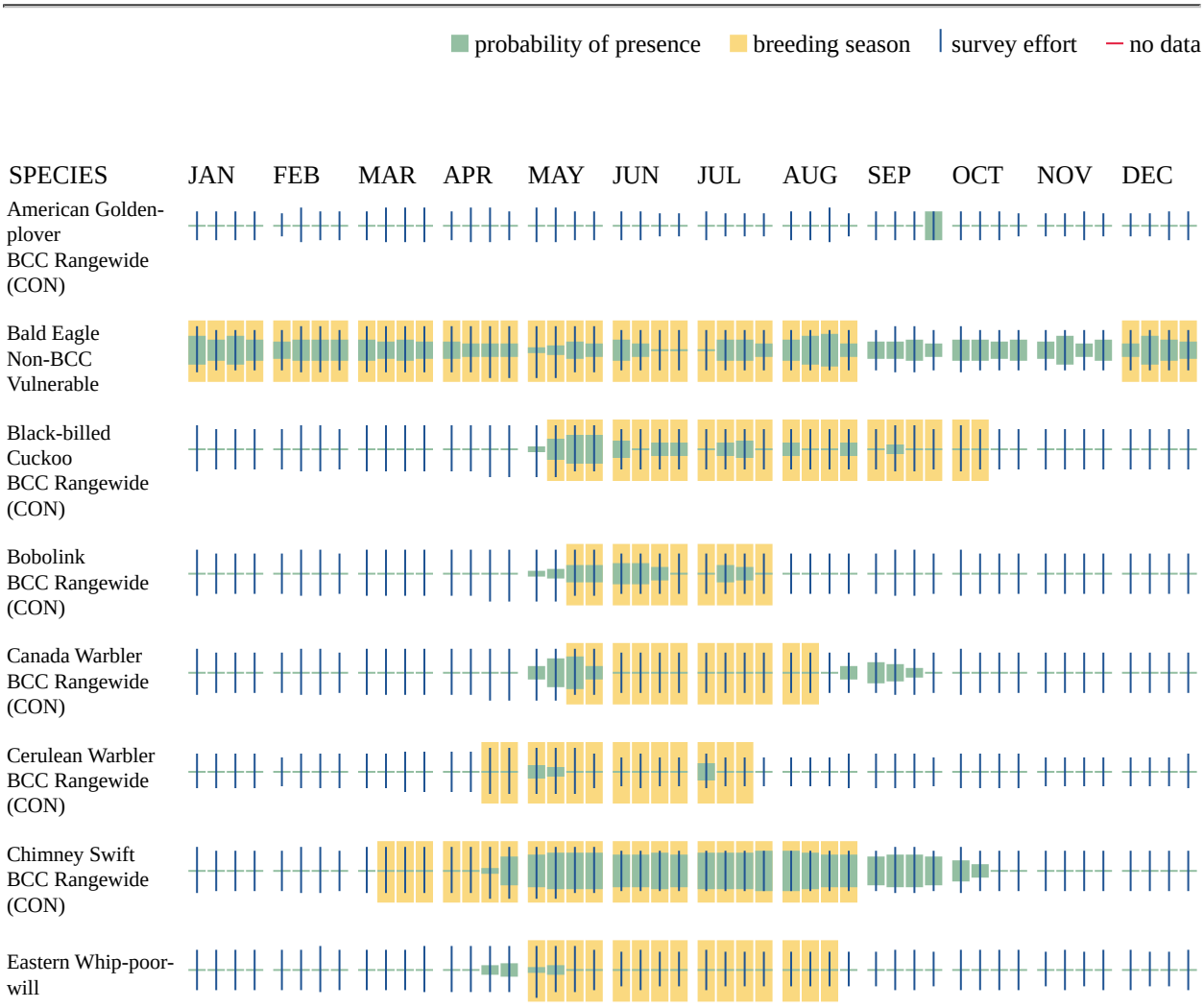
Breeding Season (■)

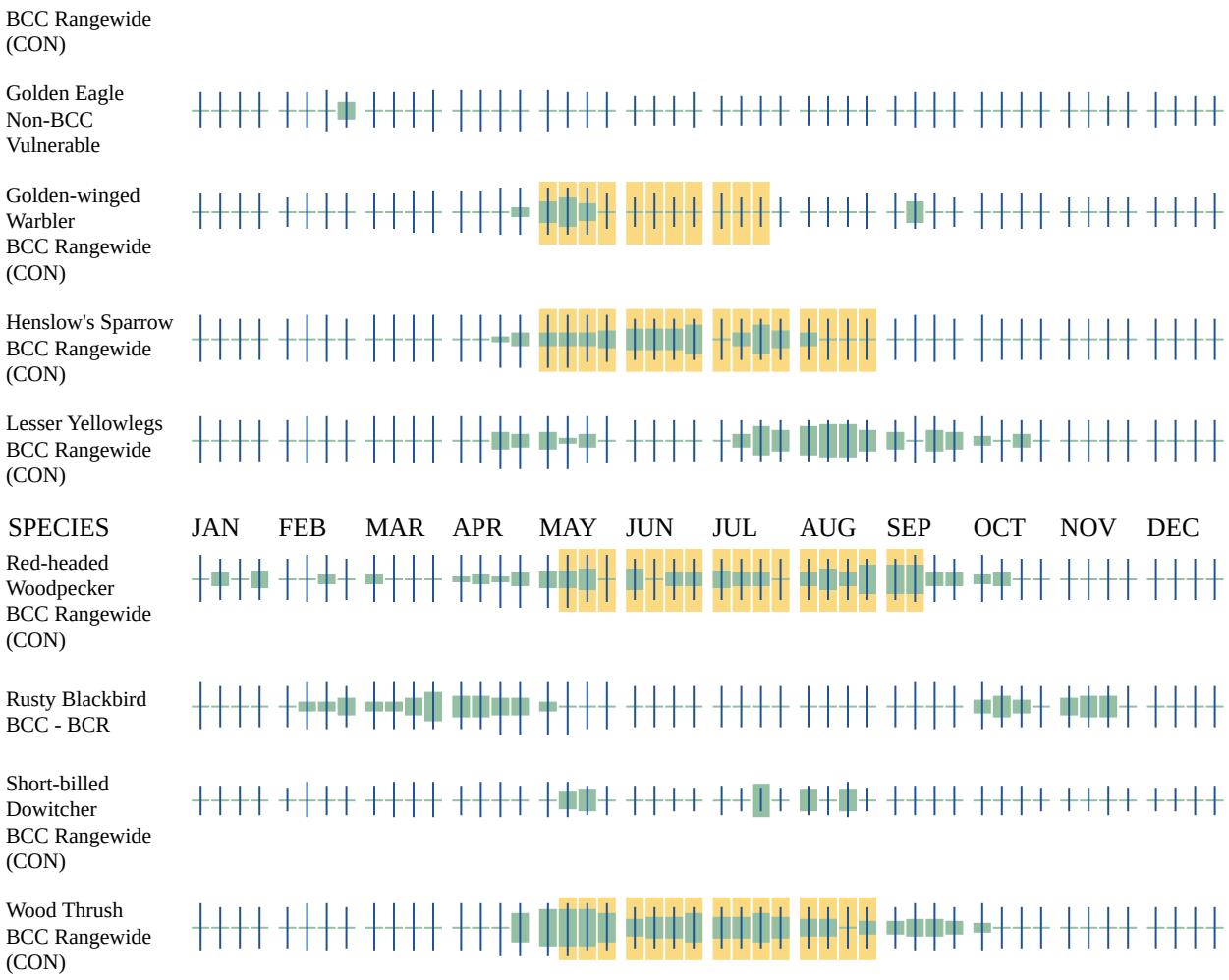
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

MIGRATORY BIRDS FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits

may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

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Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
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Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);

2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities,

should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER POND

- PABG
- PUBGx
- PUBFx
- PUBK
- PUBG

LAKE

- L2ABH
- L1UBH
- L1UBHh
- L2EM2G

FRESHWATER FORESTED/SHRUB WETLAND

- PSS1/EM1C
- PFO1/SS1Cd
- PFO1A
- PFO1C
- PSS1F
- PSS1C
- PFO5F

RIVERINE

- R5UBFx
- R5UBH

FRESHWATER EMERGENT WETLAND

- PEM2F
- PEM1C
- PEM1F

- PEM1Cd

IPAC USER CONTACT INFORMATION

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Michigan Ecological Services Field Office
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In Reply Refer To: April 26, 2023
Project code: 2023-0074609
Project Name: City of Kalamazoo FY2024 DWRF

Federal Nexus: no
Federal Action Agency (if applicable): Kalamazoo city

Subject: Technical assistance for 'City of Kalamazoo FY2024 DWRF'

Dear Brian Vilmont:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on April 26, 2023, for 'City of Kalamazoo FY2024 DWRF' (here forward, Project). This project has been assigned Project Code 2023-0074609 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements are not complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into the IPaC must accurately represent the full scope and details of the Project. Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat Rangewide Determination Key (Dkey), invalidates this letter.

Determination for the Northern Long-Eared Bat

Based upon your IPaC submission and a standing analysis, your project is not reasonably certain to cause incidental take of the northern long-eared bat. Unless the Service advises you within 15 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the Action is not likely to result in unauthorized take of the northern long-eared bat.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination for the northern long-eared bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Eastern Massasauga (=rattlesnake) *Sistrurus catenatus* Threatened
- Indiana Bat *Myotis sodalis* Endangered
- Mitchell's Satyr Butterfly *Neonympha mitchellii mitchellii* Endangered
- Monarch Butterfly *Danaus plexippus* Candidate
- Tricolored Bat *Perimyotis subflavus* Proposed Endangered
- Whooping Crane *Grus americana* Experimental Population, Non-Essential

You may coordinate with our Office to determine whether the Action may cause prohibited take of the animal species and/or critical habitat listed above. Note that if a new species is listed that may be affected by the identified action before it is complete, additional review is recommended to ensure compliance with the Endangered Species Act.

Next Steps

Coordination with the Service is complete. This letter serves as technical assistance. All conservation measures should be implemented as proposed. Thank you for considering federally listed species during your project planning.

We are uncertain where the northern long-eared bat occurs on the landscape outside of known locations. Because of the steep declines in the species and vast amount of available and suitable forest habitat, the presence of suitable forest habitat alone is a far less reliable predictor of their presence. Based on the best available information, most suitable habitat is now expected to be unoccupied. During the interim period, while we are working on potential methods to address this uncertainty, we conclude take is not reasonably certain to occur in areas of suitable habitat where presence has not been documented.

If no changes occur with the Project or there are no updates on listed species, no further consultation/coordination for this project is required for the northern long-eared bat. However, the Service recommends that project proponents re-evaluate the Project in IPaC if: 1) the scope, timing, duration, or location of the Project changes (includes any project changes or amendments); 2) new information reveals the Project may impact (positively or negatively) federally listed species or designated critical habitat; or 3) a new species is listed, or critical habitat designated. If any of the above conditions occurs, additional coordination with the Service should take place before project implements any changes which are final or commits additional resources.

If you have any questions regarding this letter or need further assistance, please contact the Michigan Ecological Services Field Office and reference Project Code 2023-0074609 associated with this Project.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

City of Kalamazoo FY2024 DWRF

2. Description

The following description was provided for the project 'City of Kalamazoo FY2024 DWRF':

> The project is for lead service line replacement and water main lining in the Kalamazoo Area water system. The project is scheduled for 2024 construction season.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.269793449999995,-85.58449642214381,14z



DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of "may affect, but not likely to adversely affect" for the Endangered northern long-eared bat (*Myotis septentrionalis*).

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of the northern long-eared bat or any other listed species?

   Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

   No

2. Do you have post-white nose syndrome occurrence data that indicates that northern long-eared bats (NLEB) are likely to be present in the action area?

   Bat occurrence data may include identification of NLEBs in hibernacula, capture of NLEBs, tracking of NLEBs to roost trees, or confirmed acoustic detections. With this question, we are looking for data that, for some reason, may have not yet been made available to U.S. Fish and Wildlife Service.

   No

3. Does any component of the action involve construction or operation of wind turbines?

   Note: For federal actions, answer 'yes' if the construction or operation of wind power facilities is either (1) part of the federal action or (2) would not occur but for a federal agency action (federal permit, funding, etc.).

   No

4. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   No

PROJECT QUESTIONNAIRE

IPAC USER CONTACT INFORMATION

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LEAD AGENCY CONTACT INFORMATION

Lead Agency: Kalamazoo city
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Michigan Endangered Species Determination Key
Standing Analysis
April 2023 (version 4.0)

Introduction

This standing analysis supports the "All-species Michigan Endangered Species Determination Key" (Dkey) delivered by the U.S. Fish and Wildlife Service (Service)'s Information for Planning and Consultation (IPaC) system. The Service's Michigan Ecological Services Field Office (MIFO) developed this DKey to streamline the process of reviewing certain routine and predictable projects that are not likely to result in adverse effects (or take) of Federally threatened and endangered species in Michigan.

In Fiscal Year 2019, the MIFO received over 1,270 projects that it reviewed and determined would not significantly affect or result in the prohibited take of species or habitats listed under the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq*.). The routine nature of the review of various Federal and non-Federal projects provides an opportunity for the MIFO to programmatically evaluate the effects of common activities on threatened and endangered species. Most incoming projects overlap with the Area of Influence (AOI) of multiple listed species in Michigan. The availability of a DKey covering all threatened and endangered species and critical habitats in Michigan will eliminate the need for the MIFO to individually review large numbers of projects and will provide Federal Action Agencies, consultants, and project proponents an immediate and consistent response to their requests for consultation, technical assistance, or conservation planning assistance.

To use this Dkey, applicants enter their project area in IPaC, and the program determines whether the project's geographic extent intersects AOI of any Federally listed species. The applicant will have the option to complete an available determination key, including this Dkey, for those species for which their project area intersects an AOI. The Dkey starts by asking a series of questions to determine if the project qualifies for the Dkey (see General Exclusions below). If they don't qualify for the Dkey, they will be notified that they must consider effects to threatened and endangered species outside of the Dkey. If the user's project qualifies for the Dkey, they will receive questions based on the specific species that may be present in the action area. Depending on how they answer the questions and the corresponding determinations that are reached, they will receive an output letter from IPaC. For Federal projects that reach a "not likely to adversely affect (NLAA)" determination, there is a 30 day "verification period" to allow the Service to review the project details and ensure the action meets the criteria for a NLAA determination. Output letters will indicate that if the project proponent does not hear otherwise within that timeframe, the NLAA determination is verified and they can proceed with their action as described in the IPaC report and concurrence verification letter. This verification period allows the Michigan Ecological Services Field Office to apply local knowledge to evaluation of the action and ensure actions do not have unanticipated impacts. Thus, there may be a small subset of actions for which the Michigan Ecological Services Field Office may request additional information during this timeframe to verify the effects determination reached through the DKey. There is no verification period for non-Federal projects or for "no effect" determinations. If the user gets a "may affect" determination for any species, they are advised to contact the Michigan Field Office to complete consultation outside of the Dkey. All output

letters include reinitiation language as follows: “The Service recommends that your agency contact the Service or re-evaluate the project in IPaC if: 1) the scope or location of the proposed Action is changed; 2) new information reveals that the action may affect listed species or designated critical habitat in a manner or to an extent not previously considered; 3) the Action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. If any of the above conditions occur, additional consultation with the Service should take place before project changes are final or resources committed”.

Proposed Action

The proposed Action is the compilation of many different types of projects that depending on their size and specific location often do not significantly affect any Federally listed threatened or endangered species or critical habitats in Michigan. Common project types include, but are not limited to, the following:

- Vegetation management, including mowing, forestry activities, prescribed burning and harvest
- Construction, maintenance, operation, and/or removal of:
    - Roads and trails
    - Communication towers
    - Transmission and utility lines
    - Bridges and culverts
    - Oil and gas pipelines
    - Solar power facilities
    - Hydroelectric facilities/dams
    - Mines/quarries
    - Canals/levees/dikes
- Commercial, residential and recreational developments
- Agricultural activities
- Site/habitat restoration/enhancement
- Shoreline protection/beach nourishment
- Dredging and filling of wetlands/waterbodies
- Military operations

General Exclusions:

To use this standing analysis and receive a conclusion from IPaC through the DKey, projects may NOT include the following:

1. Long-term (i.e., greater than 10 years) permits, plans or other actions (e.g., FERC licenses)
2. Construction or operation of wind turbines
3. Projects for which there are less than 30 days prior to action occurring
4. Construction of a communications tower that don’t use proper lighting, is located within three miles of dedicated conservation lands, has guy wires, or is over 450 feet in height
5. Water withdrawals greater than 10,000 gallons/day, or
6. Aerial or other broad application of chemicals

To ensure compliance with the ESA, project-specific consultation (or other programmatic consultation, if applicable) with the Service may be necessary for projects including the actions listed above. Those projects would not necessarily result in significant adverse effects to listed species or habitats.

Additionally, to use this standing analysis and receive a conclusion from IPaC, projects must include the species/taxon-specific conservation measures detailed below, as appropriate (Species-Specific Conservation Measures).

Action Area

The Action Area is the entire State of Michigan. Because the DKey is intended for use by future projects, we cannot identify the specific action areas of individual projects.

Covered Species/Habitats

Species and habitats covered by the Michigan Endangered Species DKey include all Federally listed species and critical habitats that occur within the state, as follows[1]:

Animals

- *Birds*
  - Whooping Crane (*Grus americana*)- NEP
  - Piping Plover (*Charadrius melodus*)- E
  - Rufa Red Knot (*Calidris canutus rufa*)- T
- *Freshwater Mussels*
  - Clubshell (*Pleurobema clava*)- E
  - Northern Riffleshell (*Epioblasma torulosa rangiana*)- E
  - Rayed Bean (*Villosa fabalis*)- E
  - Snuffbox (*Epioblasma triquetra*)- E
- *Insects*
  - Hine's Emerald Dragonfly (*Somatochlora hineana*)- E
  - Hungerford's Crawling Water Beetle (*Brychius hungerfordi*)- E
  - Karner Blue Butterfly (*Lycaeides melissa samuelis*)- E
  - Mitchell's Satyr (*Neonympha mitchelli mitchelli*)- E
  - Poweshiek Skipperling (*Oarisma poweshiek*)- E
  - Monarch butterfly (*Danaus plexippus*) - Candidate
- *Mammals*
  - Canada Lynx (*Lynx canadensis*)- T
  - Gray Wolf (*Canis lupus*)- E
  - Indiana Bat (*Myotis sodalis*)- E
  - Northern Long-eared Bat (*Myotis septentrionalis*)- T
  - Tricolored Bat (*Permyotis subflavus*)- P
- *Reptiles*
  - Copperbelly Water Snake (*Nerodia erythogaster neglecta*)- T

[1] C = candidate, CH = critical habitat, E = endangered, NEP = nonessential experimental population, P = proposed, T = threatened

- Eastern Massasauga Rattlesnake (*Sistrurus catenatus*)- T

Plants

- American Hart's-Tongue Fern (*Asplenium scolopendrium* var. *americana*)- T
- Dwarf Lake Iris (*Iris lacustris*)- T
- Eastern Prairie Fringed Orchid (*Platanthera leucophaea*)- T
- Houghton's Goldenrod (*Solidago houghtonii*)- T
- Lakeside Daisy (*Hymenoxys herbacea*)- T
- Michigan Monkey-Flower (*Mimulus michiganensis*)- E
- Pitcher's Thistle (*Cirsium pitcheri*)- T

Critical Habitats (CH)

- Hine's Emerald Dragonfly CH
- Piping Plover CH
- Poweshiek Skipperling CH

Species Descriptions/Status within the Action Area

Nonessential Experimental Population of Whooping Crane (Grus americana)

The whooping crane breeds, migrates, winters, and forages in a variety of wetland and other habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields. Bulrush is the dominant vegetation type in the potholes used for nesting, although cattail, sedge, musk-grass, and other aquatic plants are common. Nest sites are primarily located in shallow diatom ponds that contain bulrush. During migration, whooping cranes use a variety of habitats; however wetland mosaics appear to be the most suitable. For feeding, whooping cranes primarily use shallow, seasonally and semi permanently flooded palustrine wetlands for roosting, and various cropland and emergent wetlands.

The whooping crane has been Federally listed as endangered since 1967 due to habitat loss and over-hunting. Wild whooping cranes currently exist in two flocks, a non-migratory flock in Florida, and a migratory flock that summers in Wood Buffalo National Park in Canada and winters near and at Aransas National Wildlife Refuge in Texas along the Gulf coast. It is possible that all or most of these birds could be wiped out from a single event such as a hurricane, disease outbreak, toxic spill, or prolonged drought, making the species vulnerable to extinction. To ensure that the whooping crane survives, the International Whooping Crane Recovery Team recommended that an additional flock of whooping cranes be established that is separate from the single remaining natural wild migratory population. On June 26, 2001, the Service published a final rule in the Federal Register to establish a Nonessential Experimental Population (NEP) within a 20-state area in the eastern U.S., which includes Michigan.

For the purposes of section 7 of the ESA, we treat NEPs as threatened species when the NEP is located within a National Wildlife Refuge (NWR) or National Park (NP), and therefore section 7(a)(1) and the consultation requirements of section 7(a)(2) of the ESA apply in NWRs and NPs. Section 7(a)(1) requires all Federal agencies to use their authorities to conserve listed species. Section 7(a)(2) requires that Federal agencies consult with the Service before authorizing, funding, or carrying out any activity that would likely jeopardize the continued existence of a listed species or adversely modify its critical habitat.

For Federal projects outside a NWR or NP, we treat the population as proposed for listing and only two provisions of section 7 would apply: section 7(a)(1) and section 7(a)(4). In these instances, NEPs provide additional flexibility because Federal agencies are not required to consult with us under section 7(a)(2). Section 7(a)(4) requires Federal agencies to confer with the Service on actions that are likely to jeopardize the continued existence of a proposed species. The results of a conference are advisory in nature and do not restrict agencies from carrying out, funding, or authorizing activities.

For purposes of section 9 of the ESA, individual species within a NEP area are treated as threatened regardless of the species' designation elsewhere in its range. Under section 4(d) of the ESA, we have greater discretion in developing management programs and special regulations for threatened species than we have for endangered species. Section 4(d) of the ESA allows us to adopt whatever regulations are necessary to provide for the conservation of a threatened species. The special 4(d) rule contains the prohibitions and exemptions necessary and appropriate to conserve that species. Because of the flexibility, regulations issued under a 4(d) rule are generally compatible with routine human activities in the reintroduction area. For whooping crane in the NEP in Michigan, purposeful take is prohibited under the special rule; actions that cause take that is accidental and occurred incidentally to an otherwise lawful activity that was being carried out in full compliance with all applicable laws and regulations, is not prohibited under the ESA. In the case of an intentional actions (e.g., intentional shooting), the full protection of the ESA could apply.

For additional information on the whooping crane, including a five-year status review and recovery plan, please see the species profile.

Piping Plover (Charadrius melodus)

The piping plover is a small shorebird that nests in three separate geographic populations in the U.S.: the Great Plains states, the shores of the Great Lakes, and the shores of the Atlantic coast. Birds from all populations winter on the southern Atlantic and Gulf coasts in the U.S.

In the Great Lakes, piping plovers nest, feed, and rear their young in open, sparsely vegetated sandy areas, including sand spits and sand beaches with wide, unforested dunes and swales or in the flat pans behind the primary dune. Piping plovers begin arriving in Michigan in late April, and most mated pairs are nesting by mid to late May. Eggs typically hatch from late May to late July, with chicks fledging 21 to 30 days after hatching. Although piping plovers typically produce one brood per year, they sometimes bring off two broods during a summer. Piping plovers feed on exposed beach surfaces by pecking for invertebrates that are 1/2 inch or less below the surface. They feed mostly during the day and eat insects, marine worms, crustaceans, and mollusks as well as eggs and larvae of flies and beetles. Most adults depart for their wintering grounds by mid-August. Young birds hatched during the summer start their migration a few weeks later than adults, and most are gone from the Great Lakes by late August.

The Great Lakes population of the piping plover was listed as endangered in 1986. An active recovery program in Michigan, aided by many volunteers, has helped the plover population to steadily increase. In 2019, there were 71 breeding pairs (142 individuals) (USFWS unpubl. data 2020). Of these, 49 pairs nested in Michigan, while 22 pairs were found outside the state, including one pair in Chicago, Illinois, one pair in Pennsylvania, ten pairs in Wisconsin, and nine pairs in Ontario, Canada. A single breeding pair discovered in 2007 in the Great Lakes region of

Canada represented the first confirmed piping plover nest there in over 30 years. In 2019, a pair of piping plovers had their first successful nesting site at Montrose Beach in Chicago, Illinois in more than 60 years.

The species remains extremely vulnerable to extinction from factors that include disease, habitat destruction, and unpredictable changes in the environment. Recent studies of Great Lakes Piping Plovers indicate that predation and human-caused disturbance also continue to negatively affect the population. During 2019, as many as 11 adults were lost due to predation by merlins, snowy owls, and off-leash dogs (USFWS unpubl. data 2020).

For additional information on the piping plover, including a recent five-year status review and recovery plan, check out the species profile.

Under the terms of a court order, the Service designated CH for the Great Lakes breeding population of the piping plover on May 7, 2001. This includes 35 units in 8 states, including 23 units in Michigan:

- St. Louis County, Minnesota
- Douglas, Ashland, Marinette, and Manitowoc Counties, Wisconsin
- Lake County, Illinois
- Porter County, Indiana
- Erie and Lake Counties, Ohio
- Erie County, Pennsylvania
- Oswego and Jefferson Counties, New York
- Alger, Schoolcraft, Luce, Mackinac, Chippewa, Iosco, Presque Isle, Cheboygan, Emmet, Charlevoix, Leelanau, Benzie, Mason and Muskegon Counties, Michigan.

The final CH designation includes approximately 201 miles (325 km) of mainland and island shoreline for the Great Lakes breeding population in these 26 counties. Within the 35 critical habitat units, only the areas that contain the primary constituent elements of piping plover habitat, as described above, are designated as CH. See https://www.fws.gov/species-publication-action/etwp-final-determination-critical-habitat-great-lakes-breeding for more information about piping plover CH in Michigan.

Rufa Red Knot (Calidris canutus rufa)

The rufa red knot is a migratory shorebird that breeds in the Canadian Arctic and winters in parts of the United States, the Caribbean, and South America. Some red knots fly more than 9,300 miles from south to north every spring and repeat the trip in reverse every autumn, making this bird one of the longest-distance migrants in the animal kingdom. Major migration stopover areas occur along the Gulf coast and Atlantic coasts of North and South America. However, red knots have been regularly sighted in inland areas of the United States within the Atlantic and central flyways, including the coasts of the Great Lakes in Michigan.

The Service listed the rufa subspecies of red knot as threatened under the ESA on December 11, 2014. The reason for listing was due to loss of both breeding and nonbreeding habitat; likely effects related to disruption of natural predator cycles on the breeding grounds; reduced prey availability throughout the nonbreeding range; and increasing frequency and severity of asynchronies (mismatches) in the timing of the birds' annual migratory cycle relative to favorable food and weather conditions.

For additional information on the rufa red knot, including a recovery outline, please see the species profile.

Federally Listed Freshwater Mussel in Michigan

The Michigan Freshwater Mussel Survey Protocols and Relocation Procedures (https://www.fws.gov/media/michigan-freshwater-mussel-survey-protocols-and-relocation-procedures-rivers-and-streams) provide project proponents with guidance to minimize impacts to mussel species that are currently identified as threatened or endangered by the USFWS. These protocols are designed to document the potential presence or absence of state or Federally listed mussel species as well as provide guidance for survey and relocation activities to minimize impacts to native mussels in Michigan.

As part of the Michigan Freshwater Mussel Survey Protocols and Relocation Procedures Michigan rivers and streams have been grouped according to existing knowledge of mussel distribution and individual species conservation status. The Mussel Protocol Stream Groups are designed to document the potential presence or absence of state or Federally listed mussel species. The layer was created by modeling the habitat suitability for each mussel species and may not correspond directly with a documented location for a listed mussel. A segment may be predicted as suitable for a number of mussel species, so the stream group number was assigned to the most restrictive of the potential mussel species present. The watersheds have associated mussel species data and can be queried to generate a species list. These stream groups determine the necessary level of coordination by project proponents with the USFWS as well as the appropriate survey protocol applicable to the project site. Below are the stream groupings, which are available via Michigan Natural Features Inventory Mussel Map Viewer (https://mnfi.anr.msu.edu/resources/michigan-mussels). The Mussel Map Viewer is an interactive tool to allow users to explore listed native mussels across the Michigan landscape. Watershed level species lists are available alongside the Mussel Protocol Stream Groups.

- Group 1: Stream and rivers known to support mussels considered to be special concern by the State, but lacking mussel occurrence data at the project site.
- Group 2: Streams and rivers known to support populations of State threatened and endangered mussels.
- Group 3a: Small and medium streams and rivers with a drainage area less than 300 mi^2 that support populations of Federally listed mussels.
- Group 3b: Large rivers (drainage area greater than 300 mi^2) that support populations of Federally listed mussels.

Clubshell (Pleurobema clava)

The clubshell is a freshwater mussel that prefers clean, loose sand and gravel in medium to small rivers and streams. Clubshells will bury themselves in the bottom substrate to depths of up to four inches. Reproduction requires a stable, undisturbed habitat and a sufficient population of fish hosts to complete the mussel's larval development. The striped shiner (*Notropis chrysocephalus*), central stoneroller (*Campostoma anomalum*), blackside darter (*Percina maculata*), and logperch (*Percina caprodes*) have been capable of serving as hosts of the clubshell under laboratory conditions.

Clubshell was listed as endangered in 1993. The clubshell was once found from Michigan to Alabama, and from Illinois to West Virginia. Clubshell originally inhabited 100 streams across

this range; however, the current distribution is limited to 13 extant populations occurring in 21 streams. Of those 13 populations, only 7 show signs of successful reproduction. The distribution of clubshell is very limited in Michigan and only occurs in the East Branch of the West Fork of the St. Joseph River, Maumee drainage. Reasons for its decline in the upper Ohio and Wabasha watersheds have been principally due to pollution from agricultural runoff and industrial wastes, and extensive impoundments for navigation. These are thought to be also responsible for its decline elsewhere as well. An added threat now is the zebra mussel, a fast-spreading exotic species accidentally introduced in ballast water from the Caspian Sea area. These tiny mussels reproduce in enormous numbers which tend to cover and suffocate native mussels. In the St. Joseph watershed, water quality degradation as a result of land-based activities such as agriculture and development is a major threat. These types of activities result in excess sedimentation and pollutants that may affect clubshell survival, growth, and reproduction. It is likely that there are barriers within the watershed that also have altered habitat, hydrology, temperature, and sediment transport, limiting the range of clusbshell as well as potentially directly affecting certain localized populations. Lastly, instream activities such as bridge and road construction also have the potential to impact localized populations of clubshell.

For additional information on the clubshell mussel, including a recent five-year status review, please see the species profile.

Northern Riffleshell (Epioblasma torulosa rangiana)

This mussel is found in a wide variety of streams, including large streams and small rivers, where it buries itself in firmly packed sand or gravel in riffle areas. It is also found in Lake Erie. Like all freshwater mussels, northern riffleshell require a stable, undisturbed habitat and a sufficient population of host fish for reproduction. The mottled sculpin (*Cottus bairdi*), banded darter (*Etheostoma zonale*), bluebreast darter (*Etheostoma camurum*), and brown trout (*Salmo trutta*) are potential host species (Watters 1996).

Northern riffleshell was listed as endangered in 1993. Historically, the northern riffleshell was found in the Ohio river drainage in Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and west Virginia, and into southeastern Michigan and southwestern Ontario. Of the 54 streams once known to be occupied by northern riffleshell, it is known to currently occur in 13 populations, 4 of which are stable and recruiting. Of the four recruiting populations, three are apparently large and occur in the Allegheny River, French Creek, and East Branch Sydenham River. A fourth, smaller population occurs, as of 2006, in the AuSable River. In Michigan the current status of northern riffleshell is unknown with only shells found during a 2007/2008 survey of the Detroit River and Lake St. Clair. It is possible that these populations are extirpated as a result of the introduction of nonnative zebra and quagga mussels (USFWS 2019). Numerous threats persist for the remaining northern riffleshell populations, including invasive species, the effects of small population sizes, habitat alteration, land-use changes, changing precipitation and temperature patterns, and point and non-point source pollution.

For additional information on the northern riffleshell mussel, including a recent five-year status review, please see the species profile.

Rayed Bean (Villosa fabalis)

The rayed bean generally lives in smaller, headwater creeks, but it is sometimes found in large rivers and wave-washed areas of glacial lakes. It prefers gravel or sand substrates, and is often

found in and around roots of aquatic vegetation. Adults spend their entire lives partially or completely buried in substrate, filtering water through their gills to remove algae, bacteria, detritus, microscopic animals, and dissolved organic material for food. Juvenile mussels, called glochidia, use fish as hosts, allowing the species to move upstream and populate habitats it could not otherwise reach. At the time of listing, the Tippecanoe darter (*Etheostoma tippecanoe*) was the only reported known host fish for the rayed bean. Gibson et al. (2011) also verified the spotted darter (*Etheostoma maculatum*) as a suitable host fish (USFWS 2018a).

Rayed bean was listed as endangered in 2012. The rayed bean historically was found across a wide expanse that included parts of the Midwest and eastern United States, north to Ontario, Canada. Once found in at least 115 streams, canals, and lakes, the rayed bean now occurs in only 31 streams and one lake; a 73 percent reduction in the number of occupied streams and lakes. The species has been extirpated from Illinois, Kentucky, and Virginia but is still found in Indiana, Michigan, New York, Ohio, Pennsylvania, and Ontario, Canada. After extirpation from Tennessee and West Virginia, reintroductions have restored the rayed bean to these states. Major threats to rayed bean are modification and destruction of river and stream habitat, primarily by the construction of impoundments. Other factors contributing to the reduction in range include dredging and channelization, chemical contamination, oil and gas production, sand and gravel mining, and siltation.

In addition, there are other emerging threats such as disease and climate change. Little is known about diseases in freshwater mussels (Grizzle and Brunner 2007, USFWS 2018a). However, mussel die-offs have been documented in streams within the range of rayed bean, some researchers believe that disease may be a factor contributing to the die-offs (USFWS 2018a).

For additional information on the rayed bean mussel, including a recent five-year status review, please see the species profile.

Snuffbox (Epioblasma triquetra)

The snuffbox is usually found in small- to medium-sized creeks, inhabiting areas with a swift current, although it is also found in Lake Erie and some larger rivers. Adults often burrow deep in sand, gravel or cobble substrates, except when they are spawning or the females are attempting to attract host fish, including log perch. They are suspension feeders, typically feeding on algae, bacteria, detritus, microscopic animals, and dissolved organic material.

Snuffbox was listed as endangered in 2012. Snuffbox was historically known from 211 streams and lakes in 18 states and Canada (USFWS 2018b). The current distribution has been reduced to only 84 streams in 14 states (Alabama, Arkansas, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Wisconsin) and Ontario, Canada (USFWS 2018b, USFWS unpubl. data 2020). Currently there are 7 stronghold populations, 24 significant populations, and 51 marginal populations of snuffbox. Two new element occurrences were detected in new streams in Michigan in 2019 and therefore have not been evaluated yet (USFWS unpubl. data 2020). Most populations are small and geographically isolated from one another, further increasing their risk of extinction.

Habitat loss and degradation continues to be one of the major threats to snuffbox (USFWS 2018b). Water quality degradation from point and non-point sources including agricultural runoff, municipal effluents, industrial sources, and spills continue to contribute sediment, organic compounds, heavy metals, pesticides, and a wide variety of newly emerging contaminants to the

aquatic environment. Other factors contributing to the reduction in range include dredging and channelization, oil and gas production (including water withdrawal), and sand and gravel mining, and development. Exotic species, including the zebra mussel, Asian clam, round goby, and black carp, threaten the snuffbox, or its host fish, or both, through mechanisms such as habitat modification, competition, and predation (USFWS 2018b).

For additional information on the snuffbox mussel, including a recent five-year status review, please see the species profile.

Hine's Emerald Dragonfly (Somatochlora hineana)

The Hine's emerald dragonfly lives in calcareous (high in calcium carbonate) spring-fed marshes and sedge meadows overlaying dolomite bedrock. Adults males defend small breeding territories, pursuing and mating with females who enter. The female lays eggs by repeatedly plunging the tip of her body into shallow water. Later in the season or the following spring, immature dragonflies, called nymphs, hatch from the eggs. The nymph lives in the water for two to four years, eating smaller aquatic insects and shedding its skin many times. The nymph then crawls out of the water and sheds its skin a final time, emerging as a flying adult. The adults may live only four to five weeks.

The principal threat to the species is habitat destruction and alteration. Commercial and residential development, quarrying, landfills, roadways, construction of pipelines, and filling of wetlands could decrease the area of suitable habitat available to the species and fragment populations (USFWS 2001). Changes in surface and sub-surface hydrology could also be detrimental to this species. Alteration of hydrologic regimes could adversely affect the larval and breeding habitat of the species by changing water temperature, flow, chemistry, and volume. Municipal and private wells, addition of impervious surfaces, and alteration of surface drainage patterns could all cause reductions in the suitability of habitat or the outright loss of suitable larval and breeding habitat.

The Hine's emerald dragonfly was listed as endangered on January 26, 1995 (60 FR 5267). Historically, the Hine's emerald dragonfly was found in Alabama, Indiana, and Ohio, and probably has been extirpated in those states. Today, the dragonfly can only be found in Illinois, Michigan, Missouri, and Wisconsin. Hine's emerald dragonfly was first discovered in Michigan at seven sites in 1997 (Steffens 1997). Known sites in the state are in both the Upper and Lower Peninsulas. Most are near the Straits of Mackinac, with the exception of the Menominee County site. The species is known from 20 sites in six counties in Michigan. Ten of these sites occur on the Hiawatha National Forest, and five sites are owned and managed by the Michigan Department of Natural Resources.

For additional information on the Hine's emerald dragonfly, including a recent five-year status review, please see the species profile.

Critical habitat for the species was first designated on September 5, 2007 (72 FR 51101) and later revised on April 23, 2010 (75 FR 21393). A total of 37 units, encompassing approximately 26,531.8 acres (10,737 hectares) in Cook, DuPage, and Will Counties in Illinois; Alpena, Mackinac, and Presque Isle Counties in Michigan; Crawford, Dent, Iron, Phelps, Reynolds, Ripley, Washington, and Wayne Counties in Missouri; and Door and Ozaukee Counties in Wisconsin, were included in the designation. These are lands of wet meadows, groundwater seeps, and associated wetlands that lie over dolomite bedrock and provide breeding and foraging

habitat for the dragonfly. For more information on CH for Hine's emerald dragonfly in Michigan, see https://www.fws.gov/species-publication-action/final-revised-critical-habitat-hines-emerald-dragonfly-somatochlora.

Hungerford's Crawling Water Beetle (Brychius hungerfordi)

Hungerford's crawling water beetles (HCWB) are found in the cool riffles of clean, slightly alkaline streams. All streams where this beetle has been found have moderate to fast water flow, good stream aeration, inorganic substrate, and alkaline water conditions. The highest densities of HCWB have been found below beaver dams or immediately below structures (e.g., culverts) that provide similar conditions.

Adults appear to be generalists in their food choice, feeding on algae including *Chara*, *Cladophora*, and *Dichotomosiphon*, as well as the epiphytic diatom *Cocconeis* (Grant and Vande Kopple 2009). The diet of adults may also change seasonally (Grant and Vande Kopple 2003). Larvae appear to prefer the alga *Dichotomosiphon tuberosus* (Grant and Vande Kopple 2009). *Dichotomosiphon*, although widespread, is not common. Its presence may be an important factor in determining the distribution of HCWB (Grant and Vande Kopple 2009).

At the time of listing in 1994, HCWB was known to occur in only three streams range wide. Currently, it is known to occur in 13 streams, with ten of these streams in northern Michigan and three in Ontario, Canada. It is unknown whether HCWB has a wider distribution or if the species' status is stable, increasing or decreasing. Species of *Brychius* tend to be highly localized and difficult to collect. Even when present, it is possible to sample an area and collect no specimens (Mousseau 2004; Grant et al. 2011). Additional surveys are necessary to determine the extent of HCWB's distribution. There is reason to believe HCWB may be more widely distributed than the streams where it has been previously documented. The types of streams inhabited by this species do not appear to be rare. In fact, streams similar to those in which the species is found appear to be common in northern Michigan and other surrounding states.

Hungerford's crawling water beetle was added to the List of Endangered and Threatened Wildlife and Plants on April 6, 1994 (59 FR 10580). The primary threat to the species is modification of its habitat. Actions that are potentially harmful include dredging, channelization, bank stabilization, and impoundment. Fish introductions or removals may also pose a threat to the species. The introduction of brown trout, for example, can result in increased predation of HCWB. Other management practices, such as the use of chemical treatments, may also be harmful to this rare beetle.

For additional information on the Hungerford's crawling water beetle, including a recovery plan and recent biological opinions, please see the species profile.

Karner Blue Butterfly (Lycaeides melissa samuelis)

The Karner blue butterfly was historically associated with native barrens and savanna ecosystems, but is now found in remnant barrens, savannas, highway and utility rights-of-way, gaps within forest stands, young forest stands, trails, and military camps that occur on the landscapes previously occupied by native prairie and savannas. The larvae are dependent upon wild lupine (*Lupinus perennis*), the only known larval food source, while wild adults use a variety of wild flowers for nectar.

The Karner blue butterfly was Federally listed as an endangered species in 1992. The butterfly is most widespread in Wisconsin, but is also found in portions of Indiana, Michigan, Minnesota, New Hampshire, New York, and Ohio. It may also be present in Illinois. Habitat throughout the range of the Karner blue butterfly has been lost as a result of land development and lack of natural disturbance, primarily wildfire. Such disturbance helps maintain the butterfly's habitat by setting back encroaching forests and encouraging lupine and flowering plant growth. Additionally, the Karner blue butterfly's rarity and beauty make it a desirable addition to butterfly collections. Because butterfly numbers are so low, the collection of even a few individuals could harm the species' populations.

For additional information on the Karner blue butterfly, including a recent five-year status assessment, please see the species profile.

Mitchell's Satyr (Neonympha mitchelli mitchelli)

In Michigan and Indiana, Mitchell's satyrs are found exclusively in prairie fens and open parts of rich tamarack swamps. These systems are a mosaic of open, shrubby, and forested communities, with peat soils and alkaline groundwater seeps. Thin-leaved sedges usually dominate the ground layer in the fens. Mitchell's satyr butterflies are rarely found in open fens without trees or tamarack swamps without openings.

The greatest threat to Mitchell's satyr is direct destruction and modification of its habitat. Prairie fens supporting Mitchell's satyr have disappeared or been altered for agricultural or urban development, which has led to species extirpation and further isolation of populations. Hydrological disruptions also constitute a serious threat, as groundwater diversion, pollution, warming of water sources, and other groundwater alterations lead to less-than-optimal habitat conditions. Offsite activities that affect groundwater flowing into prairie fens could inadvertently impact Mitchell's satyr. For example, a prairie fen's recharge source may be located near or far away from the fen, in a different watershed, county or state. As such, no matter the distance, altering the fen's groundwater source will affect the quality, quantity, or flow of groundwater into the fen (Abbas 2011). Groundwater alteration leads to, among other things, drying of the fen and/or facilitating encroachment of invasive species.

Invasive species, such as buckthorn, hybrid cattail, narrowleaf cattail, multiflora rose, purple loosestrife, reed canary grass, and others, represent additional threats and can be a significant management problem. Removal of these plants is required at many occupied sites to maintain suitable habitat conditions.

Satyr populations in the northern part of the range have decreased drastically; however, multiple new populations of what appears to be Mitchell's satyr continue to be discovered in the southeastern U.S. (Alabama, Mississippi, and Virginia). Ongoing genetics research will confirm and compare the taxonomy of the southern butterflies.

For additional information on the Mitchell's satyr, including the recovery plan, please see the species profile.

Poweshiek Skipperling (Oarisma poweshiek)

The Poweshiek skipperling is an endemic tallgrass prairie butterfly species. Historically, this species occurred in Illinois, Indiana, Iowa, Michigan, Minnesota, North Dakota, South Dakota, Wisconsin, and Manitoba, Canada. However, the butterfly's range has contracted significantly in the last decade, and can now only be found only at a few sites in a single Michigan county, in

very limited numbers at one site in Wisconsin, and in Canada at the single Manitoba site. In Michigan, the skipperling occurs exclusively in prairie fens, specifically in peat domes within larger prairie fen complexes in a community typically composed of multiple, distinct zones of vegetation, some of which contain prairie grasses and forbs (Cuthrell and Slaughter 2012). In other locales (outside of Michigan), the species has or currently occurs in mesic prairies (Pogue et al. 2015; Selby 2016). Also within Michigan, Poweshiek skipperlings are rarely found a great distance from either prairie dropseed or mat muhly (Cuthrell and Slaughter 2012).

Poweshiek skipperling was listed as endangered in 2014. Habitat for this species been affected by altered hydrology, water pollution, sedimentation, invasive species, fire suppression, cattle grazing, and filling for development or dredging to create ponds or lakes (Kost and Hyde 2009). As a result, prairie fens are now very rare and those that remain require management to maintain appropriate habitat that supports native fen biota. Management of Poweshiek skipperling habitat is needed to maintain the basic high-quality native prairie conditions on which the species depends. Management is needed to prevent secondary succession to woody habitat types; to control invasive species; and, to ensure sufficient abundance and diversity of nectar plants. Control of invasive plants species is required to maintain important qualities of habitat, but care must be taken to ensure that treatments do not have adverse effects.

For additional information on the Poweshiek skipperling, including a recent five-year status assessment, check out the species profile.

CH for the Poweshiek skipperling was designated on October 1, 2015. CH comprises approximately 25,900 acres in 56 units in Iowa, Michigan, Minnesota, North Dakota, South Dakota and Wisconsin. See https://fws.gov/species/poweshiek-skipperling-oarisma-poweshiek for more information about CH for the Poweshiek skipperling in MI.

Monarch butterfly (Danaus plexippus)

Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. The black border has a double row of white spots, present on the upper side of the wings. Adult monarchs are sexually dimorphic, with males having narrower wing venation and scent patches. The bright coloring of a monarch serves as a warning to predators that eating them can be toxic.

During the breeding season, monarchs lay their eggs on their obligate milkweed host plant (primarily Asclepias spp.), and larvae emerge after two to five days. Larvae develop through five larval instars (intervals between molts) over a period of 9 to 18 days, feeding on milkweed and sequestering toxic chemicals (cardenolides) as a defense against predators. The larva then pupates into a chrysalis before emerging 6 to 14 days later as an adult butterfly. There are multiple generations of monarchs produced during the breeding season, with most adult butterflies living approximately two to five weeks; overwintering adults enter into reproductive diapause (suspended reproduction) and live six to nine months.

In the fall, in both eastern and western North America, monarchs begin migrating to their respective overwintering sites. This migration can take monarchs distances of over 3,000 km and last for over two months. In early spring (February-March), surviving monarchs break diapause and mate at the overwintering sites before dispersing. The same individuals that undertook the

initial southward migration begin flying back through the breeding grounds and their offspring start the cycle of generational migration over again.

For additional information on the monarch, check out the species profile.

Canada Lynx (Lynx canadensis)

Canada lynx and snowshoe hares are strongly associated with moist, cool, boreal spruce-fir forests. Landscapes with high snowshoe hare densities are optimal for lynx survival and reproduction, and research suggests that hare densities consistently at or above 0.5 hares per hectare (0.2 hares/acre) are needed to support persistent lynx populations. Hares are most abundant in young regenerating or mature multistoried forests with dense understory vegetation that provides food and cover. In the northern contiguous U.S., boreal forests become naturally patchy and marginal for lynx as they transition to temperate forest types that support lower hare densities. Such forests cannot support lynx populations, even though snowshoe hares may still be present. Snow also influences lynx distribution, and populations typically occur where continuous snow cover lasts four months or longer. Such areas are believed to provide lynx with a seasonal competitive advantage over other terrestrial hare predators like bobcats and coyotes.

Lynx are broadly distributed across most of Canada and Alaska, which combined encompass about 98% of the species breeding range. The contiguous U.S. distinct population segment (DPS) accounts for the other two percent, and includes resident breeding populations in northern Maine, northeastern Minnesota, northwestern Montana/northern Idaho, and north-central Washington. An introduced population also occurs in western Colorado, and several other areas may have historically supported small resident populations (e.g., northern New Hampshire, Isle Royale, Michigan, northeastern Washington, and the Greater Yellowstone area of southwestern Montana and northwestern Wyoming). Lynx also have occurred temporarily in many other states, typically during irruptions (mass dispersal events) from Canada, when northern hare populations underwent dramatic cyclic declines roughly every 10 years. The Contiguous U.S. DPS of lynx was listed as threatened in 2000 because regulations on some Federal lands at that time were inadequate to ensure the conservation of lynx populations and habitats.

Currently, the best available information, including historic records and recent surveys, indicates that Canada lynx, if present in Michigan, are likely limited to a small number of dispersing individuals in the Upper Peninsula. There is no indication of recent or current lynx breeding within the state. Verified sightings of lynx in Michigan are infrequent and dispersed. In 2003, a lynx was incidentally captured in a bobcat trap on the Hiawatha National Forest, and in 2010 a lynx was observed on Sugar Island near Sault Ste. Marie. Most recently, a Canada lynx was trapped in the Lower Peninsula in early 2019, and was subsequently released in Schoolcraft County. Detection of a very low number of dispersing individuals may be difficult, however project assessment for potential effects to lynx in the Upper Peninsula may be prudent.

For additional information on the Canada lynx, please see the species profile.

Gray Wolf (Canis lupus)

Gray wolves are highly social animals that live in groups, called packs, which typically include a breeding pair, their offspring, and other non-breeding adults. Wolves are capable of mating by age one or two and sometimes form a lifelong bond. On average, four to five pups are born in early spring and are cared for by the entire pack. For the first six weeks, pups are reared in dens. Dens are often used year after year, but wolves may also dig new ones or use some other type of

shelter, such as a cave. After a year or two, young wolves often leave their packs to try to find a mate and form a pack or join other existing packs. Wolf packs occupy and defend territories, which range in size from less than 50 square miles to more than 1,000 square miles, depending on habitat and seasonal movements of available prey. Wolves travel over large areas to hunt, as far as 30 miles in a day. Although they usually trot along at five miles per hour, wolves can run as fast as 40 miles per hour for short distances.

Wolves occur throughout Michigan's Upper Peninsula, and efforts to reintroduce a population of 20-30 wolves to Isle Royale were initiated in 2018. On November 3, 2020, the Service issued a final rule (effective January 4, 2021) removing from the List of Endangered and Threatened Wildlife the gray wolf entities in the lower 48 United States and Mexico, except for the Mexican wolf (*C. l. baileyi*), that will remain listed (85 FR 69778). On February 10, 2022, a district court vacated and remanded the delisting rule, resulting in return to the List of Endangered and Threatened Wildlife.

For additional information on the gray wolf, please see the species profile.

Indiana Bat (Myotis sodalis)

Indiana bats may summer in a wide range of habitats, from highly altered landscapes to intact forests. Roost trees vary considerably in size. Although trees used by Indiana bat maternity colonies are typically greater than 9 inches diameter at breast height (dbh), those used by males and non-reproductive females or as alternate roosts for maternity colonies may be as small as 5 inches dbh. Indiana bats typically roost beneath peeling bark but may also use cracks or crevices. As such, roost trees tend to be dead or dying trees with some bark remaining, or live trees with naturally exfoliating bark, such as shagbark hickory (*Carya ovata*); see Appendix III for more information. Rarely do Indiana bats roost in structures, such as barns, sheds, or bridges. During winter, the species hibernates in caves, abandoned mine portals or similar structures.

The Indiana bat was listed as endangered in 1967 due to episodes of people disturbing hibernating bats in caves during winter, which resulted in the death of substantial numbers of bats. Indiana bats are vulnerable to disturbance because they hibernate in large numbers in only a few sites, with major hibernacula supporting 20,000 to 50,000 bats. Since its listing, the range-wide Indiana bat population has declined by nearly 60%. Several threats are believed to have contributed to the Indiana bat's decline, including the commercialization of caves, loss and degradation of forested habitat, pesticides and other contaminants, and most recently, the disease white-nose syndrome.

Indiana bats have been documented at many sites in Lower Michigan and are believed to range throughout the southern five county tiers, as well as parts of the thumb and the western coastal counties up to (and including) the Leelanau peninsula. Indiana bats that summer in Michigan roost in trees in riparian, bottomland, and upland forests from approximately April through September. Michigan is home to a single known Indiana bat hibernaculum: a hydroelectric dam in Manistee County. Although the dam supports about 20,000 hibernating bats, Indiana bats comprise less than 1% of the winter population. Research suggests that the majority of the Indiana bats that summer in Michigan migrate to hibernacula in nearby states, including Indiana and Kentucky. See the Appendices for more information on suitable Indiana bat habitat in Michigan.

For additional information on the Indiana bat, please see the species profile.

Northern Long-eared Bat (Myotis septentrionalis)

Northern long-eared bats spend winter hibernating in caves, mines, or similar structures, preferring areas with constant temperatures, high humidity, and no air currents. During the summer, the species typically roosts underneath bark or in cavities, crevices, or hollows of both live and dead trees and/or snags (typically ≥3 inches dbh; see Appendix IV). On occasion, northern long-eared bats will roost in manmade structures, such as barns and sheds. These bats forage for insects in upland and lowland woodlots and tree-lined corridors.

The northern long-eared bat is one of the species most impacted by white-nose syndrome. The northern long-eared bat was proposed for federal listing as endangered on October 2, 2013. On April 2, 2015, the species was given a proposed listing of threatened with an interim 4(d) rule, which was finalized on January 14, 2016 (USFWS 2016a). No critical habitat has been proposed for the species. On March 22, 2022, the Service published a Species Status Assessment Report for the Northern Long-eared Bat (USFWS 2022a), and on the following day (March 23, 2022), published a proposal to reclassify the northern long-eared bat as endangered under the ESA. On November 29, 2022, the Service published a final rule reclassifying the northern long-eared bat from threatened to endangered. The final rule, effective March 31, 2023, addresses a court order requiring the Service to reconsider the previous listing decision for the northern long-eared bat within 18 months of completing a species status assessment, or by November 30, 2022 (Case 1:15-cv-00477, March 1, 2021), and removes its species-specific 4(d) rule.

To streamline the formal section 7 process for any projects that are completed by **April 1, 2024** and consistent with the previous 4(d) rule, the Service is providing an Interim Consultation Framework that provides take authorization for northern long-eared bat. The framework applies to a wide variety of ongoing projects with a federal nexus (federal permit or funding), such as timber harvest, prescribed fire, and infrastructure projects. For projects where take is likely to occur that meet the requirements of the framework, agencies will fill out a template Biological Assessment form, and Field Offices will provide a completed template Biological Opinion and Incidental Take Statement in a timely manner.

During the Interim Consultation Framework period (March 31, 2023, through April 1, 2024), the Service is incorporating known northern long-eared bat locations into project reviews and IPaC assisted determination keys to help project proponents decide where take of northern long-eared bats is reasonably certain to occur. We have integrated the Interim Consultation Framework and known locations into our analysis and All Species Michigan Determination Key and will update these again at the end of the Interim period.

The northern long-eared bat has been documented in many Michigan counties and is believed to range throughout the entire state. The species is present in the state year-round, migrating between summer and winter habitat during the spring and fall. Many northern long-eared bat hibernacula have been documented in Michigan, most of which are abandoned mines located in the western Upper Peninsula. See the Appendices for more information on suitable northern long-eared bat habitat in Michigan.

For additional information on the northern long-eared bat, including the previous 4(d) rule, Species Status Assessment, reclassification rule, and details on the 2023 Interim Consultation Framework, please see the species profile.

Tricolored Bat (Perimyotis subflavus)

A petition to list the tricolored bat as threatened was received by the Service on June 16, 2016. On December 20, 2017, the Service found that the petition presented substantial scientific or commercial information indicating that the petitioned actions may be warranted and commenced a review (as a 12-month finding) to determine if listing of the tricolored bat is warranted (82 C.F.R. 60362; December 20, 2017). On September 14, 2022, the Service posted a completed Species Status Assessment (SSA) Report for the Tricolored Bat (USFWS 2021) and published a proposed rule to list the tricolored bat as endangered. The proposed rule noted that WNS has caused estimated declines of more than 90% in affected tricolored bat colonies and is currently present across 59% of the species' range.

In Michigan, the tricolored bat was rare pre-WNS and is exceedingly rare post-WNS. The species has been observed in 12 Michigan counties to date, largely during the fall or winter. With very few exceptions, the species has not been observed in Michigan in the summer months, and no maternity colonies have been found. During winter, tricolored bats hibernate in caves, abandoned mines, and abandoned tunnels. During spring, summer and fall months, they roost primarily among leaf clusters of live or recently dead deciduous/hardwood trees.

For additional information on the tricolored bat, please see the species profile.

Copperbelly Water Snake (Nerodia erythogaster neglecta)

Copperbelly water snakes require a mosaic of shallow wetlands or floodplain wetlands surrounded by forested uplands. Seasonally flooded wetlands without fish are favored foraging areas, and copperbellies frequently move from one wetland to another. The species feeds primarily on amphibians, mostly frogs and tadpoles, and requires shallow wetlands along the edges of larger wetlands complexes where they can hunt for frogs, as well as multiple wetland types and adjacent uplands. Copperbellies hibernate, often in crayfish burrows, in forested wetlands and immediately adjacent forested uplands. They remain underground from late October until late April.

The copperbelly water snake is found in two geographically separated areas. The northern distinct population segment (DPS) includes southern Michigan, northeastern Indiana and northwestern Ohio. This DPS was listed as threatened under the ESA in 1997. The southern DPS is not Federally listed. Over the last 20 years, surveys have shown a continuing decline in the overall number of snakes in the northern DPS. At present, only five small sub-populations persist within the tri-state area, including Hillsdale County in Michigan. Threats to copperbelly watersnake include habitat fragmentation and loss, predation, persecution, and emerging stressors such as climate change and disease.

For additional information on the copperbelly watersnake, including a recent five-year status assessment, please see the species profile.

Eastern Massasauga Rattlesnake (Sistrurus catenatus)

The Eastern massasauga rattlesnake (EMR)'s habitat is typically associated with open to forested wetlands and adjacent uplands. During colder months (generally October through April), EMR hibernate below the frostline in crayfish or small mammal burrows, tree root networks or rock cervices in areas where the water table is near the surface (areas where the soil is saturated but not inundated) and with consistent hydrology to support overwinter survival. Hibernacula are

typically near wetland edges, or slightly upland (typically within 500 meters of regulated wetland). EMR stay in the area around their hibernacula until overnight temperatures warm up enough for them to move to their active season range.

The Service listed the EMR as a threatened species under the ESA on September 30, 2016. Once common across its range, the EMR has declined dramatically since the mid-1970s as a result of habitat loss and fragmentation, a lack of proper habitat management, and eradication by humans. The most prominent threats include habitat loss and fragmentation through development and vegetative succession, mortality of individuals as a result of roads, hydrologic alteration resulting in drought or flooding, persecution, collection, and post-emergent prescribed fire, mowing, and disking. Disease is a relatively recent threat with still unknown consequences. The effects of threats on extinction risk to EMR populations were included in model evaluations (Faust *et al.* 2011), while the Species Status Assessment (Szymanski *et al.* 2016) considered the total number of sites range wide where specific threats were reported.

Michigan currently supports more EMR populations than any other state or province, although the species has declined within the state. The range within Michigan includes most of the Lower Peninsula and Bois Blanc Island in Mackinac County (Lake Huron). The EMR is highly secretive and cryptic in nature, and can persist in low densities, which makes them difficult to detect. Further, there are extensive areas of the state that have never been surveyed for EMR. To assist project proponents in determining the likelihood of EMR presence in their project areas, the Service has identified occupied and likely occupied habitat using a tiered system in Michigan. Tiered habitat is based on the proximity to a known element occurrence and the suitability of the habitat according to available spatial data and population modeling. Tier 1 habitat are those areas known to be occupied or highly likely to be occupied by EMR. Tier 2 habitat includes areas with high potential habitat (and may be occupied by EMR). Projects can also be "within the known range" of EMR. Areas within the known range but outside of Tier 1 and Tier 2 are considered less likely to be occupied. However, it is likely that there are additional and yet-unknown occurrences throughout the Lower Peninsula of Michigan.

For additional information on the eastern massasauga, including a recent Species Status Assessment and draft recovery plan, please see the species profile.

American Hart's-Tongue Fern (Asplenium scolopendrium var. americana)

American hart's-tongue fern is found in close association with outcrops of dolomitic limestone, in coulees, gorges and in cool limestone sinkholes in mature hardwood forests. It requires high humidity and deep shade provided by mature forest canopies or overhanging rock cliffs. It prefers soils high in magnesium.

Although American hart's-tongue is found over a very wide area, from Alabama to Canada, its populations tend to be very small and isolated due to its unique habitat. Because of its natural rarity, it is particularly vulnerable to disturbance. Many activities threaten the American hart's-tongue. Quarrying, recreation, and residential development have all destroyed these plants and their habitat. Canadian populations are threatened by lumbering and the development of land for ski resorts and country estates, among other activities. By removing shade trees, logging raises light levels and lowers humidity, decimating any American hart's-tongue ferns in that area. The Service officially listed American hart's-tongue on July 14, 1989.

In Michigan, all known American hart's-tongue populations occur on prominent highlands of the Niagara escarpment in the eastern Upper Peninsula, typically in relatively young forest dominated by sugar maple. It is commonly found in association with northern holly fern (*Polystichum lonchitis*), common polypody (*P. virginianum*), maidenhair spleetwort (*Asplenium trichomanes*), fragile fern (*Cystopteris fragilis*), and herb-robert (*Geranium robertianum*).

For additional information on the Hart's-tongue fern, including a recent Species Status Assessment, please see the species profile.

Dwarf Lake Iris (Iris lacustris)

Occurring close to Great Lakes shorelines in cool, moist lakeshore air, dwarf lake iris is found on sand or in thin soil over limestone-rich gravel or bedrock. Habitat is along old beach ridges or behind open dunes. Changing water levels can open new habitat for the plants.

Dwarf lake iris was added to the U.S. List of Endangered and Threatened Wildlife and Plants in 1988. Dwarf lake iris only grows around the Great Lakes and occurs near the northern shores of Lakes Huron and Michigan in Michigan, Wisconsin, and Ontario, Canada. The lakeshore habitat of dwarf lake iris has been greatly reduced by shoreline development. Residential and vacation homes as well as associated road-widening, chemical spraying and salting, and off-road vehicle use have caused disturbance and destruction of habitat.

For additional information on the dwarf lake iris, including a recovery plan, please see the species profile.

Eastern Prairie Fringed Orchid (Platanthera leucophaea)

The eastern prairie fringed orchid occurs in a wide variety of habitats, from mesic prairie to wetlands such as sedge meadows, marsh edges, even bogs. It requires full sun for optimum growth and flowering and a grassy habitat with little or no woody encroachment. A symbiotic relationship between the seed and soil fungi, called mycorrhizae, is necessary for seedlings to become established. This fungi helps the seeds assimilate nutrients in the soil. This orchid is a perennial herb that grows from an underground tuber. Flowering begins from late June to early July, and lasts for 7 to 10 days. Blossoms often rise just above the height of the surrounding grasses and sedges. The more exposed flower clusters are more likely to be visited by the hawkmoth pollinators, though they are also at greater risk of being eaten by deer. Seed capsules mature over the growing season and are dispersed by the wind from late August through September.

Historically, eastern prairie fringed orchid was found in more than 20 Michigan counties, including the southern Lower Peninsula and Cheboygan County. Following extensive habitat loss, it now persists in fewer than 10 counties and is largely limited to the remnant lakeplain prairies of Saginaw Bay and western Lake Erie. Since the 1980s, inventories have demonstrated a continued decline of the orchid within known habitats, likely as a result of high lake levels and drought.

The eastern prairie fringed orchid was listed as threatened on September 28, 1989. Early decline was attributed to loss of habitat, mainly conversion of natural habitats to cropland and pasture. Habitat loss, including from the drainage and development of wetlands, is a continued threat to the species. Other current threats include succession to woody vegetation, competition from non-native species, and over-collection.

For additional information on the eastern prairie fringed orchid, please see the species profile.

Houghton's Goldenrod (Solidago houghtonii)

Houghton's goldenrod typically grows on moist sandy beaches and shallow depressions between low sand ridges along the shoreline, called interdunal wetlands. Fluctuating water levels of the Great Lakes play a role in maintaining this unique goldenrod. During high water years, colonies of Houghton's goldenrod may be submerged. When water levels recede, some plants survive the inundation and new seedlings establish on the moist sand. Other plants that often grow with Houghton's goldenrod include Grass-of-Parnassus, Kalm's lobelia, shrubby cinquefoil, twigrush, and other goldenrods.

Houghton's goldenrod occurs almost exclusively on Great Lakes shoreline, growing primarily along the northern shores of Lakes Michigan and Huron in the Straits region. Most populations occur in Chippewa, western Mackinac, northern Emmet, Cheboygan, and northern Presque Isle counties. There are also interior populations in Mackinac County (a few miles from the Great Lakes shoreline). Interior populations in Kalkaska and Crawford Counties have been determined to be another species, *S. vossii* (Laureto and Pringle 2010).

Houghton's goldenrod was listed as threatened on July 18, 1988 (53 FR 27134). High lake levels are a potential threat to some population that occur along Great Lakes shorelines, particularly in recent years. Residential development continues to be a threat, especially along the shores of Lake Huron in Cheboygan and Presque Isle Counties, Michigan. Invasive species, including *Phragmites australis* (common reed) and *Typha spp.* (cattails) threaten some populations (Leopold and Weber 2019).

For additional information on Houghton's goldenrod, including a recent five-year status review, please see the species profile.

Lakeside Daisy (Hymenoxys herbacea)

Lakeside daisy is a long-lived perennial daisy that grows on alvars, a type of limestone with little plant cover, in full sunlight. All individuals within a given population tend to bloom about the same time, typically in late spring. After about a week, the double notched petals fade before falling. Seed dispersal takes place about a month later. Lakeside daisy also reproduces vegetatively by rhizomatous growth.

Lakeside daisy is an endemic restricted to the Great Lakes area, within which it is one of the region's rarest plants, naturally occurring at only a handful of sites. In the U.S., it is known only from the Marblehead Peninsula area in northern Ohio, three restored populations in northern Illinois (where it was known historically from two sites), and a single, extremely small colony in Michigan's Upper Peninsula. In Ontario, Canada, where lakeside daisy is most abundant, it occurs along much of the southern coast of Manitoulin Island and in several restricted areas near the tip of the Bruce Peninsula.

The lakeside daisy was listed as threatened on June 23, 1988. The wide area encompassing known lakeside daisy sites suggests that the species was once widespread in prairie habitats throughout the Midwest and along Huron's northern shore. Fire suppression practices have eliminated the wildfires which once regularly cleared prairie grasslands of the encroaching woods. Now the expansion of shrubs and trees threatens the daisy, which needs full sun to survive. Limestone quarrying, which has increased in recent years, destroys the daisy's habitat. Finally, collectors may also pose a threat, since the daisy is now found in just a handful of sites.

For additional information on lakeside daisy, please see the species profile.

Michigan Monkey-Flower (Mimulus michiganensis)

The Michigan monkey-flower (MMF) is a rare Michigan endemic plant with a range restricted to Great Lakes shorelines in the Mackinac Straits and Grand Traverse regions. It is semi-aquatic and forms mats over mucky soil and sand saturated or covered by cold, flowing spring water.

The MMF was listed as endangered on June 21, 1990 55 FR 25596 25599). The greatest threat to MMF is direct destruction and modification of its habitat. The MMF's habitat has been developed for recreational and residential purposes, which has led to severe impacts to and, in some cases, extirpation of historical populations. Hydrological disruptions also constitute a serious threat, as water diversion, warming of water sources, and other groundwater alterations lead to less-than-optimal habitat conditions.

Consequently, this species may be inadvertently impacted by offsite activities. Populations of MMF are particularly vulnerable to extirpation due to low numbers and limited capability for sexual reproduction. Additionally, periodic high-water levels of the Great Lakes and strong winter storms impact MMF habitat that occurs near the Great Lakes shoreline by redirecting seepage streams and opening the overstory by felling cedars. However, opening of the overstory may also benefit MMF by allowing for colonization.

Invasive species, including forget-me-not (*Myosotis scirpoides*), coltsfoot (*Tussilago farfara*), reed canary grass (*Phalaris arundinacea*), and Canada thistle (*Cirsium arvense*) represent an additional threat. Some of the MMF colonies at the Maple River site are in pockets of habitat with up to 99% invasive species (Canada thistle and forget-me-not), with only scattered MMF stems remaining. Coltsfoot and reed canary grass are known to occur at or in the vicinity of other MMF sites.

For additional information on the MMF, including a recent five-year status review, please see out the species profile.

Pitcher's Thistle (Cirsium pitcheri)

Pitcher's thistle is a native thistle occurring on the open sand dunes and low open beach ridges of Great Lakes shoreline. It is most often found in near-shore plant communities but it can grow in all non-forested areas of a dune system. It is now found in Indiana, Michigan, Wisconsin, and Ontario, Canada. Pitcher's thistle was extirpated from Illinois but has been reintroduced in Lake County.

Pitcher's thistle was added to the List of Endangered and Threatened Wildlife and Plants on July 18, 1988 (53 FR 27137). The primary threats are invasive plants and recreational use of the dunes, but there is continued concern regarding the potential impact of seed-eating weevils. Surveys have been done in portions of the range, indicating increased abundance and potential stability in parts of the range (i.e., Upper Peninsula of Michigan) and decreased abundance or even extirpation of previously known populations in other parts of the range (i.e., southern Michigan).

Survey work by Michigan Natural Features Inventory in 2012-2016 has shown that the Pitcher's thistle population in Michigan may be larger than previously believed and could exceed 1,000,000 individuals (Slaughter and Cuthrell 2017). Conversely, research on the invasive weevil species (*Larinus planus* and *Rhinocyllus conicus*) in recent years has shown cause for

concern, with demonstrated declines in population growth rates that could lead to localized extinctions of some populations (Havens et al. 2012a). More information is needed in order to assess the magnitude and extent of this threat.

For additional information on Pitcher's thistle, including a recent five-year status review, please see the species profile.

Specific Conservation Measures

In addition to the general exclusions, this section details species- or taxon-specific exclusions and/or conservation measures that must be met in order to use this standing analysis and receive a conclusion from IPaC through the DKey. To ensure compliance with the ESA, project-specific consultation (or other programmatic consultation, if applicable) with the Service may be necessary for projects that cannot make a "no effect" determination for any listed species that may occur in the project area and cannot apply the following conservation measures. Such projects would not necessarily result in significant adverse effects to Federally listed species or their habitats.

Whooping Crane

Projects that intersect the whooping crane NEP AOI must not occur within a National Wildlife Refuge or National Park. For Federal projects for which the action agency cannot conclude "no effect" to whooping crane within NWRs or NPs, agencies must consult with the Service outside of the determination key. Outside of NWRs or NPs, agencies must confirm that their project is not likely to jeopardize the continued existence of whooping crane. If they cannot confirm no jeopardy, they must conference to complete their section 7 requirement outside of the determination key.

Piping Plover and Piping Plover Critical Habitat

Projects that intersect the piping plover AOI, occur within ¼ mile onshore and ¼ mile offshore of Great Lakes shoreline, and contain suitable piping plover habitat; or intersect piping plover critical habitat containing the primary constituent elements, must not result in:

1. Any changes to the quality, quantity, or availability[2] of suitable piping plover habitat[3] during the breeding season (April 15 through August 15) or to CH at any time of year
2. Any permanent changes to suitable piping plover habitat[4] or CH
3. Increased activity[5] within suitable piping plover habitat or CH

If the project does not occur in suitable habitat along the Great Lakes shoreline, or if the critical habitat doesn't contain the physical and biological features essential to the conservation of piping plover (for details, refer to 66 FR 22938), piping plovers are not likely to be present in the action area. As such, adverse effects are discountable. Projects that increase human disturbance or potential for predation need further evaluation and do not qualify for the Dkey.

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[2]For example, beach grooming, boardwalk actions, breakwaters, development, dredge deposition, etc.
[3]Piping plover habitat consists of Great Lakes islands and mainland shorelines that support, or have the potential to support, open, sparsely vegetated sandy habitats, such as sand spits or sand beaches that are associated with wide, non-forested systems of dunes and inter-dune wetlands.
[4]In this context, we define permanent to be effects lasting in duration more than 3 weeks
[5]For example, human disturbance, dog activity, or an increase in potential predators such as merlins, or mammalian predators.

Rufa Red Knot

Projects that intersect the rufa red knot AOI and occur within 0.25 mi of a Great Lakes shoreline or inland wetland buffer must not:

1. Permanently modify beaches, dunes, mudflats, peat banks, sandbars, shoals, or other red knot habitats[6] during the red knot migration windows (May 15 through June 15 in the spring OR July 1 through September 30 in the fall)
2. Result in increased human disturbance or predation[7] during the red knot migration windows (May 15 through June 15 in the spring OR July 1 through September 30 in the fall)

During migration, habitat loss, disturbance and increased predation could result in adverse effects and warrant additional evaluation separate from the DKey. If these actions occur outside of the migration window, adverse effects are discountable.

Freshwater Mussels

Projects that intersect the AOI for rayed bean, northern riffleshell, snuffbox, or clubshell mussels must have no permanent effects on local hydrology. If any portion of the project area intersects a Group 3 stream or the 0.5-mi area upstream of a Group 3 stream, the project must not:

1. Have any direct impacts to a stream or river (e.g., stream/road crossings, new stormwater outfall discharge, dams, other in-stream work, etc.)
2. Have potential to indirectly impact the stream/river or the riparian zone (e.g., cut and fill, horizontal directional drilling, construction, vegetation removal, discharge, etc.)

The AOI for mussels is currently a county-based list. The Group 3 is a more specific list of stream segments within known counties that contain habitat likely to be occupied by listed mussels (see https://www.fws.gov/media/michigan-freshwater-mussel-survey-protocols-and-relocation-procedures-rivers-and-streams for additional information). Avoiding direct or indirect impacts to the stream, including changes to hydrology, will ensure adverse effects are insignificant and/or discountable.

In addition, some Michigan EGLE/Army Corps of Engineer joint permit application Minor Permit (MP) and General Permit (GP) categories (https://www.michigan.gov/documents/deq/wrd-general-permit-categories_555828_7.pdf) have been evaluated and determined to have discountable effects to listed mussels, including:

- MP 3 - Boat Hoist;

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[6]For example, the following actions may modify red knot habitat: groins, jetties, sea walls, revetments, bulkheads, rip-rap, beach nourishment, nearshore dredging, dredge spoil disposal, sand mining/borrowing, beach bulldozing, sandbagging, sand fencing, vegetation planting/alteration/removal, deliberate or possible introduction of non-native vegetation, beach raking/mechanized grooming, boardwalks, aquaculture development.

[7]For example, the action is likely to indirectly increase access or use of red knot habitats by humans and/or predators at times of year that the birds are typically present (e.g., commercial/residential development, beach access structures, boardwalks, pavilions, bridges/roads/ferries/trails, marinas, posts or other avian predator perches, structures or habitat features likely to encourage predator nesting/denning, trash cans or other predator attractants, feral cat colonies, policy changes likely to increase human use).

- MP 5 - Boat Wells;
- MP 7 - Completed Enforcement Actions;
- MP 13 - Dock;
- MP 22 - Fish and Wildlife Habitat Structures;
- MP 25 - Ford Stream Crossings for Commercial Forestry Operations;
- MP 31 - Maintenance and Repair of Serviceable Structures;
- MP 52 - Temporary Recreational Structures;
- MP 54 - Wetland Habitat Restoration and Enhancement;
- GP A - Aids to Navigation;
- GP C - Clear Span Bridge;
- GP G - Culverts - Small;
- GP J - Dry Fire Hydrant;
- GP O - Minor Permit Revisions and Transfers;
- GP Q - Mooring Buoy;
- GP V - Scientific Measuring Devices;
- GP W - Snow Road Stream Crossings for Forestry Operations;
- GP Y - Spring Piles and Piling Clusters

Group 2 Streams are those that are likely to have state listed mussels. Note that if the project intersects a Group 2 stream, the output letter will include language notifying the applicant that state-listed mussels may occur in the area, and to contact the Michigan Department of Natural Resources to determine effects to state-listed mussels.

Hine's Emerald Dragonfly and Hine's Emerald Dragonfly CH

Projects that intersect the Hine's emerald dragonfly AOI or CH must not:

1. Disturb the ground or existing vegetation within 500 meters of a calcareous wetland, fen, sedge meadow, or marsh[8]
2. Affect local hydrology (permanently or temporarily)
3. Include construction or modification of a road or trail within occupied or CH buffered habitat

The main threats to Hine's emerald dragonfly are habitat destruction, urban sprawl, off-road vehicles, road and pipeline construction – all of which result in ground disturbance. Avoiding ground disturbance will preclude direct effects to Hine's emerald dragonfly. Avoiding alterations to hydrology will preclude indirect effects.

Hungerford's Crawling Water Beetle

Projects that intersect the HCWB AOI must not:

1. Involve any road or stream actions (e.g., bridge or culvert actions) or in-stream disturbance within or adjacent to (i.e., within 100m of) a stream or river including loss of riparian vegetation
2. Affect local hydrology (permanently or temporarily)

[8]This includes any off road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc.

Avoiding direct and indirect impacts to streams will avoid impacts to suitable HCWB habitat. Projects that involve work within or adjacent to streams within the HCWB's AOI do not qualify for this key.

Karner Blue Butterfly

Projects that intersect the KBB AOI must avoid the following within suitable habitat[9]:

1. Disturbance to any areas containing wild lupine
2. Chemical use
3. Any activities that may result in habitat loss

Avoiding areas containing wild lupine (the host plant for KBB) will ensure disturbance will have no adverse effects to KBB. Additional consultation (outside of the Dkey) is needed if loss of habitat will occur to ensure effects are insignificant or discountable.

Mitchell's Satyr

Projects that intersect the Mitchell's satyr AOI must not:

1. Include alteration or fill of more than 3 acres of wetland
2. Affect local hydrology (permanently or temporarily)
3. Disturb the ground or existing vegetation within 0.5 miles of a Mitchell's satyr occurrence in suitable habitat (prairie fen, shrub carr, tamarack swamp, tamarack savanna, wet meadow, or wet prairie habitat)

Projects must avoid disturbing the ground or existing vegetation, which includes any off road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc. Avoiding ground disturbance (defined to include use of chemicals) in suitable habitat will ensure direct effects are discountable. Avoiding changes to hydrology will avoid indirect effects to Mitchell's satyr within an occupied watershed.

Poweshiek Skipperling and Poweshiek Skipperling Critical Habitat

Projects that intersect the Poweshiek skipperling AOI or CH must not:

1. Include alteration or fill of more than 3 acres of wetland
2. Affect local hydrology (permanently or temporarily)
3. Disturb the ground or existing vegetation within 0.5 miles of a population that has been extant within the last 5 years in suitable habitat (prairie fen, sedge meadow, or tall grass prairie habitat)

Projects must avoid disturbing the ground or existing vegetation, which includes any off road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc. Avoiding ground disturbance (defined to include use of chemicals) in suitable habitat will ensure direct

[9]This includes a variety of habitats containing wild lupine, including oak savanna, oak or pine barrens, openings within oak forest (including rights-of-way), or old fields in association with oak forest.

effects are discountable. Avoiding changes to hydrology will avoid indirect effects to Poweshiek skipperling within an occupied watershed.

Canada Lynx

Projects that intersect the Canada lynx AOI must not include any actions that would harm the species directly (e.g., mammal trapping, poison bait, etc.).

Gray Wolf

Projects that intersect the gray wolf AOI must not:

1. Overlap with a known gray wolf denning or rendezvous area (users are directed to contact the lead gray wolf biologist with the Michigan Department of Natural Resources for assistance in determining whether their project area may overlap known denning or rendezvous areas)
2. Have any potential for the action to harm wolves directly (e.g., mammal trapping, poison bait), or indirectly (e.g., increasing vehicle use that may result in vehicle strikes, exposure to potential human persecution)

Indiana Bat

Projects that intersect the Indiana bat AOI must not:

1. Contain any known or potential hibernacula (including natural caves, abandoned mines, or underground quarries) within 0.25 miles of the project area
2. Remove/modify a human structure (barn, house or other building) known to contain roosting Indiana bats

Additionally, projects that contain known or potential Indiana bat habitat[10] and include tree cutting/trimming, prescribed fire, and/or pesticide (including insecticide and rodenticide) application must not:

1. Clear >10 contiguous acres of forest habitat within 5 miles of a known Indiana bat hibernaculum (Tippy Dam)
2. Clear >10 contiguous acres of modeled summer habitat (see Appendix I, II)
3. Fragment a connective corridor between 2 or more forest patches of at least 5 acres (see Appendix II)

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[10]Suitable summer habitat for Indiana bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats, such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥5 inches dbh that have exfoliating bark or cracks/crevices), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit characteristics of suitable roost trees and are within 1,000 feet of other forested/wooded habitat. Southern Michigan maternity roost trees are typically dead or dying trees in open areas exposed to solar radiation. Infrequently, Indiana bats are observed roosting in human-made structures, such as buildings, barns, bridges, and bat boxes.
The Michigan Field Office has modeled suitable Indiana bat habitat across the species' expected range in Michigan based on available data. See Appendix I for details on how the habitat suitability model was developed and incorporated into the DKey.

4. Cut or trim any potential Indiana bat roost trees (trees ≥5 inches in diameter [at breast height] with cracks, crevices and/or exfoliating bark; see Appendix III), conduct prescribed burning, or apply pesticides (including insecticides and rodenticides) during the following location-specific periods:
    a. Within 5 miles of a known hibernaculum (Tippy Dam): April 1 through October 31 (i.e., activities limited to November 1 through March 31)
    b. In modeled summer habitat and >5 mi from Tippy Dam: April 1 through September 30 (i.e., activities limited to October 1 through April 14)
    c. Outside modeled summer habitat and >5 miles from Tippy Dam: June 1 through July 31 (i.e., activities limited to August 1 through May 31)

Projects that contain known or potential Indiana bat habitat and include herbicide application must follow all label instructions and limit application to targeted methods such as spot-spraying, hack-and-squirt, basal bark, injections, cut-stump, or foliar spraying on individual plants.

Projects that include removal/modification of an existing bridge or culvert suitable for day-roosting Indiana bats[11] must not:

1. Result in the permanent loss of known or potential roosting spaces
    a. Perform construction activities during the active season of April 15 through September 30 (i.e., construction activities limited to October 1 through April 14)

Lastly, projects that include temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s) must:

1. When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation agencies using the BUG system developed by the Illuminating Engineering Society, the goal is to be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable.
2. Direct temporary lighting away from suitable habitat when bats may be present

Northern Long-eared Bat

During the northern long-eared bat Interim Consultation Period (March 31, 2023 – April 1, 2024), projects within known northern long-eared bat occurrence buffers (including 5 miles of a known hibernaculum, 3 miles of a post-WNS mist net capture or verified, post-WNS acoustic detection, and/or 1.5 miles of a post-WNS roost tree) must not:

1. Contain any known or potential hibernacula (including natural caves, abandoned mines, or underground quarries) within 0.25 miles of the project area
2. Remove/modify a human structure (barn, house or other building) known to contain roosting northern long-eared bats

[11]Suitable bridges and culverts include those located below the third county tier of Michigan and within 1,000 feet of suitable forested habitat that contain suitable roosting spaces (e.g., expansion joints, cracks/crevices). Suitable culverts are limited to those at least 4 feet (1.2 meters) high and 50 feet (15 meters) long. If the bridge/culvert been inspected for signs of roosting bats (guano, urine staining, bat vocalizations, and/or bats) during the summer roosting season (May 15 through August 15) and no bats or signs of bats were observed, work on the bridge/structure can proceed at any time of year.

Additionally, projects within the Interim Period occurrence buffers that contain potential northern long-eared bat habitat[12] and include tree cutting/trimming, prescribed fire, and/or pesticide (including insecticide and rodenticide) application must not:

1. Clear >10 acres of forest habitat within 5 miles of a known northern long-eared bat hibernaculum
2. Clear >10 acres of modeled summer habitat within the Indiana bat range/AOI (see Appendix I, II)
3. Clear >20 acres of modeled habitat outside the Indiana bat range/AOI (see Appendix I, II)
4. Fragment a connective corridor between 2 or more forest patches of at least 5 acres (see Appendix II)
5. Cut or trim any potential northern long-eared bat roost trees (trees ≥3 inches in diameter [at breast height] with cracks, crevices, cavities/hollows and/or exfoliating bark; see Appendix IV), conduct prescribed burning, or apply pesticides (including insecticides and rodenticides) during the following location-specific periods:
    a. Within 5 miles of a known hibernaculum in the Upper Peninsula: April 15 through October 14 (i.e., activities limited to October 15 through April 14)
    b. Within 5 miles of a known hibernaculum in the Lower Peninsula: April 1 through October 31 (i.e., activities limited to November 1 through March 31)
    c. In modeled summer habitat and >5 mi from known hibernacula in the Upper Peninsula: May 15 through August 31 (i.e., activities limited to September 1 through May 14)
    d. In modeled summer habitat and >5 mi from known hibernacula in the Lower Peninsula within the Indiana bat range/AOI: April 15 through September 30 (i.e., activities limited to October 1 through April 14)
    e. In modeled summer habitat and >5 mi from known hibernacula in the Lower Peninsula outside of the Indiana bat range/AOI: May 1 through August 31 (i.e., activities limited to September 1 through April 30)
    f. Outside modeled summer habitat and >5 miles from known hibernacula: June 1 through July 31 (i.e., activities limited to August 1 through May 31)

Projects within the Interim Period occurrence buffers that contain potential northern long-eared bat habitat and include herbicide application must follow all label instructions and limit

[12]Suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats, such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks/crevices, and/or cavities/hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit characteristics of suitable roost trees and are within 1,000 feet of other forested/wooded habitat. Infrequently, northern long-eared bats are observed roosting in human-made structures, such as buildings, barns, bridges, and bat boxes.
The Michigan Field Office has modeled suitable Indiana bat habitat across the species' expected range in Michigan based on available data. See Appendix I for details on how the habitat suitability model was developed and incorporated into the DKey.

application to targeted methods such as spot-spraying, hack-and-squirt, basal bark, injections, cut-stump, or foliar spraying on individual plants.

Projects within the Interim Period occurrence buffers that include removal/modification of an existing bridge or culvert suitable for day-roosting northern long-eared bats[13] must not:

2. Result in the permanent loss of known or potential roosting spaces
    a. Perform construction activities during the active season of April 15 through September 30 (i.e., construction activities limited to October 1 through April 14)

Lastly, projects within the Interim Period occurrence buffers that include temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s) must:

3. When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation agencies using the BUG system developed by the Illuminating Engineering Society, the goal is to be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable
4. Direct temporary lighting away from suitable habitat when bats may be present

Copperbelly Water Snake

Projects that intersect the copperbelly water snake AOI and buffered habitat must not:

1. Involve construction or maintenance of a road or other barrier (e.g., paved trail)
2. Affect local hydrology (permanently or temporarily)
3. Disturb the ground or existing vegetation[14] within 0.5 miles of a copperbelly occurrence

Projects that fragment habitat, affect hydrology, or result in ground disturbance need project-specific review in areas where copperbelly occur.

Eastern Massasauga Rattlesnake

The following projects are not covered by the Dkey in Tier 1 or Tier 2 habitat[15]:

1. Prescribed fire
2. New roads, widening existing roads, and other types of projects that create a permanent barrier to snake movement
3. Projects that permanently alter hydrology
4. Projects that temporarily alter hydrology during the inactive season

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[13]Suitable bridges and culverts include those located below the third county tier of Michigan and within 1,000 feet of suitable forested habitat that contain suitable roosting spaces (e.g., expansion joints, cracks/crevices). Suitable culverts are limited to those at least 4 feet (1.2 meters) high and 50 feet (15 meters) long. If the bridge/culvert been inspected for signs of roosting bats (guano, urine staining, bat vocalizations, and/or bats) during the summer roosting season (May 15 through August 15) and no bats or signs of bats were observed, work on the bridge/structure can proceed at any time of year.

[14]This includes any off road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc.

[15]In Tier 1 habitat, contact the Service regarding the potential applicability of surveys to determine EMR absence in suitable habitat.

5. In Tier 1, projects that impact more than 0.5 acres of EMR habitat, or in Tier 2, greater than 1 acre of EMR habitat
6. Projects that include mowing vegetation (non-turf grass) during the active season

In addition, in order to reach a not likely to adversely affect determination:

7. In Tier 1, projects cannot result in ground disturbance in areas where potential hibernacula occur. (If present in Tier 1, projects must avoid ground disturbance any time of year). In Tier 2, projects cannot result in ground disturbance to potential hibernacula during the inactive season (if present in Tier 2, ground disturbance must be well within the active season to avoid when snakes are present underground).
8. If conducting ground disturbing work in Tier 1 or Tier 2 habitat, the following best management practices (BMPs) must be implemented (if applicable):
    a. Use existing roads and minimize speeds at facilities and access roads (e.g., <15 mph on two track roads), during the active season.
    b. Use low impact equipment such as lightweight track mounted vehicles with low ground pressure OR limit vehicle use to the inactive season, when the ground is completely frozen.
    c. Revegetate all disturbed areas with appropriate plant species (i.e., native species or other suitable non-invasive species present on site prior to disturbance). Monitor all restoration plantings for proper establishment and implement supplemental plantings as necessary to ensure restorations are of equal to or better habitat quality than previous conditions.
    d. Avoid the spread of invasive species into suitable EMR habitat by following best practices such as inspecting and cleaning equipment and vehicles for invasive plant materials and seeds before entering EMR habitat areas.
    e. Ensure fill is clean and free of contaminants/invasive species.
9. For projects during the active season, in Tier 1 and Tier 2, projects must include the following BMPs (if applicable):
    a. In Tier 1, for projects involving earth work, properly install exclusionary fencing, clear the area before work begins using a qualified person, and remove all fencing following project completion.
    b. Keep turf grass short (<6 inches) throughout the active season. In non-turf grass, mow tall (>6 inches) vegetation during the inactive season (for Tier 1), or raise the deck height to greater than 8 inches (for Tier 2).
10. For projects using chemical treatments (e.g., herbicides), they must agree to follow all appropriate label instructions regarding which herbicide formulation and proper use in potential EMR habitat AND avoid spray drift beyond the target species/area (observing label instructions regarding optimal wind speed and direction, boom height, droplet size calibration, precipitation forecast, etc.).

For all Projects within the range, including Tier 1 and Tier 2, projects must include all General BMPs:

    a. Use wildlife-safe materials for erosion control and site restoration throughout the project area. Do not use erosion control products containing plastic mesh netting or other similar material that could entangle eastern massasauga rattlesnake (EMR). Several products for soil erosion and control exist that do not contain

plastic netting including net-less erosion control blankets (for example, made of excelsior), loose mulch, hydraulic mulch, soil binders, unreinforced silt fences, and straw bales. Others are made from natural fibers (such as jute) and loosely woven together (often referred to as "leno weave") in a manner that allows wildlife to wiggle free.

b. To increase human safety and awareness of EMR, those implementing the project should first watch MDNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake" video (available at https://youtu.be/~PFnXe_e02w), review the EMR factsheet (available at https://www.fws.gov/media/eastern-massasauga-rattlesnake-fact-sheet), or call (517) 351-2555.
c. During project implementation, require reporting of any Federally listed species, including EMR, to the Service within 24 hours.

Based on implementation of the recommended BMPs, and avoidance of the excluded actions, adverse effects to eastern massasauga are expected to be discountable.

Plants

In Michigan, threatened plants include American hart's tongue fern, dwarf lake iris, eastern prairie fringed orchid, Houghton's goldenrod, lakeside daisy, and Pitcher's thistle. Michigan monkey flower is Michigan's only endangered plant species. Plants in Michigan are protected by state law in additional to the Federal ESA.

Projects that are funded, authorized, or carried out by a Federal agency, intersect the AOI and/or buffered habitat of a Federally listed plant, and have either determined presence through a survey or have not conducted a survey and are assuming presence must not:

1. Indirectly alter the habitat or resources of the listed plant(s)[16]
2. Directly harm the listed plant(s)[17]

If the project does not have a Federal nexus but has the potential to affect a listed plant, the user will receive output language advising them to contact the Michigan Department of Natural Resources regarding compliance with state law and to determine whether a state permit is needed. We also encourage landowners to maintain habitat for listed plant species and avoid disturbing listed plants to the extent possible.

For projects with a Federal nexus, avoiding direct and indirect effects to plants will ensure effects are insignificant or discountable.

Bald eagle

Although no longer listed under the ESA, bald eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.C. 668a-d). The Dkey provides the user with information on the BGEPA and directs users to contact the MIFO for more information on the BGEPA if their action may impact bald or golden eagles.

[16]For example, actions that cause a change in canopy cover, microclimate, humidity, increase in invasive species, hydrologic alterations, etc.
[17]For example, through prescribed fire, herbicide application, trampling, increased herbivory, cutting/clearing, cultivation, crushing by vehicle, reduction to possession, etc.

Effects Analysis

Projects that meet all of the following criteria can get to a “no effect” determination for all species:

1. Occurs entirely within an already-developed area (e.g., within an existing structure, graveled or paved lot, industrial site) that does not provide habitat for listed species.
2. Does not have any potential for indirect effects to listed species or the habitats they depend on (e.g., water discharge into adjacent habitat or waterbody, changes in hydrology (e.g., surface flows, discharges, groundwater elevation, etc.), sound, introduction of an exotic plant species).
3. Will not impact structures that may serve as roosts for listed bats.

Note that we define "already-developed area", for the purpose of the Dkey, as highly disturbed habitat that does not provide potential feeding, breeding, or sheltering resources for any listed species. This does not include areas such as road or transmission line rights-of-way, other roadside habitat, bridges/culverts, or other developed or disturbed areas that still provide resources to listed species.

For the most part, the species-specific conservation measures ensure projects are not occurring in suitable (occupied) habitat and will not have direct or indirect effects, as described above. For projects where listed species may be present, activities may involve some or all of the following stressors:

Insignificant Habitat Loss/Degradation

Some projects that qualify for use of this DKey may result in minor loss/fragmentation or temporary degradation of available habitat for one or more Federally listed species. However, we believe that adherence to the specific conservation measures will ensure that any reduction or modification of available habitat will result in only insignificant effects to listed species and critical habitats. Conservation measures that control for significant loss/degradation of habitat include restrictions on the extent and timing of certain activities (e.g., acreage thresholds for tree clearing projects within the Indiana bat AOI, seasonal restrictions on temporary surface- and groundwater elevation changes in potential eastern massasauga hibernation habitat), restrictions on stream/hydrology-impacting or vegetation/ground-disturbing activities within the AOIs/buffered habitat of several species (e.g., copperbelly water snake, listed insects), and restrictions on actions that may fragment habitat or create barriers to movement/dispersal within the AOIs of several species (e.g., dams within Group 3 streams, roads/trails/fences within listed snake habitats).

Noise and Vibration

Noise and/or vibration resulting from some projects are typically produced temporarily during the construction phase (e.g., construction vehicles and equipment, blasting) and may be permanently produced during the operation phase (e.g., roads/trails/bridges, commercial/recreational facilities, military operations, etc.). However, we believe that adherence to the specific conservation measures will ensure that any disturbance related to an increase in noise and/or vibration will result in only insignificant effects to listed species and critical habitats. Conservation measures that limit exposure to these stressors and control for significant disturbance include restrictions on the timing of certain activities (e.g., tree cutting during the Indiana bat active season, modifications to beaches, dunes, mudflats or other potential habitats

during the red knot migration windows), restrictions on ground-disturbing activities within the AOIs of several species (e.g., listed snakes, insects), and restrictions on in-stream disturbance within the AOIs of Hungerford's crawling water beetle and listed mussels).

Smoke, Dust, Chemicals, and Odor

Smoke, dust, chemicals, and/or odor resulting from some project activities are typically produced temporarily during the construction phase (e.g., construction vehicles and equipment, blasting, invasives treatment/pesticide application, prescribed burning) and may be permanently produced during the operation phase (e.g., mines/quarries, commercial/residential developments, military operations, etc.). However, we believe that adherence to the specific conservation measures will ensure that any disturbance related to an increase in smoke, dust, chemicals, and/or odor will result in only insignificant effects to listed species and critical habitats. Conservation measures that limit exposure to these stressors and control for significant disturbance include restrictions on the timing of certain activities (e.g., prescribed burning and pesticide use in potential habitat during the Indiana bat and eastern massasauga active seasons), restrictions on chemical use and vegetation-disturbing activities within the AOI of listed insects, restrictions on direct and indirect river/stream impacts in Group 3 streams, and disturbance buffers around sensitive areas (e.g., known gray wolf denning or rendezvous sites).

Night Lighting

Night lighting produced by some projects may occur temporarily during the construction phase (e.g., equipment lighting) and/or permanently during the operation phase (e.g., road/trail and facility lighting). However, we believe that application of the specific conservation measures will ensure that any disturbance related to night lighting will result in only insignificant effects to listed species and critical habitats. Most Federally listed species are not expected to be affected by night lighting; however, certain species that are active at night (e.g., listed mammals, snakes, migrating birds) may be sensitive to an increase in lighting at night. Conservation measures that limit exposure to this stressor and control for significant disturbance include the general exclusion for communications towers more than 200 feet in height (which require night lighting), the timing of certain activities (e.g., actions that may increase human activity in potential habitat during the red knot migration windows), and disturbance buffers around sensitive areas (e.g., known gray wolf denning or rendezvous sites).

Conclusion

If a project is not consistent with the general and species/taxon-specific conservation measures and/or exclusions detailed above, the DKey will provide a response indicating that it cannot generate a conclusion (i.e., "no effect" [NE] or "may affect – not likely to adversely affect" [NLAA] determinations) for all species and will recommend project-specific coordination with the MIFO. In other words, for any species for which the user gets a "may affect" (MA) determination, further consultation with MIFO is required and their endangered species review cannot be completed using the Dkey. On the other hand, if the user provides project-specific information consistent with the conservation measures, IPaC will generate a consistency letter (for non-Federal action agencies) or a concurrence letter (for Federal action agencies) concluding that the project is consistent with NE and/or NLAA determinations for all listed species. We base these conclusions on the effects analysis above, which are summarized in Table 1.

Table 1. A summary of the effects of the stressors from qualifying projects on Federally listed species in Michigan.

Stressor	Effect
Habitat Loss/Degradation	None or insignificant
Noise and Vibration	None or insignificant
Smoke, Dust, Chemicals, and Odor	None or insignificant
Night Lighting	None or insignificant
Conclusion	**"May affect – not likely to adversely affect"**

REFERENCES

Abbas, H. 2011. Prairie Fen Hydrology. Ph.D. Dissertation. Michigan State University, East Lansing, Michigan. 212 pp.

Cuthrell, D.L. and B.S. Slaughter. 2012. Special animal abstract for *Oarisma poweshiek* (Poweshiek skipperling). Michigan Natural Features Inventory, Lansing, MI. 4 pp.

Faust, L., J. Szymanski, and M. Redmer. 2011. Range wide extinction risk modeling for the eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*). Unpublished report, Lincoln Park Zoo and U.S. Fish and Wildlife Service. 66p.

Gibson, T., J. Cecil, and G.T. Watters. 2011. New or confirmed potential host/mussel associations in Ellipsaria, September 2011, Vol.13, No.3, pp 7-8.

Grant, M. and R. Vande Kopple. 2003. Preliminary report of the feeding habits of Hungerford's crawling water beetle. Report to the U.S. Fish and Wildlife Service. 4 pp.

Grant, M. and R. Vande Kopple. 2009. A stable isotope investigation into the feeding behavior of *Brychius hungerfordi* Spangler (Coleoptera: Haliplidae), a federally endangered crawling water beetle. The Coleopterist Bulletin 63(1): 71-83.

Grant, M., R. Vande Kopple, and B. Ebbers. 2011. Hungerford's crawling water beetle survey, Northern Lower Michigan, 2011 Field Season. Report to the U.S. Fish and Wildlife Service. 10 pp.

Grizzle, J.M., and C.J. Brunner. 2007. Assessment of current information available for detection, sampling, necropsy, and diagnosis of diseased mussels. Auburn University, Auburn, Alabama. 84 pp.

Jones, J.A. 2015. Recovery strategy for the Houghton's goldenrod (*Solidago houghtonii*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. vi + 31pp.

Kost, M.A. and D.A. Hyde. 2009. Exploring the Prairie Fen Wetlands of Michigan. Extension Bulletin E-3045. East Lansing, Michigan: Michigan Natural Features Inventory, Michigan State University Extension.

Laureto, P.J. and J. S. Pringle. 2010. *Solidago vossii* (Asteraceae), a new species of goldenrod from northern Michigan. The Michigan Botanist 49: 105-117.

Leopold, D.J. and Weber, J. 2019. Range wide status assessment of Houghton's goldenrod (*Oligeneuron [=Solidago] houghtonii*) with a special emphasis on niche limits, demographic transitions, and population stability. Final Report to U.S. Fish and Wildlife Service. 27pp.

Mousseau, T. 2004. Taxonomy, classification, reconstructed phylogeny, biogeography, and natural history of nearctic species of' *Brychius* Thomson (Coleoptera: Haliplidae). Master's Thesis, University of Manitoba, Winnipeg. 155 pp+ appendices.

Slaughter, B.S. and D.L. Cuthrell. 2017. Status Assessment of Pitcher's Thistle and Hart's-tongue Fern: Acquiring Contemporary Information for Recovery Planning and Five-year Reviews. Michigan Natural Features Inventory, Report No. 2017-02, Lansing, MI. 106 pp.

Steffens, W.P. 1997. 1997 Hine's emerald (*Somatochlora hineana* Williamson) surveys in Michigan's Upper Peninsula. Report to the U.S. Fish and Wildlife Service. 17 pp.

Szymanski, J., C. Pollack, L. Ragan, M. Redmer, L. Clemency, K. Voorhies, and J. Jaka. 2016. Species Status Assessment for the Eastern Massasauga Rattlesnake (*Sistrurus catenatus*) July 2016 (v2).

U.S. Fish and Wildlife Service (USFWS). 2001. Hine's emerald dragonfly (*Somatochlora hineana*) Recovery Plan. Fort Snelling, MN. 120 pp.

U.S. Fish and Wildlife Service (USFWS). 2018a. Rayed Bean (*Vilosa fabalis*) 5-Year review: Summary and Evaluation. Midwest Region Ecological Services Field Office Columbus, Ohio. 27pp.

U.S. Fish and Wildlife Service (USFWS). 2018b. Snuffbox (*Epioblasma triquetra*) 5-Year review: Summary and Evaluation. Midwest Region Ecological Services Field Office Columbus, Ohio. 60pp.

U.S. Fish and Wildlife Service (USFWS). 2019. Northern Riffleshell (*Epioblasma torulosa rangiana*) 5-Year review: Summary and Evaluation. Pennsylvania Field Office. State College, PA. 33 pp.

Watters, G.T. 1996. Hosts for the northern riffle shell (*Epioblasma torulosa rangiana*). Triannual Unionid Report 10: 14.

APPENDIX I

Development of a Habitat Suitability Model for the Indiana Bat (*Myotis septentrionalis*) and Northern Long-eared Bat (*M. sodalis*) in Michigan

In 2018, the Michigan Ecological Services Field Office (MIFO) contracted with Dr. Eric McCluskey of Grand Valley State University to develop a habitat model for the Indiana bat in Michigan. In 2021, MIFO again contracted with Dr. McCluskey to develop a habitat model for the northern long-eared bat in Michigan, which we combined with the Indiana bat model. A shapefile of the combined habitat model is available here: Michigan Listed Bat Habitat Model

Indiana Bat Model

To develop the model, we compiled all available Indiana bat summer capture (foraging) and roost occurrence data for Michigan and applied a 500-m spatial filter as a minimum distance between occurrence records to minimize overemphasis of habitat importance based on clusters of individuals. After filtering the occurrence data, 44 locations remained (20 capture and 24 roost locations). We developed models using capture and roost occurrences separately as well as with all occurrences combined to determine which model was best suited for identifying foraging and roost habitat.

Due to the small number of occurrences, we used an ensemble of small models (ESM) approach that permits more predictor variables to be used by running each pairwise combination of variables and then weighting these final models in an ensemble. The ESMs were run in the R package ecospat. Presence only modeling requires the selection of background area from which background points will be randomly sampled to compare to the occurrence data. The background area should represent parts of the landscape that are accessible to the focal organism. We created a convex hull around our occurrence data using ArcMap, a polygon formed by connecting straight lines between points. We then buffered this convex hull by 25 km to include areas beyond the known core distribution of Indiana Bat in southern Michigan that should be physically accessible and may have undetected presences. We set background point selection for this entire buffered area except for within 5 km of Indiana Bat occurrences where background points are most likely to unintentionally represent true presences.

We selected predictor variables by removing the worse performing variable from highly correlated pairs (>0.75) using the 'corSelect' function from the fuzzySim R package. Then we then used Maxent's internal variable importance (permutation importance) and jackknife measures to determine which of the remaining variables were important to retain for separate capture and roost models. We selected two model types, Artificial neural network (ANN) and Maxent, for the ESMs. We compared five runs for each model type with the capture, roost, and combined datasets using area under the ROC curve (AUC) and true skill statistic (TSS). We then calculated the Boyce Index value using ecospat to compare the ANN and Maxent models from each dataset in their ability to identify capture and roost locations. We used Boyce Index as the primary assessment metric as it allowed for comparisons across all three model types for capture and roost data.

Based on the Boyce Index assessment, we selected the Maxent presence-only roost model as the strongest fit model. Using the 10th percentile threshold, we converted the model output to a binary raster. The binary raster was then converted to a shapefile using non-simplified

shapes. Because considerable portions of the modeled habitat contained clearly non-suitable cover types, particularly near highly developed urban areas, we further refined the model by clipping the binary shapefile by the most recent available National Land Cover Database (NLCD 2019) data. Land cover categories excluded ("Clipped") from modeled habitat included open water, perennial ice/snow, developed (low, medium, and high intensity), and barren land (sand, rock, clay).

Northern Long-eared Bat Model

To develop the model, we compiled all available northern long-eared bat summer capture (foraging) and roost occurrence data for Michigan's Lower Peninsula and applied a 1-km spatial filter as a minimum distance between occurrence records to reduce the potential for biased results from over-represented sites. After filtering the occurrence data, 56 locations remained.

We screened a diverse set of candidate variables (30 m resolution) representing different habitat elements, including land cover, hydrology, and elevation. First, we identified and removed highly correlated variables (>0.75) with the 'corSelect' function in the fuzzySim R package, keeping the better performing variable from each correlated pair. We further evaluated the remaining variables using the jackknife of variable importance and training gain output in Maxent. The final northern long-eared bat variables were mean canopy at 100 m, canopy range at 500 m, percentage of emergent wetland at 50 ha, percentage of forested wetland at 5 ha, wetland diversity index at 25 ha, and wetland diversity index at 1,000 ha.

Once the occurrence data were thinned, we used a buffered region to clip the selected variable rasters to serve as the area for background point selection by ecospat. We used a 25-km buffer for background point selection (10,000 random points). The sample size was low enough (n=56) that we opted to use the R package ecospat, that was developed for datasets with few occurrences. Ecospat uses an ESM approach where separate models are produced with each pair of variables before an ensemble is created under a weighting scheme. We used Maxent and ANN for the ecospat ESMs. The ecospat models used five-fold cross validation (80% training partitions). We used Boyce Index implemented in ecospat as the primary model selection metric using the 'ecospat.boyce' function for the ESMs. Finally, we converted the continuous habitat suitability values from each species SDM to a binary raster of habitat and non-habitat to represent the distribution of habitat patches. We used the maximum sum of sensitivity and specificity (MSSS) threshold for the ecospat ESM models (equivalent to the maximum true skill statistic (TSS)).

Combined Listed Bat Model

To combine and further refine the habitat models, we created a grid of five-acre hexagons for Michigan using the "Generate Tessellation" tool in ArcPro 2.9. Five acres was selected as the patch size based on available literature and data suggesting that Indiana and northern long-eared bats are unlikely to occupy an isolated forest stand of less than five acres. The total acres of modeled habitat were summarized by hexagon using the "Summarize Within" tool. Hexagons with less than one acre of either bat's habitat were then removed. These small model fragments were typically isolated from other modeled hexagons, likely artifacts of imprecise raster data, and were considered unlikely to provide sufficient habitat to support roosting listed bats. Hexagons containing more than one acre of modeled habitat of either species were

retained, helping to fill gaps and buffer edges among smaller but closely connected modeled patches and increasing the overall acreage of modeled habitat across the state.

The remaining hexagons were then aggregated using the “Dissolve” tool allowing for multipart features. The “Summarize Within” tool was run again to obtain acres of modeled habitat within each hexagon cluster. We then ran a “Near Neighbor” analysis to identify forest patches that were greater than 1,000 feet from forested areas to remove isolated patches unlikely to be used by roosting listed bats. We removed hexagons that were more than 1,000 feet from their nearest neighbor and that contained less than five acres of modeled habitat. These isolated forest patches are considered unlikely to support roosting listed bats due to their insufficient size and distance from other suitable, modeled areas. The final layer was then checked against known listed bat roosting areas and detections. An additional three hexagons were added to the model to capture locations that fell outside of the modeled habitat.

APPENDIX II

Projects that may cause indirect adverse effects/harm to ESA-listed bats

Indiana bats and northern long-eared bats are forest dependent and require a network of forested tracts for roosting, commuting, and foraging. The Service defines suitable roosting habitat for Indiana bats as forest patches containing trees of 5 inches diameter at breast height (DBH) or larger, and suitable roosting habitat for the northern long-eared bat as forest patches containing trees of 3 inches DBH or larger. However, early successional habitat with small diameter trees may also be used as important foraging and/or commuting habitat by listed bats.

Indiana and northern long-eared bat exhibit high interannual site fidelity, with maternity colonies roosting together in the same area over multiple years (USFWS 2007, Foster and Kurta 1999, Johnson et al. 2009, Silvis et al. 2015). Because their roosts (typically dead/dying trees) are naturally ephemeral, listed bats are expected to be adapted to some amount of roost loss. However, largescale loss or degradation of occupied habitat could lead to maternity colony fragmentation and/or reproductive failure if a substantial number of roost trees (particularly primary maternity roosts) are removed or if a sufficient amount of suitable roosting, foraging, swarming/staging, and/or commuting habitat will no longer be available, even if the clearing takes place during times of the year when bats are not present on the landscape (inactive season).

Although project specifics (e.g., timing, availability of nearby habitat, quality of remaining habitat, etc.) can modify a risk assessment, the Michigan Ecological Services Field Office generally views the following project activities as having potential to cause adverse effects and/or harm to federally listed bats if they are present (or when assuming potential presence without survey data[18]) without further considerations. In other words, projects involving the following activities are not eligible to receive automated concurrence through our All Species Michigan Dkey:

1. Clearing >10 contiguous[19] acres of forest within 5 miles of a known listed bat hibernaculum;
2. Clearing >10 contiguous[20] acres of modeled bat habitat in the Indiana bat range;
3. Clearing >20 contiguous[21] acres of modeled bat habitat outside the Indiana bat range;
4. Fragmenting[22] a connective corridor (e.g., tree line) between two or more forest patches of at least 5 acres

Acreage Thresholds

To better characterize potential habitat and focus conservation efforts, the Michigan Ecological Services Field Office developed a habitat suitability model for listed bats in Michigan. Potentially suitable habitat for listed bats may occur outside of modeled areas, but occupancy of

[18]Surveys conducted in accordance with the Service's Range-wide Indiana bat and Northern Long-eared Bat Survey Guidelines may be used to demonstrate presence or probable absence of listed bats within a project area. Lacking presence/absence survey data, presence is assumed in suitable habitat.
[19]Connected by 1,000 feet or less
[20]Connected by 1,000 feet or less
[21]Connected by 1,000 feet or less
[22]Creating a gap of 1,000 feet or more between previously connected forest

such areas is expected to be less likely.

As listed bat maternity home ranges contain multiple primary and secondary roost trees, it is extremely unlikely that loss of up to 10 contiguous acres of habitat would eliminate all primary roost trees within a maternity roosting area anywhere in Michigan. Available literature suggests that northern long-eared bat maternity colonies can tolerate loss of a single primary roost or up to 20% of available secondary roosts in the inactive season before abandoning roosting areas or substantially altering roosting behaviors (Silvis et al. 2014, 2015), and Indiana bats are expected to respond similarly. Loss of up to 10 contiguous acres of habitat is also unlikely to noticeably degrade the quality of an occupied roosting or foraging area or render a travel corridor unsuitable anywhere in Michigan. For these reasons, the Michigan Ecological Services Field Office believes it is extremely unlikely that loss of up to 10 contiguous acres during the inactive season would lead to detectable adverse effects/harm, even where listed bats are most likely present (e.g., within 5 miles of known hibernacula) and forest habitat is most limited/fragmented (e.g., modeled habitat within the Indiana bat range). Because of the abundance of forest habitat outside the Indiana bat's range in Michigan (e.g,, northern Lower Peninsula and Upper Peninsula), we believe that removal of up to 20 contiguous acres of modeled habitat during the inactive season is unlikely to cause adverse effects/harm. Finally, because of the low probability of occupancy, we do not believe that any amount of inactive season tree removal outside modeled habitat and >5 mi from known hibernacula is likely to cause harm or adverse effects to listed bats.

Michigan projects that will clear >10 contiguous acres within 5 mi of a known listed bat hibernaculum, >10 acres of modeled habitat in the Indiana bat range, and/or >20 contiguous acres of modeled habitat outside the Indiana bat range or that will fragment a connective corridor between two or more forest patches of at least 5 acres may warrant further project-specific consideration or coordination with the Service in order to evaluate and minimize potential impacts.

Minimum Patch Size

Based on life history information and available literature for Indiana bats (e.g., average foraging distances and occupied forest patch sizes), the Service believes that it is unlikely that an isolated forest stand of 10 acres or less would provide sufficient resources for an Indiana bat. However, available data indicate that Indiana bats may infrequently use isolated forest patches as small as 5.6 acres (Keith Lott, personal communication). The Michigan Ecological Services Field Office believes a conservative minimum patch size of 5 acres is appropriate for both Indiana and northern long-eared bats. Although listed bats rarely traverse non-forested areas of 1,000 feet or more, they are frequently observed using vegetated corridors, such as tree lines, to travel among suitable forest patches. Because they may connect important foraging and roosting habitats, removal of forested corridors (regardless of size/area of corridor) could severely fragment available habitat and result in adverse effects or indirect take of listed bats. Therefore, projects that remove connective corridors between forest patches warrant project-specific consideration and coordination with the Service.

Northern Long-eared Bat Interim Consultation Period (March 31, 2023 - April 1, 2024)

During the Interim Consultation period, the Service does not consider take of northern long-eared bats to be reasonably certain except within the specified distance buffers of known occurrences. During the Interim Consultation period, projects outside of these buffers may conclude that take of northern long-eared bats is not reasonably certain and that adverse effects

are unlikely. During the Interim Consultation period, this framework has been integrated into the Michigan All Species Determination Key. Additionally, to assist private landowners and stakeholders with non-Federal actions, the Service has published range-wide Interim Voluntary Guidance for Forest Habitat Modification and Wind Energy Operation.

However, please note that the Interim Consultation Framework and associated Standing Analysis only consider and address the effects of covered actions that are expected to occur from March 31, 2023, until April 1, 2024. In other words, the Standing Analysis and Interim Consultation Framework do not consider any effects or incidental take resulting from the covered actions that may occur after April 1, 2024. Additionally, they do not consider effects to or take of Indiana bats or other federally listed bats. After April 1, 2024, any action agency that was issued an individual BO that relied on the Interim Consultation Framework will need to reinitiate consultation if its continuing, discretionary action is expected to affect the northern long-eared bat (i.e., cause incidental take). If the action agency fails to reinitiate consultation on or before April 1, 2024, its individual BO will no longer be based on the best available information, which means the action agency's section 7 compliance and incidental take exemptions provided by section 7(o)(2) may lapse. Please see the USFWS northern long-eared bat page for more information.

Supporting Documents

The following Service web pages provide further information and background on the potential for indirect adverse effects via habitat loss or fragmentation.

- Section 7 Technical Assistance, Summary of Indiana Bat Ecology
- Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects
- Range-wide Indiana bat and Northern Long-eared Bat Survey Guidelines
- Standing Analysis and Implementation Plan for the Rangewide Northern Long-eared Bat Assisted Determination Key

Literature Cited

Foster, R.W. and A. Kurta. 1999. Roosting ecology of the northern bat (*Myotis septentrionalis*) and comparisons with the endangered Indiana bat (*Myotis sodalis*). Journal of Mammalogy 80: 659-672.

Johnson, J.B., J.W. Edwards, W.M. Ford, and J.E. Gates. 2009. Roost tree selection by northern myotis (*Myotis septentrionalis*) maternity colonies following prescribed fire in a Central Appalachian Mountains hardwood forest. Forest Ecology and Management 258:233-242.

Silvis, A., W.M. Ford, E.R. Britzke, and J.B. Johnson. 2014. Association, roost use and simulated disruption of *Myotis septentrionalis* maternity colonies. Behavioural Processes 103:283-290.

Silvis, A., W.M. Ford, and E.R. Britzke. 2015. Effects of Hierarchical Roost Removal on Northern Long-Eared Bat (*Myotis septentrionalis*) Maternity Colonies. PLoS ONE 10(1):e0116356.

U.S. Fish and Wildlife Service (USFWS). 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. U.S. Fish and Wildlife FWS, Fort Snelling, MN. 258 pp.

APPENDIX III

Potential Indiana bat roost trees

The Service defines suitable Indiana bat roost tree as any tree ≥5 inches in diameter (at breast height) with cracks, crevices and/or exfoliating bark that is within 1,000 feet of forested/wooded habitat.

Although live trees may be used, Indiana bat roosts are most typically snags in early to mid-decay stages. When healthy live trees are used, they tend to be species with naturally sloughing bark, such as shagbark hickory (*Carya ovata*). While over 40 Indiana bat roost tree species have been documented, including coniferous species, deciduous trees are most frequently used, and all the Indiana bat roosts reported in Michigan have been deciduous species. Generally, roost quality improves with tree height, diameter, amount of peeling bark, and solar exposure. Maternity roosts (roost trees used by reproductive female bats and their young) are typically high-quality roosts (i.e., large, tall trees with peeling bark and/or large cracks/crevices that receive a high degree of solar radiation).

Examples of Indiana bat roost trees:







APPENDIX IV

Potential northern long-eared bat roost trees

The Service defines suitable northern long-eared bat roost tree as any tree ≥3 inches in diameter (at breast height) with cracks, crevices, exfoliating bark, and/or cavities/hollows that is within 1,000 feet of forested/wooded habitat.

Although northern long-eared bat roosts are often dead or dying trees, live trees with defects are also commonly used. Northern long-eared bats have been reported to use over 35 roost tree species, but deciduous species are most frequently selected. Maternity roosts (roost trees used by reproductive female bats and their young) are typically higher-quality roosts (i.e., large-diameter, tall trees with peeling bark and/or notable defects and adequate solar exposure); however, compared to sympatric Indiana bat roosts, northern long-eared bat roosts (even maternity roosts) are often smaller, shorter trees with a higher degree of canopy cover and are more likely to be living.

Examples of northern long-eared bat roost trees:







APPENDIX D: OPINIONS OF PROBABLE COST AND PRESENT WORTH ANALYSIS

OPINION OF PROBABLE CONSTRUCTION COST

3497 Coolidge Rd, East Lansing, MI 48823

Telephone: (517) 316-3930 FAX: (517) 484-8140

PROJECT:	City of Kalamazoo, MI DWSRF Project Plan	**DATE:**	3/27/2024
LOCATION:	Kalamazoo, MI	**PROJECT NO.**	200-19743-24005
BASIS FOR ESTIMATE:	[X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL	**ESTIMATOR:**	D. Warren
WORK:	Pump Station 5 and 14 Consolidated WTP	**CHECKED BY:**	N. Raut
	Alternative 1	**CURRENT ENR:**	13532

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT		Civil/Site/Piping		Structures		Mechanical/ Electrical		Other
	Consolidated WTP												
1	Yard Piping and Site Work	1	Lump Sum	$ 3,604,000	$ 3,604,000.00	TRUE	$3,604,000		$0		$0		$0
2	Building Costs	1	Lump Sum	$ 5,180,000	$ 5,180,000.00		$0	TRUE	$5,180,000		$0		$0
3	Electrical and I&C	1	Lump Sum	$ 6,630,000	$ 6,630,000.00		$0		$0	TRUE	$6,630,000		$0
4	Utilities	1	Lump Sum	$ 100,000	$ 100,000.00		$0		$0	TRUE	$100,000		$0
5	Process Interconnections	1	Lump Sum	$ 3,178,000	$ 3,178,000.00	TRUE	$3,178,000		$0		$0		$0
6	Process Gas and Liquid Handling, Purification, and Storage Equipment	1	Lump Sum	$ 1,483,000	$ 1,483,000.00	TRUE	$1,483,000		$0		$0		$0
7	Water and Wastewater Equipment	1	Lump Sum	$ 6,800,000	$ 6,800,000.00	TRUE	$6,800,000		$0		$0		$0
8	Land Acquisition	4	Acres	$ 750,000	$ 3,000,000.00	TRUE	$3,000,000						
	Raw Water Main												
9	PS 14 3,000 GPM Pumps	2	Each	$ 100,000	$ 200,000.00	TRUE	$200,000						
10	Mobilization (5% of Pipe Construction Cost, Max $75,000)	1	LS	$ 46,000	$ 46,000		$0		$0		$0	TRUE	$46,000
11	Traffic Control	1	LS	$ 50,000	$ 50,000		$0		$0		$0	TRUE	$50,000
12	12-inch Raw Water Main	9,000	LF	$ 250	$ 2,250,000	TRUE	$2,250,000		$0		$0		$0
13	Jack / Bore at Gull Rd	100	LF	$ 600	$ 60,000	TRUE	$60,000		$0		$0		$0
14	Jack / Bore at Main St	100	LS	$ 600	$ 60,000	TRUE	$60,000		$0		$0		$0
15	Pressure Control Valve	1	EA	$ 15,000	$ 15,000	TRUE	$15,000		$0		$0		$0
16	Air Vacuum Valves	1	LS	$ 25,000	$ 25,000	TRUE	$25,000		$0		$0		$0
	Subtotal				$ 32,681,000								
						Sewers	$20,675,000	Structures	$5,180,000	Mech	$6,730,000	Other	$96,000
	General Conditions and Requirements	5	%		$ 1,635,000	General	$1,034,000	General	$259,000	General	$337,000	General	$5,000
	Administrative, Legal, and Engineering	15	%		$ 5,148,000	Admin	$3,257,000	Admin	$816,000	Admin	$1,060,000	Admin	$15,000
	Contingencies	30	%		$ 11,840,000	Contingency	$7,490,000	Contingency	$1,877,000	Contingency	$2,438,000	Contingency	$35,000
	TOTAL CONSTRUCTION COST				**$ 51,304,000.00**	**Total**	**$32,456,000.00**		**$8,132,000.00**		**$10,565,000.00**		**$151,000.00**

Assumptions

1. Building costs increased 40% from original estimate to include additional flow from PS 14.
2. Process interconnection costs increased 40% from original estimate to include additional flow from PS 14.
3. Water and wastewater equipment costs increased 200% from original estimate to include additional flow from PS 14.
4. Electrical costs increased 30% from original estimate to include additional flow from PS 14.

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

3497 Coolidge Rd, East Lansing, MI 48823 Telephone: (517) 316-3930 FAX: (517) 484-8140

PROJECT:	City of Kalamazoo, MI CWSRF Project Plan	DATE:	3/27/2024
LOCATION:	Kalamazoo, MI	PROJECT NO.	200-19743-24005
BASIS FOR ESTIMATE:	[X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL	ESTIMATOR:	J. Christopher
WORK:	Pump Station 5 and 14 Consolidated WTP	CHECKED BY:	N. Raut
	Alternative 1	CURRENT ENR:	13532

Construction and Equipment Costs Summary

	Total Project Costs	Service Life	Present Worth of Capital Investments	Salvage Value at End of Planning Period (NPW)	Net Present Worth (Cost)
Civil/Site Work/Piping	$32,456,000	50	$32,456,000	$11,885,000	$20,571,000
Structures	$8,132,000	50	$8,132,000	$2,978,000	$5,154,000
Mechanical/Electrical	$10,565,000	20	$10,565,000	$0	$10,565,000
Other	$151,000	20	$151,000	$0	$151,000
Total	$51,304,000			Total	$36,441,000

Annual Costs (O&M) Summary

Type	Annual Cost	Net Present Worth of O&M
O&M	$745,000.00	$11,614,000
	Total	$11,614,000

Net Present Worth	$48,055,000
Weighted Useful Life (years)	43.73

Assumptions:

Present Worth Factor Salvage Value	0.610270943
Present Worth Factor O&M	15.58916229
Discount Rate (%)	2.5

Weighted Useful Life = ((Item Cost A * Service Life A)+(Item Cost B * Service Life B) + (etc.)) / (Total Capital Cost)

OPINION OF PROBABLE CONSTRUCTION COST

3497 Coolidge Rd, East Lansing, MI 48823

Telephone: (517) 316-3930 FAX: (517) 484-8140

PROJECT:	City of Kalamazoo, MI DWSRF Project Plan	**DATE:**	3/27/2024
LOCATION:	Kalamazoo, MI	**PROJECT NO.**	200-19743-24005
BASIS FOR ESTIMATE:	[X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL	**ESTIMATOR:**	L. Roberts
WORK:	Individual WTPs at Pump Station 5 and 14	**CHECKED BY:**	N. Raut
	Alternative 2	**CURRENT ENR:**	13532

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT		Civil/Site/Piping		Structures		Mechanical/ Electrical		Other
	Pump Station 14 WTP												
1	Yard Piping and Site Work	1	Lump Sum	$ 3,604,000	$ 3,604,000.00	TRUE	$3,604,000		$0		$0		$0
2	Building Costs	1	Lump Sum	$ 3,700,000	$ 3,700,000.00		$0	TRUE	$3,700,000		$0		$0
3	Electrical and I&C	1	Lump Sum	$ 5,100,000	$ 5,100,000.00		$0		$0	TRUE	$5,100,000		$0
4	Utilities	1	Lump Sum	$ 100,000	$ 100,000.00		$0		$0	TRUE	$100,000		$0
5	Process Interconnections	1	Lump Sum	$ 2,270,000	$ 2,270,000.00	TRUE	$2,270,000		$0		$0		$0
6	Process Gas and Liquid Handling, Purification, and Storage Equipment	1	Lump Sum	$ 1,483,000	$ 1,483,000.00	TRUE	$1,483,000		$0		$0		$0
7	Water and Wastewater Equipment	1	Lump Sum	$ 3,400,000	$ 3,400,000.00	TRUE	$3,400,000		$0		$0		$0
8	Land Acquisition	4	Acres	$ 750,000	$ 3,000,000.00	TRUE	$3,000,000						
	Pump Station 5 WTP												
9	Yard Piping and Site Work	1	Lump Sum	$ 3,604,000	$ 3,604,000.00	TRUE	$3,604,000		$0		$0		$0
10	Building Costs	1	Lump Sum	$ 3,700,000	$ 3,700,000.00		$0	TRUE	$3,700,000		$0		$0
11	Electrical and I&C	1	Lump Sum	$ 5,100,000	$ 5,100,000.00		$0		$0	TRUE	$5,100,000		$0
12	Utilities	1	Lump Sum	$ 100,000	$ 100,000.00		$0		$0	TRUE	$100,000		$0
13	Process Interconnections	1	Lump Sum	$ 2,270,000	$ 2,270,000.00	TRUE	$2,270,000		$0		$0		$0
14	Process Gas and Liquid Handling, Purification, and Storage Equipment	1	Lump Sum	$ 1,483,000	$ 1,483,000.00	TRUE	$1,483,000		$0		$0		$0
15	Water and Wastewater Equipment	1	Lump Sum	$ 3,400,000	$ 3,400,000.00	TRUE	$3,400,000		$0		$0		$0
	Subtotal				$ 42,314,000								
						Sewers	$24,514,000	Structures	$7,400,000	Mech	$10,400,000	Other	$0
	General Conditions and Requirements	5	%		$ 2,116,000	General	$1,226,000	General	$370,000	General	$520,000	General	$0
	Administrative, Legal, and Engineering	15	%		$ 6,665,000	Admin	$3,861,000	Admin	$1,166,000	Admin	$1,638,000	Admin	$0
	Contingencies	30	%		$ 15,329,000	Contingency	$8,880,000	Contingency	$2,681,000	Contingency	$3,768,000	Contingency	$0
	TOTAL CONSTRUCTION COST				**$ 66,424,000.00**	**Total**	**$38,481,000.00**		**$11,617,000.00**		**$16,326,000.00**		**$0.00**

Assumptions

1. Original costs increased 200% from original estimate to include 2 WTPs.
2. Land will be purchased for WTP at PS 14.

$66,424,000.00

OPINION OF PROBABLE CONSTRUCTION COST

TETRA TECH

3497 Coolidge Rd, East Lansing, MI 48823 Telephone: (517) 316-3930 FAX: (517) 484-8140

PROJECT:	City of Kalamazoo, MI CWSRF Project Plan	DATE:	3/27/2024
LOCATION:	Kalamazoo, MI	PROJECT NO.	200-19743-24005
BASIS FOR ESTIMATE:	[X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL	ESTIMATOR:	J. Christopher
WORK:	Individual WTPs at Pump Station 5 and 14	CHECKED BY:	N. Raut
	Alternative 2	CURRENT ENR:	13532

Construction and Equipment Costs Summary

	Total Project Costs	Service Life	Present Worth of Capital Investments	Salvage Value at End of Planning Period (NPW)	Net Present Worth (Cost)
Civil/Site Work/Piping	$38,481,000	50	$38,481,000	$14,091,000	$24,390,000
Structures	$11,617,000	50	$11,617,000	$4,254,000	$7,363,000
Mechanical/Electrical	$16,326,000	20	$16,326,000	$0	$16,326,000
Other	$0	20	$0	$0	$0
Total	$66,424,000			Total	$48,079,000

Annual Costs (O&M) Summary

Type	Annual Cost	Net Present Worth of O&M
O&M	$934,000.00	$14,561,000
	Total	$14,561,000

Net Present Worth	$62,640,000
Weighted Useful Life (years)	42.63

Assumptions:

Present Worth Factor Salvage Value	0.610270943
Present Worth Factor O&M	15.58916229
Discount Rate (%)	2.5

Weighted Useful Life = ((Item Cost A * Service Life A)+(Item Cost B * Service Life B) + (etc.)) / (Total Capital Cost)

Station 5 Operation and Maintenance Cost

Labor	hrs/yr	Rate[13]	
Iron Filters	1900	$ 36.20	$ 68,780.00
GAC Contactors	460	$ 36.20	$ 16,652.00
Chlorine Gas	500	$ 36.20	$ 18,100.00
Phosphate	65	$ 36.20	$ 2,353.00
Fluoride	62	$ 36.20	$ 2,244.40
Wells	530	$ 36.20	$ 19,186.00
Booster Pumps	0	$ 36.20	$ -
High Service	530	$ 36.20	$ 19,186.00
Admin, Lab and Maintenance	2200	$ 36.20	$ 79,640.00
Total			$ 226,141.40

Chemicals	Flow, MGD	Dose, mg/L	PPD	PPY	Cost/lb	Total Annual
Chlorine-Pre-Ox	0.27	0.74	1.66993488	609.526231	$ 1.32	804.5746252
Fluoride	0.27	0.89	2.004102	731.49723	$ 0.32	234.0791136
Phosphate	0.27	5.3	11.93454	4356.1071	$ 1.76	7666.748496
Chlorine-Disinfection	0.27	2.69	6.057342	2210.92983	$ 1.32	2918.427376
Total						$ 11,623.83

Energy	Flow, MGD	Head, feet	Efficiency	KWH/Year	$/KWH	Total Annual
Pumping						
Wells	0.27	50	0.71	21,543	$0.14	$3,015.96
Booster	0	120	0.71	0	$0.14	$0.00
High Service	0.27	209	0.73	88,124	$0.14	$12,337.30
Process						
Iron Pressure Filters				115000	$0.14	$16,100.00
Pressure Carbon Contactors				2200		
Chlorine Gas				505	$0.14	$70.70
Fluoride				3000	$0.14	$420.00
Phosphate				3000	$0.14	$420.00
Building						
Iron Filters				230000	$0.14	$32,200.00
Pressure Carbon Contactors				230000	$0.14	$32,200.00
Chlorine Gas				2250	$0.14	$315.00
Fluoride				1200	$0.14	$168.00
Phosphate				3100	$0.14	$434.00
Admin, Lab and Maintenance				85000	$0.14	$11,900.00
Total				784,921		$109,580.96

			Cost/Year	Escalation[12]	Total $/year
Maintenance Materials					
Iron Filter Maintenance			3200	3.59	11,488
Pressure Carbon Contactors			2350	3.59	8,437
GAC Media Regen/Replace	40,000 lbs/year	@$1.50/lb	60000	1.00	60,000
Chlorine Gas			2000	3.59	7,180

Fluoride Feed System	74	3.59	266
Phosphate	74	3.59	266
Admin, Lab and Maintenance	2200	3.59	7,898
Raw Water/Well Pumps	460	3.59	1,651
Booster Pumps	0	3.59	0
High Service Pumps	480	3.59	1,723
Total			$ 98,908.42
Total Annual O&M			$446,254.61

1 Design Flow: Sta 14 1600 gpm, 2.304 MGD; Sta 5 1,400 gpm, 2.016 MGD; Combined 3,000 gpm, 4.32 MGD
2 Estimating WTP Costs, EPA, 1979, Figure 107 with filter area of 450 sq ft
3 Estimating WTP Costs, EPA, 1979, Figure 18 for <1 pph
4 Estimating WTP Costs, EPA, 1979, Figure 203 for 2 MGD capacity
5 Estimating WTP Costs, EPA, 1979, Figure 215 for 2 MGD capacity
6 Estimating WTP Costs, EPA, 1979, Figure 216 for 2 MGD capacity
7 Estimating WTP Costs, EPA, 1979, Figure 202 for 2 MGD capacity
8 Estimating WTP Costs, EPA, 1979, Figure 205 for 2 MGD capacity
9 Estimating WTP Costs, EPA, 1979, Figure 206 for 2 MGD capacity
10 Estimating WTP Costs, EPA, 1979, Figure 136 for 450 sq ft* .2 adjust for no backwashing and reduced replacement freq
11 Estimating WTP Costs, EPA, 1979, Figure 135 for 450 sq ft
Estimating WTP Costs, EPA, 1979, Figure 216 for 2 MGD capacity
12 Escalation October 1978 Producer Price Index Finished Goods = 71.6 to February 2024 = 256.872
13 Mean wage $25.83 Michigan W & WW treatment operator BLS May 2022 x 1.4 fringe.
14 2 vessels @ 40,000 lbs.every 730 days = 40000
15 Estimating WTP Costs, EPA, 1979, Figure 17 for <1 pph
17 Estimating WTP Costs, EPA, 1979, Figure 2 for 60 ppd
18 Estimating WTP Costs, EPA, 1979, Figure 3 for 60 ppd
19 Estimating WTP Costs, EPA, 1979, Figure 17 for <4 pph
20 Estimating WTP Costs, EPA, 1979, Figure 18 for <4 pph

Station 14 Operation and Maintenance Cost

Labor	hrs/yr	Rate[13]	
Iron Filters	1900	$ 36.20	$ 68,780.00
GAC Contactors	460	$ 36.20	$ 16,652.00
Chlorine Gas	500	$ 36.20	$ 18,100.00
Phosphate	65	$ 36.20	$ 2,353.00
Fluoride	62	$ 36.20	$ 2,244.40
Wells	530	$ 36.20	$ 19,186.00
Booster Pumps	0	$ 36.20	$ -
High Service	530	$ 36.20	$ 19,186.00
Admin, Lab and Maintenance	2200	$ 36.20	$ 79,640.00
Total			$ 226,141.40

Chemicals	Flow, MGD	Dose, mg/L	PPD	PPY	Cost/lb	Total Annual
Chlorine-Pre-Ox	0.808	0.47	3.18672691	1163.15532	$ 1.32	1535.365023
Fluoride	0.808	0.89	5.99870336	2189.52672	$ 0.32	700.6485519
Phosphate	0.808	5.3	35.7226155	13038.7547	$ 1.76	22948.20819
Chlorine-Disinfection	0.808	2.26	15.2326625	5559.9218	$ 1.32	7339.09677
Total						$ 32,523.32

Energy	Flow	Head	Efficiency	KWH/Year	$/KWH	Total Annual
Pumping						
Wells	0.808	50	0.71	64,481	$0.14	$9,027.40
Booster	0	120	0.71	0	$0.14	$0.00
High Service	0.808	151	0.73	190,573	$0.14	$26,680.15
Process						
Iron Pressure Filters				115000	$0.14	$16,100.00
Pressure Carbon Contactors				2200		
Chlorine Gas				505	$0.14	$70.70
Fluoride				3000	$0.14	$420.00
Phosphate				3000	$0.14	$420.00
Building						
Iron Filters				230000	$0.14	$32,200.00
Pressure Carbon Contactors				230000	$0.14	$32,200.00
Chlorine Gas				2250	$0.14	$315.00
Fluoride				1200	$0.14	$168.00
Phosphate				3100	$0.14	$434.00
Admin, Lab and Maintenance				85000	$0.14	$11,900.00
Total				930,309		$129,935.25

			Cost/Year	Escalation[12]	Total $/year
Maintenance Materials					
Iron Filter Maintenance			3200	3.59	11,488
Pressure Carbon Contactors			2350	3.59	8,437
GAC Media Regen/Replace	40,000 lbs/year	@$1.50/lb	60000	1.00	60,000
Chlorine Gas			2000	3.59	7,180

Fluoride Feed System	74	3.59	266
Phosphate	74	3.59	266
Admin, Lab and Maintenance	2200	3.59	7,898
Raw Water/Well Pumps	460	3.59	1,651
Booster Pumps	0	3.59	0
High Service Pumps	480	3.59	1,723
Total			$ 98,908.42
Total Annual O&M			$487,508.39

1 Design Flow: Sta 14 1600 gpm, 2.304 MGD; Sta 5 1,400 gpm, 2.016 MGD; Combined 3,000 gpm, 4.32 MGD
2 Estimating WTP Costs, EPA, 1979, Figure 107 with filter area of 450 sq ft
3 Estimating WTP Costs, EPA, 1979, Figure 18 for <1 pph
4 Estimating WTP Costs, EPA, 1979, Figure 203 for 2 MGD capacity
5 Estimating WTP Costs, EPA, 1979, Figure 215 for 2 MGD capacity
6 Estimating WTP Costs, EPA, 1979, Figure 216 for 2 MGD capacity
7 Estimating WTP Costs, EPA, 1979, Figure 202for 2 MGD capacity
8 Estimating WTP Costs, EPA, 1979, Figure 205 for 2 MGD capacity
9 Estimating WTP Costs, EPA, 1979, Figure 206 for 2 MGD capacity
10 Estimating WTP Costs, EPA, 1979, Figure 136 for 450 sq ft* .2 adjust for no backwashing and reduced replacement freq
11 Estimating WTP Costs, EPA, 1979, Figure 135 for 450 sq ft
Estimating WTP Costs, EPA, 1979, Figure 216 for 2 MGD capacity
12 Escalation October 1978 Producer Price Index Finished Goods = 71.6 to February 2024 = 256.872
13 Mean wage $25.83 Michigan W & WW treatment operator BLS May 2022 x 1.4 fringe.
14 2 vessels @ 40,000 lbs.every 730 days = 40,000lbs/year; 310 * 1400/561
15 Estimating WTP Costs, EPA, 1979, Figure 17 for <1 pph
17 Estimating WTP Costs, EPA, 1979, Figure 2 for 60 ppd
18 Estimating WTP Costs, EPA, 1979, Figure 3 for 60 ppd
19 Estimating WTP Costs, EPA, 1979, Figure 17 for <4 pph
20 Estimating WTP Costs, EPA, 1979, Figure 18 for <4 pph

Station 5 @ 3,000 gpm Operation and Maintenance Cost

Labor					hrs/yr	Rate[13]	
Iron Filters					2400	$ 36.20	$ 86,880.00
GAC Contactors					560	$ 36.20	$ 20,272.00
Chlorine Gas					550	$ 36.20	$ 19,910.00
Phosphate					65	$ 36.20	$ 2,353.00
Fluoride					62	$ 36.20	$ 2,244.40
Wells					1200	$ 36.20	$ 43,440.00
Booster Pumps					530	$ 36.20	$ 19,186.00
High Service					610	$ 36.20	$ 22,082.00
Admin, Lab and Maintenance					3400	$ 36.20	$ 123,080.00
Total					9,377		$ 339,447.40

Chemicals	Flow, MGD	Dose, mg/L	PPD	PPY	Cost/lb	Total Annual
Chlorine-Pre-Ox	1.063	0.54	4.81091282	1755.98318	$ 1.32	2317.897797
Fluoride	1.063	0.89	7.8913266	2880.33421	$ 0.32	921.7069474
Phosphate	1.063	5.3	46.9932933	17152.552	$ 1.76	30188.49159
Chlorine-Disinfection	1.063	2.46	21.8178925	7963.53077	$ 1.32	10511.86061
Total						$ 43,939.96

Energy	Flow	Head	Efficiency	KWH/Year	$/KWH	Total Annual
Pumping						
Wells	1.063	50	0.71	84,826	$0.14	$11,875.60
Booster	0.532	120	0.71	102,422	$0.14	$14,339.03
High Service	1.063	209	0.73	346,994	$0.14	$48,579.19
Process						
Iron Pressure Filters				210000	$0.14	$29,400.00
Pressure Carbon Contactors				4300		
Chlorine Gas				6000	$0.14	$840.00
Fluoride				3000	$0.14	$420.00
Phosphate				3000	$0.14	$420.00
Building						
Iron Filters				360000	$0.14	$50,400.00
Pressure Carbon Contactors				360000	$0.14	$50,400.00
Chlorine Gas				3200	$0.14	$448.00
Fluoride				1500	$0.14	$210.00
Phosphate				4800	$0.14	$672.00
Admin, Lab and Maintenance				130000	$0.14	$18,200.00
Total				1,620,042		$226,203.82

				Cost/Year	Escalation	Total $/year
Maintenance Materials						
Iron Filter Maintenance				5400	3.59	19,386
Pressure Carbon Contactors				4000	3.59	14,360
GAC Media Regen/Replace	49,650	lbs/year	@$1.50/lb	74475	1.00	74,475
Chlorine Gas				2150	3.59	7,719

Fluoride Feed System	74	3.59	266
Phosphate	74	3.59	266
Admin, Lab and Maintenance	3000	3.59	10,770
Raw Water/Well Pumps	800	3.59	2,872
Booster Pumps	460	3.59	1,651
High Service Pumps	800	3.59	2,872
Total			$ 134,636.22
Total Annual O&M			$744,227.39

1 Design Flow: Sta 14 1600 gpm, 2.304 MGD; Sta 5 1,400 gpm, 2.016 MGD; Combined 3,000 gpm, 4.32 MGD
2 Estimating WTP Costs, EPA, 1979, Figure 107 with filter area of 450 sq ft
3 Estimating WTP Costs, EPA, 1979, Figure 18 with feed rate xx lb/hr
4 Estimating WTP Costs, EPA, 1979, Figure 19 with feed rate xx lb/hr
5 Estimating WTP Costs, EPA, 1979, Figure 215 for 2 MGD capacity
6 Estimating WTP Costs, EPA, 1979, Figure 216 for 2 MGD capacity
7 Estimating WTP Costs, EPA, 1979, Figure 202 for 2/4.32 MGD capacity
8 Estimating WTP Costs, EPA, 1979, Figure 205 for 4.322 MGD capacity
9 Estimating WTP Costs, EPA, 1979, Figure 206 for 2 MGD capacity
10 Estimating WTP Costs, EPA, 1979, Figure 136 for 904 sq ft* .2 adjust for no backwashing and reduced replacement freq
11 Estimating WTP Costs, EPA, 1979, Figure 135 for 450 sq ft
Estimating WTP Costs, EPA, 1979, Figure 216 for 2 MGD capacity
12 Escalation October 1978 Producer Price Index Finished Goods = 71.6 to February 2024 = 256.872
13 Mean wage $25.83 Michigan W & WW treatment operator BLS May 2022 x 1.4 fringe.
14 2 vessels @ 40,000 lbs.every 588 days = 49,650lbs/year; 310*1400/738 gpm
15 Estimating WTP Costs, EPA, 1979, Figure 17 for <1 pph
17 Estimating WTP Costs, EPA, 1979, Figure 2 for 133 ppd
18 Estimating WTP Costs, EPA, 1979, Figure 3 for 133 ppd
19 Estimating WTP Costs, EPA, 1979, Figure 17 for <8pph
20 Estimating WTP Costs, EPA, 1979, Figure 18 for <8 pph

APPENDIX E: PUBLIC MEETING DOCUMENTATION

NOTICE OF PROJECT PLANNING PUBLIC MEETING

The City of Kalamazoo will hold a public meeting on the proposed Pump Station 5 and 14 project for the purpose of receiving comments from interested persons. The meeting will be held at **6 p.m. on April 23, 2024** at the following location:

Kalamazoo Water Reclamation Plant

1415 Harrison Street, Kalamazoo, MI 49007

The purpose of the proposed projects is to improve drinking water quality. The projects will address this by adding iron and PFAS treatment capabilities for Pump Station 5 and 14.

Project construction will occur from approximately 2025 to 2029 and will involve construction of a new transmission main in the Eastside neighborhood area from Spring Valley Drive to Schippers Lane along Henson, Trimble, and Wallace Avenues.

Impacts of the proposed project will include temporary traffic disruptions and noise from construction activities during daylight, weekday hours.

The approximate cost of each project is shown below.

Project	Project Cost
Project 1: Pump Station 5 and 14 Upgrades	$51,304,000

The estimated cost to users if all of the projects are constructed based on these approximate costs will be approximately $13.69 per user per quarter.

Copies of the draft project planning document detailing the proposed projects are available for inspection at the following location(s):

www.kalamazoocity.org

https://twitter.com/KalamazooCity

Written comments received before the meeting record is closed on April 23, 2024 at 6 pm will receive responses in the final project planning document.

Written comments should be sent to:

Anna Crandall, Assistant City Engineer, 415 E. Stockbridge Avenue, Kalamazoo, MI 49001

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CITY OF KALAMAZOO PUBLIC SERVICES DEPT
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KALAMAZOO MI 49007 USA

(269)337-8658

FAX:
burlinghamw@kalamazoocity.org

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CITY OF KALAMAZOO PUBLIC SERVICES DEPT
241 W SOUTH ST
KALAMAZOO MI 49007 USA

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External Ad #		*Color*	<NONE>
Production Method	AdBooker	*Production Notes*	

Run Dates 04/11/2024 *Sort Text* NOTICEOFPROJECTPLANNINGPUBLICMEETINGTHECITYOFKALAMAZOOWILLHOLDAPUBLICMEETINGONTHEPROP

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# Inserts	1	*POS/Sub-Class*	Public Notices
Cost	$11.76	*AdNumber*	0010852076-01
Ad Type	MI CLS Liner	*Ad Size*	1 X 79 li
Pick Up #		*Ad Attributes*	
External Ad #		*Color*	<NONE>
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NOTICE OF PROJECT PLANNING PUBLIC MEETING

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Project construction will occur from approximately 2025 to 2029 and will involve construction of a new transmission main in the Eastside neighborhood area from Spring Valley Drive to Schippers Lane along Henson, Trimble, and Wallace Avenues.

Impacts of the proposed project will include temporary traffic disruptions and noise from construction activities during daylight, weekday hours.

The approximate cost of each project is shown below.

Project	Project Cost
Project 1: Pump Station 5 and 14 Upgrades	$51,304,000

The estimated cost to users if all of the projects are constructed based on these approximate costs will be approximately $23.81 per user per quarter.

Copies of the draft project planning document detailing the proposed projects are available for inspection at the following location(s):

www.kalamazoocity.org
https://twitter.com/KalamazooCity

Written comments received before the meeting record is closed on April 23, 2024 at 6 pm will receive responses in the final project planning document.

Written comments should be sent to:

Anna Crandall,
Assistant City Engineer,
415 E. Stockbridge Avenue,
Kalamazoo, MI 49001

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2025 DWSRF Project Plan Public Meeting – Station 14 and 5 Consolidation and Treatment Plan

Sign-In Sheet
Tuesday, April 23, 2024

NAME (Please Print)	CONTACT INFORMATION (Please Print)
JAMES BAKER	bakerj@kalamazoocity.org
Daniel Warren	daniel.warren@tetratech.com
Lauryn Roberts	lauryn.roberts@tetratech.com
Anna Crandall	crandalla@kalamazoocity.org



2025 DWSRF Project Plan Public Meeting – Station 14 and 5 Consolidation and Treatment Plan

KWRP Harrison, Tuesday, April 23, 2024, 6:00 PM


Agenda
Background
Project Descriptions & Justifications
Examined Alternatives
Costs & Debt Repayment
Impacts & Mitigation
Public Comment

Background

- The City is applying for the Drinking Water State Revolving Fund (DWSRF) which is a low interest loan financing program that would allow the City to fund or finance important updates to water infrastructure at a lower cost to users than open market bond financing.

- DWSRF is a Federal financing program administered by the State. In Michigan, the Department of Environment, Great Lakes, and Energy administers the program.

- To be considered for DWSRF, the City must submit a Project Plan that describes the projects we intend to finance and explain why they are necessary.

- Project Plans are scored and prioritized based on need. There is a fixed amount of money available for lending each year and the Project Plan allows the City to state its case as to why its projects are more critical than other submitted Plans.

Background

- Part of the requirements to be considered for DWSRF is that the Public can review the Project Plan and be able to ask questions or comment on the Plan before it is submitted to the State.

- The FY2025 DWSRF Project Plan consist of three (3) smaller project based project plans including the Richland/Ross Township Water Main Extension Plan, the Stations 5 and 14 Upgrades Plan the Replacement of Lead/Galvanized Water Services Plan

- We are here tonight to present the Stations 5 and 14 Upgrades Plan, address questions and comments that were submitted in writing prior to this meeting and allow for further public comment in person at this meeting.

Project Descriptions & Justifications

- The projects included in the Project Plan were chosen based on the City's Asset Management Plan and Capital Improvement Program.

- City staff scored these projects to find the top priority projects based on several Asset Management Scoring Criteria.

Project Descriptions & Justifications

Compound (Parts Per Trillion, PPT)	Michigan MCL (August 2020)	EPA MCLe (Enforceable) (April 2024)	EPA MCLg (Goal)	Kalamazoo Results
PFOA	8	4.0	Zero	2.6
PFOS	16	4.0	Zero	4.2
PFHxS	51	10	10	4.0
PFNA	6	10	10	ND
PFHxA	400,000	Hazard Index	Hazard Index	4.1
PFBS	420	Hazard Index	Hazard Index	6.3
HFPO-DA (GenX)	370	10	10	ND
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, PFBS		Hazard Index	Hazard Index	

Project Descriptions & Justifications



Project Descriptions & Justifications

- Station 5 was constructed in 1914 and is due for replacement
- Station 14 was constructed in 1958 and is due for replacement
- Station 14 production water exceeds new EPA PFOS criteria
- Station 5 is located within 1000 feet or less of a known PFAS contamination site
- Station replacement and PFAS treatment are needed at both sites
- Groundwater supplies must employ iron and manganese removal prior to PFAS removal technologies or fouling and failure of PFAS removal technology may occur

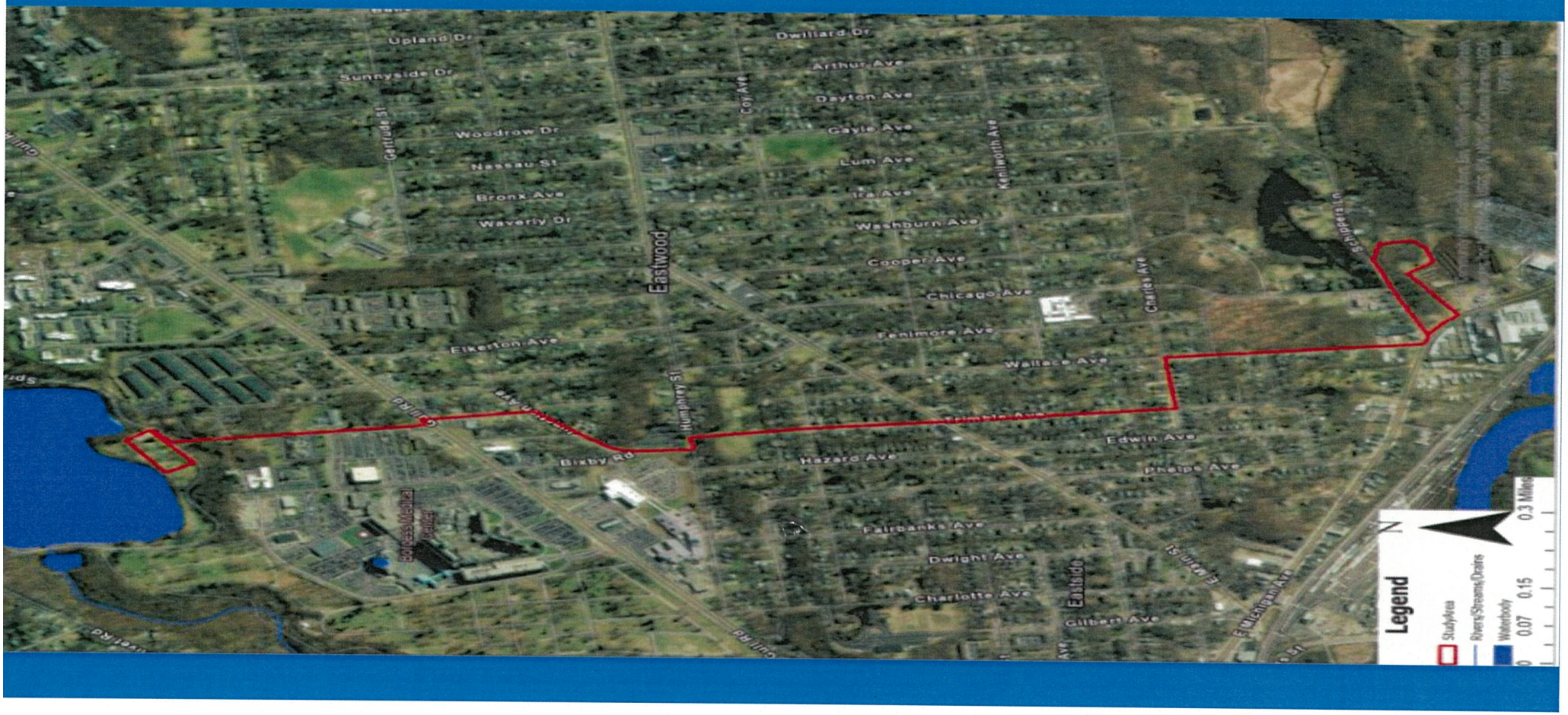
Project Descriptions & Justifications

- The Kalamazoo PWS WSSN 03520 was built and expanded over the years following a model of resiliency and reliability via redundancy
- As regulatory standards, including the Michigan Lead & Copper Rule, PFAS regulations and LOS demands, have changed controlling accuracy and precision across many redundant, often functionally obsolete stations has now contributed to reduced reliability
- As a milestone requirement of the 2021 Administrative Consent Order with EGLE, Kalamazoo studied a plan to reduce the points of entry into the system via a station consolidation plan
- https://www.kalamazoocity.org/files/assets/public/v/1/plans-amp-reports/utility-studies/water-consolidation-study_reduction-of-entry-points_2022.pdf

Project Descriptions & Justifications

- Proposed station consolidation and treatment plan
- One location for treatment
- Raw water from Station 14 pumped to the Station 5 site
- Station 14 and 5 treatment to occur on the Station 5 site
- Treatment to consist of iron removal, manganese removal, PFAS removal to below MCLg, optimized corrosion control, fluoride and chlorination

Project Descriptions & Justifications



Project Descriptions & Justifications



Examined Alternatives

- **No Action: The no-action alternative is evaluated to assess the impact of continuing with the existing system.**
  - **No Action is not a viable alternative to any of the selected project alternatives as all involve either the replacement of antiquated or failing equipment, bringing current systems up to required standards, or improvements to operator safety.**
- **Optimization of Existing Systems: The existing system should be evaluated to determine if it can function more efficiently with operational changes, additional new equipment, or addition and training of operating personnel.**

  The existing water system is performing as well as it can and additional staffing, staff training, and operational changes are not likely to improve the performance of the system because the primary concerns are related to the condition of the infrastructure. Therefore, this alternative was not considered further.

Examined Alternatives

- **Regionalization: Regionalization is evaluated to assess the feasibility of connection to an existing regional system and/or the creation of a regional system with neighboring municipalities.**
  - **As Kalamazoo is already a Regional System this alternative does not apply.**
- **Monetary Evaluation: The monetary evaluation includes a present worth analysis which compares all costs (design, construction, mitigation) for each alternative over the 20-year planning period.**
  - **Included in the project plan for selected Alternatives**

Examined Alternatives

- **Environmental Evaluation: The major environmental impacts expected to result from each alternative must be compared.**
  - **These evaluations are included for the selected Alternatives in the Project Plan.**

Costs & Debt Repayment

- Pump Station 5 and 14 Upgrades
  - $51,304,000
- Richland/Ross Township Water Main Extensions
  - $27,000,000
- Kalamazoo Lead/Galvanized Service Replacements
  - $13,000,000
- FY2025 DWSRF Project Plan Total (all projects)
  - $91,304,000

Costs & Debt Repayment

- These projects are included within our long-term capital plans. Current planned annual rate increases are in the range of 6% to 9% for Water
- Award of much needed grant and/or principal forgiveness would reduce impacts to rate payers
- The actual impact to a household would be based on usage

Costs & Debt Repayment

- Station 14 and 5 Consolidation and Treatment Plan
- Estimated rate increase would be $7.94/REU/month assuming the City meets the requirements for a 20-year loan with a 2.5% interest rate
- The actual impact to a household would be based on usage.

Costs & Debt Repayment

- Richland/Ross Water Main Extensions
- Estimated rate increase would be $3.39/REU/month assuming the City meets the requirements for a 20-year loan with a 2.5% interest rate
- The actual impact to a household would be based on usage.

Costs & Debt Repayment

- Kalamazoo Lead/Galvanized Service Replacements
- Estimated rate increase would be $1.63/REU/month assuming the City meets the requirements for a 20-year loan with a 2.5% interest rate
- The actual impact to a household would be based on usage.

Costs & Debt Repayment

- All FY2025 DWSRF Project Plan projects in total
- Estimated rate increase would be $12.93/REU/month assuming the City meets the requirements for a 20-year loan with a 2.5% interest rate
- The actual impact to a household would be based on usage.

Impacts & Mitigation

Environmental, Public Health, and Other Examined Impacts

- Historical/Archeological
- Geological
- Cultural/Social
- Recreational
- Water Quality/Surface Waters
- Air Quality
- Wetlands
- Coastal Zones
- Floodplains
- Construction Impacts
- Natural or Wild and Scenic Rivers
- Endangered Species
- Prime and Unique Agricultural Land
- Construction Material/Energy Consumption
- Accidents
- Unavoidable Adverse Impacts and Mitigative Measures

Impacts & Mitigation

Construction/Operational Impacts

Construction of the proposed facilities will be coordinated and sequenced to minimize disruptions to residential and natural areas.

The following impacts are anticipated:

- Tree removal: Tree removal will be needed for the new treatment facilities at WPS 5.
- Traffic patterns: Traffic may need to be stopped or redirected in project areas.
- Construction chemicals, dust, air emissions, and noise: Use of construction chemicals will follow safety procedures. Water will be used for dust control. Well maintained equipment will be used to minimize air emissions. Construction will occur during daylight on work weekdays to reduce noise unless significant traffic changes are required. If night work is necessary, proper permitting will be acquired.
- Groundwater/dewatering impacts and proximity to wetlands: Proper permitting will be acquired for dewatering and work near wetlands.
- Soil erosion: Soil erosion prevention will be implemented during excavation activities and the project area will be revegetated shortly after construction completion.

Public Comment

CITY OF KALAMAZOO, MICHIGAN

PUBLIC MEETING

2025 DRINKING WATER STATE REVOLVING

FUND PROJECT PLAN

PUMP STATION 5 AND 14 UPGRADES

Tuesday April 23, 2024 at 6:00 P.M.

KALAMAZOO WATER RECLAMATION PLANT
1415 HARRISON STREET
KALAMAZOO, MI 49007

In attendance: See sign-in sheet.

The City of Kalamazoo has prepared a 2025 Project Plan for upgrades to Pump Station 5 and 14. These projects will improve drinking water quality and ensure continued compliance with drinking water standards. A Project Plan is part of the planning documents for the Michigan Department of Environment, Great Lakes, and Energy (EGLE) low interest Drinking Water State Revolving Fund (SRF) loan. A public meeting is a regulatory requirement for this Project Plan.

According to EGLE regulations this public meeting must describe the following four items:

1. **The water quality problems to be addressed by the project and the alternatives that were considered.**

   The City operates **13** point of entry stations that utilize groundwater from **90** wells. Each well pump station has various treatment technologies to remove pollutants of concern. Pump Station 5 and 14 have detectable iron and PFAS levels that should be mitigated to protect human health. Additional water treatment is recommended at Pump Station 5 and 14 to remove iron and PFAS.

   Alternatives were reviewed to identify a cost-effective approach that allows the City to maintain reliable drinking water service and meet drinking water permit requirements.

   Alternatives considered include:

   Project 1 – Pump Station 5 and 14 Upgrades

   - Alternative 1, Pump Station 5 Consolidated Water Treatment Plant
   - Alternative 2, Pump Station 5 and 14 Water Treatment Plant
   - Alternative 3, Do Nothing

2. **The recommended alternatives, including the capital costs and a cost breakdown by project components.**

   The recommended alternative options and capital costs for the improvements are as follows:
   - Project 1, Alternative 1, Pump Station 5 and 14 Consolidated Water Treatment Plant, has an opinion of probable capital cost of $51,304,000 and a SRF Eligible Cost of $51,304,000.

3. **The project financing and cost to users, including the proposed method of project financing and estimated debt retirement and the proposed charge to the typical residential customer.**

   Based on financing the eligible portion of all of these projects through the low interest EGLE Drinking Water SRF loan program, the estimated total gross cost to the typical residential customer in the City of Kalamazoo would be approximately $13.69 per quarter. The portions of projects that are not eligible for SRF Funding will be paid from cash on hand and will not impact the quarterly rate of residents.

   The FY 2025 DWSRF Project Plan also includes a Richland/Ross Township Water Main Extension Project and a City of Kalamazoo Lead/Galvanized Service Replacement Project for a

total Project Plan estimated cost of $91,304,000 and a total quarterly user charge of $22.38, this quarterly user charge equates to a $7.46 per month user charge.

4. **The anticipated social and environmental impacts associated with the recommended alternative and the measures that will be taken to mitigate adverse impacts.**

   The short-term adverse impacts associated with construction activities would be minimal, and mitigatable, in comparison to the resulting long-term beneficial impacts. Short-term impacts include tree removals, traffic disruption, dust, and noise.

   No long-term negative impacts are anticipated. No historical, archaeological, or tribal resources will be affected during these projects. Surface water and ground water quality will not be negatively impacted from the construction of the proposed projects. No floodplains will be impacted. Wetlands along Schippers Lane may be impacted, however a Joint Permit will be obtained if needed. Threatened or endangered species or their habitat may be affected by the proposed project. Additional reviews and the appropriate environmental agency will be contacted during project design to mitigate disturbances to listed species. Loss of recreational area may be a concern from the community and comments will be addressed.

The City Commission must adopt the Project Plan prior to the June 1, 2024, Project Plan submittal deadline date. Public attendance must be noted. Public comments must be noted and publicly addressed.

I will now open this Public Meeting to any Public Comments. Written public comments will be received until May 3, 2024, and will be included in the Final Project Plan, which will be delivered to EGLE. EGLE will rank Project 1 Pump Station 5 and 14 Upgrades to determine if it is eligible for a FY 2025 low interest SRF loan in mid-August 2024. The Draft Project Plan is available for review at:

- The City of Kalamazoo Website: www.kalamazoocity.org
- Kalamazoo Water Reclamation Plant: 1415 Harrison St, Kalamazoo, MI 49007
- City Hall: 241 W South St, Kalamazoo, MI 49007
- The City of Kalamazoo Twitter page: twitter.com/KalamazooCity

Public Meeting Transcript

0:2:12.540

Well, good evening, everybody.

Ladies and gentlemen, thanks for attending tonight.
My name is James Baker.
I'm the public services director and city engineer for City Kalamazoo.
We're presenting today the 2025 drinking water State Revolving Fund project plan.
Specifically, one project within that project plan we're going to be talking about Pump Station 5 and 14 upgrades.
I've got just a real quick sheet I want to read through here.
These are some very important items that that we want to make sure we cover.
Following this I'm going to be going into a presentation that goes into some more detail on some of these things.
So at this point, we'll open the public meeting and we'll go ahead and get started.
There is a sign in sheet in the back for anybody that hasn't signed in yet that is available.
You don't have to sign in if you don't want to, but that is an option the city Kalamazoo is prepared a 2025 project plan for upgrades to pump Station 5 and 14.
These projects will improve drinking water quality and ensure continued compliance with drinking water standards.
The project plan is part of the planning documents for the Michigan Department of Environment, Great Lakes and Energy Eagle low interest drinking water state revolving fund loan program.
A public meeting is a regulatory requirement for this project plan, according to Eagle regulations, this public meeting must describe the following four items #1 water quality problems to be addressed by the project, and the alternatives that were considered.
The city operates 13 point of entry stations that utilize groundwater from 90 wells each well and pump station has various treatment technologies to remove pollutants of concern.
Pump Station 5 and 14 have detectable iron and PFAS levels that should be mitigated to protect human health.
Additional water treatment is recommended at station 5 and 14 to remove iron and P5.
Alternatives were reviewed to identify cost effective approach.
It allows the city to maintain reliable drinking water service and meat drinking water, permanent requirements.
The alternatives, which were considered for this project were alternative one pump Station 5, consolidated water treatment plant so that consolidate treatment for both station 5 and 14 at one consolidated plan.
The second alternative considered was a station water treatment plant at 5 and at station 14.
So that's two water treatment plants and then a third alternative which was considered was a do not be an alternative in which no improvements were made.
Our recommendation of these alternatives would be the pump Station 5 and 14 consolidated plan, which provides treatment for both station 5 and 14 at one consolidated treatment plant.
The recommended alternatives, including capital costs and the cost breakdown by product components, the recommended alternative options and capital costs are improvements are described as follows.

The selected alternative one which I discussed was a pump Station 5 and station 14 consolidated with water treatment at one site at Station 5 for a probable cost or as beers, opinion and cost of 51 million, 304,000 and SRF eligible cost of 51 million $304,000.
The project financing and cost to users, including the proposed method of project financing and estimated that retirement and the proposed change in the typical residential customer based on financing the edible portion of these projects through the low interest eagle drinking water state revolving loan fund program.
The estimated total cost of the typical residential customer in the City Council would be approximately 1369 to $1374.00 per course, that's $13.69 or $13.74 per quarter.
If our estimates range between those values, the portion of the project that is not eligible for us, there are funny would be paid from cash on hand and will not impact the quarterly residents.
There is no ineligible amount on this project that fiscal year 2025 drinking water state revolving fund project plan includes 3 projects.
So this includes our Richland, Ross Township Water Main Extension Project, City Council, Zoo led galvanized service replacement project and this project that station 5 and 14 consolidate treatment project for a total cost of 91,304,000.
That's totally core user charge for all three of these projects under this one project plan is estimated at $22.38 per quarter that has that equates to approximately $7.46 per month in users charge increases above where they are currently today.
The anticipated social and environmental impacts associated with the recommended alternative and the measures that will be taking to mitigate adverse effect short term adverse impacts associated with construction activities would be minimal and would be able we would be able to mitigate these impacts in comparison to long term benefits.
So you know, we have very long term benefit to public health and drinking water with this proposed project and it would have some very short term impacts that could be mitigated these short term impacts would include tree removals, some minor traffic disruptions and potential dust and noise from the project itself.
Although work will be done to mitigate those impacts, no long-term negative impacts are anticipated.
No historical, archaeological, or tribal resources will be affected during these projects.
Surface water.
Groundwater quality will not be negatively impacted by the construction of the proposed project.
No floodplains will be impacted.
There may be wetlands along Skippers Lane.
However, a joint permit will be obtained as the design progresses to ensure that no impacts are made to the wetland, or if so, any impacts will be mitigated through the appropriate joint permit as obtained from Eagle.
Additional reviews and their appropriate environmental agency will be contacted during project designed to mitigate the services to any listed species.
Loss of recently recreational area.
Maybe a conservative community.
However, that is does not apply to this project.
There's no loss to recreation area as there are no areas of the project site which are currently open to a recreation.
The City Commission must adopt the project plan prior to the June 1st or prior to June 1st, 2024 project plan submittal deadline date is June 1st, 2024.
Public attendance must be noted, and public comments must be noted for a publicly addressed I.
So given our limited audience that we have at this time, I just don't.
There are no members of the public in the room, and so I we don't have any questions at this time.

Just a reminder that the project plans are available to the city website.
At www.kalamazoocity.org
A copy of the project plan is also available with the city clerk.

And this time I am going to transition into the presentation that we have certainly this meeting is recorded and we'll have a transcript and recording available so that folks may be able to access this in the in the future between now the project plan submittal and when we plan to move forward with the design.
So just have it ended this we've got a brief agenda in front of us today.
We'll talk about the background of this this project, some project descriptions, and justifications.
We'll talk through our exam and alternatives and we'll focus again on costs and debt repayment as well as the impacts and mitigation.
And we'll also have opportunity for public comment if we're joined by any audience member.
So just some broad background.
The city is applying for drinking water, state revolving loan funds and which is a low interest term financing program which will allow the city to fund or finance portion important updates to to water infrastructure.
This is a federal program that is administered at the state level and to be considered for this program, we must submit a project plan.
So that's the activities that we were barred upon.
Now this project plan is available.
We reference this available online and available at the City Clerk's office, and that this public meeting in presentation as part of that project plan.
That project plan will then be submitted to the state, scored, prioritized, based on need.
There's a fixed amount of money available for lending each year, so it's important that the city submit the project plan and that we're competitive against other cities across state of Michigan.
So again, part of the requirement to submit the detailer SRF project plan is that the public can review and comment in the plan.
So that's one of the reasons why we're here tonight.
It did want to note that this DWSRF project plan submittal for fiscal year 25 includes 3 projects in total.
It's the Richland, Ross Township water main extension plan.
The Station 5 and 14 upgrades plan and it's the replacement of blood galvanized water Service plan.
So today we're going to really focus on at Station 5 and 14 consolidation treatment plan.
The projects, including the project plan, were chosen based on the city's asset management plan and Capital Improvement program.
City staff score these projects to find really the top priority projects within our asset management plan and within our capital grouping plan.
So this these projects represent are the most important projects to the city within our capital improvement plan.
Alright, so we've got a table in front of you.
You know, one of the items that we talked about was the importance to, you know, increase water quality improvements to the public and to address water quality problems.
So one of the challenges with Station 5 and Station 14 is local PFAS contamination.
When I say PFAS, I'm referencing PFOA, PFOS, PFFS, XHP F and A.
FHX APFSDS androgenic compounds as well.
Michigan has enacted MCL in August of 2020.
The set and established maximum contaminant levels.

By law, the EPA has just recently announced an update to that so EPA has more stringent, enforceable MCL.
In place and with the more St more stringent EPA MCL's in place, Kalamazoo is an exceedance of PFOS requirement by EPA.
That EPA requirement, under the enforceable MCL, is 4 parts per trillion for PFOS and Station 14, the highest average result is 4.2, so slightly above that.
We also want to know, you see here in the map in front of you, the red triangle provides a general location of station #5.
The Blue triangle is the location of the known part, 201 PFAS contamination site.
So as you look at kind of these two previous slides, you've got an understanding that station 14 is currently in exceedance of the EPA requirement for POS.
If you also see that Station 5 is near no within 1000 feet of a known part tool, one PFAS contamination site.
So with that, certainly we've got both demonstrated facts and future concern for the future water quality, reliability of station 5 and 14.
Well, get some more justification in terms of timing and overall system need.
Station 5 was constructed in 1914, is due for replacement.
We are now in 2024, so that station has been in service for 110 years, certainly due for replacement.
Station 14 was constructed in 1958.
It's also due for replacement again, Station 14 production water exceeds new EPA POF OS requirement by the MCL Station 5.
Again, located within 1000 feet of a known PFAS contamination site, station replacement and treatment are needed Apple sites and you know, we also wanted to note that.
Groundwater supplies that have iron in in Manganese present must be removed prior to PFAS treatment, and that's due to following or failure of the P5 removal technology.
If the iron and manganese is not removed from the process first, you know continuing on the discussion of project justification, Kalamazoo is a system I referenced Kalamazoo public water supply W Assad 03520.
Essentially, that's the Kalamazoo system is the regional system that covers the entire metro area of Kalamazoo, including many of our neighboring townships.
This system was built expanded over the years following a model of resiliency and reliability versus redundancy, meaning that we had many stations that could contribute flow into the system and that any one of those stations could be taken offline and the the system was reliable because the overall redundancy.
However, as we Fast forward through changes in regulatory standards, including Michigan's letting copper rule, PFAS regulations and not only from state of Michigan but now from EPA as well as local level service demands, this is all changed in terms of water quality.
Our ability to control the accuracy and precision across many redundant, often function absolutely stations has now contributed to reduce reliability.
So as we have many stations, we're the water quality has a variability across those stations.
Those stations lack modern treatment techniques.
They also lack, you know, controls and optimization.
And so our ability to control those stations with the precision needed to comply with Michigan Lead and Copper rule as well as Michigan and the EPA.
Criteria for PFAS has become increasingly challenged again, a milestone requirement of administrative consent order with Eagle in 2021 was the study of plans to reduce the points of entry into the system via consolidation plan.
In the statements that I read earlier on, we talked about Kalamazoo with 13 point of entry treatment

stations that is already reduced from where we were a few years ago.
We had started with a 16 stations as recently as 2019.
With those stations were taken offline due to P5 risk within the capture zone of those stations.
So talking about the proposed station consolidation and treatment plan we're looking at, we've described this in the alternatives.
We could have station treatment at 14 and we could have station treatment at 5.
So two independent treatment sites, St both iron, Manganese and PFOS.
At each site independently, however, that was deemed costly and that was also deemed to be not in line with our consolidation plan.
So, but the proposed project would consolidate the raw water from 14, pump it over to Station 5 and then to gather the raw water from both 5 and 14 would be completed at the station 5 site.
So this slide shows you that route from on the left where you see the lake that's near where Station 14 is, and then that would flow to the South, which is, you know, to the to the right.
So south is on the left.
The flow would be to your right, which is to the to the South to go to Station 5 so that red Polygon that's on the right side of the sheet there along E Michigan and skippers that would represent the site for station 5 consolidate treatment where you see that lake there at Spring Valley Lake and you see that rectangle that represents where Station 14 is that North is to the left S is to the right.
So now we're zoomed in here at this, looking at this line, this provides kind of an overview of pictorial image of what the consolidated footprint would look like at Station 5.
You've got Lincoln Ave or E Michigan along the left side of the paper and skippers Lane that runs across the top.
So you also have the cities leave compost site kind of below that.
That's kind of imaged out.
So again, looking through the alternatives, no action was looked at that was not viable.
That would not improve water quality.
That would not address iron, manganese, and PFAS, which we described to be water quality concerns.
We looked optimize existing systems and you know existing water supply system is performing as well as it can.
Additional staffing staff training operational changes are not likely to improve water quality.
We need treatment and the only way to get treatment for PFAS is to build it.
Uh, again, we looked at regionalization.
Kalamazoo Water supply is already regional system, so there wasn't really an opportunity for us to partner with another community to address our or treatment needs.
This is something that needs to be addressed within the Kalamazoo system and again, we evaluated net present worths of all the alternatives to compare the lowest net present value over the 20 year planning period, which is including the project plan.
Many environmental evaluations were considered.
Major environmental impacts are not are not expected to occur from this project needs alternatives and these evaluations are discussed in the alternatives and located the project plan.
Uh, you know, getting into the details of proposed cost at this time, we're estimating the pump station 5 in 14 consolidated treatment upgrades, the cost 51,304,000.
We also summarize the cost of the other projects, including the Richland Ross Water Main extensions, $27 million, Kalamazoo 11, galvanized service replacements, $13 million the total fiscal year 2025 DWR project plan.
This is all the projects is estimated at $91,304,000.
Just going to talk about these projects and where they fit in with our overall debt Service plan, capital improvement project plan.

These projects are included within our long range capital plans.
Their current our current capital program anticipates annual rate increases in the range of 6-9%.
That's just to give us some context of where we are in overall planning.
Certainly we're really need grant award into principal forgiveness for these projects.
That would certainly help reduce the impact to ratepayers.
The actual impact to households would be based on usage and actual impact would be based on you know, where we come in in terms of funding opportunities.
If we are successful with this project plan request and if we are successful in any state, federal grant amounts that may be applied.
So looking at this project and assuming a 20 year loan, 2 1/2% interest rate, the estimated or rate increase would be about $7.94 per RU per month.
And again, that's for those costs are what's estimated for the station, 14 and 5 consolidates treatment.
The actual cost would be based on usage and those other factors you know.
We did also want to reference those other projects as well, Richland, Walk, Richland Township and Ross Township Water main extension.
That would have an estimated per RU per month cost of about $3.39 and the Kalamazoo Lad galvanized service replacement would have an estimated cost of $1.64 per RU per month.
And REU is residential equivalent unit essentially represents the typical household cost.
On a monthly basis, important with this report.
So if we looked at all the fiscal year 2025 projects, we're looking to include the station 5 and 14 consolidation, the Richland Ross Township watering extensions and the Cal City County Zoo led galvanized service replacement.
The estimated cost would be about $12.93 per residential equivalent unit per month.
Based on those factors of a 20 year loan, 2 1/2% interest rate and the we didn't know that the actual impact will household would be based on your usage impacting mitigation, there's a whole bunch of environmental, public health and other areas that we examined from our archaeological and history, geological, cultural, recreational, water quality, air quality, wetlands, coastlands, floodplains.
We also looked at short term things like construction impacts, natural wild scenic rivers and age of Species Priming Inc air cultural land.
So some of these may not apply to this project.
Specifically, when we're talking about Station 5 and 14 consolidation, but every one of these items was looked at, I'm looking at some impacts specific to construction.
We did want to highlight that this project will require tree removals.
Tree removals will be needed for this new facilities at the station 5 footprint that will also be true removals along that force main route that goes from station 14.
Excuse me from that raw water pipeline.
It goes from station 14 to station 5.
Construction also may impact traffic, and it may also impact DOST and other features, but that that will get mitigated through, you know, soil erosion, segmentation control, permits and other best management practices.
So at this point I've concluded the presentation and I will have it open for public comment.
Unfortunately, we don't have anybody in the audience, so at this point we're going to conclude the meeting. --> 0:28:6.740

APPENDIX F: RESOLUTION OF ADOPTION

CITY OF KALAMAZOO

KALAMAZOO CITY COMMISSION

A RESOLUTION ADOPTING A FINAL PROJECT PLAN FOR WATER SYSTEM IMPROVEMENTS AND DESIGNATING AN AUTHORIZED PROJECT REPRESENTATIVE

WHEREAS, the City of Kalamazoo recognizes the need to make improvements to its existing water treatment and distribution system; and

WHEREAS, the City of Kalamazoo authorized Tetra Tech to prepare a Drinking Water State Revolving Fund Project Plan, which recommends the following projects;

- Pump Station 5 and 14 Upgrades

WHEREAS, said Project Plan was presented at a Public Meeting held on Tuesday, April 23, 2024, and all public comments have been considered and addressed;

NOW THEREFORE BE IT RESOLVED, that the City of Kalamazoo formally adopts said Project Plan and agrees to implement the selected alternatives.

BE IT FURTHER RESOLVED, that the City Engineer of the Water Resources Division, a position currently held by James J. Baker, PE, is designated as the authorized representative for all activities with the project referenced above, including the submittal of said Project Plan as the first step in applying to the State of Michigan for a Drinking Water State Revolving Fund Loan to assist in implementation of the selected alternative.

Yeas:

Nays:

Abstain:

Absent:

I certify that the above Resolution was adopted by Kalamazoo City Commission on Monday May 20, 2024.

BY: _____.

Name and Title *(please print or type)*

_____.

Signature Date

APPENDIX G: BASIS OF DESIGN

Water Resources Division
Department of Publics Services
415 Stockbridge Avenue
Kalamazoo, MI 49001

LETTER OF TRANSMITTAL

To:

EGLE
7953 Adobe Road
Kalamazoo, MI 49009

Date: 2/3/2023	Job No. wat0200083
Attention: Nathan Yutzy	
Re: Kalamazoo Water Station 5 Project	

WE ARE SENDING YOU ☒ Attached via email

☐ Shop Drawings ☐ Prints ☒ Plans ☒ Specifications
☐ Copy of Letter ☐ Change Order ☐ Samples ☐

Copies	Date	NO.	Description
1	2/3/2023		Water Main Plans – Civil/Landscape, Process, Architectural
1	2/3/2023		Permit Application & Basis of Design
1	2/3/2023		Specifications – Civil & Treatment Plant

THESE ARE TRANSMITTED as checked below:

☒ For approval	☐ As requested	☐ Approved as submitted	☐ Returned for corrections
☐ For your use	☒ For Review and Comment	☐ Approved as noted	☐

Remarks:

Thank you,
City of Kalamazoo
Water Resources Division

COPY TO:

SIGNED: John Crandall

Department of Public Services
Water Resources Division
415 Stockbridge Avenue
Kalamazoo, MI 49001
Phone: 269.337.8601
Fax: 269.337.8533
www.kalamazoocity.org

February 3, 2023

Nathan Yutzy
EGLE
7953 Adobe Rd
Kalamazoo, MI 49009

Nathan,

Attached are the plans and the PA 399 Permit for construction application for the proposed water main construction for the Kalamazoo Water Station 5 Project.

The City of Kalamazoo will inspect and monitor the installation of the water main and station to ensure that it is installed in full compliance with City standards.

Please review the attached information and, if acceptable, provide the permit for construction at your earliest convenience.

If there are any questions or comments, do not hesitate to contact me directly at 269-337-8055.

Sincerely,

JoAnna Crandall, P.E.
Assistant City Engineer – Water Resources
City of Kalamazoo

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION

PERMIT APPLICATION FOR WATER SUPPLY SYSTEMS

(CONSTRUCTION - ALTERATION - ADDITION OR IMPROVEMENT) AS DESCRIBED HEREIN
Required under the Authority of 1976 PA 399, as amended (Act 399)

This application becomes an Act 399 Permit only when signed and issued by authorized Michigan Department of Environment, Great Lakes, and Energy (EGLE) staff. See instructions below for completion of this application.

1. **Municipality or Organization, Address and WSSN** that will own or control the water facilities to be constructed. This permit is to be issued to: **City of Kalamazoo** **415 Stockbridge** **Kalamazoo, MI 49001-2896** **WSSN**: **3520**	Permit Stamp Area (EGLE use only)	
2. **Owner's Contact Person** (provide name for questions): Contact: **Anna Crandall, PE** Title: **Assistant City Engineer, Water Resources** Phone: **(269) 337-8055**		
3. **Project Name** (Provide phase number if project is segmented): **Kalamazoo Water Station 5** **wat0200083**	4. **Project Location** (City, Village, Township): **City of Kalamazoo**	5. **County** (location of project): **Kalamazoo**

ISSUED UNDER THE AUTHORITY OF THE DIRECTOR OF
THE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

cc/enc: Mr. Frank Renaldi, P.E., Wightman

Issued by: _____

Reviewed by: _____

☐**If this box is marked see attached special conditions**.

Instructions: Complete items 1 through 5 above and 6 through 21 on the following pages of this application. Print or type all information except for signatures. Mail completed application, plans and specifications, and any attachments to the EGLE District Office having jurisdiction in the area of the proposed construction.

Please Note:

a. This **PERMIT** only authorizes the construction, alteration, addition or improvement of the water system described herein and is issued solely under the authority of 1976 PA 399, as amended.
b. The issuance of this **PERMIT** does not authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other EGLE permits, or approvals from other units of government as may be required by law.
c. This **PERMIT** expires two (2) years after the date of issuance in accordance with R 325.11306, 1976 PA 399, administrative rules, unless construction has been initiated prior to expiration.
d. Noncompliance with the conditions of this permit and the requirements of the Act constitutes a violation of the Act.
e. Applicant must give notice to public utilities in accordance with 1974 PA 53, (MISS DIG), being Section 460.701 to 460.718 of the Michigan Compiled Laws and comply with each of the requirements of that Act.
f. All earth changing activities must be conducted in accordance with the requirements of the Soil Erosion and Sedimentation Control Act, Part 91, 1994 PA 451, as amended (Act 451).
g. All construction activity impacting wetlands must be conducted in accordance with the Wetland Protection Act, Part 303, 1994 PA 451, as amended.
h. Intentionally providing false information in this application constitutes fraud which is punishable by fine and/or imprisonment.
i. Where applicable for water withdrawals, the issuance of this permit indicates compliance with the requirements of Part 327 of Act 451, Great Lakes Preservation Act.

6. **Facilities Description –** In the space below provide a detailed description of the proposed project. Applications without adequate facilities descriptions **will be returned**. SEE EXAMPLES BELOW**.** Use additional sheets if needed.

The design includes the construction of new treatment facilities for existing Water Pump Station No. 5, which will reduce concentrations of iron, manganese, and per- and polyfluoroalkyl substances (PFAS) currently found in the four (4) existing groundwater production wells. The new treatment facilities are to be constructed east of the existing well field site with access from East Michigan Ave. The existing wells will be cleaned, receive new pumps and motors, and then water will be pumped from the wells to a raw water holding tank for oxidation. High service pumps will then bring the raw water into the treatment facility and through greensand and GAC filters. Chemical disinfection and corrosion control strategies are maintained and coordinated with the new treatment systems. The plant effluent will then tie into the existing distribution system. Station 5 is to become base load station.

APPROVED BY:
THE CITY OF KALAMAZOO



DATE: 02/03/2023

DEPARTMENT OF PUBLIC SERVICES
ASSISTANT CITY ENGINEER

EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES – EXAMPLES	
Water Mains	500 feet of 8-inch water main in First Street from Main Street north to State Street. **OR** 250 feet of 12-inch water main in Clark Road from an existing 8-inch main in Third Avenue north to a hydrant.
Booster Stations	A booster station located at the southwest corner of Third Avenue and Main Street, and equipped with two, 15 Hp pumps each rated 150 gpm @ 200 feet TDH. Station includes backup power and all other equipment as required for proper operation.
Elevated Storage Tank	A 300,000 gallon elevated storage tank located in City Park. The proposed tank shall be spherical, all welded construction and supported on a single pedestal. The tank shall be 150 feet in height, 40 feet in diameter with a normal operating range of 130 – 145 feet. The interior coating system shall be ANSI/NSF Standard 61 approved or equivalent. The tank will be equipped with a cathodic protection system, and includes a tank level control system with telemetry.
Chemical Feed	A positive displacement chemical feed pump, rated at 24 gpd @ 110 psi to apply a chlorine solution for Well No. 1. Chlorine is 12.5% NaOCL, ANSI/NSF Standard 60 approved and will be applied at a rate of 1.0 mg/l of actual chlorine.
Water Supply Well	Well No. 3, a 200 foot deep well with 170 feet of 8-inch casing and 30 feet of 8-inch, 10 slot screen. The well will be equipped with a 20 Hp submersible pump and motor rated 200 gpm @ 225 feet TDH, set at 160 feet below land surface.
Treatment Facilities	A 5 million gpd water treatment plant located at the north end of Second Avenue. The facility will include 6 low service pumps, 2 rapid mix basins, 4 flocculation/sedimentation basins, 8 dual media filters, 3 million gallon water storage reservoir and 6 high service pumps. Also included are chemical feed pumps and related appurtenances for the addition of alum, fluoride, phosphate and chlorine.

General Project Information – Complete all boxes below.

7. Design engineer's name, engineering firm, address, phone number, and email address:
Frank J. Renaldi, PE
Wightman and Associates, Inc.
433 East Ransom Street
Kalamazoo, MI 49007
269-217-4673
frenaldi@gowightman.com

8. Indicate who will provide project construction inspection:
☒Organization listed in Box 1.
☐Engineering firm listed in Box 7.
☐Other - name, address, and phone number listed below.

9. Is a basis of design attached?
☒YES ☐NO

If no, briefly explain why a basis of design is not needed.

10. Are sealed and signed engineering plans attached?
☒YES ☐NO

If no, briefly explain why engineering plans are not needed.

11. Are sealed and signed construction specifications attached?
☒YES ☐NO

If specifications are not attached, they need to be on file at EGLE. The project specifications will be used in conjunction with the City of Kalamazoo Standard Specifications

12. Were Recommended Standards for Water Works, Suggested Practice for Water Works, AWWA guidelines, and the requirements of Act 399 and its administrative rules followed?
☒YES ☐NO

If no, explain which deviations were made and why.

13. Are all coatings, chemical additives and construction materials ANSI/NSF or other adequate 3rd party approved?
☒YES ☐NO

If no, describe what coatings, additives or materials did not meet the applicable standard and why.

14. Are all water system facilities being installed in the public right-of-way or a dedicated utility easement? (For projects not located in the public right-of-way, utility easements must be shown on the plans.)
☒YES ☐NO

If no, explain how access will be obtained.

15. Is the project construction activity within a wetland (as defined by Section 324.30301(d)) of Part 303, 1994 PA 451?
☒YES ☐NO

If yes, a wetland permit must be obtained. – Delineated as a mixed hardwood swamp. Permit application in process.

16. Is the project construction activity within a 100-year floodplain (as defined by R 323.1311(e)) of Part 31, 1994 PA 451, administrative rules?
☐YES ☒NO

If yes, a flood plain permit must be obtained.

17. Is the project construction activity within 500 feet of a lake, reservoir, or stream?
☐YES ☒NO

If yes, a Soil and Erosion Control Permit must be obtained or indicate if the owner listed in box 2 of this application is an Authorized Public Agency (Section 10 of Part 91, 1994 PA 451) ☒Owner is APA.

18. Will the proposed construction activity be part of a project involving the disturbance of five (5) or more acres of land?
☐YES ☒NO – disturbed area is 3.44AC

If YES, is this activity regulated by the National Pollutant Discharge Elimination System (NPDES) storm water regulations?

☐YES: NPDES Authorization to discharge storm water from construction activities must be obtained.

☐NO: Describe why activity is not regulated.

Please call 517-241-8993 with questions regarding the applicability of the storm water regulations.

19. Is the project in or adjacent to a site of suspected or known soil or groundwater contamination?
☐YES ☒NO

If YES, attach a copy of a plan acceptable to EGLE for handling contaminated soils and/or groundwater disturbed during construction. Contact the local EGLE district office for listings of Michigan sites of environmental contamination.

20. IF YOU ARE A CUSTOMER/WHOLESALE/BULK PURCHASER, COMPLETE THE FOLLOWING

1. Name and WSSN of source water supply system (seller): _____
2. Does the water service contract require water producer/seller to review and approve customer/wholesale/bulk purchaser water system construction plans?

   ☐YES ☐NO

If yes to #2, the producer/seller approval letter must be attached when submitted to EGLE.

21. **Owner's Certification** The owner of the proposed facilities or the owner's authorized representative shall complete the owner's certification. It is anticipated that the owner will either be a governmental agency (city, village, township, county, etc.) or a private owner (individual, company, association, etc.) of a Type I public water supply.

OWNER'S CERTIFICATION

I, JoAnna Crandall (print) (name), acting as the Assistant City Engineer (print) (title/position) for the City of Kalamazoo (print) (entity owning proposed facilities) certify that this project has been reviewed and approved as detailed by the Plans and Specifications submitted under this application, and is in compliance with the requirements of 1976 PA 399, as amended, and its administrative rules.

Signature	Date	Phone
JoAnna Crandall	2/3/2023	269-337-8055

*Original signature only, no photocopies will be accepted.

Summary of Work:

The design includes the construction of new treatment facilities for existing Water Pump Station No. 5, which will reduce concentrations of iron, manganese, and per- and polyfluoroalkyl substances (PFAS) currently found in the four (4) existing groundwater production wells. The new treatment facilities are to be constructed east of the existing well field site with access from East Michigan Ave. The existing wells will be cleaned, receive new pumps and motors, and then water will be pumped from the wells to a raw water holding tank for oxidation. High service pumps will then bring the raw water into the treatment facility and through greensand and GAC filters. Chemical disinfection and corrosion control strategies are maintained and coordinated with the new treatment systems. The plant effluent will then tie into the existing distribution system. Station 5 is intended to become base load station and is designed to be expandable to include flow from Station 14 in the future. There are provisions in the building design to allow for expansion of the building to the East in the high bay process area to allow for additional filtration to treat future Station 14 water. A space has also been reserved for ion exchange polishing to the west of GAC tanks if it becomes necessary in the future.

Following Sections:

1 Groundwater Characteristics
2 PFAS Sampling Data
3 Well Pumps
4 Groundwater Oxidation
5 Oxidation/Detention Basins
6 High Service Pumps
7 Pre-Filter Oxidation
8 Greensand Pressure Filters
9 GAC Adsorption
10 Backwash Holding Tank
11 Final Disinfection
12 Corrosion Control
13 Fluoridation
14 Workspace Planning

APPROVED BY:
THE CITY OF KALAMAZOO

DATE: 02/03/2023

DEPARTMENT OF PUBLIC SERVICES
ASSISTANT CITY ENGINEER



Appendix A - Hydraulic Calculations
Appendix B - Hydraulic Model Analysis
Appendix C - ACT Study

Analytes	Design Summary Data: Sampling Data Range (mg/l)	Design Value (mg/l)	Primary MCLs (mg/l)	Secondary MCLs (mg/l)
Alkalinity[2]	324-366	340	---	---
Ammonia[2]	<0.1-0.15	<0.1[3]	---	---
Arsenic	0.0027	0.0027	0.010	---
Barium	0.1	0.1	2.0	---
Calcium	*84-125*	*110*	---	---
Chloride	75	75	---	250
Chloroform (TTHM)	0.0084	0.0084	0.080	---
Conductivity[2]	965-1170	1100	---	---
Dissolved Oxygen[2]	1.2-5.1	1.3[4]	---	---
Fluoride	<0.10-0.12	0.12	4.0	2.0
Hardness (as CaCO3)	320	320	---	---
Iron	*<0.01-1.88*	*1.2*[5]	---	0.30
Magnesium	*26-34.8*	*32*	---	---
Manganese	*<0.01-0.478*	*0.35*[6]	---	0.05
Nitrate (as N)	<0.050-3.7	1.1[7]	10	---
Nitrite (as N)	<0.10-.012	0.11	1.0	---
pH[2]	7.11-7.23	7.15	---	6.5-8.5
Potassium	*2.55-4.92*	*3.4*	---	---
Sodium	*31.8-61.3*	*40*	---	---
Sulfate (as SO4)	38.3-48.8	42	---	250

Notes:

[1] *italicized values originally reported as ug/L*

[2] data listed on sheet entitled, "2017 Summer Well Sampling" and does not appear to part of Pace Analytical report

[3] confirm anomaly in November 2017 sampling at PW5-1A.

[4] confirm anomaly in November 2017 sampling at PW5-2A.

[5] wide range in sampling data, design value selected as average of PW5-3A and PW5-4A.

[6] wide range in sampling data, design value selected as average of PW5-1A, 3A and 4A.

[7] PW5-2A appears to be impacted by nitrate. July 2019 composite sample concentration similar to average of individual well sampling in November 2017. Design value selected as average of November 2017 data.

Analytes	November 16, 2017 Sample Data Pace PN: 464627, Sample: 17-320-x PW5-1A (mg/l)	PW5-2A (mg/l)	PW5-3A (mg/l)	PW5-4A (mg/l)
Alkalinity(2)	334	366	336	324
Ammonia(2)	0.15	<0.1	<0.1	<0.1
Arsenic				
Barium				
Calcium	*112*	*125*	*110*	*107*
Chloride				
Chloroform				
Conductivity(2)	965	1170	1105	1055
Dissolved Oxygen(2)	1.4	5.1	1.3	1.2
Fluoride	0.12	<0.10	0.12	<0.10
Hardness (as CaCO3)				
Iron	*0.332*	*<0.01*	*1.34*	*1.88*
Magnesium	*32.1*	*34.8*	*32.2*	*32.0*
Manganese	*0.369*	*<0.01*	*0.478*	*0.204*
Nitrate (as N)	0.61	3.7	<0.050	<0.050
Nitrite (as N)	<0.10	<0.10	0.011	0.012
pH(2)	7.14	7.11	7.13	7.23
Potassium	*2.63*	*2.55*	*3.58*	*4.92*
Sodium	*34.4*	*61.3*	*31.8*	*36.0*
Sulfate (as SO4)	42.6	42.1	48.8	38.3

Analytes	July 02, 2018 Sample Pace PN: 4614380 18-183-TP305 (mg/l)	June 25, 2019 Sample Trace ID: 19F0853-01 19-176-5-B (mg/l)	July 31, 2019 Sample Trace ID: 19G0914-08 TP 305-5 (mg/l)
Alkalinity[(2)]			
Ammonia[(2)]			
Arsenic		0.0027	
Barium		0.10	
Calcium			84
Chloride			75
Chloroform	*0.0084*		
Conductivity[(2)]			
Dissolved Oxygen[(2)]			
Fluoride			0.6
Hardness (as CaCO3)			320
Iron			0.22
Magnesium			26
Manganese			
Nitrate (as N)			0.9
Nitrite (as N)			<0.10
pH[(2)]			
Potassium			
Sodium			35
Sulfate (as SO4)			40

Analytes	Design Summary			
	Sampling Data Range (ng/L, ppt)[1]	Design Value (ng/L, ppt)[1]	Michigan MCLs (ng/L, ppt)[1]	**Treatment Goal** (ng/L, ppt)[1]
Perfluorooctanoic Acid (PFOA)	ND - 4	4	8	ND
Perfluorooctane Sulfonic Acid (PFOS)	ND - 3	3	16	ND
Perfluorononanoic Acid (PFNA)	ND	ND	6	ND
Perfluorohexane Sulfonic Acid (PFHxS)	ND - 5	5	51	ND
Perfluorobutane Sulfonic Acid (PFBS)	2 - 35	35	420	ND
Perfluorohexanoic Acid (PFHxA)	ND - 4	4	400,000	ND
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)[2]	ND	ND	370	ND

Notes:

[1] ng/L = nanograms per Liter, ppt = parts per trillion, (10^{12})

[2] HFPO-DA, a GenX compound

Kalamazoo Environmental is conducting soil analysis and drilling test wells to determine likely source of PFAS and expected plume migration. City to provide results when available.

Low concentrations of PFAS detected at Station 14 also. May combine groundwater treatment at new Station 5 facilities. Station 14 wells reportedly in poor condition with reduced output.

	Station 5 Composite Samples							
	06/15/18	08/15/18	11/13/18	07/11/19	10/17/19	03/23/20	06/17/20	10/21/20
Analytes	(ng/L, ppt)	(ng/L, ppt)	(ng/L, ppt)	(ng/L, ppt)	(ng/L, ppt)	(ng/L, ppt)	(ng/L, ppt)	(ng/L, ppt)
PFOA	2	ND	ND	3	ND	ND	ND	2
PFOS	ND	ND	ND	ND	ND	ND	ND	ND
PFNA	ND	ND	ND	ND	ND	ND	ND	ND
PFHxS	ND	3	3	2	ND	ND	4	3
PFBS	4	6	6	14	10	2	13	10
PFHxA	ND	ND	ND	ND	ND	ND	ND	ND
HFPO-DA	---	---	---	---	ND	ND	ND	ND

	Station 5 Individual Well Samples			
	Well 1A	**Well 2A**	**Well 3A**	**Well 4A**
	11/18/2020	11/18/2020	11/18/2020	11/18/2020
Analytes	(ng/L, ppt)	(ng/L, ppt)	(ng/L, ppt)	(ng/L, ppt)
PFOA	ND	4	ND	2
PFOS	ND	3	ND	ND
PFNA	ND	ND	ND	ND
PFHxS	3	5	3	ND
PFBS	16	35	3	8
PFHxA	ND	4	ND	2
HFPO-DA	ND	ND	ND	ND

	Station 14 Composite Samples							
Analytes	10/17/19 (ng/L, ppt)	03/23/20 (ng/L, ppt)	06/17/20 (ng/L, ppt)	09/21/20 (ng/L, ppt)	10/21/20 (ng/L, ppt)	03/24/21 (ng/L, ppt)	06/28/21 (ng/L, ppt)	09/03/21 (ng/L, ppt)
PFOA	2	2	2	2	3	3	2	3
PFOS	4	3	4	5	4	3	4	5
PFNA	ND	ND	ND	ND	ND	ND	ND	ND
PFHxS	4	4	4	4	4	5	3	4
PFBS	5	6	5	6	5	7	5	6
PFHxA	ND	ND	ND	ND	ND	ND	ND	ND
HFPO-DA	ND	ND	ND	ND	ND	ND	ND	ND

	Station 5 Composite Samples 2021							
Analytes	03/18/21 (ng/L, ppt)	06/28/21 (ng/L, ppt)	09/03/21 (ng/L, ppt)	11/01/21 (ng/L, ppt)	- (ng/L, ppt)	- (ng/L, ppt)	- (ng/L, ppt)	- (ng/L, ppt)
PFOA	ND	ND	ND	ND	-	-	-	-
PFOS	ND	ND	ND	ND	-	-	-	-
PFNA	ND	ND	ND	ND	-	-	-	-
PFHxS	3	3	3	3	-	-	-	-
PFBS	8	4	7	3	-	-	-	-
PFHxA	2	ND	ND	ND	-	-	-	-
HFPO-DA	ND	ND	ND	ND	-	-	-	-

Existing Well Construction and Performance:

	Well Construction						Well Maintenance Report				
			Well Casing		Screen			Static	Test	Draw	Specific
	Year	Depth	Outer	Inner	Length	Dia.	Year	Depth	Flow	Down	Capacity
Well #	Drilled	(ft)	(in)	(in)	(ft)	(in)	Tested	(ft)	(gpm)	(ft)	(gpm/ft)
1A	1993	89.5	24	16	30	16	2013	14.9	486	15.5	31.4
2A	1992	86	24	16	26	16	2014	12.9	518	12.8	40.5
3A	1993	95.5	24	16	20	16	2018	11.5	513	20.0	25.7
4A	1993	97	24	16	30	16	2015	16.2	634	10.6	59.8

Soil Characteristics: Unconfined Aquifer:

	Formation Thickness (ft)			
Summary Description*	1A	2A	3A	4A
Topsoil	1	1	1	1
Sandstone w/Clay	17	---	---	---
Unknown Fill	---	---	---	3
Sand, Gravel, Stone, Fine Clay	76	91	96	92
Blue/Gray Clay w/Shale	Boundary Layer			

*see boring logs for details

Preliminary Well Pump Duty Point Estimates:

Assumed WTP Discharge Elevation		781
Approximate Site Elevation		765
Approximate Draw Down Elevation		735
Static Discharge Head (ft)		46
Dynamic Head Estimate, w/ 10% Minor Loss Allowance (ft):		3
Design Flow (gpm)	1400	
Pipe Size, Diameter (in)	12	
Design Velocity, 4 Pumps (fps)	3.97	
Transmission Main (ft)	500	
Hazen-Williams Coefficient, C	120	
Preliminary Duty Point, Four Pumps, Each (gpm, TDH feet):	***350***	***50***

Pump Type:	Vertical Turbine, Multistage
Duty Point Efficiency:	80%
Preliminary W-to-W Horsepower:	6.1
Preliminary Motor Horsepower:	7.5

Existing Well Pumps:



Worthington Vertical Turbine
Bowl Description: 8-inch, 8H48
4-Stage, Impeller Dia. 4 3/4-inch
Design Duty Point: 400 gpm @ 80 feet TDH, 1760 rpm
Original Hydraulic Efficiency: 76%
Installation Date: April 1972
Potential Modifications for Reuse:
Bowl Description: 8-inch, 8H48
2-Stage, Imp. Dia. 5-inch
Design Duty Point: 350 gpm @ 50 feet TDH
Modified Hydraulic Efficiency: 72%

*As discussed with City, no additional pump information available. Likely that existing pumps are to be replaced rather than refurbished.

Replacement Well Pumps:

Vertical Turbine
Design Duty Point: 350 gpm @ 50.1 feet TDH
Hydroflo Pumps
Model 11LL, 1-stage, 1800 rpm, 7.5 hp
Hydraulic Efficiency: 75.1%

Considerations:

1 Based on scanned well and pump records, appears that pumps are ~50 years old.
2 Condition of existing well pumps, columns, shafting, and motors unknown.
3 Replacement pumps could increase hydraulic efficiency by 10% or more.
4 Pumps and motors will be replaced and "condos" built at each wellhead.
5 Power supply will be from the treatment plant and will be backed up with generator power.

Chlorine Demand and Dosage Calculations:

	November 2017 Sample Analytics			
	PW5-1A (ug/l)	PW5-2A (ug/l)	PW5-3A (ug/l)	PW5-4A (ug/l)
Analysis				
Iron[(1)]	332	*1200*	1340	1880
Manganese[(1)]	369	*350*	478	204
Ammonia	0.15	<0.1	<0.1	<0.1
pH	7.14	7.11	7.13	7.23
Alkalinity	334	366	336	324
Dissolved Oxygen[(1)]	1.4	5.1	1.3	1.2
Conductivity	965	1170	1105	1055

[(1)] PW5-2A appears impacted by elevated Dissolved Oxygen, design value selected as average of PW5-1A, 3A and 4A.

Stoichiometric Chlorine Oxidation Rates		
Iron(II)	0.64	(mg CL_2 / mg Fe(II))
Manganese(II)	1.29	(mg CL_2 / mg Mn(II))
Design Chlorine Oxidation Rates		
Design Multiplier	2.00	
Iron(II)	1.28	(mg CL_2 / mg Fe(II))
Manganese(II)	2.58	(mg CL_2 / mg Mn(II))

Design Flow Rates (gpm):	350	350	350	350
Daily Hours of Operation:	24	24	24	24
Daily Flow (mgd):	0.50	0.50	0.50	0.50
Design Chlorine Demand	(ppd)	(ppd)	(ppd)	(ppd)
Iron	1.79	6.46	7.21	10.12
Manganese	4.00	3.80	5.19	2.21
Totals, per Well	5.79	10.26	12.40	12.33

Total, Design Demand **41** **(ppd)**

Total, Eq. Chlorine Dosage **2.4** **(mg/l)**

Preferred Chlorinator System:

Superior Water Solutions, Gas Chlorinator Series CL-16

Ejector nozzle sized to feed up to 50 ppd.

Water supply pressure: 55 psi @ 3.4 gpm.

Scrubber:

Purafil Dry Scrubber

Model FOC5

Chlorine Residual Analyzer:

Free chlorine residual analyzer for groundwater oxidation Chlorinator control.

Oxidation Aging/Detention Basins:

Primary Purposes:

1 Provide extended detention time for complete oxidation of dissolved iron and manganese in groundwater supply prior to pressure filtration.

2 Enhanced process and pump controls:

a High Service Pumps controlled/paced on water level in Detention Basin.

General Notes:

1 Oxidation of iron and manganese is to be provided by chlorine.

2 Pressure filters are designed with detention volume above the media.

3 Chlorination does not require additional detention when manganese mineral media or manganese coated media (I.e., "Greensand") is used for filtration.

Conceptual Sizing:

Detention (min.)	Volume (gal.)	SWD (ft.)	Footprint (sf.)	Width (ft.)	Length (ft.)
30	42,000	10	561	20	30
60	84,000	10	1,123	30	40

Detention Tank:

Volume: 50,000 gallons (Rounded for roughly 30 min detention time).

Diameter: 24'

Height: 16'

Concrete foundation as a base.

Design Flow Rate:

Hydraulic Capacity for Water Pump Station 5:				1,400	gpm
Firm Capacity Criteria:					
High Service Pumps:	**2**	**each**	**@**	**1,400**	**gpm**
	1	**each**	**@**	**700**	**gpm**

Design Future Flow Rate when Combined with Station 14:

Future Hydraulic Capacity for Water Pump Station:				2,800	gpm
Firm Capacity Criteria:					
High Service Pumps:	**2**	**each**	**@**	**2,800**	**gpm**
	1	**each**	**@**	**1,400**	**gpm**
	1	**each**	**@**	**700**	**gpm**

Pump Selection (see Appendix A for Hydraulic Calculations and Appendix B for Hydraulic Model Analysis):

700 GPM Pump: Aurora Model 411 - Horizontal, single-stage, split-case pump.

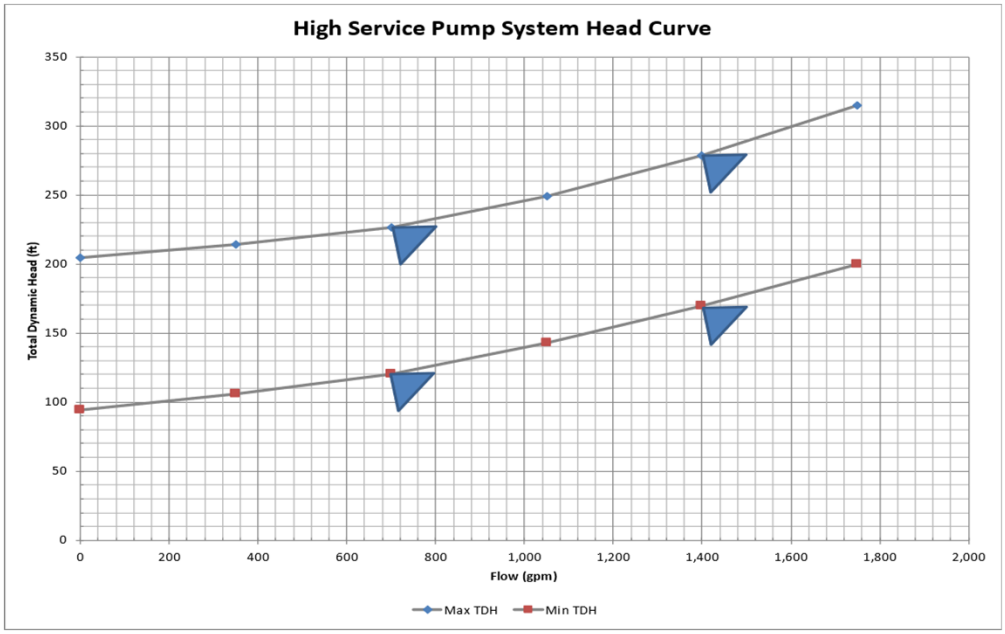
Design Duty Point: 700 gpm @ 223.3 ft TDH

3550 rpm, 75 hp

1400 GPM Pump: Aurora Model 411 - Horizontal, single-stage, split-case pump.

Design Duty Point: 1400 gpm @ 274.7 ft TDH

3550 rpm, 150 hp



Additional Design Considerations:

1 Water Hammer Mitigation/Protection:
   a Variable Frequency Drives
   b Pressure Relief Valve

2 Potential Future Increase in Hydraulic Design Capacity (to 2,800 gpm)

Purpose:

Greensand filters require "oxidizing conditions" within the filters to effectively reduce and capture remaining soluble iron and manganese on filter media. Operations will need to minimize chlorine residuals from Detention Basin and Greensand Pressure Filters to reduce adsorption capacity impacts on GAC. Therefore, "tweaking" of chlorine residual prior to the Greensand Pressure Filters will enhance process control and operation flexibility.

Conceptual Design Conditions:

1 Chlorine Analyzer measuring free chlorine for Pre-Filter Chlorinator control.

2 Pre-Filter Chlorinator, designed for independent operation and control.

3 Chlorine Demand Estimate:

a	**Dosage:**	**0.5**	**mg/l**	(design range 0.0 to 0.5 mg/l)
b	Flow:	1,400	gpm	
c	Demand:	8	ppd	

4 Chlorine Future Demand Estimate:

a	**Dosage:**	**0.5**	**mg/l**	(design range 0.0 to 0.5 mg/l)
b	Flow:	2,800	gpm	
c	Demand:	17	ppd	

5 Booster pump for chlorine injection (sized to satisfy current and future demand):
Design Duty Point: 36 GPM @ 280 ft TDH.

6 Ejector nozzle sized to feed up to 50 ppd.
Backpressure at injection point: 120 psi.
Water supply pressure: 212 psi @ 8.1 gpm.

Purpose:

Greensand filters exist to remove Iron and Manganese to below secondary MCLs and to eliminate the potential for fouling of the GAC filters by Iron and Manganese.

Design Criteria:

Design Based on Ten State Standards

For Iron/Manganese Removal by Manganese Coated Media Filtration:

a. Provisions should be made to apply the chlorine as far ahead of the filter as practical and to a point immediately before the filter.
b. Aeration is used prior to the pre-filter chlorine oxidation point to reduce the amount of the chemical oxidant needed.
c. An anthracite media cap of at least 6 inches shall be provided over manganese coated media.
d. Normal filtration rate is 3gpm/sf.
e. With air washing provided, normal backwash rate shall be less than 8 gpm/sf.

Backwash Rates and Volumes

Using finished water (post GAC) for backwash to address PFAS concerns.

Design Backwash Rate and Volume per 10 State Standards:

With Combination Air/Water Backwash Process:

Diameter Options:	12	ft
Filtration Area, Ea.:	113.2	sf
Number of Filters:	4	units
Backwash Rate, Ea.:	5	gpm/sf
Backwash Duration:	15	min.
Waste Volume, Ea.:	8500	gal.
Waste Volume, Total:	34000	gal.
Design Backwash Flow Rate:	**566.1**	**gpm**
Design Waste Volume/Backwash Cycle:	**34000**	**gallons**

Purpose:

Following removal of Iron and Manganese in the greensand filters, the GAC filters will remove PFAS substances from the water to levels below Michigan drinking water MCLs for PFAS.

Per- and Polyfluoroalkyl Substances (PFAS) Reduction:

PFAS has been the primary focus of this proposed Water Station 5 Reconstruction project since mid-2019. A draft Summary Report subtitled "Letters of Interest from Equipment Manufacturers and System Suppliers, Proposed Pilot Study for PFAS Reduction at Water Supply Station No. 5" was prepared November 12, 2019 and provided detailed background on treatment options. PFAS regulation and treatment has evolved rapidly over the past 2+ years, including Michigan establishing Drinking Water Maximum Contaminant Levels (MCLs) for PFAS, which went into effect in August 2020. See previous documents for evaluations of PFAS treatment alternatives.

Based on evaluations, Granular Activated Carbon (GAC) adsorption was selected as the preferred treatment technology for PFAS reduction at Water Station 5.

Calgon Carbon Corporation has extensive experience with PFAS Adsorption and has provided numerous GAC systems for treatment of PFAS-impacted groundwater systems. As the frontrunner in this emerging market, Calgon has provided invaluable technical support and guidance in developing this proposed treatment system.

Calgon's Accelerated Column Test (ACT) analysis confirmed original opinions that short-chain PFAS compounds (PFBS, more specifically) would have the lowest adsorption capacity and would likely exceed the City's performance standard of Non-Detect (ND) after approximately 310 days of full-scale operation at full hydraulic design capacity.

Calgon's current proposal includes two (2) "skids," with lead and lag reactors in each train. A total of four (4) 12-foot diameter reactors is proposed.

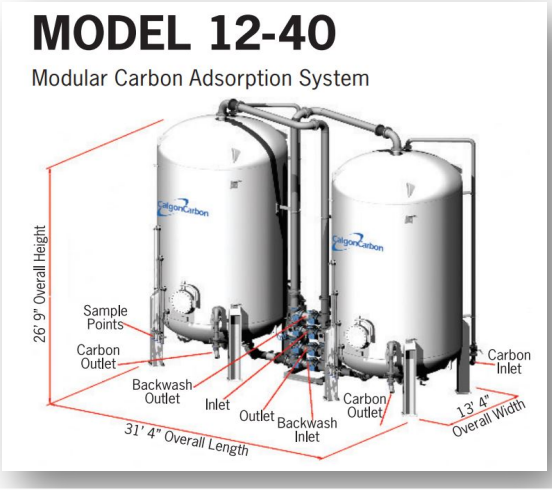
System Configuration:

Dimensional sketch for the proposed Model 12-40 GAC Adsorption System:

<u>Backwash Volume:</u>

960.5 gpm @ 75F

45000 gallon per vessel



Pilot Study:

ACT Study: Removal of Per- and Polyfluoroalkyl Substances and TOC from Potable Drinking Water Using F400 Granular Activated Carbon. (See Appendix C at the end of this document).

Special Considerations:

In a June 8, 2021 email from Dan Iorio, Senior Technical Sale Representative for Calgon Carbon, it was noted that "systems could be 45+ weeks out from PO issuance to shipment" due to raw material shortages and delivery delays.

It is the City's intent that Calgon Carbon will be fully responsible and accepts liability for receiving PFAS-impacted materials. City notes that Calgon Carbon advertises that their regeneration process "destroys" PFAS substances. The City's potential liability for PFAS discharge to atmosphere if PFAS is not fully destroyed shall be minimized by Calgon Carbon.

Summary:

Greensand filter air/water BW requires 5 gpm/sf, (566 gpm) for 10 minutes, then 5 minutes of 15 gpm/sf (1695 gpm) water only.

The GAC filter BW requires about 8.5 gpm/sf @ 55 °F, or 961 gpm.
Calgon BW for 4 bed volumes @ 10,000 gal/bed volume, or 40,000 gal.

The BW holding tank volume could be reduced if we assume the discharge will always be open and allows up to 600 gpm discharge to the sanitary sewer (some head/depth in the holding tank is needed to produce 600 gpm).

The backwash discharge rate to the sanitary sewer has been limited to 600gpm maximum by the City of Kalamazoo Wastewater Division. Assuming 600 gpm discharge from the tank at all times, the tank would need to hold the difference between the 1000 gpm BW rate, and 600 gpm discharge rate for the duration of the BW, or (40,000 gal/1000 gpm) 40 minutes. 400 gpm x 40 minutes = 16,000 gallons.

The tank has been designed to hold 20,000 gallons to provide some safety buffer.

Purpose:

Final disinfection and residual for distribution system. Majority of iron and manganese should be removed through the oxidation and greensand pressure filtration system. In addition to PFAS, the GAC adsorption system will also reduce total organic carbon (TOC) concentrations. Chlorine demand in the finished water prior to final disinfection should be minimal.

Conceptual Design Conditions:

1 Inline Chlorine Analyzer measuring total chlorine for Final Disinfection Chlorinator control.

2 Final Disinfection Chlorinator, designed for independent operation and control.

3 Chlorine Demand Estimate:

a **Dosage:** **2 mg/l** (design range 1.0 to 2 mg/l)

b Flow: 1,400 gpm

c Demand: 34 ppd

4 Chlorine FUTURE Demand Estimate:

a **Dosage:** **2 mg/l** (design range 1.0 to 2 mg/l)

b Flow: 2,800 gpm

c Demand: 67 ppd

5 Ejector nozzle sized to feed up to 100 ppd.
Backpressure at injection point: 120 psi.
Water supply pressure: 215 psi @ 27.2 gpm.

Corrosion Control Strategy:

City is conducting a corrosion control study and intends to change to CARUS 8700 for corrosion control. Calculations on this page are for CARUS 8700.

Based on demand calculations for selected product, there will be bulk storage w/ day

Chemical Feed Calculations

1 According to the EPA, orthophosphate treatment for controlling lead and copper should target residual concentrations of 1.0 to 3.0 mg/L as PO4 at the tap.

2 Orthophosphate Demand Estimate:

a	**Dosage:**	**5.5**	**mg/l PO4**	(Design range 1-5.5 mg/L)
b	Flow:	1,400	gpm	
c	Usage:	384	ppd PO4	
	Usage:	33	gpd PO4	

3 Day Tank 30 Hour Storage Volume = 41 gallons
Bulk Tank 30 Day Storage Volume = 994 gallons

4 Orthophosphate Future Demand Estimate:

a	**Dosage:**	**5.5**	**mg/l PO4**
b	Flow:	2,800	gpm
c	Usage:	768	ppd PO4
	Usage:	66	gpd PO4

5 Day Tank 30 Hour Storage Volume = 83 gallons
Bulk Tank 30 Day Storage Volume = 1989 gallons

6 Transfer Pump for Liquid Chemical Feed Systems
Lutz-Jesco Centran Mag Drive Transfer Pump Model 5.05
3450 rpm, 1/2 hp, 5 gpm
With a back-pressure valve.

7 Metering Pump for Liquid Chemical Feed Systems
Grundfos Digital Diaphragm Dosing Pump Model DDA 12-10
Feed Rate Range: 12 ml/h - 3.17 gph

Fluoridation:

Individual well sample data from November 16, 2017 indicate Fluoride concentrations range from <0.10 to 0.12 mg/l, and would support supplemental fluoridation.

Chemical Feed Calculations

1 Hydrofluorosilicic Acid, H2SiF6

a	Concentration:	23%	Hydrofluorosilicic Acid	
b	Available Fluoride Ion:	0.79		
	$Temp_{avg:}$	14	°C	
	Background F:	0.1	mg/L F	

2	Dosage:	0.99	mg/L F	
	Based on Average maximum daily air temperature			

3 Hydrofuorosilicic Acid Demand Estimate:

a	**Dosage:**	**0.99**	**mg/L Fluoride**	
b	Flow:	1,400	gpm	
c	Usage:	91.04	ppd	Hydrofluorosilicic Acid
	Usage:	10.90	gpd	Hydrofluorosilicic Acid

4	Day Tank 30 Hour Volume =	13.63	gallons
	Bulk 30 Day Storage Volume =	327.08	gallons

5 Hydrofluorosilicic Acid Future Demand Estimate:

a	**Dosage:**	**0.99**	**mg/L Fluoride**	
b	Flow:	2800	gpm	
c	Usage:	182.08	ppd	Hydrofluorosilicic Acid
	Usage:	21.81	gpd	Hydrofluorosilicic Acid

6	Day Tank 30 Hour Volume =	27.26	gallons
	Bulk 30 Day Storage Volume =	654.17	gallons

1 General

1.1 Existing facilities are to be retained and refurbished for continued use as noted.

1.2 New facilities are to be constructed for iron and manganese removal,

1.3 PFAS reduction, and for associated operation and administrative functions.

2 Existing Water Station 5 Facilities

Well No. 1A	Retain. Well cleaning and testing.
Well No. 2A	Retain. Well cleaning and testing.
Well No. 3A	Retain. Well cleaning and testing.
Well No. 4A	Retain. Well cleaning and testing.
Pump House	Retain. Repurpose and upgrade as Well Pump Control Building.
	Demo booster pumps and revise piping, new flow meter.
	Upgrade electrical feed to pumps.

After cleaning and testing, all wells will receive new pumps, motors, and enclosures.

Power Supply will be routed from treatment plant for all wells with backup generator.

Chemical Building	Demolish. Chemical feed systems will be in new building.
Booster Building	Historical building. Turn into water equipment storage.

APPENDIX A

Hydraulic Calculations

WIGHTMAN

ARCHITECTURE | ENGINEEERING
ENVIRONMENTAL | SURVEYING | GIS
INTERIOR DESIGN | LANDSCAPE ARCHITECTURE
PLANNING | REALITY CAPTURE

Blue = User Input

City of Kalamazoo
Water Station 5

Date 11/17/2021 Author B. Sabin

Design Point	**1400 gpm**	**274.7 ft**	118.9 psi

	Synthetic	Max TDH (ft)	Min TDH (ft)
	0	200.8	90.5
Water Elevations	350	206.5	98.0
Detention tank **789.5 ft**	700	212.3	105.5
	1050	225.8	119.6
	1400	243.3	134.5
C Factor **130**	1750	266.0	151.1

Calgon: O&M Manual, Sect 1 - Backwashing/backflushing is usually required whe
Tonka: 10/26/2021 Tonka recommends using a max headloss of 15 psi through t
WesTech: 10/25/2021 For pressure filters, no “curve” so to say, but the design star

Flow (gpm)	Friction Head (ft)	Max TDH	Min TDH
0	0.0	**200.8**	**90.5**
350	4.3	**210.8**	**102.3**
700	11.0	**223.3**	**116.5**
1050	20.0	**245.8**	**139.7**
1400	31.4	**274.7**	**165.9**
1750	45.2	311.2	196.3
2100	61.2		
2450	79.6		
2800	100.2		
3150	123.1		
3500	148.3		
3850	175.8		
4200	205.6		
4550	237.6		
4900	271.9		
5250	308.5		
5600	347.3		
5950	388.4		
6300	431.7		
6650	477.3		
7000	525.2		

Pipe Velocity at Design Point	
Pipe Dia (in)	Velocity at design point (fps)
3	63.58
4	35.76
6	15.90
8	8.94
10	5.72
12	3.97
16	2.24
18	1.77
24	0.99
30	0.64
36	0.44

Prein&Newhof memo 9/22/2021

Dist. System (gpm)	Max TDH (ft)	Min TDH (ft)
0	969.5	880.0
350	975.3	887.5
700	981.0	895.0
1000	992.0	907.0
1050	994.5	909.1
1400	1012.0	924.0
1750	1034.8	940.6
1800	1038.0	943.0



Pipe Section 1 **Detention tank to H.S. pump 3** Flow Modifier *gpm or value*

Nominal Diameter **12** inches Add 0
Pipe Type **Ductile Iron**
Actual Diameter 12.4 inches
Length **118** ft
C 130
K 3.71

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	350	0.9	0.04	0.0	0.09
700	700	1.9	0.13	0.2	0.33
1050	1050	2.8	0.28	0.4	0.73
1400	1400	3.7	0.48	0.8	1.28
1750	1750	4.7	0.72	1.2	1.97
2100	2100	5.6	1.01	1.8	2.81
2450	2450	6.5	1.35	2.4	3.79
2800	2800	7.4	1.73	3.2	4.92
3150	3150	8.4	2.15	4.0	6.19
3500	3500	9.3	2.61	5.0	7.59
3850	3850	10.2	3.11	6.0	9.14
4200	4200	11.2	3.65	7.2	10.83
4550	4550	12.1	4.24	8.4	12.66
4900	4900	13.0	4.86	9.8	14.63
5250	5250	14.0	5.52	11.2	16.74
5600	5600	14.9	6.22	12.8	18.99
5950	5950	15.8	6.96	14.4	21.37
6300	6300	16.7	7.74	16.2	23.89
6650	6650	17.7	8.55	18.0	26.55
7000	7000	18.6	9.40	19.9	29.35

Minor Losses, 12":

Fittings:	Number	K value	K Sum
Pipe Entrance	1	0.78	0.78
Pipe Exit	0	1.00	0.00
Valves (gate)	1	0.10	0.10
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.35	0.00
Valves (plug)	0	1.08	0.00
90 Deg. Bends	3	0.39	1.17
45 Deg. Bends	1	0.21	0.21
Tee (branch)	1	0.78	0.78
Tee (flow thru)	2	0.26	0.52
Valves (check)	0	1.30	0.00
6"x12" reducer-pump suction	1	0.15	0.15
			3.71

Pipe Section 2 Pump #3 suction to discharge header Flow Modifier *gpm or value*

Nominal Diameter **6** inches Divide 2

Pipe Type **Ductile Iron**

Actual Diameter 6.22 inches

Length **17.5** ft

C 130

K 2.29

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	175	1.8	0.04	0.1	0.17
700	350	3.7	0.16	0.5	0.64
1050	525	5.5	0.33	1.1	1.43
1400	700	7.4	0.57	1.9	2.51
1750	875	9.2	0.85	3.0	3.89
2100	1050	11.1	1.20	4.4	5.57
2450	1225	12.9	1.59	6.0	7.55
2800	1400	14.8	2.04	7.8	9.82
3150	1575	16.6	2.53	9.8	12.38
3500	1750	18.5	3.08	12.2	15.23
3850	1925	20.3	3.67	14.7	18.38
4200	2100	22.2	4.31	17.5	21.82
4550	2275	24.0	5.00	20.5	25.54
4900	2450	25.9	5.74	23.8	29.56
5250	2625	27.7	6.52	27.3	33.87
5600	2800	29.6	7.34	31.1	38.46
5950	2975	31.4	8.22	35.1	43.34
6300	3150	33.3	9.13	39.4	48.51
6650	3325	35.1	10.09	43.9	53.97
7000	3500	37.0	11.10	48.6	59.72

Minor Losses, 6":

Fittings:	Number	K value	K Sum
Pipe Entrance (flare)	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	2	0.12	0.24
Valves (ball)	0	0.05	0.00
Valves (butterfly)	0	0.68	0.00
Valves (plug)	0	0.83	0.00
90 Deg. Bends	1	0.45	0.45
45 Deg. Bends	0	0.24	0.00
Tee (branch)	0	0.90	0.00
Tee (flow thru)	0	0.3	0.00
Valves (check)	1	1.50	1.50
4" x 6" increaser	1	0.10	0.10
			2.29

Pipe Section 3 Pumps to Greensand filter #4 Flow Modifier *gpm or value*

Nominal Diameter **12** inches Add 0

Pipe Type **Ductile Iron**

Actual Diameter 12.4 inches

Length **83.25** ft

C 130

K 3.37

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	350	0.9	0.03	0.0	0.07
700	700	1.9	0.09	0.2	0.27
1050	1050	2.8	0.20	0.4	0.61
1400	1400	3.7	0.34	0.7	1.06
1750	1750	4.7	0.51	1.1	1.64
2100	2100	5.6	0.72	1.6	2.35
2450	2450	6.5	0.95	2.2	3.17
2800	2800	7.4	1.22	2.9	4.12
3150	3150	8.4	1.51	3.7	5.18
3500	3500	9.3	1.84	4.5	6.37
3850	3850	10.2	2.19	5.5	7.68
4200	4200	11.2	2.58	6.5	9.10
4550	4550	12.1	2.99	7.7	10.64
4900	4900	13.0	3.43	8.9	12.31
5250	5250	14.0	3.90	10.2	14.09
5600	5600	14.9	4.39	11.6	15.99
5950	5950	15.8	4.91	13.1	18.00
6300	6300	16.7	5.46	14.7	20.13
6650	6650	17.7	6.03	16.4	22.38
7000	7000	18.6	6.63	18.1	24.75

Minor Losses, 12":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	1	0.10	0.10
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.35	0.00
Valves (plug)	0	1.08	0.00
90 Deg. Bends	2	0.39	0.78
45 Deg. Bends	0	0.21	0.00
Tee (branch)	2	0.78	1.56
Tee (flow thru)	3	0.26	0.78
Valves (check)	0	1.30	0.00
12" x 6" reducer (branch flow tee)	1	0.15	0.15
			3.37

Pipe Section 4 Filter #4 inlet to effluent inc. media

Flow Modifier: Divide — *gpm or value*: 4

Nominal Diameter	8	inches
Pipe Type	Ductile Iron	
Actual Diameter	8.33	inches
Length	6.5	ft
C	130	
K	3.22	

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)	Clean Greensand Bed Headloss (ft)
0	0	0.0	0.00	0.0	0.00	0.00
350	87.5	0.5	0.00	0.0	0.43	0.42
700	175	1.0	0.00	0.1	0.90	0.84
1050	262.5	1.5	0.01	0.1	1.40	1.27
1400	350	2.1	0.01	0.2	1.93	1.70
1750	437.5	2.6	0.02	0.3	2.49	2.14
2100	525	3.1	0.03	0.5	3.08	2.58
2450	612.5	3.6	0.04	0.7	3.71	3.02
2800	700	4.1	0.05	0.9	4.37	3.46
3150	787.5	4.6	0.06	1.1	5.05	3.92
3500	875	5.2	0.08	1.3	5.77	4.37
3850	962.5	5.7	0.09	1.6	6.53	4.83
4200	1050	6.2	0.11	1.9	7.31	5.29
4550	1137.5	6.7	0.12	2.2	8.13	5.76
4900	1225	7.2	0.14	2.6	8.97	6.23
5250	1312.5	7.7	0.16	3.0	9.85	6.70
5600	1400	8.2	0.18	3.4	10.76	7.18
5950	1487.5	8.8	0.20	3.8	11.70	7.66
6300	1575	9.3	0.23	4.3	12.68	8.14
6650	1662.5	9.8	0.25	4.8	13.68	8.63
7000	1750	10.3	0.28	5.3	14.72	9.13

Minor Losses, 6":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	0	0.11	0.00
Valves (ball)	0	0.04	0.00
Valves (butterfly)	2	0.63	1.26
Valves (plug)	0	0.89	0.00
90 Deg. Bends	0	0.42	0.00
45 Deg. Bends	0	0.22	0.00
Tee (branch)	2	0.84	1.68
Tee (flow thru)	1	0.28	0.28
Valves (check)	0	1.40	0.00
12" x 6" icreaser (branch flow tee)	1	0.00	0.00
		15	3.22

Pipe Section 5 Filter #4 to #3 effluent

Flow Modifier: Divide — *gpm or value*: 4

Nominal Diameter	12	inches
Pipe Type	Ductile Iron	
Actual Diameter	12.4	inches
Length	15	ft
C	130	
K	0.26	

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	87.5	0.2	0.00	0.0	0.00
700	175	0.5	0.00	0.0	0.00
1050	262.5	0.7	0.00	0.0	0.00
1400	350	0.9	0.00	0.0	0.01
1750	437.5	1.2	0.01	0.0	0.01
2100	525	1.4	0.01	0.0	0.02
2450	612.5	1.6	0.01	0.0	0.02
2800	700	1.9	0.02	0.0	0.03
3150	787.5	2.1	0.02	0.0	0.04
3500	875	2.3	0.03	0.0	0.05
3850	962.5	2.6	0.03	0.0	0.06
4200	1050	2.8	0.04	0.0	0.07
4550	1137.5	3.0	0.04	0.0	0.08
4900	1225	3.3	0.05	0.0	0.09
5250	1312.5	3.5	0.05	0.0	0.10
5600	1400	3.7	0.06	0.1	0.12
5950	1487.5	4.0	0.07	0.1	0.13
6300	1575	4.2	0.08	0.1	0.15
6650	1662.5	4.4	0.08	0.1	0.16
7000	1750	4.7	0.09	0.1	0.18

Minor Losses, 12":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	0	0.10	0.00
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.35	0.00
Valves (plug)	0	1.08	0.00
90 Deg. Bends	0	0.39	0.00
45 Deg. Bends	0	0.21	0.00
Tee (branch)	0	0.78	0.00
Tee (flow thru)	1	0.26	0.26
Valves (check)	0	1.30	0.00
Misc.	0	0.00	0.00
			0.26

Pipe Section 6 Filter #3 to #2 effluent

Nominal Diameter	12	inches	Flow Modifier	*gpm or value*
Pipe Type	Ductile Iron		Divide	2
Actual Diameter	12.4	inches		
Length	15	ft		
C	130			
K	0.36			

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	175	0.5	0.00	0.0	0.00
700	350	0.9	0.00	0.0	0.01
1050	525	1.4	0.01	0.0	0.02
1400	700	1.9	0.02	0.0	0.04
1750	875	2.3	0.03	0.0	0.06
2100	1050	2.8	0.04	0.0	0.08
2450	1225	3.3	0.05	0.1	0.11
2800	1400	3.7	0.06	0.1	0.14
3150	1575	4.2	0.08	0.1	0.17
3500	1750	4.7	0.09	0.1	0.21
3850	1925	5.1	0.11	0.1	0.26
4200	2100	5.6	0.13	0.2	0.30
4550	2275	6.0	0.15	0.2	0.35
4900	2450	6.5	0.17	0.2	0.41
5250	2625	7.0	0.19	0.3	0.47
5600	2800	7.4	0.22	0.3	0.53
5950	2975	7.9	0.25	0.3	0.60
6300	3150	8.4	0.27	0.4	0.66
6650	3325	8.8	0.30	0.4	0.74
7000	3500	9.3	0.33	0.5	0.82

Minor Losses, 12":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	1	0.10	0.10
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.35	0.00
Valves (plug)	0	1.08	0.00
90 Deg. Bends	0	0.39	0.00
45 Deg. Bends	0	0.21	0.00
Tee (branch)	0	0.78	0.00
Tee (flow thru)	1	0.26	0.26
Valves (check)	0	1.30	0.00
Misc.	0	0.00	0.00
			0.36

Pipe Section 7 Filter #2 to #1 effluent

Nominal Diameter	12	inches	Flow Modifier	*gpm or value*
Pipe Type	Ductile Iron		Multiply	0.75
Actual Diameter	12.4	inches		
Length	15	ft		
C	130			
K	0.26			

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	262.5	0.7	0.00	0.0	0.00
700	525	1.4	0.01	0.0	0.02
1050	787.5	2.1	0.02	0.0	0.04
1400	1050	2.8	0.04	0.0	0.07
1750	1312.5	3.5	0.05	0.0	0.10
2100	1575	4.2	0.08	0.1	0.15
2450	1837.5	4.9	0.10	0.1	0.20
2800	2100	5.6	0.13	0.1	0.25
3150	2362.5	6.3	0.16	0.2	0.32
3500	2625	7.0	0.19	0.2	0.39
3850	2887.5	7.7	0.23	0.2	0.47
4200	3150	8.4	0.27	0.3	0.56
4550	3412.5	9.1	0.32	0.3	0.65
4900	3675	9.8	0.36	0.4	0.75
5250	3937.5	10.5	0.41	0.4	0.85
5600	4200	11.2	0.46	0.5	0.97
5950	4462.5	11.9	0.52	0.6	1.09
6300	4725	12.6	0.58	0.6	1.21
6650	4987.5	13.3	0.64	0.7	1.35
7000	5250	14.0	0.70	0.8	1.49

Minor Losses, 12":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	0	0.10	0.00
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.35	0.00
Valves (plug)	0	1.08	0.00
90 Deg. Bends	0	0.39	0.00
45 Deg. Bends	0	0.21	0.00
Tee (branch)	0	0.78	0.00
Tee (flow thru)	1	0.26	0.26
Valves (check)	0	1.30	0.00
Misc.	0	0.00	0.00
			0.26

Pipe Section 8 Greensand to GAC #1 Flow Modifier *gpm or value*

Nominal Diameter	12	inches	Add	0
Pipe Type	Ductile Iron			
Actual Diameter	12.4	inches		
Length	80	ft		
C	130			
K	1.82			

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	350	0.9	0.02	0.0	0.05
700	700	1.9	0.09	0.1	0.19
1050	1050	2.8	0.19	0.2	0.41
1400	1400	3.7	0.32	0.4	0.72
1750	1750	4.7	0.49	0.6	1.10
2100	2100	5.6	0.69	0.9	1.57
2450	2450	6.5	0.91	1.2	2.11
2800	2800	7.4	1.17	1.6	2.74
3150	3150	8.4	1.45	2.0	3.44
3500	3500	9.3	1.77	2.4	4.21
3850	3850	10.2	2.11	3.0	5.07
4200	4200	11.2	2.48	3.5	6.00
4550	4550	12.1	2.87	4.1	7.01
4900	4900	13.0	3.29	4.8	8.09
5250	5250	14.0	3.74	5.5	9.25
5600	5600	14.9	4.22	6.3	10.48
5950	5950	15.8	4.72	7.1	11.79
6300	6300	16.7	5.24	7.9	13.17
6650	6650	17.7	5.80	8.8	14.63
7000	7000	18.6	6.37	9.8	16.16

Minor Losses, 12":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	0	0.10	0.00
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.35	0.00
Valves (plug)	0	1.08	0.00
90 Deg. Bends	4	0.39	1.56
45 Deg. Bends	0	0.21	0.00
Tee (branch)	0	0.78	0.00
Tee (flow thru)	1	0.26	0.26
Valves (check)	0	1.30	0.00
Misc.	0	0	0.00
			1.82

Pipe Section 9 GAC #1 to GAC #2 influent Flow Modifier *gpm or value*

Nominal Diameter	8	inches	Divide	2
Pipe Type	Ductile Iron			
Actual Diameter	8.33	inches		
Length	51.83	ft		
C	130			
K	1.27			

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	175	1.0	0.03	0.0	0.05
700	350	2.1	0.11	0.1	0.20
1050	525	3.1	0.24	0.2	0.43
1400	700	4.1	0.40	0.3	0.74
1750	875	5.2	0.61	0.5	1.13
2100	1050	6.2	0.86	0.8	1.61
2450	1225	7.2	1.14	1.0	2.16
2800	1400	8.2	1.46	1.3	2.80
3150	1575	9.3	1.81	1.7	3.51
3500	1750	10.3	2.20	2.1	4.30
3850	1925	11.3	2.63	2.5	5.16
4200	2100	12.4	3.08	3.0	6.10
4550	2275	13.4	3.58	3.5	7.12
4900	2450	14.4	4.10	4.1	8.21
5250	2625	15.5	4.66	4.7	9.38
5600	2800	16.5	5.25	5.4	10.62
5950	2975	17.5	5.88	6.1	11.93
6300	3150	18.6	6.53	6.8	13.32
6650	3325	19.6	7.22	7.6	14.78
7000	3500	20.6	7.94	8.4	16.32

Minor Losses, 8":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	0	0.11	0.00
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.63	0.00
Valves (plug)	0	0.89	0.00
90 Deg. Bends	3	0.42	1.26
45 Deg. Bends	0	0.22	0.00
Tee (branch)	0	0.84	0.00
Tee (flow thru)	0	0.28	0.00
Valves (check)	0	1.40	0.00
12" x 8" reducer	1	0.01	0.01
			1.27

Pipe Section 10 16" x 12" reducer to existing 12" main on Flow Modifier *gpm or value*

Nominal Diameter	**12**	inches	Divide	2
Pipe Type	**Ductile Iron**			
Actual Diameter	12.4	inches		
Length	**35.75**	ft		
C	130			
K	1.09			

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	175	0.5	0.00	0.0	0.01
700	350	0.9	0.01	0.0	0.03
1050	525	1.4	0.02	0.0	0.06
1400	700	1.9	0.04	0.1	0.10
1750	875	2.3	0.06	0.1	0.15
2100	1050	2.8	0.09	0.1	0.22
2450	1225	3.3	0.11	0.2	0.29
2800	1400	3.7	0.15	0.2	0.38
3150	1575	4.2	0.18	0.3	0.48
3500	1750	4.7	0.22	0.4	0.59
3850	1925	5.1	0.26	0.4	0.70
4200	2100	5.6	0.31	0.5	0.83
4550	2275	6.0	0.36	0.6	0.98
4900	2450	6.5	0.41	0.7	1.13
5250	2625	7.0	0.46	0.8	1.29
5600	2800	7.4	0.52	0.9	1.46
5950	2975	7.9	0.58	1.1	1.64
6300	3150	8.4	0.65	1.2	1.84
6650	3325	8.8	0.72	1.3	2.04
7000	3500	9.3	0.79	1.5	2.26

Minor Losses, 12":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	1	0.10	0.10
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.35	0.00
Valves (plug)	0	1.08	0.00
90 Deg. Bends	0	0.39	0.00
45 Deg. Bends	1	0.21	0.21
Tee (branch)	1	0.78	0.78
Tee (flow thru)	0	0.26	0.00
Valves (check)	0	1.30	0.00
Misc.	0	0.00	0.00
			1.09

Pipe Section 11 GAC #2 influent, GAC media, effluent Flow Modifier *gpm or value*

Nominal Diameter	**8**	inches	Divide	2
Pipe Type	**Ductile Iron**			
Actual Diameter	8.33	inches		
Length	**101**	ft		
C	130			
K	40.00			

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)	Bed Headloss each
0	0	0.0	0.00	0.0	0.00	0.00
350	175	1.0	0.06	0.7	3.35	1.31
700	350	2.1	0.22	2.6	8.14	2.64
1050	525	3.1	0.46	5.9	14.37	3.98
1400	700	4.1	0.79	10.6	22.03	5.34
1750	875	5.2	1.19	16.5	31.12	6.71
2100	1050	6.2	1.67	23.8	41.63	8.10
2450	1225	7.2	2.22	32.3	53.57	9.50
2800	1400	8.2	2.84	42.2	66.93	10.92
3150	1575	9.3	3.53	53.5	81.70	12.36
3500	1750	10.3	4.29	66.0	97.90	13.81
3850	1925	11.3	5.12	79.9	115.52	15.27
4200	2100	12.4	6.01	95.0	134.55	16.75
4550	2275	13.4	6.97	111.5	155.00	18.24
4900	2450	14.4	7.99	129.4	176.86	19.75
5250	2625	15.5	9.08	148.5	200.14	21.28
5600	2800	16.5	10.23	169.0	224.83	22.82
5950	2975	17.5	11.45	190.7	250.93	24.37
6300	3150	18.6	12.73	213.8	278.45	25.94
6650	3325	19.6	14.06	238.3	307.38	27.53
7000	3500	20.6	15.46	264.0	337.72	29.13

Minor Losses, 8":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	0	0.11	0.00
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.63	0.00
Valves (plug)	0	0.89	0.00
90 Deg. Bends	0	0.42	0.00
45 Deg. Bends	0	0.22	0.00
Tee (branch)	0	0.84	0.00
Tee (flow thru)	0	0.28	0.00
Basket strainer/fittings/pipe	2	20.00	40.00
misc	0	0	0.00
			40.00

Pipe Section 12 Finished water GAC #2 to GAC #1

Nominal Diameter	16	inches	
Pipe Type	Ductile Iron		
Actual Diameter	16.54	inches	
Length	36	ft	
C	130		
K	1.04		

Flow Modifier: Multiply; *gpm or value*: 0.5

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	175	0.3	0.00	0.0	0.00
700	350	0.5	0.00	0.0	0.01
1050	525	0.8	0.01	0.0	0.02
1400	700	1.0	0.01	0.0	0.03
1750	875	1.3	0.02	0.0	0.04
2100	1050	1.6	0.02	0.0	0.06
2450	1225	1.8	0.03	0.1	0.08
2800	1400	2.1	0.04	0.1	0.11
3150	1575	2.4	0.04	0.1	0.13
3500	1750	2.6	0.05	0.1	0.16
3850	1925	2.9	0.06	0.1	0.20
4200	2100	3.1	0.08	0.2	0.24
4550	2275	3.4	0.09	0.2	0.27
4900	2450	3.7	0.10	0.2	0.32
5250	2625	3.9	0.12	0.2	0.36
5600	2800	4.2	0.13	0.3	0.41
5950	2975	4.4	0.14	0.3	0.46
6300	3150	4.7	0.16	0.4	0.52
6650	3325	5.0	0.18	0.4	0.58
7000	3500	5.2	0.20	0.4	0.64

Minor Losses, 16":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	0	0.10	0.00
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.35	0.00
Valves (plug)	0	1.10	0.00
90 Deg. Bends	0	0.39	0.00
45 Deg. Bends	0	0.21	0.00
Tee (branch)	1	0.78	0.78
Tee (flow thru)	1	0.26	0.26
Valves (check)	0	1.30	0.00
Misc.	0	0	0.00
			1.04

Pipe Section 13 GAC #1 to flow meter

Nominal Diameter	16	inches	
Pipe Type	Ductile Iron		
Actual Diameter	16.54	inches	
Length	26	ft	
C	130		
K	0.19		

Flow Modifier: Add; *gpm or value*: 0

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	350	0.5	0.00	0.0	0.00
700	700	1.0	0.01	0.0	0.01
1050	1050	1.6	0.02	0.0	0.02
1400	1400	2.1	0.03	0.0	0.04
1750	1750	2.6	0.04	0.0	0.06
2100	2100	3.1	0.05	0.0	0.08
2450	2450	3.7	0.07	0.0	0.11
2800	2800	4.2	0.09	0.1	0.15
3150	3150	4.7	0.12	0.1	0.18
3500	3500	5.2	0.14	0.1	0.22
3850	3850	5.8	0.17	0.1	0.27
4200	4200	6.3	0.20	0.1	0.31
4550	4550	6.8	0.23	0.1	0.37
4900	4900	7.3	0.26	0.2	0.42
5250	5250	7.8	0.30	0.2	0.48
5600	5600	8.4	0.34	0.2	0.54
5950	5950	8.9	0.38	0.2	0.61
6300	6300	9.4	0.42	0.3	0.68
6650	6650	9.9	0.46	0.3	0.76
7000	7000	10.5	0.51	0.3	0.83

Minor Losses, 16":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	0	0.10	0.00
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.35	0.00
Valves (plug)	0	1.10	0.00
90 Deg. Bends	0	0.39	0.00
45 Deg. Bends	0	0.21	0.00
Tee (branch)	0	0.78	0.00
Tee (flow thru)	0	0.26	0.00
Valves (check)	0	1.30	0.00
16"x8" reducer	1	0.19	0.19
			0.19

Pipe Section 14 Flow meter Flow Modifier *gpm or value*

Nominal Diameter **8** inches Add 0

Pipe Type **Ductile Iron**

Actual Diameter 8.33 inches

Length **0** ft

C 130

K 0.30

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	350	2.1	0.00	0.0	0.02
700	700	4.1	0.00	0.1	0.08
1050	1050	6.2	0.00	0.2	0.18
1400	1400	8.2	0.00	0.3	0.32
1750	1750	10.3	0.00	0.5	0.50
2100	2100	12.4	0.00	0.7	0.71
2450	2450	14.4	0.00	1.0	0.97
2800	2800	16.5	0.00	1.3	1.27
3150	3150	18.6	0.00	1.6	1.60
3500	3500	20.6	0.00	2.0	1.98
3850	3850	22.7	0.00	2.4	2.40
4200	4200	24.7	0.00	2.9	2.85
4550	4550	26.8	0.00	3.3	3.35
4900	4900	28.9	0.00	3.9	3.88
5250	5250	30.9	0.00	4.5	4.46
5600	5600	33.0	0.00	5.1	5.07
5950	5950	35.0	0.00	5.7	5.72
6300	6300	37.1	0.00	6.4	6.42
6650	6650	39.2	0.00	7.1	7.15
7000	7000	41.2	0.00	7.9	7.92

Minor Losses, 8":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	0	0.11	0.00
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.63	0.00
Valves (plug)	0	0.89	0.00
90 Deg. Bends	0	0.42	0.00
45 Deg. Bends	0	0.22	0.00
Tee (branch)	0	0.84	0.00
Tee (flow thru)	1	0.28	0.28
Valves (check)	0	1.40	0.00
8"x16" expansion	1	0.02	0.02
			0.30

Pipe Section 15 Building to Michigan St. Flow Modifier *gpm or value*

Nominal Diameter **16** inches Add 0

Pipe Type **Ductile Iron**

Actual Diameter 16.54 inches

Length **475** ft

C 130

K 1.77

Flow (gpm)	Flow (gpm, w/ mod)	Velocity (fps)	Friction Loss (ft)	Fitting Loss (ft)	Total Head Loss (ft)
0	0	0.0	0.00	0.0	0.00
350	350	0.5	0.04	0.0	0.04
700	700	1.0	0.13	0.0	0.16
1050	1050	1.6	0.28	0.1	0.35
1400	1400	2.1	0.47	0.1	0.59
1750	1750	2.6	0.72	0.2	0.90
2100	2100	3.1	1.00	0.3	1.27
2450	2450	3.7	1.34	0.4	1.70
2800	2800	4.2	1.71	0.5	2.19
3150	3150	4.7	2.13	0.6	2.74
3500	3500	5.2	2.58	0.8	3.34
3850	3850	5.8	3.08	0.9	3.99
4200	4200	6.3	3.62	1.1	4.70
4550	4550	6.8	4.20	1.3	5.47
4900	4900	7.3	4.82	1.5	6.29
5250	5250	7.8	5.47	1.7	7.16
5600	5600	8.4	6.17	1.9	8.09
5950	5950	8.9	6.90	2.2	9.07
6300	6300	9.4	7.67	2.4	10.10
6650	6650	9.9	8.47	2.7	11.19
7000	7000	10.5	9.32	3.0	12.32

Minor Losses, 16":

Fittings:	Number	K value	K Sum
Pipe Entrance	0	0.78	0.00
Pipe Exit	0	1.00	0.00
Valves (gate)	0	0.10	0.00
Valves (ball)	0	0.04	0.00
Valves (butterfly)	0	0.35	0.00
Valves (plug)	0	1.10	0.00
90 Deg. Bends	2	0.39	0.78
45 Deg. Bends	2	0.21	0.42
Tee (branch)	0	0.78	0.00
Tee (flow thru)	2	0.26	0.52
Valves (check)	0	1.30	0.00
16" x 12" reducer	1	0.05	0.05
			1.77

APPENDIX B

Hydraulic Model Analysis

Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

Memorandum

Date:	September 22, 2021
To:	Anna Crandall
Company:	City of Kalamazoo Water Resources Division
From:	Julie Feria
Project #:	2180076
Re:	PS 5 Rebuild Hydraulic Model Analysis

Pump Station (PS) 5 is being rebuilt in the Intermediate Pressure District. To inform the design of the station rebuild, the hydraulic model of the City of Kalamazoo Water System was used to simulate the needed total dynamic head (TDH) of the pump station and to simulate the impact of different PS 5 flow rates on cycling of the Mt. Olivet and Parchment elevated tanks.

Assumptions

1. Stations 10 and 23 were assumed to be closed for all scenarios, isolating the Intermediate Pressure District and the City of Parchment from the rest of the water system.
2. PS 14 was assumed to be closed for some scenarios and was assumed to be utilized as a peaking station for other scenarios. The eventual goal is to provide treatment for water from both PS 14 and PS 5 at the current PS 5 site.
3. Average day and maximum demands for the Intermediate Pressure District and the City of Parchment were taken from the 2017 Water System Reliability Study.
    a. Average Day Demand: 1,260 gpm
    b. Maximum Day Demand: 2,800 gpm
4. Tank trend graphs are based on a simulated diurnal curve, with an hourly peaking factor of 1.7 times the average day or maximum day demand.

Analysis with PS 14 as a Peaking Station

If the design flow rate of PS 5 is unable to meet projected demands, PS 14 will need to be utilized as a peaking station, turning on when the Mt. Olivet Tank level drops below 70% full. The model was used to simulate the following flow rates at PS 5 with PS 14 as a peaking station: 700 gpm, 1,000 gpm, and 1,400 gpm. Table 1 show the modeled discharge head elevation at PS 5 for each flow rate, to be used in selecting the design TDH. Figures 1A and 1B illustrate simulated tank levels for each flow rate for average day and maximum day demands, respectively.

See Basis of Design Hydraulic Calculations (Appendix A).

Table 1. Modeled Discharge Elevation Range with PS 14 as a Peaking Station

Scenario	PS 5 Flow Rate (gpm)	Modeled Discharge Head Elevation (ft)
Maximum TDH	700	981
Minimum TDH	700	895
Maximum TDH	1,000	992
Minimum TDH	1,000	907
Maximum TDH	1,400	1,012
Minimum TDH	1,400	924
Maximum TDH	1,800	1,038
Minimum TDH	1,800	943

Notes:
1. Maximum TDH scenario assumes system demand is zero, and tanks are 95% full.
2. Minimum TDH scenario assumes peak hour system demand with tanks at 60% full.
3. PS 14 assumed to be off for TDH calculation scenarios.
4. The PS 5 pump elevation is approximately 762 feet.
5. Discharge head elevation does not include station losses.

Proposed Oxidation tank FF = 774.5 with water level maintained at 15' via use of VFDs on High Service Pumps for a pumping level of 789.5 in the tank.

The modeled discharge head elevations for PS 5 flow rates of 1,000 gpm and 1,400 gpm result in discharge pressures over 100 psi. A significant cause of head loss is the lack of transmission between PS 5 and the Mt. Olivet Tank. The 8-inch main on Mt. Olivet Road in particular results in high head loss at high flow rates. Transmission improvements are recommended to prevent high pressures if the flow rate of PS 5 is increased from existing conditions.

As shown in Figure 1A, PS 14 does not turn on as often when PS 5 is operating at 1,400 gpm, resulting in tank levels remaining low throughout the day. This could be addressed with a higher “pump on” elevation setting for PS 14. Even with PS 14 as a peaking station, the simulated flow rates of 700 gpm and 1,000 gpm at PS 5 are not sufficient to keep tank levels up during maximum day demands. Figure 1B shows that PS 5 at 1,400 gpm results in the Mt. Olivet Tank level dropping to 957.5 feet. A flow rate of 1,800 gpm is needed to keep the Mt. Olivet Tank low level at 959 feet, under simulated demand patterns.

Analysis with PS 14 Closed (PS 5 only Supply Location)

Since PS 14 is currently master planned to be piped to PS 5 for treatment, the model was also used to look at flow rates greater than 1,400 gpm at PS 5. Due to the need for more transmission between PS 5 and the Mt. Olivet Tank to reduce discharge pressures, future transmission routes of 12-inch main and 16-inch main between PS 5 and the Mt. Olivet Tank were also simulated.

Table 2 provides the modeled discharge head elevation for PS 5 at flow rates of 2,800 gpm and 3,800 gpm for existing water main, a future 12-inch transmission route, and a future 16-inch transmission route. The 3,800 gpm flow rate was selected due to its ability to maintain the Mt. Olivet Tank at 60% full during maximum day demands. Discharge head elevations show that

transmission improvements are necessary at these higher flow rates to maintain pressures below 150 psi at the PS 5 discharge.

Figure 2 shows tank trending for PS 5 at 2,800 gpm under average day demand conditions. Figure 3 illustrates trending for PS 5 at 2,800 gpm under existing maximum day demand conditions with transmission improvements, and Figure 4 shows trending for PS 5 at 3,800 gpm under existing and projected maximum day demand conditions with transmission improvements.

Table 2. Modeled Discharge Elevation Range with PS 5 as the Only Station

Scenario	Transmission Alternative	PS 5 Flow Rate (gpm)	Modeled Discharge Head Elevation (ft)
Maximum TDH	Existing Water Main	2,800	1,124
Minimum TDH	Existing Water Main	2,800	990
Maximum TDH	Existing Water Main	3,800	1,241
Minimum TDH	Existing Water Main	3,800	1,049
Maximum TDH	12” Transmission	2,800	1,032
Minimum TDH	12” Transmission	2,800	970
Maximum TDH	12” Transmission	3,800	1,080
Minimum TDH	12” Transmission	3,800	994
Maximum TDH	16” Transmission	2,800	994
Minimum TDH	16” Transmission	2,800	964
Maximum TDH	16” Transmission	3,800	1,012
Minimum TDH	16” Transmission	3,800	973

Notes:
1. Maximum TDH scenario assumes system demand is zero, and tanks are 95% full.
2. Minimum TDH scenario assumes peak hour system demand with tanks at 60% full.
3. The PS 5 pump elevation is approximately 762 feet.
4. Discharge head elevation does not include station losses.
5. The transmission route was modeled as the most direct route between PS 5 and the Mt. Olivet Tank.

Conclusion

According to the existing hydraulic model, to maintain tank levels at 70% full for average day demands and 60% full for maximum day demands, PS 5 must be able to provide approximately 1,800 gpm if PS 14 will be maintained as a separate peaking station. PS 5 must be able to provide approximately 3,800 gpm when PS 14 is piped to PS 5 for treatment. Calibration of the model to current tank trending and demand patterns would give more confidence in selecting a specific flow rate for design. Transmission improvements between PS 5 and the Mt. Olivet Tank are recommended to keep discharge pressures at PS 5 within an acceptable range, especially if PS 5 is the only supply location.

Figure 1A: Simulated Tank Levels with PS 14 as Peaking Station (Average Day Demand)

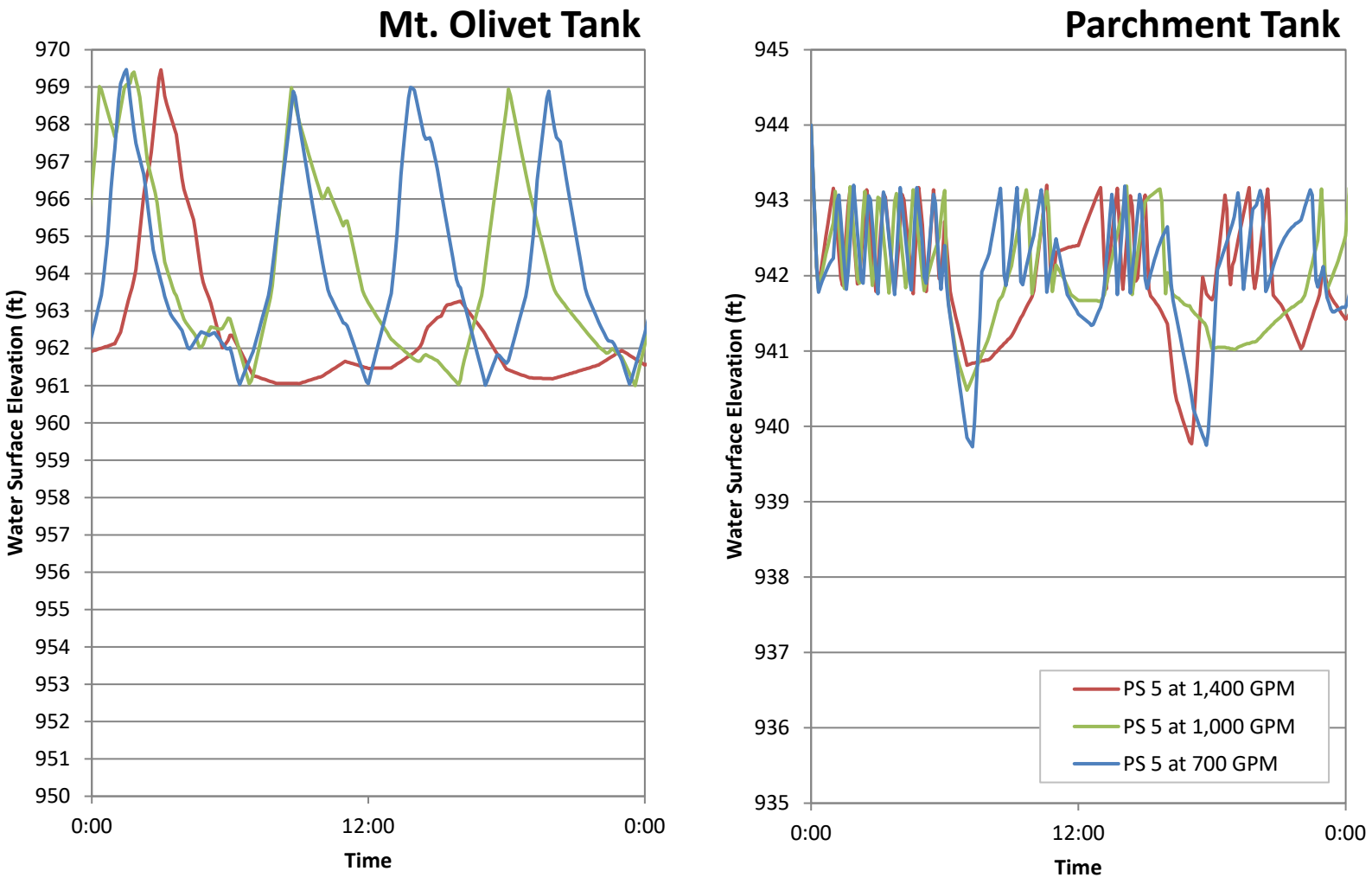


Figure 1B: Simulated Tank Levels with PS 14 as Peaking Station (Maximum Day Demand)

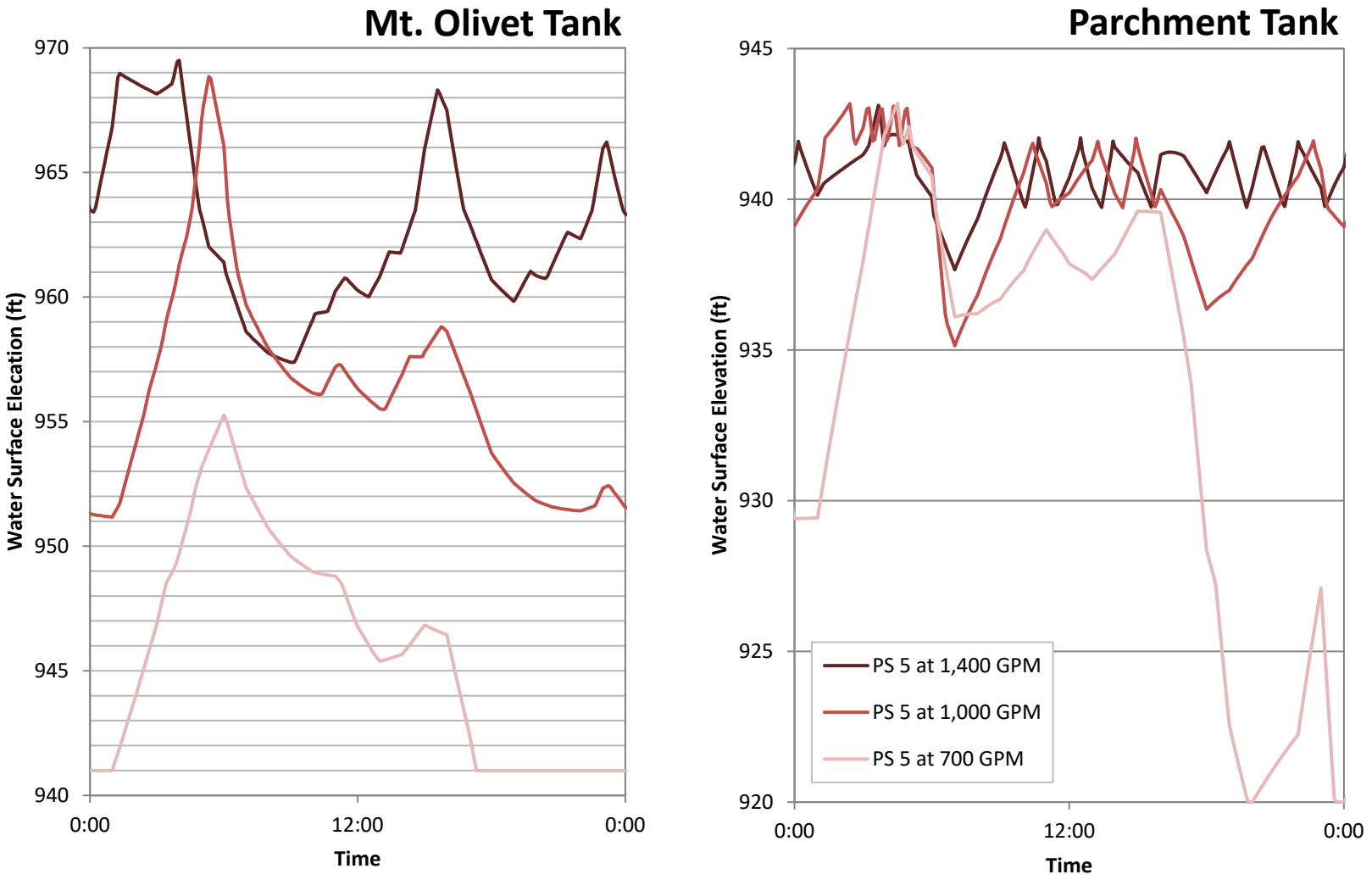


Figure 2: Simulated Tank Levels with PS 5 at 2,800 gpm (Average Day Demand)

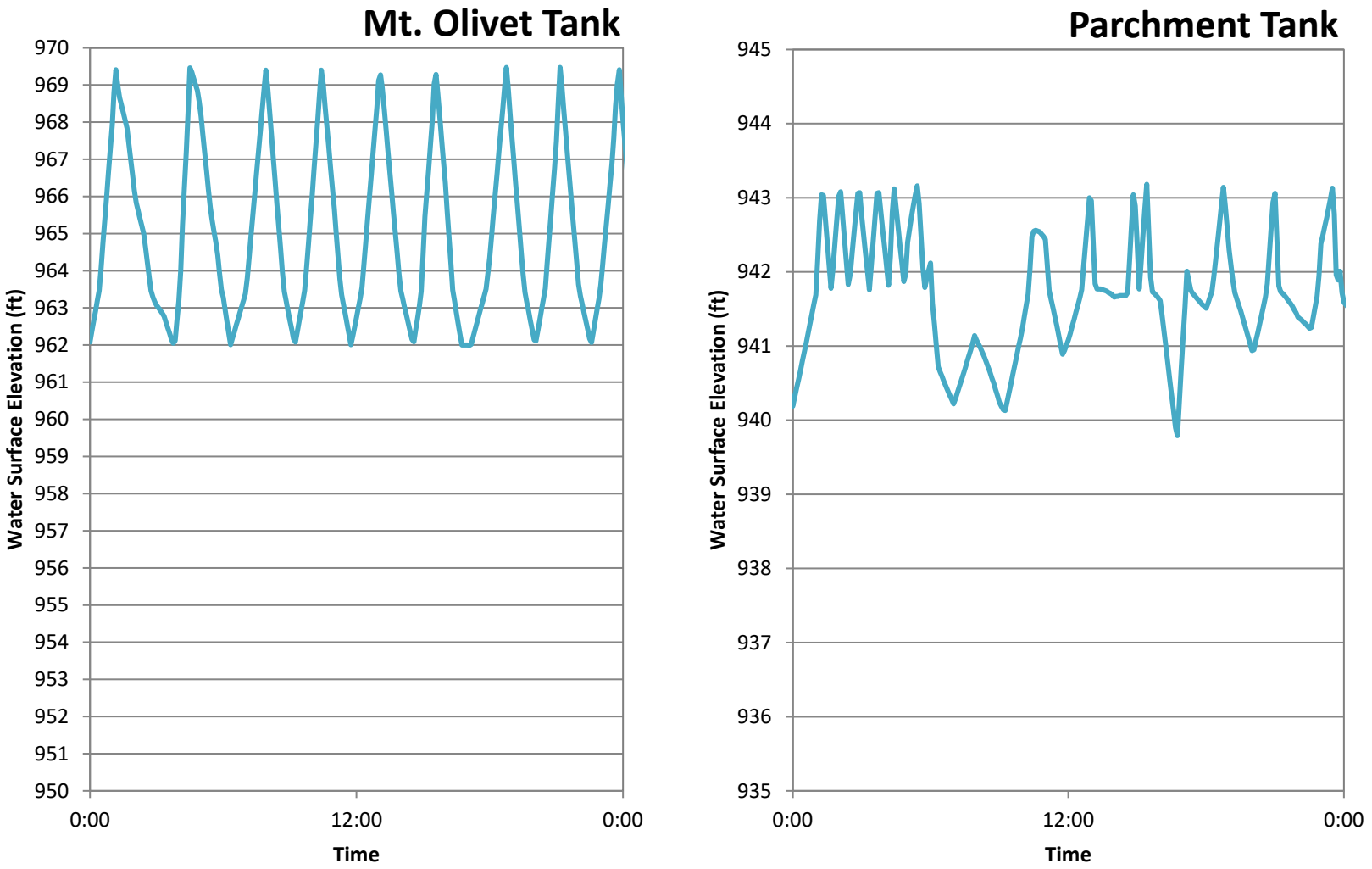


Figure 3: Simulated Tank Levels with PS 5 at 2,800 gpm with Transmission Improvements (Existing Maximum Day Demand)

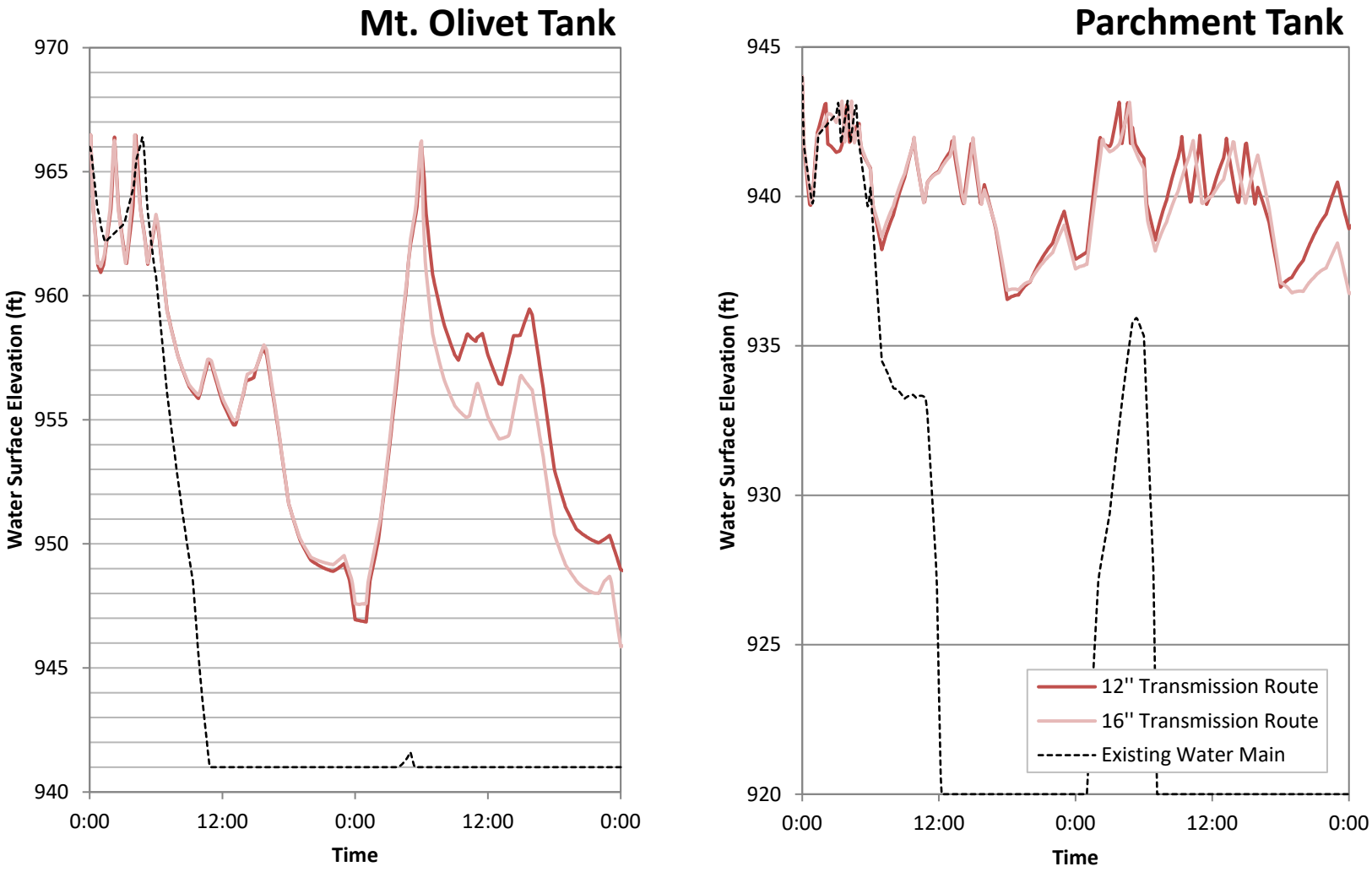
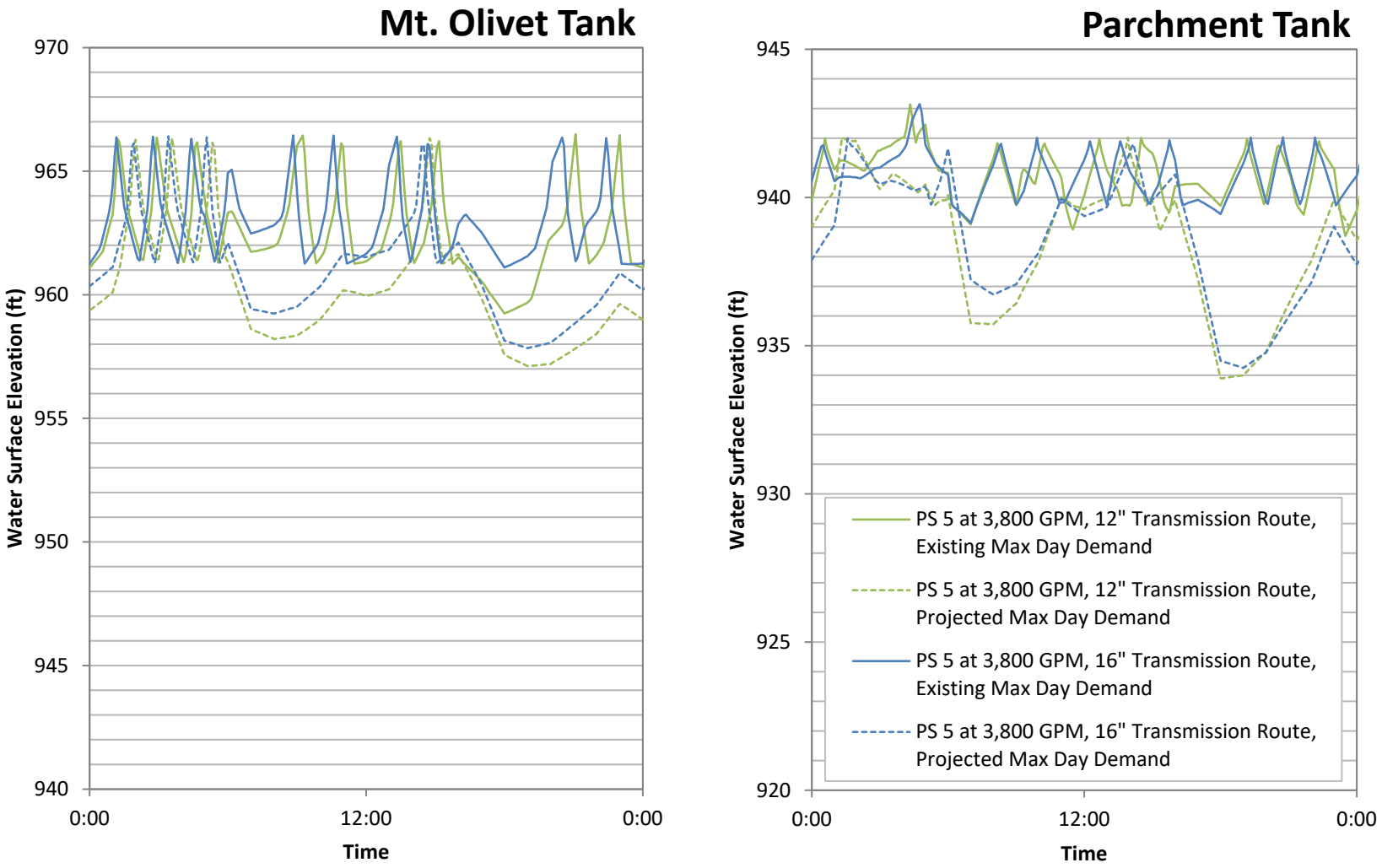


Figure 4: Simulated Tank Levels with PS 5 at 3,800 gpm with Transmission Improvements (Existing and Projected Maximum Day Demand)



APPENDIX C

ACT Study

CONFIDENTIAL

Calgon Carbon Corporation

Pittsburgh, PA

Technical Service Report No. 20200454

ACT Study: Removal of Per- and Polyfluoroalkyl Substances and TOC from Potable Drinking Water Using F400 Granular Activated Carbon

Prepared For:

Kalamazoo, MI - Water Treatment Plant

Author: Adam Creveling

Adam Creveling

Date: May 1, 2020

cc: J. Gray
A. Lynn
R. DiStefano
R. Klingbeil
S. Briczinski Kalamazoo ACT20200454 SB20209

INTRODUCTION

Calgon Carbon Corporation, hereinafter CCC, conducted an Accelerated Column Test (ACT) at the request of the Kalamazoo Water Treatment Plant to determine the performance of Filtrasorb 400 (F400) granular activated carbon (GAC) for the removal of total organic carbon (TOC) and Per- and Polyfluoroalkyl Substances (PFAS) from drinking water sourced from the treatment plant. The ACT simulated a M12-40 system with a flow rate of 700 gpm operating for two years.

Filtrasorb F400 is a 12x40 mesh granular activated carbon with a 1000 Iodine number that is commonly used in municipal water applications. F400 is manufactured from select grades of bituminous coal through CCC's reagglomeration process.

Due to their useful properties, such as oil and water repellency, PFAS have been used in a variety of manufacturing processes since the mid-20th century. Some PFAS are problematic because of their stability and persistence in the environment, mobility, and bioaccumulative nature. Pefluoroalkyl substances, where every carbon atom in the chain is saturated with fluorine atoms, are generally separated into two main categories: perfluoroalkyl sulfonates and perfluoroalkyl carboxylates, of which PFOS and PFOA are respective examples. The EPA Health Advisory Exposure Limit for combined perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) is 70 ng/L (ppt) in treated water. In addition, the Michigan PFAS Action Response Team Science Advisory Work Group (MPART SAWG) provided the health-based values (HBV) listed in Table 1. These are being used as a starting point for the rulemaking process, as Michigan works toward draft Maximum Contaminant Levels for PFAS.

Table 1. HBVs for PFAS in Michigan

PFAS Name		Potable water HBV
Perfluorononanoic acid	PFNA	6 ppt
Perfluorooctanoic acid	PFOA	8 ppt
Perfluorooctanesulfonic acid	PFOS	16 ppt
Perfluorohexanesulfonic acid	PFHxS	51 ppt
Hexafluoropropylene oxide dimer	GenX	370 ppt
Perfluorobutanesulfonic acid	PFBS	420 ppt
Perfluorohexanoic acid	PFHxA	400,000 ppt

SUMMARY and CONCLUSIONS

The ACT was conducted using virgin F400 activated carbon to determine the effective bed life for the removal of the target PFAS compounds, PFBS, PFHxS, PFOA, and PFOS spiked in the water. The column test was designed to simulate treatment through a 12-ft. GAC adsorption vessel containing 40,000 lbs. of GAC (Model 12-40), operating at 700 gpm and providing 12.1

minutes of Empty Bed Contact Time (EBCT) based on apparent density (AD) packing; 14.0 minutes after back-washing and bed expansion. The feed water was spiked with an additional 25 ppt PFBS, 25 ppt PFHxS, 25 ppt PFOA, and 25 ppt PFOS to ensure breakthrough would be achieved for most compounds during the study. Complete simulation details are shown in Table 3. At completion, the ACT simulated 770 days of operation and 776 million gallons of water treated.

PFAS and TOC breakthrough curves are shown in Figure 1 and raw data is shown in Table 2. PFOS is not shown because breakthrough was never detected in the effluent.

The following conclusions may be drawn from the test results:

- The TOC in the feed was measured to be 0.92 ppm. After spiking, the PFAS concentrations were PFBS (26.3 ppt), PFHxS (21.3 ppt), PFOA (22.3 ppt), and PFOS (24.3 ppt).
- PFAS compounds were successfully removed by F400 GAC. PFOS in the effluent remained below the limit of detection of ~1.8 ppt for the entire duration of the ACT. PFOA was detected after 474 simulated days (478 million gallons treated) and approached the HBV of 8 ppt by the end of the 770-day simulation (Figure 1). PFHxS was detected in the effluent after 529 simulated days (533 million gallons treated) and PFBS was detected after 309 days (311 million gallons treated). The mass transfer zone (MTZ) for PFOA occupies 53% of the adsorber (7.3 minutes), and the MTZ for PFBS occupies 42% of the adsorber (5.9 minutes).
- Carbon change out at 474 days (478 million gallons treated) based on PFOA effluent detection corresponds to a Carbon Usage Rate (CUR) of 0.083 lb. GAC / 1000 gallons treated, and carbon change out at 770 days corresponds to a CUR of 0.051 lb. GAC / 1000 gallons treated based on the average feed PFOA concentration of 22.3 ppt.

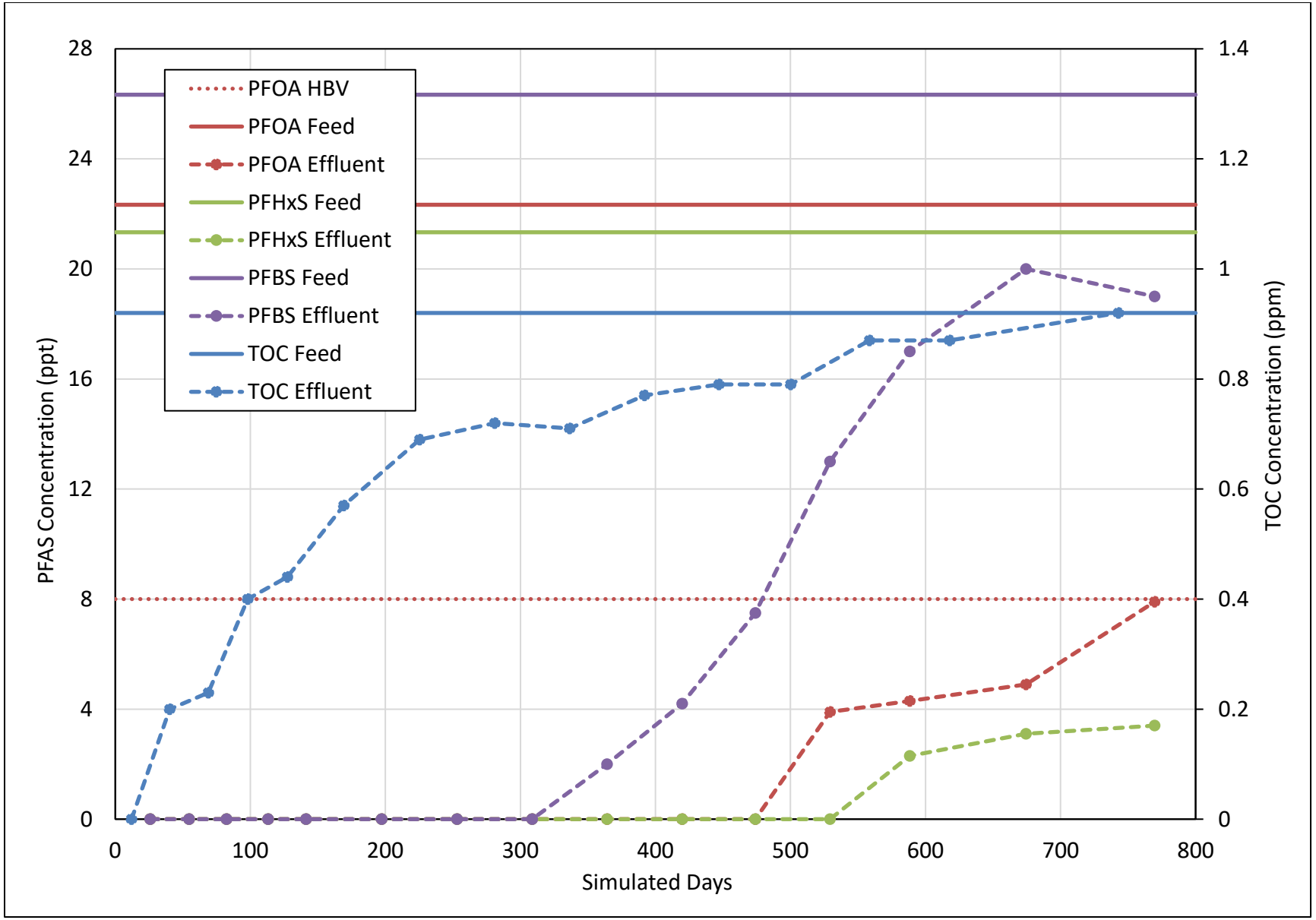


Figure 1. PFAS Concentration vs Simulated Days

Table 2. Raw data

Sample	Date & Time Collected	Simulated Days of Operation	Simulated Gallons Treated (x1,000,000)	Bed Volumes Treated	TOC (ppm)	Perfluorobutanesulfonic acid (ppt)	Perfluorohexanesulfonic acid (ppt)	Perfluorohexanoic acid (ppt)	Perfluorooctanesulfonamide (ppt)	Perfluorooctanesulfonic acid (ppt)	Perfluorooctanoic acid (ppt)	Perfluoropentanoic acid (ppt)
						PFBS	PFHxS	PFHxA	PFOSA	PFOS	PFOA	PFPnA
Feed 1	2/5/2020	--	--	--	0.87	29	21	1.9	14	22	21	2.0
Feed 2	2/6/2020	--	--	--	0.97	--	--	--	--	--	--	--
Feed 3	3/6/2020	--	--	--	0.88	27	23	2.1	<1.8	22	24	<1.8
Feed 4	3/31/2020	--	--	--	0.96	23	20	<1.8	2.2	29	22	<1.8
3	2/6/20 8:00	12.1	12.2	1,424	<0.1	--	--	--	--	--	--	--
4	2/7/20 8:00	25.9	26.1	3,064	--	<1.9	<1.9	<2.6	6.3	<1.9	<1.9	<1.9
5	2/8/20 8:00	40.2	40.5	4,838	0.20	--	--	--	--	--	--	--
6	2/9/20 8:00	54.6	55.0	6,612	--	<1.8	<1.8	<1.8	7.0	<1.8	<1.8	<1.8
7	2/10/20 8:00	68.9	69.5	8,386	0.23	--	--	--	--	--	--	--
8	2/11/20 8:00	82.4	83.0	9,941	--	<1.9	<1.9	<1.9	4.2	<1.9	<1.9	<1.9
9	2/12/20 8:00	98.1	98.9	12,079	0.40	--	--	--	--	--	--	--
10	2/13/20 8:00	113	114	14,014	--	<1.7	<1.7	<1.7	2.1	<1.7	<1.7	<1.7
11	2/14/20 8:00	127	128	15,762	0.44	--	--	--	--	--	--	--
12	2/15/20 8:00	141	142	17,433	--	<1.8	<1.8	<1.8	3.8	<1.8	<1.8	<1.8
13	2/17/20 8:00	169	171	20,776	0.57	--	--	--	--	--	--	--
14	2/19/20 8:00	197	199	24,152	--	<1.8	<1.8	<1.8	3.4	<1.8	<1.8	<1.8
15	2/21/20 8:00	225	227	27,548	0.69	--	--	--	--	--	--	--

Sample	Date & Time Collected	Simulated Days of Operation	Simulated Gallons Treated (x1,000,000)	Bed Volumes Treated	TOC (ppm)	Perfluorobutanesulfonic acid (ppt)	Perfluorohexanesulfonic acid (ppt)	Perfluorohexanoic acid (ppt)	Perfluorooctanesulfonamide (ppt)	Perfluorooctanesulfonic acid (ppt)	Perfluorooctanoic acid (ppt)	Perfluoropentanoic acid (ppt)
						PFBS	PFHxS	PFHxA	PFOSA	PFOS	PFOA	PFPnA
16	2/23/20 8:00	253	255	30,887	--	<1.8	<1.8	<1.8	3.1	<1.8	<1.8	<1.8
17	2/25/20 8:00	281	283	34,227	0.72	--	--	--	--	--	--	--
18	2/27/20 8:00	309	311	37,533	--	<1.8	<1.8	<1.8	4.0	<1.8	<1.8	<1.8
19	2/29/20 8:00	336	339	40,839	0.71	--	--	--	--	--	--	--
20	3/2/20 8:00	364	367	44,145	--	2.0	<1.9	<1.9	3.0	<1.9	<1.9	<1.9
21	3/4/20 8:00	392	395	47,462	0.77	--	--	--	--	--	--	--
22	3/6/20 8:00	420	423	50,798	--	4.2	<1.8	<1.8	6.2	<1.8	<1.8	1.9
23	3/8/20 8:00	447	451	53,968	0.79	--	--	--	--	--	--	--
24	3/10/20 8:00	474	478	57,139	--	7.5	<1.9	<1.9	3.0	<1.9	<1.9	2.1
25	3/12/20 8:00	500	504	60,043	0.79	--	--	--	--	--	--	--
26	3/14/20 8:00	529	533	63,710	--	13	<1.8	<1.8	2.4	<1.8	3.9	2.4
27	3/16/20 8:00	558	563	67,377	0.87	--	--	--	--	--	--	--
28	3/18/20 8:00	588	593	71,207	--	17	2.3	1.9	3	<1.8	4.3	2.3
29	3/20/20 8:00	618	623	74,989	0.87	--	--	--	--	--	--	--
31	3/24/20 8:00	674	680	81,865	--	20	3.1	<1.9	4.1	<1.9	4.9	2.1
33	3/29/20 8:00	743	749	89,907	0.92	--	--	--	--	--	--	--
34	3/31/20 8:00	770	776	93,008	--	19	3.4	<2.0	<2.0	<2.0	7.9	<2.0

Table 3. ACT design parameters

Parameter	Full-Scale Adsorber	ACT
ACT Scale Factor	--	14.1
Carbon Mesh Size	12x40	100x325
Mean Particle Diameter	1.11 mm	0.10 mm
*Carbon A.D.	0.577 g/mL	0.567 g/mL
Adsorber I.D.	12 ft	0.46 cm
Weight of Carbon in Adsorber	40,000 lbs.	2.00 g
Flow Rate	700 gpm	4.2 mL/min
EBCT	13.96 min	50 sec
Operation Time	770 days	55 days
Volume of Water Treated	776 million gallons	87 gallons

*****Full-scale uses the average AD for F400, ACT uses the specific AD of the carbon

EXPERIMENTAL

ACT Design

The ACT simulated a 12-ft. adsorber containing 40,000 lbs. of F400 12x40, operating at 700 gpm, and providing 14 minutes of EBCT after backwashing. See Table 2 for design parameters used in the simulation. The ACT ran for 770 simulated days (776 million gallons treated). A description of the ACT is shown in Appendix A.

ACT Carbon Preparation

A current production sample of virgin F400 GAC was systematically re-sized to 100x325 mesh for use in the ACT. The test carbon was dried at 105° C for 16 hours and allowed to cool in a desiccator. Prior to the introduction of the challenge water, the column was pre-wetted with deionized water for approximately 16 hours.

ACT Influent Preparation

CCC received two 55-gallon plastic drums on January 31, 2020. The feed was spiked with an additional 25 ppt of each of the following compounds: PFBS, PFHxS, PFOA, and PFOS. A total of 87 gallons was consumed throughout the course of the ACT.

ACT Sampling

Samples were collected once per day via an automated sample collector. The effluent was collected into 8-oz plastic bottles. The TOC samples were collected manually into 40 mL vials from the 8-oz bottles.

The flow rate of the ACT was closely monitored throughout the study. Composite samples of each ACT effluent, minus discrete samples for testing, were collected at least three times per week. From these data, average flow rates were calculated, and the flow rate was adjusted as necessary.

Analytical

TOC samples were analyzed in CCC's analytical laboratory using SM 5310B Total Organic Carbon, High Temperature Combustion. PFAS samples were analyzed by Eurofins Lancaster Laboratories using EPA 537 Version 1.1 Modified.

Appendix A: Accelerated Column Test Protocol

The Accelerated Column Test (ACT) procedure uses a miniature carbon-filled column to rapidly simulate the adsorption breakthrough curve that would be obtained by treating an aqueous stream in a large adsorption system. This technique, developed by Calgon Carbon Corporation's Research and Development, has been shown to accurately simulate the carbon treatment of a wide range of waters and wastewaters under various conditions.

The principle advantage of the ACT procedure compared to the one-inch diameter column adsorption test is its increased speed. Typically, an ACT can be completed in 1/20th to 1/10th of the time required for a one-inch diameter study. The basic description of the ACT system is defined in the article, "High Pressure Technique for Rapid Screening of Activated Carbons for Use in Potable Water." [1]

Scale factors for sizing the full-scale adsorbers from the ACT data are developed by a proprietary method based on the chemistry of adsorption on activated carbon. To predict the volume breakthrough curve for the full-scale adsorber, the ACT results must be multiplied by the volume scale factor determined for each carbon type. The time breakthrough curve for the full-scale adsorber can be calculated by either of two methods. First, one can divide the predicted volumes calculated above by the flow rate of the full-scale system. Second, one can multiply the run time by the scale factor determined for each carbon type.

[1] Rosene, M.R., R. T. Deithorn, J. R. Lutchko, and N.J. Wagner, "High Pressure Technique for Rapid Screening of Activated Carbon for Use in Potable Water," Activated Carbon Adsorption of Organics from the Aqueous Phase, Vol. 1. I. H. Suffet and M. J. McGuire, editors, Ann Arbor Science, Ann Arbor, MI Chapter 15 (1980)

Appendix B: Sales Spec Sheet

SALES SPECIFICATION SHEET

FILTRASORB 400

Granular Activated Carbon

Test	Specification Min	Specification Max	Calgon Carbon Test Method
IODINE NUMBER, mg/g	1000	-	TM-4,ASTM D4607
MOISTURE (AS PACKAGED), wt%	-	2	TM-1,ASTM D2867
ABRASION NUMBER	75	-	TM-9,AWWA B604
EFFECTIVE SIZE, mm	0.55	0.75	TM-8,ASTM D2862
UNIFORMITY COEFFICIENT	-	1.9	TM-8,ASTM D2862
FCC - WATER EXTRACTABLE, wt%	-	4	TM-43,FCC
12 US MESH [1.70 mm], wt%	-	5	TM-8,ASTM D2862
< 40 US MESH [0.425 mm] (PAN), wt%	-	4	TM-8,ASTM D2862

Typical Properties:

This product complies with ANSI/AWWA B604 (2012) – Granular Activated Carbon.

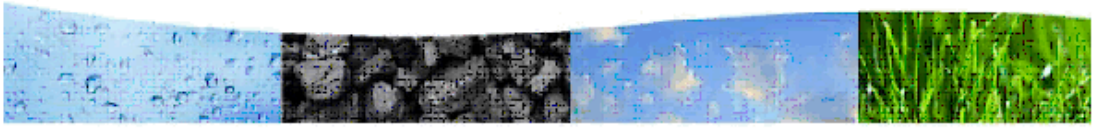
This product complies with the requirements for activated carbon as defined by the Food Chemicals Codex (FCC) (Latest Edition) published by the U.S. Pharmacopeia.

This product is produced under supervision of the Islamic Food and Nutrition Council of America (IFANCA).

This product is prepared under the supervision of the Kashruth Division of the Orthodox Union and is Kosher.

Only products bearing the NSF Mark are Certified to NSF/ANSI/CAN 61 - Drinking Water System Components - Health Effects standard. Certified Products will bear the NSF Mark on packing or documentation shipped with the product.

Calgon Carbon Corporation's activated carbon products are continuously being improved and changes may have taken place since this publication went to press. 12030-10/09/2018



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Drinking Water State Revolving Fund Project Chapter 3 – Richland/Ross Townships Water Main Extension

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Appendix C National Fish and Wildlife Service Review
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Appendix E Public Meeting Documentation
Appendix F Project Plan Resolution
Appendix G Water Modeling Memorandum
Appendix H Environmental Corridor Review
Appendix I Overburdened Worksheet

1 INTRODUCTION

In Richland Township in the M-89 corridor, there is a facility identified as 34th Street Production Plated Plastics Company. That facility was closed in 1991 but the site had contamination from heavy metals and chlorinated volatile organic compounds. The site has an active groundwater extraction/treatment system and in 2018, PFAS was discovered in the system.

Groundwater flow from the site extends southward and southeastward into both Richland and Ross Townships. Groundwater sampling by the State of Michigan has revealed exceedances of current Michigan PFAS criteria in both townships. Additionally, both Chromium 6 and Nickel continue to migrate from the site into the townships. The primary project goal is to provide a permanent, long-term solution to contamination free drinking water source for the local residents and businesses.

2 BACKGROUND

2.1 Study and Service Area

The extent of the project area is illustrated in Figure 1 and is labelled as Phase 1. This area is proposed for fiscal year 2025. The area is bounded on the east by N 37th Street and N 36th Street, and by E D Avenue and E CD Avenue connecting them. The northern boundary is the intersection of E C Avenue and West Gull Lake Drive. The project extends west and south to tie into the existing water main on E C Avenue, N 35th Street, E D Avenue, M-89, and E DE Avenue. It also includes the neighborhoods along Lake Vista Drive, Delmar, Littlefield, Sherbrook, and Merrimac Street. No water main currently exists in the project area. The area is currently composed of 260 developed properties supplied with private wells. A comprehensive review of the current and future needs and development within the project area can be found in the latest City of Kalamazoo Water Reliability Study.

The project area crosses potential water withdrawal site WSSN 2013239 for 0.15 miles on N 37th St and E D Ave. The proposed water main will have no effects on this potential water withdrawal site.

2.2 Population

Based on the assumptions of the Water Model Analysis Memo dated September 5, 2023 included in Appendix G, the current population of the project area is approximated to be 650 people.

Based on the 2022 Kalamazoo Water Reliability Study, Richland Township is expected to increase population by approximately 11.6% by the year 2042. Therefore, it is estimated that the population in the new service area will increase to approximately 729 people in 2045.

2.3 Existing Environmental Evaluation

2.3.1 Cultural and Historic Resources

2.3.1.1 THPO We have contacted all of the local Tribal Organizations who have confirmed there are no known cultural resources which may be impacted within the project areas. Copies of these correspondences are included in Appendix A.

2.3.1.2 SHPO The proposed projects will not impact existing structures in work areas. Therefore, no historic or archaeological sites will be impacted by the construction of the proposed project. A historical and environmental evaluation was performed by Orbis Environmental Consulting who is a State of Michigan approved consultant for this work. Their report of no impact is included in Appendix B.

2.3.2 Air Quality

There are no project activities which will affect air quality.

2.3.3 Wetlands

There is no project work proposed in wetland areas as can be seen in Figure 2.

2.3.4 Great Lakes Shorelands, Coastal Zones, and Coastal Management Areas

There is no project work which will affect great lakes shorelands, coastal zones, or coastal management areas.

2.3.5 Floodplains

There are no floodplains within the project area, as can be seen in Figure 3.

2.3.6 Natural or Wild and Scenic Rivers

There is no project work which will affect these areas.

2.3.7 Major Surface Waters

In Ross Township, Gull Creek will be crossed at three locations at E DE Avenue, M-89, and E D Avenue as can be seen in Figure 1. At each of these locations, horizontal directional drilling methods are proposed to be used to avoid impacting the waterways. In Richland Township, a stream will be crossed on East DE Avenue approximately 4,000 feet west of N 37th Street. Although this stream may be crossed using open trench methods, no permanent changes will be made to the stream. EGLE permitting will be obtained for the construction of all stream crossings.

There is no project work which will affect Gull Lake or other major bodies of water.

2.3.8 Topography

There are no proposed topographical changes in the project.

2.3.9 Geology

There are no proposed changes to local geology nor is any dewatering anticipated.

It is not anticipated that contamination will affect the construction of the proposed project as all work will be within existing utility corridors. Corridors have been reviewed and no contamination is expected to be encountered.

2.3.10 Soil Types

Based on the USDA Web Soil Survey, local soils consist primarily of sandy loams and clay loams. No import of material or export of native material is anticipated.

2.3.11 Agricultural Resources

All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent farmlands.

2.3.12 Fauna and Flora

The proposed project work will be within the existing road right-of-way and will not impact fauna or flora within the project areas. Although the habitats of the Indiana bat (endangered) and the Northern long-eared bat (threatened) have the potential to be encountered as they typically roost under bark or in crevices in trees, if tree removal or trimming is required, it will be performed between October 15 and March 31 to prevent disruption of roosting bats.

The typical habitats of the Eastern Massasauga Rattlesnake (threatened) and the Whooping Crane (experimental population, non-essential) include stream beds, which are near our project area. The current plan is to utilize horizontal directional drilling methods to avoid impacts to existing streams. The clearance report through the National Fish and Wildlife Service is included in Appendix C.

2.4 Existing System

There are 260 developed properties within the project area which are supplied with water from private wells. There is currently no public water supply available to these properties.

The City of Kalamazoo currently provides municipal water to Richland Township through a water service agreement. The City of Kalamazoo and Ross Township are establishing a water service agreement in anticipation of this extension project.

Appendix G contains the report summarizing the modeling results of adding the existing Richland/Ross system to the Kalamazoo system. Based on the modeling, the existing system can support both current and future demand in the proposed project area.

The City of Kalamazoo system is supplied by several well fields n various locations throughout the system. The entire system has approximately 73,440 Residential Equivalent Units currently served. A full summary and analysis of the Kalamazoo water system is available in the latest Water Reliability Study.

2.5 Need for the Project

2.5.1 Standards Compliance and Reliability

Several State of Michigan monitoring wells have detected unacceptable levels of PFAS in Richland and Ross Townships within the project area, as can be seen in Figure 4.

The water main installation will effectively address water safety concerns for the 260 properties and approximated 650 residents. The City of Kalamazoo water system is currently in compliance with all drinking water standards and has the capacity to serve the affected area.

2.5.2 Orders of Enforcement Action

Currently the City of Kalamazoo is under an enforcement action to complete system-wide corrosion control optimization.

2.5.3 Drinking Water Quality Problems

The City of Kalamazoo water system is currently not providing water to the affected area. There are currently 260 private wells in the project area which are impacted by the PFAS to varying degrees. The proposed project is designed to provide water free of PFAS to the Richland and Ross Township residents in the affected areas.

2.6 Projected Future Needs

The project area is not currently fully developed. Based on current zoning/land use maps, and land use may change in future years. Appendix G contains the report summarizing the modeling results of adding the existing Richland/Ross system to the Kalamazoo system. Based on the modeling, the existing system can support both current and future demand in the proposed project area.

3 NEW WATER SUPPLY WELL PROCEDURES

No new wells are proposed.

4 ANALYSIS OF ALTERNATIVES

4.1 No Action

This alternative is not acceptable to any of the communities as it does not address the immediate health concern or provide any other long-term solution.

4.2 Optimum Performance of the Existing System

There are no current or foreseen operational issues with the existing water system which would prevent/hinder the proposed water main extensions into Richland and Ross Townships.

4.3 Regionalization – Extension of the City of Kalamazoo Water System

The City of Kalamazoo is the regional water provider and will continue to be in the future. No other regional alternatives exist. The City of Kalamazoo water system is immediately adjacent to

the area of Richland/Ross Townships affected by the PFAS contamination. The new water main is proposed to tie into the existing water mains on E C Avenue, N 35th Street, E D Avenue, M-89, and E DE Avenue. No other routes will effectively reach the properties proposed for new water main. The Kalamazoo system has the capacity to meet all the demands in the Richland/Ross Townships area proposed to be served by the system extension. The City of Kalamazoo currently provides municipal water to Richland Township through a water service agreement. The City of Kalamazoo and Ross Township are establishing a water service agreement in anticipation of this extension project.

4.4 Monetary Evaluation

Although there are no alternatives to the proposed water main extension, a present worth analysis for the water main is provided in Figure 6.

4.5 Environmental Evaluation

4.5.1 Cultural and Historic Resources

4.5.1.1 THPO: We have contacted all of the local Tribal Organizations who have confirmed there are no known cultural resources which may be impacted within the project areas. Copies of these correspondences are included in Appendix A.

4.5.1.2 SHPO: The proposed projects may have impact if there exists previously undisturbed soils within the road right-of-way in several areas. `A historical and environmental evaluation was performed by Orbis Environmental Consulting who is a State of Michigan approved consultant for this work. Their report of potential impact is included in Appendix B. They have recommended a supplemental survey of several specific sites, after which a final determination of effect will be made.

4.5.2 Air Quality

There are no project activities which will affect air quality.

4.5.3 Wetlands

There is no project work proposed in wetland areas as can be seen in Figure 2.

4.5.4 Great Lakes Shorelands, Coastal Zones, and Coastal Management Areas

There is no project work which will affect great lakes shorelands, coastal zones, or coastal management areas.

4.5.5 Floodplains

There are no floodplains within the project area, as can be seen in Figure 3.

4.5.6 Natural or Wild and Scenic Rivers

There is no project work which will affect these areas.

4.5.7 Major Surface Waters

In Ross Township, Gull Creek will be crossed at three locations at E DE Avenue, M-89, and E D Avenue as can be seen in Figure 1. At each of these locations, horizontal directional drilling methods are proposed to be used to avoid impacting the waterways. In Richland Township, a stream will be crossed on East DE Avenue approximately 4,000 feet west of N 37th Street. Although this stream may be crossed using open trench methods, no permanent changes will be made to the stream. EGLE permitting will be obtained for the construction of all stream crossings.

There is no project work which will affect Gull Lake or other major bodies of water.

4.5.8 Topography

There are no proposed topographical changes in the project.

4.5.9 Geology

There are no proposed changes to local geology nor is any dewatering anticipated.

It is not anticipated that contamination will affect the construction of the proposed project as all work will be within existing utility corridors. Corridors have been reviewed and no contamination is expected to be encountered. An environmental corridor review memorandum is included in Appendix H.

4.5.10 Soil Types

Based on the USDA Web Soil Survey, local soils consist primarily of sandy loams and clay loams. No import of material or export of native material is anticipated.

4.5.11 Agricultural Resources

All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent farmlands.

4.5.12 Fauna and Flora

The proposed project work will be within the existing road right-of-way and will not impact fauna or flora within the project areas. Although the habitats of the Indiana bat (endangered) and the Northern long-eared bat (threatened) have the potential to be encountered as they typically roost under bark or in crevices in trees, if tree removal or trimming is required, it will be performed between October 15 and March 31 to prevent disruption of roosting bats.

The typical habitats of the Eastern Massasauga Rattlesnake (threatened) and the Whooping Crane (experimental population, non-essential) include stream beds, which are near our project area. The current plan is to utilize horizontal directional drilling methods to avoid impacts to existing streams. The clearance report through the National Fish and Wildlife Service is included in Appendix C.

4.5.13 Anticipated Mitigation Requirements and Costs

As there are no anticipated detrimental Environmental impacts due to the project, there are no mitigation measures required and therefore no associated costs.

4.5.14 Technical Considerations

4.5.14.1 Pressure and Flow Capacity

Appendix G contains the report summarizing the modeling results of adding the existing Richland/Ross system to the Kalamazoo system. Based on the modeling, the existing system can meet current and future maximum day demand along with the desired fire flow in the project area.

4.5.15 New/Increased Water Withdrawals

No new or increased water withdrawals, above existing permit limits, are proposed for this project.

5 SELECTED ALTERNATIVE

5.1 Water Main Installation

5.1.1 Design Parameters

The routing and sizing of the proposed water main extensions were based on several factors:

- Potential new customers along the proposed water main extension route were divided into two categories: Current and Buildout. Existing homes and businesses along the proposed water main extension were incorporated into the model as current demands (260 REU) and were modeled as existing demands in the proposed scenarios. Houses were counted as 1 Residential Equivalence Unit (REU), and other structures were assigned an estimated REU based on size and function.
- Vacant parcels adjacent to the proposed water main extension were counted as future buildout customers. The zoning category for each parcel and the minimum lot size in the zoning ordinance for Richland and Ross Townships was used to estimate an REU per acre for each vacant parcel. Zoning categories predicted a higher customer demand than Future Land Use categories, and therefore were used for estimating future buildout demands (approximately 1,300 REU). For the buildout demand scenarios, the existing Kalamazoo distribution system was modeled using the 20-year projected demands from the 2022 Water System Reliability Study.
- Future phases of potential extensions were examined to provide additional service to other areas of Richland and Ross Townships. This generated the need for water main sizing that facilitated transmission capacity for an expanded future service district.
- Fire flows for both current and future service area.

5.1.2 Useful Life

5.1.3 Materials

Water Services – Current City of Kalamazoo Building Code adopts the use of the Michigan Building Code and Michigan Residential Code. These codes allow for the use of multiple water service materials on the private property side of water services. Because the City of Kalamazoo is responsible for water services from the water main up to, and including, the water meter, all water services installed will be Type K copper as is required of services in the City of Kalamazoo water system. These services are expected to have a useful life of 75 years.

Water Mains – The current City of Kalamazoo Standards for Construction require the use of minimum Class 52 Ductile Iron pipe, materials, and fittings in accordance with ANSI/AWWA Standards. The water mains are expected to have a useful life of 100 years.

5.1.4 Water and Energy Efficiency

Water meters will be placed at all current user connections and are required for all future connections. Billed water volumes are compared to production water volumes to quantify unmetered water losses. Leaks and meter repairs are identified and maintenance activities directed to mitigate the losses.

5.1.5 Schedule for Design and Construction

Design for all of the proposed work will begin immediately after funding is secured. It is anticipated that all of the proposed work will be designed in 2025 and begin construction in 2026. Multiple contractors will be required, and multiple project segments will be constructed concurrently.

The table below is a schedule for the proposed water distribution system improvement project. It would be funded under the fourth quarter of fiscal year 2025.

DWRF Project (4rd Quarter 2025)
Proposed Project Schedule

Milestone	Date
Hold Public Meeting	April 2024
Submit Final Project Plan to EGLE	June 2024
Receive Funding Determination	September 2024

User Charge System Approved	January 2025
Plans and Specifications Approved	May 2025
Bid Advertisement	May 2025
Receive Construction Bids	June 2025
EGLE Order of Approval	August 2025
Begin Construction	April 2026
Construction Completed	October 2027

5.1.6 Cost Summary

Appendix D contains a detailed cost estimate for the proposed water system installation. The estimated $45,960,000 dollar project costs for FY 2025 includes both construction costs and construction administration/inspection costs.

The entire three area project plan of the proposed lead service replacements, station upgrades, and watermain extensions is estimated to cost $110,264,000. If the entire project plan is DWRF loan funded with an estimated 2.5 % interest rate for a 20 year period, the expected annual debt service for the proposed project based on the DWRF loan criteria will be approximately $7,039,600 per year.

The city typically bases its cost allocations on a Residential Equivalent Unit (REU). One REU is the designation given to a single-family residential household which has an average water use of approximately 210 gallons per day and a water meter size of 1-inch. For businesses or industries with larger meters, the number of Residential Equivalent Units is calculated based on the meter size serving that entity. The larger the meter, the larger the number of equivalent units assigned to that meter. The assigned REU is directly proportional to the larger meter's capacity as compared to the capacity of a residential meter.

With the current number of 73,440 REU in the entire water system, the potential debt service and added O&M cost associated with the improvements, there will be a usage cost increase of approximately $106.00 per year per REU.

5.1.7 Implementability

There are no physical, legal, or managerial issues which will prevent or affect the implementation of the proposed water main installation.

6 ENVIRONMENTAL AND PUBLIC HEALTH IMPACTS

6.1 Direct Impacts

6.1.1 Social Impact/Economic Impact

The proposed projects will have a positive impact on the economics of the project area. Properties with wells affected by PFAS have been recommended to not utilize the water for drinking, food preparation/canning, teeth brushing, or any other task that could result in ingestion. Given the multiple impacts of PFAS on humans and other organisms, there is an atmosphere of fear which reduced the current quality of life in the area and is potentially affecting property values. The proposed installation of water main and connection to a reliable, safe potable water supply will significantly reduce or eliminate the current social and economic impacts of the PFAS contamination.

6.1.2 Construction Impacts

6.1.2.1 Construction Methods

With the exception of waterway crossings, water main will be installed using open cut trenching. The width of the trenches will vary based on the depth of the trench, but all open cut work must be contained within the right-of-way, including the trench width. Water services will be connected using directional drill technology.

6.1.2.2 Natural and Man-Made Features

The water main and services will be installed underground, and thus their presence will not affect species or environments on the ground surface.

6.1.2.3 Historical/Archaeological

6.1.2.3.1 THPO We have contacted all of the local Tribal Organizations who have confirmed there are no known cultural resources which may be impacted within the project areas. Copies of these correspondences are included in Appendix A.

6.1.2.3.2 SHPO The proposed projects will not impact existing structures in work areas. Therefore, no historic or archaeological sites will be impacted by the construction of the proposed project. A historical and environmental evaluation was

performed by Orbis Environmental Consulting who is a State of Michigan approved consultant for this work. Their report of no impact is included in Appendix B.

6.1.2.4 Water Quality

The proposed project will replace the PFAS contaminated well water sources and will provide local residents with potable municipal drinking water which meets all current public drinking water standards.

6.1.2.5 Endangered Species

The proposed project work will be within the existing road right-of-way and will not impact fauna or flora within the project areas. Although the habitats of the Indiana bat (endangered) and the Northern long-eared bat (threatened) have the potential to be encountered as they typically roost under bark or in crevices in trees, if tree removal or trimming is required, it will be performed between October 15 and March 31 to prevent disruption of roosting bats.

The typical habitats of the Eastern Massasauga Rattlesnake (threatened) and the Whooping Crane (experimental population, non-essential) include stream beds, which are near our project area. The current plan is to utilize horizontal directional drilling methods to avoid impacts to existing streams. The clearance report through the National Fish and Wildlife Service is included in Appendix C.

6.1.2.6 Agricultural Land

All of the proposed water main will be placed within existing road right-of-way and will not impact any adjacent farmlands.

6.1.2.7 Groundwater Impacts

No dewatering is proposed for this project.

6.1.2.8 Traffic Impacts

The proposed project is within road rights-of-way where streets and driveways will be impacted. All components of the project will be coordinated carefully with residences and businesses in the area, and construction methods will be selected to minimize disruptions.

Standard traffic and safety control devices such as barricades and lighted barrels will be in place to warn and protect residents during construction activities.

6.1.2.9 Air Quality

All of the projects are installing underground water infrastructure. Therefore, the projects will not negatively impact the air quality in the affected areas.

6.1.2.10 Wetlands

There is no project work proposed in wetland areas as can be seen in Figure 2.

6.1.2.11 Great Lakes Shorelands, Coastal Zones, and Coastal Management Areas

There is no project work which will affect great lakes shorelands, coastal zones, or coastal management areas.

6.1.2.12 Floodplains

There are no floodplains within the project area, as can be seen in Figure 3.

6.1.2.13 Natural or Wild and Scenic Rivers

We reviewed the State of Michigan Department of Natural Resources data and found that no designated wild, scenic or natural rivers or tributaries exist within the study area.

6.1.2.14 Dust and Noise

Dust control methods such as water and/or brine will be used to keep dust to a minimum. All public roadways will be swept regularly and maintained to assure residents access to the area. Construction equipment will be maintained in good condition to decrease noise.

6.2 Indirect Impacts

No long-term impacts to the environment are anticipated. No changes in the environment are proposed for this project.

6.3 Cumulative impacts

Once construction is completed, there are no anticipated permanent, detrimental impacts to the environment or the community.

7 MITIGATION

7.1 Short Term Construction Related Mitigation

Standard procedures used in the construction industry will be included in the construction contract documents to mitigate construction activities.

7.1.1 Traffic Disruption

The proposed project is within road rights-of-way where streets and driveways will be impacted. All components of the project will be coordinated carefully with residences and businesses in the area, and construction methods will be selected to minimize disruptions.

Standard traffic and safety control devices such as barricades and lighted barrels will be in place to warn and protect residents during construction activities.

7.1.2 Dust and Noise

Dust control methods such as water and/or brine will be used to keep dust to a minimum. All public roadways will be swept regularly and maintained to assure residents access to the area. Construction equipment will be maintained in good condition to decrease noise.

7.1.3 Soil Erosion

Soil erosion and sedimentation control measures such as straw bales, sedimentation basins, and silt fence, will be part of the construction activities to prevent soil release and protect streams, wetlands, and existing storm water system.

7.1.4 Potential Loss of Wildlife / Habitat

Given the potential for tree removal within the road right-of-way, tree removal can be limited to the time periods between October 1 and March 31, in order to protect young bats that are not able to fly. If tree cutting is performed outside of this season, surveys of the trees will be performed in order to determine whether they are roost trees for the endangered Indiana bat or the threatened Northern long-eared bat. No other habitat impacts are anticipated.

8 PUBLIC PARTICIPATION

As noted in the Project Need section, the proposed project work is in response to discovered PFAS contamination. The scope of the proposed project is based on the current testing data available and the public input received to date.

8.1 Public Meetings

A public meeting was held on The meeting will be held on Monday, April 15, 2024 at 6 p.m. EST at Gracespring Bible Church located at 8643 Gull Rd, Richland, MI 49083.

A Notice of Public meeting was published on MLive prior to the Public Meeting and was posted on the websites for City of Kalamazoo, Richland Township, and Ross Township. Physical posters were also put up at the offices of both Townships. A copy of the notice and proof of advertisement are included in Appendix E. The Project Planning Document was posted on the city's website. The city received no comments or questions during the public advertisement period.

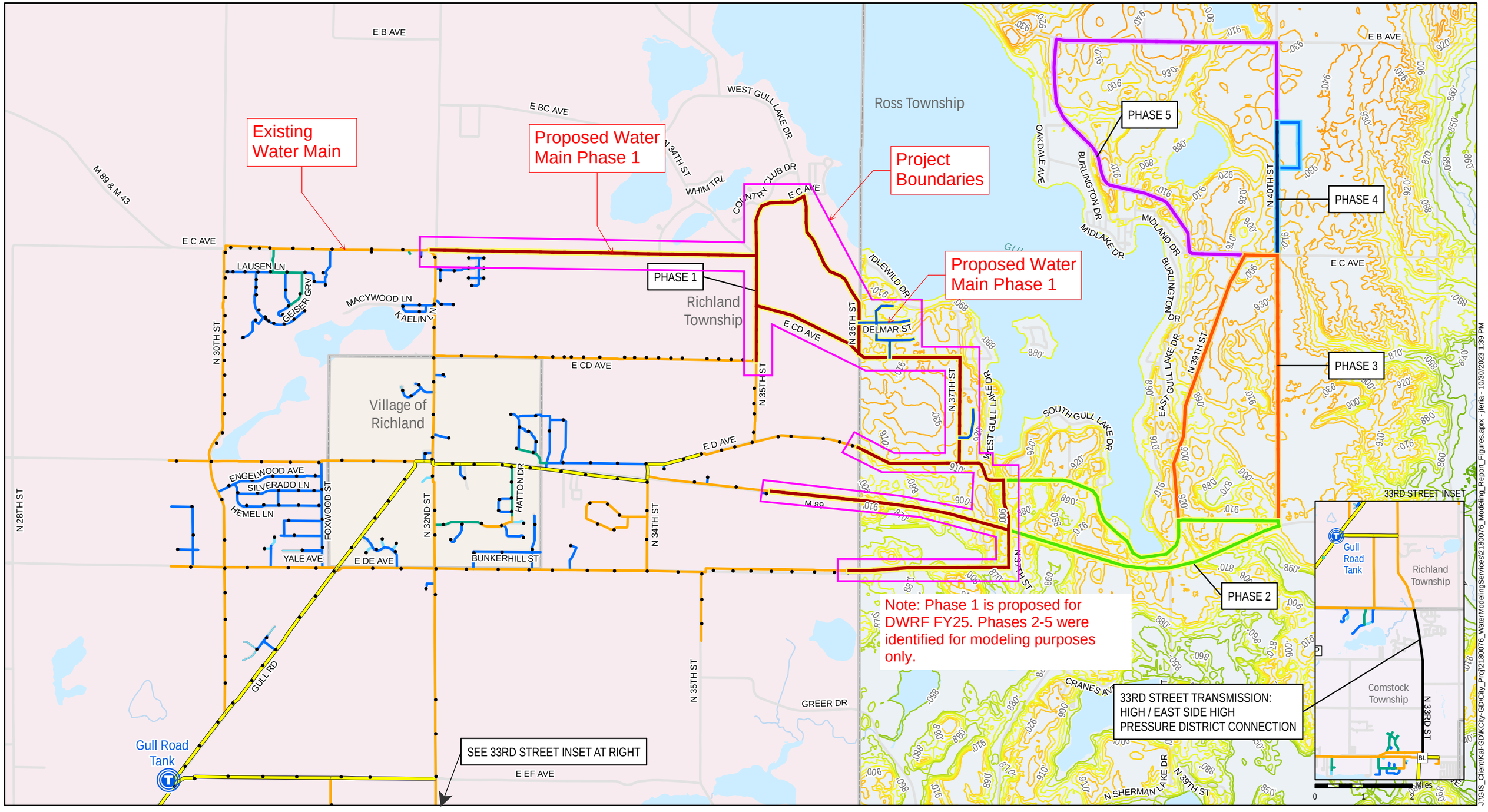
A presentation was given by the project consultant and City staff during which a description of the DWSRF program and general comments on the Project Planning Document were presented. It was noted that the Project Planning Document contained cost estimates for projects and potential impacts. The Public Meeting summary is provided in Appendix E.

8.2 Adoption of Project Planning Document

On Monday, May 20, 2024, the City of Kalamazoo City Commission passed a resolution adopting the Project Planning Document. A copy of the signed resolution is provided in Appendix F.

Figures

Figure 1 Map of Proposed Project Area
Figure 2 Area Wetlands
Figure 3 Floodplain
Figure 4 PFAS Sampling Map
Figure 5 Zoning Map
Figure 6 Present Worth Analysis



LEGEND

Proposed Water Main (Phase 1)
- 8"
- 12"

Proposed Water Main (Phase 2)
- 12"

Proposed Water Main (Phase 3)
- 12"

Proposed Water Main (Phase 4)
- 8"
- 12"

Proposed Water Main (Phase 5)
- 12"

Existing Water Main
- 4" and Smaller
- 6"
- 8"
- 10"
- 12"
- 16"
- Hydrant

CITY OF KALAMAZOO
KALAMAZOO COUNTY, MICHIGAN

FIGURE 1
ROSS TOWNSHIP WATER MAIN EXTENSIONS
OCTOBER 2023

Prein&Newhof
2180076

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FIGURE 2

E BC AVE
N 30TH ST
N 34TH ST
WHIM TRL
COTTERS RIDGE RD
COUNTRY CLUB DR
WEST GULL LAKE DR
FRAULIN DR
OAKDALE AVE
SYLVAN DR
BURLINGTON DR
MIDLAKE DR
MIDLAND DR
E C AVE
LAUSEN LN
W STURTEVANT AVE
GEISER GRV
MACYWOOD LN
KAELIN LN
IDLEWILD DR
WILD DR
N 36TH ST
DELMAR ST
GULL LAKE SHD
E CD AVE
N 32ND ST
N 35TH ST
N 39TH ST
EAST GULL LAKE DR
LAKE VISTA DR
E D AVE
Village of Richland
ENGELWOOD AVE
SILVERADO LN
HEMEL LN
FOXWOOD ST
YALE AVE
GULL RD
HATTON DR
HATTON CIR
RICHLAND WOODS DR
BUNKERHILL ST
YORKTOWN ST
M 89
Richland Township
N YORKVILLE LN
SOUTH GULL LAKE DR
Ross Township
E DE AVE
N 38TH ST
N 37TH ST

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LEGEND

Project Area

National Wetlands Inventory

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine

SCALE: 1" = 1,500 '

CITY OF KALAMAZOO
RICHLAND AND ROSS TOWNSHIPS, KALAMAZOO COUNTY, MI
WETLANDS
2024 DWRF APPLICATION
Prein&Newhof
2230982

FIGURE 3

E BC AVE
N 30TH ST
N 34TH ST
WHIM TRL
COTTERS RIDGE RD
COUNTRY CLUB DR
WEST GULL LAKE DR
FRALIN DR
OAKDALE AVE
SYLVAN DR
BURLINGTON DR
MIDLAKE DR
MIDLAND DR
E C AVE
LAUSEN LN
W STURTEVANT AVE
GEISER GRV
MACYWOOD LN
KAELIN LN
Richland Township
IDLEWILD DR
WILD DR
N 36TH ST
DELMAR ST
GULL LAKE SWD
E CD AVE
N 32ND ST
N 35TH ST
Ross Township
N 39TH ST
LAKE VISTA DR
SOUTH GULL LAKE DR
EAST GULL LAKE DR
N YORKVILLE LN
E D AVE
Village of Richland
ENGELWOOD AVE
SILVERADO LN
HEMEL LN
FOXWOOD ST
HATTON CIR
HATTON DR
M 89
RICHLAND WOODS DR
BUNKERHILL ST
YORKTOWN ST
YALE AVE
GULL RD
E DE AVE
N 37TH ST
N 38TH ST

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SCALE: 1" = 1,500 '

LEGEND

Project Area

FEMA Flood Hazard Areas

1% Annual Chance Flood Hazard

CITY OF KALAMAZOO

RICHLAND AND ROSS TOWNSHIPS, KALAMAZOO COUNTY, MI

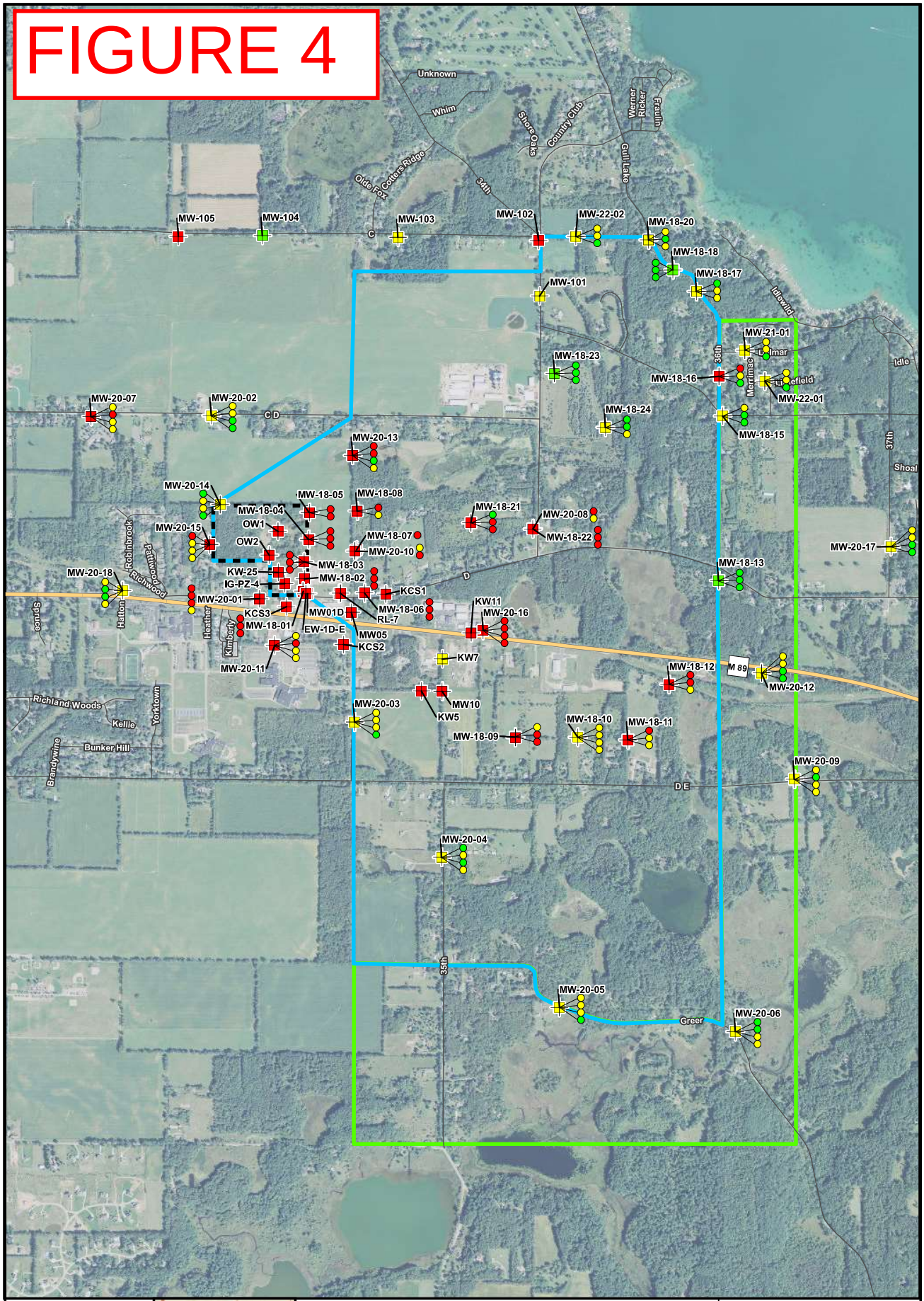
FEMA FLOOD HAZARD AREAS

2024 DWRF APPLICATION

Prein&Newhof

2230982

FIGURE 4



AECOM

Drawn: DP Date: 10/21/2022

Approved: JB Date: 10/21/2022

Project #: 60582450



Legend

Monitoring Well

- Non-Detect for Part 201 PFAS Compounds
- Detection below Part 201 PFAS Criteria, but no Exceedance
- One or more Part 201 PFAS Criteria Exceeded
- Production Plated Plastics
- Study Area
- Buffer Zone

Results from nested monitoring wells:

- Top = Shallow
- Middle = Intermediate
- Bottom = Deep

*Locations without depth indicators have only one monitoring well.

N

0 0.2 0.4 Miles

PFAS HEAT MAP
AS OF AUGUST
2022

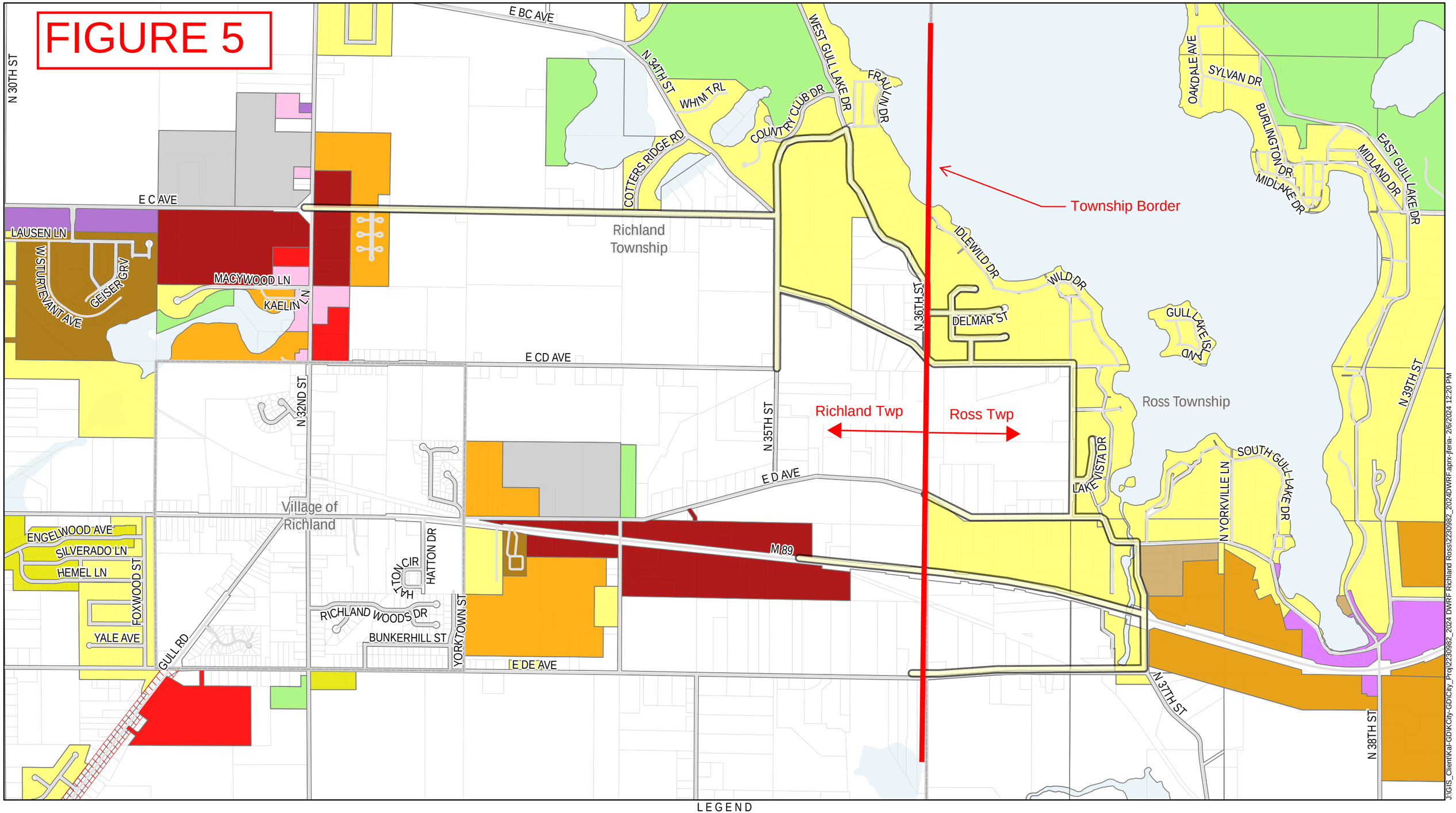
DRAFT

RICHLAND, MI

Document Path: L:\DCS\GIS\ArcMap_GeoDB_Projects\ENV\GIS_Data\GIS\Richland\MXDs\Second_Quarter_Sampling_PFAS.mxd

Aerial imagery: 2014 NAIP Imagery

FIGURE 5



LEGEND

Project Area

Richland Township Zoning
- R/OS Recreation / Open Space District
- A-1 Agricultural / Residential District
- A Single Family Residential District
- A-2 Two Family Residential District
- B-1 Multiple Family / Office District
- B-2 Mobile Home Park District

- C Office / Retail District
- C-1 Local Business District
- C-2 Highway Business District
- D Regional Commercial District
- D-1 Commercial / Industrial District
- CP Corridor Presrvation Overlay District

Ross Township Zoning
- AG Agricultural Preservation District
- C-1 Bay-Commercial District
- R-1 Single Family District
- R-2 Single & Two Family District
- R-3 Muiltiple Family Residental District
- RR Rural Residential District

SCALE: 1" = 1,500 '

CITY OF KALAMAZOO
RICHLAND AND ROSS TOWNSHIPS, KALAMAZOO COUNTY, MI

LAND USE

2024 DWRF APPLICATION

Prein&Newhof
2230982

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FIGURE 6

Present Worth Analysis

Project Description	***Project 1*** Richland/Ross Water Main Extension
	FY2025
Capital Costs (including ELAC)	
Structures	$38,299,650
Equipment	$0
Planning	$0
Design / Construction Engineering	$5,744,948
Project Cost	$44,044,598
(A) 20-yr Present Worth of Capital Costs [1]	$17,577,577
Operation, Maintenance & Replacement (OM&R)	
Energy Cost Savings	$0
OM&R	$0
Annual OM&R [2]	$0
(B) 20-yr Present worth of OM&R [1]	$0
(C) 20-yr Present worth of Energy Cost Savings [3]	$0
Salvage Value of Capital	
Salvage value at 20 years	$22,979,790
(D) 20-yr Present worth of Salvage [1]	$9,170,910
Total Present Worth (A + B + C - D)	**$8,406,668**
Equivalent Annual Cost (based on Total Present Worth)	$657,521

Appendices

Appendix A	THPO Review
Appendix B	SHPO Review
Appendix C	National Fish and Wildlife Service Review
Appendix D	Project Costs
Appendix E	Public Meeting Documentation
Appendix F	Project Plan Resolution
Appendix G	Water Modeling Memorandum
Appendix H	Environmental Corridor Review
Appendix I	Overburdened Worksheet

Appendix A

THPO Review

Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

February 13, 2024
2240278

Match-E-Be-Nash-Shee-Wish Band of Pottawatomi Indians
2872 Mission Drive
Shelbyville, MI 49344
lakota.hobia@glt-nsn.gov
kaila.akina@glt-nsn.gov
shawn.mckenney@glt-nsn.gov

RE: **Notice and Opportunity to Comment**
City of Kalamazoo Water Main Installation

Lakota/Kaila/Shawn:

On behalf of the City of Kalamazoo, we are submitting the information noted below for the City of Kalamazoo Water Main Project for which we are completing a Section 106 review. This is required as part of the environmental review process associated with a State of Michigan Drinking Water State Revolving Fund (DWSRF) project. The City will be using the DWSRF funds to install water main throughout the Richland and Ross Townships.

We are proposing to install water main within Sections 11, 12, 13, 14, 24, and 25 in Township 1 South, Range 10 West and Sections 14 and 19 in Township 1 South, Range 9 West. The work will include trenching for water main within the right of way and running service lines to homes and businesses. The service lines will be connected using directional drills, so the project will involve disturbance to the surface within the right of way with minimized disturbance directly above the proposed services. A project phase map is attached. Please note that we are requesting review for Phase 1 only.

We would appreciate your response within 30 days of this request, so that we might include the correspondence with the environmental application submittal and have time to respond to any questions you might have.

We appreciate your time to review this matter. If you need any additional information to complete your review, please feel free to contact me at (616) 364-8491, bvilmont@preinnewhof.com.

Sincerely,

Prein&Newhof

Brian G Vilmont

Brian Vilmont, P.E.

JMD:BGV:dlj

Enclosure: Project Location Maps

Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

February 13, 2024
2240278

Hannahville Potawatomi Indian Community
N-14911 Hannahville B-1 Road
Wilson, MI 49896
mschuster@hicservices.org
csagataw@hicservices.org
molly.meshigaud@hannahville.org

RE: **Notice and Opportunity to Comment**
City of Kalamazoo Lead Service Line Replacement

Michael/Cory/Molly:

On behalf of the City of Kalamazoo, we are submitting the information noted below for the City of Kalamazoo Water Main Project for which we are completing a Section 106 review. This is required as part of the environmental review process associated with a State of Michigan Drinking Water State Revolving Fund (DWSRF) project. The City will be using the DWSRF funds to install water main throughout the Richland and Ross Townships.

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Sincerely,

Prein&Newhof

Brian G Vilmont

Brian Vilmont, P.E.

JMD:BGV:dlj

Enclosure: Project Location Maps

Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

February 13, 2024
2240278

Little River Band of Ottawa Indians
2608 Governmental Center Drive
Manistee, MI 49660
jonniesam@lrboi-nsn.gov
williambeaver@lrboi-nsn.gov

RE: **Notice and Opportunity to Comment**
City of Kalamazoo Lead Service Line Replacement

Jay/Frank:

On behalf of the City of Kalamazoo, we are submitting the information noted below for the City of Kalamazoo Water Main Project for which we are completing a Section 106 review. This is required as part of the environmental review process associated with a State of Michigan Drinking Water State Revolving Fund (DWSRF) project. The City will be using the DWSRF funds to install water main throughout the Richland and Ross Townships.

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Sincerely,

Prein&Newhof

Brian G Vilmont

Brian Vilmont, P.E.

JMD:BGV:dlj

Enclosure: Project Location Maps

Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

February 13, 2024
2240278

Nottawaseppi Huron Band of Pottawatomi Indians
1301 T Drive South
Fulton, MI 49052
douglas.taylor@nhbp-nsn.gov
environmental@nhbp-nsn.gov

RE: **Notice and Opportunity to Comment**
City of Kalamazoo Lead Service Line Replacement

Douglas/Nottawaseppi Environmental:

On behalf of the City of Kalamazoo, we are submitting the information noted below for the City of Kalamazoo Water Main Project for which we are completing a Section 106 review. This is required as part of the environmental review process associated with a State of Michigan Drinking Water State Revolving Fund (DWSRF) project. The City will be using the DWSRF funds to install water main throughout the Richland and Ross Townships.

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Sincerely,

Prein&Newhof

Brian G Vilmont

Brian Vilmont, P.E.

JMD:BGV:dlj

Enclosure: Project Location Maps

Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

February 13, 2024
2240278

Pokagon Band of Potawatomi Indians
59291 Indian Lake Road
P.O. Box 180
Dowagiac, MI 49047
matthew.bussler@pokagonband-nsn.gov
jennifer.kanine@pokagonband-nsn.gov

RE: **Notice and Opportunity to Comment**
City of Kalamazoo Lead Service Line Replacement

Matthew/Jennifer:

On behalf of the City of Kalamazoo, we are submitting the information noted below for the City of Kalamazoo Water Main Project for which we are completing a Section 106 review. This is required as part of the environmental review process associated with a State of Michigan Drinking Water State Revolving Fund (DWSRF) project. The City will be using the DWSRF funds to install water main throughout the Richland and Ross Townships.

We are proposing to install water main within Sections 11, 12, 13, 14, 24, and 25 in Township 1 South, Range 10 West and Sections 14 and 19 in Township 1 South, Range 9 West. The work will include trenching for water main within the right of way and running service lines to homes and businesses. The service lines will be connected using directional drills, so the project will involve disturbance to the surface within the right of way with minimized disturbance directly above the proposed services. A project phase map is attached. Please note that we are requesting review for Phase 1 only.

We would appreciate your response within 30 days of this request, so that we might include the correspondence with the environmental application submittal and have time to respond to any questions you might have.

We appreciate your time to review this matter. If you need any additional information to complete your review, please feel free to contact me at (616) 364-8491, bvilmont@preinnewhof.com.

Sincerely,

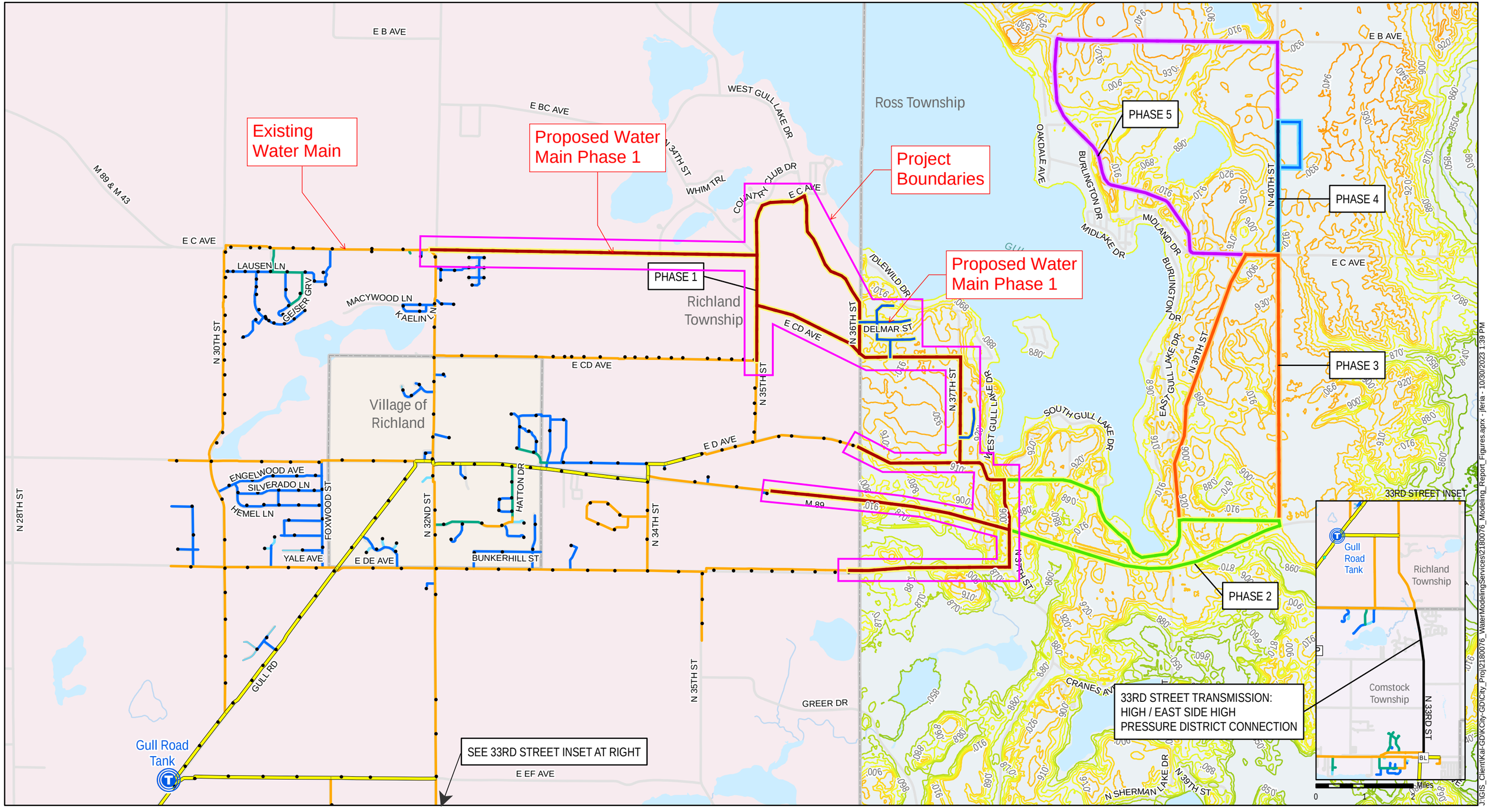
Prein&Newhof

Brian G Vilmont

Brian Vilmont, P.E.

JMD:BGV:dlj

Enclosure: Project Location Maps



LEGEND

Proposed Water Main (Phase 1)
- 8"
- 12"

Proposed Water Main (Phase 2)
- 12"

Proposed Water Main (Phase 3)
- 12"

Proposed Water Main (Phase 4)
- 8"
- 12"

Proposed Water Main (Phase 5)
- 12"

Existing Water Main
- 4" and Smaller
- 6"
- 8"
- 10"
- 12"
- 16"
- Hydrant

CITY OF KALAMAZOO
KALAMAZOO COUNTY, MICHIGAN

FIGURE 1
ROSS TOWNSHIP WATER MAIN EXTENSIONS
OCTOBER 2023

Prein&Newhof
2180076

J:\GIS_Client\Kal-GDI\City-GDI\City_Proj\2180076_WaterModelingServices\2180076_Modeling_Report_Figures\Report_Figures.aprx - jferia - 10/30/2023 1:39 PM

Appendix B

SHPO Review

APPLICATION FOR SHPO SECTION 106 CONSULTATION

Submit one application for each project for which comment is requested. Consult the *Instructions for the Application for SHPO Section 106 Consultation Form* when completing this application.

Submit application materials online at www.michigan.gov/shposection106 or mail to: Michigan State Historic Preservation Office, 300 North Washington Square, Lansing, MI 48913

I. GENERAL INFORMATION

☒ New submittal

☐ More information relating to SHPO ER# SHPO Project #

☐ Submitted under a Programmatic Agreement (PA)

PA Name/Date: PA name/date, if applicable

a. **Project Name: Richland and Ross Township Waterline**

b. **Project Location(s):**

If there is more than one location for your project, additional rows may be added to the table below. Township, Range, Section/Private Claim refer to the public land survey sections. Each Township/Range group must have its own row in the table below and must include the corresponding county and municipal unit.

County	Municipality	Street Address	Township (N/S)	Range (E/W)	Section(s) or Private Claim
Kalamazoo	Ross Township	N/A	01S	09W	18 and 19
Kalamazoo	Richland Township	N/A	01S	10W	11, 12, 13, 14, and 24

II. FEDERAL AGENCY INVOLVEMENT AND RESPONSE CONTACT INFORMATION

a. **Federal Agency:** Michigan Department of Environment, Great Lakes, and Energy (EGLE)
Contact Name: Jonathan M. Berman, State Revolving Fund Compliance Specialist
Contact Address: P.O. Box 30457, Lansing, Michigan 48909-7957 **City:** Lansing **State:** MI **Zip:** 48909-7957
Email: BermanJ@Michigan.gov
Specify the federal agency involvement in the project: Funding Source

b. **If HUD is the Federal Agency: 24 CFR Part 50 ☐ or Part 58 ☐**
Responsible Entity (RE): Name of the entity that is acting as the Responsible Entity
Contact Name: RE Contact name
Contact Address: RE mailing address **City:** RE city **State:** RE State **Zip:** RE zip code
RE Email: RE contact's email **Phone:** RE contact's phone #

c. **State Agency Contact (*if applicable*):** Michigan Department of Environment, Great Lakes, and Energy
Contact Name: Ms. Valorie White

Contact Address: PO Box 30457 **City:** Lansing **State:** MI **Zip:** 48909-7957
Email: whitev1@michigan.gov **Phone:** 517-599-5879

d. **Applicant (if different than federal agency):** City of Kalamazoo
Contact Name: Anna Crandall, P.E.
Contact Address: 415 Stockbridge Ave. **City:** Kalamazoo **State:** MI **Zip:** 49001
Email: crandalla@kalamazoocity.org **Phone:** 269-337-8055

e. **Consulting Firm (if applicable):** Prein&Newhof
f. Contact Name: Brian Vilmont
g. Contact Address: 3355 Evergreen Drive NE **City:** Grand Rapids **State:** MI **Zip**: 49525
h. **Email:** bvilmont@preinnewhof.com Phone: 616-364-8491

III. PROJECT INFORMATION

a. **Project Work Description**

Describe all work to be undertaken as part of the project:

Installation of public water main within public road right-of-way including water services to individual structures.

b. **Project Location and Area of Potential Effect (APE)**

i. **Maps.** Please indicate all maps that will be submitted as attachments to this form.

☒Street map, clearly displaying the direct and indirect APE boundaries
☒Site map
☒USGS topographic map Name(s) of topo map(s): Kalamazoo
☒Aerial map
☒Map of photographs
☐Other: Identify type(s) of map(s)

ii. **Site Photographs**
iii. **Describe the APE:**

The Area of Potential Effects for direct effects includes the limits of construction, which lies within the existing road right-of-way (ROW). The project design is ongoing, but the construction limits typically extend up to 10 feet from the edge of pavement. If utilities or topography prevents this, then the construction will occur under the existing road.

The APE for indirect effects includes the area adjacent to the construction limits where temporary noise, visual, and traffic impacts will occur.

i. **Describe the steps taken to define the boundaries of the APE:**

The APE for direct effects was defined by the extent of construction activities. The APE for indirect effects was defined as the extent of temporary visual and noise from construction activities because the proposed improvement involves activities in the ground.

IV. IDENTIFICATION OF HISTORIC PROPERTIES

a. **Scope of Effort Applied**

i. **List sources consulted for information on historic properties in the project area** (including but not limited to SHPO office and/or other locations of inventory data).

MSHPO records, aerial images, historic maps

ii. Provide documentation of previously identified sites as attachments.
iii. **Provide a map** showing the relationship between the previously identified properties and sites, your project footprint and project APE.
iv. Have you reviewed existing site information at the SHPO: ☒Yes ☐ No
v. Have you reviewed information from non-SHPO sources: ☒Yes ☐ No

b. **Identification Results**

i. **Above-ground Properties**

A. **Are you submitting above-ground identification information?** ☒ Yes ☐ No

B. **If yes, please indicate level:**

☒ Literature Review ☐ Reconnaissance Survey Report ☐ Intensive Survey Report

C. **Total number of properties surveyed** Zero:

D. **Total number of previously identified Historic Properties in your APE** Zero

E. **Total number of newly identified properties recommended eligible for listing in the National Register of Historic Places** Zero

F. **Summarize, briefly, your findings for above-ground resources**.

See the cultural resources desktop review.

G. **Attach the appropriate Michigan SHPO Architectural Identification Form for each resource or site 50 years of age or older in the APE.** Refer to the *Instructions for the Application for SHPO Section 106 Consultation Form* for guidance on this. N/A

H. **Provide the name and qualifications of the person who made recommendations of eligibility for the above-ground identification forms.**

Name Mollie Olynik **Agency/Consulting Firm:** The Mannik & Smith Group

Is the individual a 36CFR Part 61 Qualified Historian or Architectural Historian ☒ Yes ☐ No

Are their credentials currently on file with the SHPO? ☒ Yes ☐ No

If NO attach this individual's qualifications form and resume.

ii. **Archaeology**

Submit the following information using attachments, as necessary.

A. **Are you submitting archaeological information?** ☒ Yes ☐ No

B. **If yes, please indicate:** ☒ Assessment (Desktop Review) ☐ Archeological Report

C. **Width(s), length(s), and depth(s) of proposed ground disturbance(s):** Water main replacement may disturb a 10'wide by 6' deep excavation trench along the length of the water main

D. **Is a portion of the APE underwater?** ☐ Yes ☒ No
If the assessment did not include the underwater portions of the APE, please briefly justify:
Justification for not assessing the potential for submerged historic resources:

E. **Potential to adversely affect significant archaeological resources**:

☐ Low ☒ Moderate ☐ High

Is fieldwork recommended? ☒ Yes ☐ No

Briefly justify the recommendation:

There are known sites in or near the project area and ground disturbing activities may occur in intact soils.

F. **Have you attached an Archaeological Sensitivity Map?** ☒ Yes ☐ No

G. **Summary of previously reported archaeological sites and surveys:**

See the cultural resources desktop review

H. **Summarize past and present land use:**

The project occurs in existing road right-of-way in rural Ross and Richland Townships.

I. **If archaeological fieldwork has been conducted, please attach a copy of the report copy and provide full report reference here**:

Full report reference

J. **Provide the name and qualifications of the person who provided the information for the Archaeology section:**

Name: J Ryan Duddleson **Agency/Firm:** Orbis Environmental Consulting
Is the person a 36CFR Part 61 Qualified Archaeologist? ☒ Yes ☐ No
Are their credentials currently on file with the SHPO? ☒ Yes ☐ No
If NO, attach this individual's qualifications form and resume.

Archaeological site locations are legally protected.

This application may not be made public without first redacting sensitive archaeological information.

V. IDENTIFICATION OF CONSULTING PARTIES

a. **Provide a list of *all* consulting parties,** including Native American tribes, local governments, applicants for federal assistance/permits/licenses, parties with a demonstrated interest in the undertaking, and public comment:

Prein&Newhof

b. **Provide a summary of consultation with consultation parties:**

Prein&Newhof provides water main design and construction document preparation for the project.

c. **Provide summaries of public comment and the method by which that comment was sought:**

Public meeting was held on April 15, 2024 to receive public comment. All present were in favor of applying for State of Michigan DWRF funding.

VI. DETERMINATION OF EFFECT

Guidance for applying the Criteria of Adverse Effect can be found in *the Instructions for the Application for SHPO Section 106 Consultation Form*.

a. **Basis for determination of effect**:

MSHPO records show one historic resource and seven archaeological sites within the study area. One historic structure, the Yorkville House, and one archaeological site, 20Kz88, are located immediately adjacent to the project area. There have been three previous cultural resources survey within the study area, but the project area has not been surveyed.

While many of the known archaeological sites have not been field verified, records indicate substantial precontact occupation in Ross and Richland Townships. Historic atlas maps show structures along the existing roads, including residences, a school, a church, and a tavern/inn. The maps also show a cemetery near the project.

Archaeological materials associated with these pre-and post-contact occupations may occur in any intact soils in the project area. These materials may be associated with precontact Native populations in the area and could range from individual artifacts or deposits associated with longer term use of the area, such as the noted garden beds, mounds, and villages. There may also be materials associated with Euroamerican settlement and occupation of Ross and Richland Townships, specifically associated with the structures shown on the atlas maps. The cemetery shown on the maps is over 400 feet east of the project and is unlikely to be affected.

The Area of Potential Effects for direct effects includes the limits of construction, which lies within the existing road right-of-way (ROW). The project design is ongoing, but the construction limits typically extend up to 10 feet from the edge of pavement. If utilities or topography prevents this, then the construction will occur under the existing road. The APE for indirect effects includes the area adjacent to the construction limits where temporary noise, visual, and traffic impacts will occur. The proposed waterline is unlikely to affect significant above-ground resources, but we recommend a Phase I Archaeological survey to determine the presence or absence of intact archaeological deposits in the APE.

b. **Determination of effect**

☐ **No historic properties will be affected**

☐ **Historic properties will be affected** and the project will (check one):

☐ have **No Adverse Effect** on historic properties within the APE.

☐ have an **Adverse Effect** on one or more historic properties in the APE and the federal agency, or federally authorized representative, will consult with the SHPO and other parties to resolve the adverse effect under 800.6.

☒ **More Information Needed:** We are initiating early consultation. A determination of effect will be submitted to the SHPO at a later date, pending results of survey.

Federally Authorized Signature: Jonathan M. Berman Date: 05/06/2024

Type or Print Name: Jonathan M. Berman

Title: State Revolving Fund Compliance Specialist

ATTACHMENT CHECKLIST

Identify any materials submitted as attachments to the form:

☐ Additional federal, state, local government, applicant, consultant contacts

☒ Maps of project location

Number of maps attached: 10

☒ Site Photographs

☒Map of photographs

☒ Plans and specifications

☐ Other information pertinent to the work description: Identify the type of materials attached

☐ Updated documentation of previously identified historic properties

☐ New Architectural Properties Identification Forms

☒ Map showing the relationship between identified historic properties, your project footprint, and project APE

☐ Above-ground qualified person's qualification form and resume

☐ Above-ground survey report

☒ Archaeological sensitivity map

☒ Archaeology survey report

☐ Archaeologist and Historian qualifications and resume- if not on file already.

☐ Other: cultural resources desktop review

Appendix C

USFWS Review

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
Phone: (517) 351-2555 Fax: (517) 351-1443

In Reply Refer To: February 13, 2024
Project Code: 2024-0048649
Project Name: FY 2025 Richland Ross Townships Water Main

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

Official Species List
The attached species list identifies any Federally threatened, endangered, proposed and candidate species that may occur within the boundary of your proposed project or may be affected by your proposed project. The list also includes designated critical habitat if present within your proposed project area or affected by your project. This list is provided to you as the initial step of the consultation process required under section 7(c) of the Endangered Species Act, also referred to as Section 7 Consultation.

Under 50 CFR 402.12(e) (the regulations that implement section 7 of the Endangered Species Act), the accuracy of this species list should be verified after 90 days. You may verify the list by visiting the IPaC website (https://ipac.ecosphere.fws.gov/) at regular intervals during project planning and implementation. To update an Official Species List in IPaC: from the My Projects page, find the project, expand the row, and click Project Home. In the What's Next box on the Project Home page, there is a Request Updated List button to update your species list. Be sure to select an "official" species list for all projects.

Consultation requirements and next steps
Section 7 of the Endangered Species Act of 1973 requires that actions authorized, funded, or carried out by Federal agencies not jeopardize Federally threatened or endangered species or adversely modify designated critical habitat. To fulfill this mandate, Federal agencies (or their designated non-Federal representative) must consult with the Fish and Wildlife Service if they determine their project may affect listed species or critical habitat.

There are two approaches to evaluating the effects of a project on listed species.

Approach 1. Use the All-species Michigan determination key in IPaC. This tool can assist you in making determinations for listed species for some projects. In many cases, the determination key

will provide an automated concurrence that completes all or significant parts of the consultation process. Therefore, we strongly recommend screening your project with the **All-Species Michigan Determination Key (Dkey)**. For additional information on using IPaC and available Determination Keys, visit https://www.fws.gov/media/mifo-ipac-instructions (and click on the attachment). Please carefully review your Dkey output letter to determine whether additional steps are needed to complete the consultation process.

Approach 2. Evaluate the effects to listed species on your own without utilizing a determination key. Once you obtain your official species list, you are not required to continue in IPaC, although in most cases using a determination key should expedite your review. If the project is a Federal action, you should review our section 7 step-by-step instructions before making your determinations: https://www.fws.gov/office/midwest-region-headquarters/midwest-section-7-technical-assistance. If you evaluate the details of your project and conclude "no effect," document your findings, and your listed species review is complete; you do not need our concurrence on "no effect" determinations. If you cannot conclude "no effect," you should coordinate/consult with the Michigan Ecological Services Field Office. The preferred method for submitting your project description and effects determination (if concurrence is needed) is electronically to EastLansing@fws.gov. Please include a copy of this official species list with your request.

For all **wind energy projects** and **projects that include installing communications towers >450 feet that use guy wires**, please contact this field office directly for assistance, even if no Federally listed plants, animals or critical habitat are present within your proposed project area or may be affected by your proposed project.

Migratory Birds
Please see the "Migratory Birds" section below for important information regarding incorporating migratory birds into your project planning. Our Migratory Bird Program has developed recommendations, best practices, and other tools to help project proponents voluntarily reduce impacts to birds and their habitats. The Bald and Golden Eagle Protection Act prohibits the take and disturbance of eagles without a permit. If your project is near an eagle nest or winter roost area, see our Eagle Permits website at https://www.fws.gov/program/eagle-management/eagle-permits to help you avoid impacting eagles or determine if a permit may be necessary.

Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your consideration of threatened and endangered species during your project

planning. Please include a copy of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
(517) 351-2555

PROJECT SUMMARY

Project Code: 2024-0048649
Project Name: FY 2025 Richland Ross Townships Water Main
Project Type: Water Supply Pipeline - New Constr - Below Ground
Project Description: The Kalamazoo water system is proposed to be extended into Richland and Ross Townships. The new water main will be installed within the road right-of-way, and services will be constructed using directional drill technology.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.38180525,-85.40672482813036,14z



Counties: Kalamazoo County, Michigan

ENDANGERED SPECIES ACT SPECIES

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949 General project design guidelines: https://ipac.ecosphere.fws.gov/project/CBIWNRWTXJB7XCTB5Z7W7OT2LA/documents/generated/6982.pdf	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

BIRDS

NAME	STATUS
Whooping Crane *Grus americana* Population: U.S.A. (AL, AR, CO, FL, GA, ID, IL, IN, IA, KY, LA, MI, MN, MS, MO, NC, NM, OH, SC, TN, UT, VA, WI, WV, western half of WY) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/758	Experimental Population, Non-Essential

REPTILES

NAME	STATUS
Eastern Massasauga (=rattlesnake) *Sistrurus catenatus*	Threatened

No critical habitat has been designated for this species.
This species only needs to be considered under the following conditions:

- For all Projects:Project is within Tier1 Habitat
- For all projects:Project is within Tier2 Habitat
- For all Projects: Project is within EMR Range

Species profile: https://ecos.fws.gov/ecp/species/2202
General project design guidelines:
https://ipac.ecosphere.fws.gov/project/CBIWNRWTXJB7XCTB5Z7W7OT2LA/documents/generated/5280.pdf

INSECTS

NAME	STATUS
Mitchell's Satyr Butterfly *Neonympha mitchellii mitchellii*	Endangered

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/8062

Monarch Butterfly *Danaus plexippus*	Candidate

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9743

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider

implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are bald and/or golden eagles in your project area.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

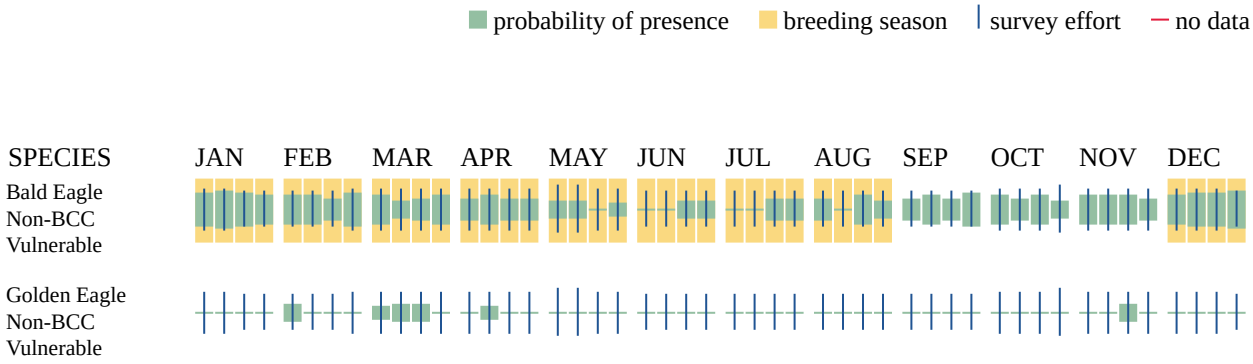
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)

Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover *Pluvialis dominica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10561	Breeds elsewhere
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Black Tern *Chlidonias niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3093	Breeds May 15 to Aug 20
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9454	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9643	Breeds May 20 to Aug 10
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere
Golden-winged Warbler *Vermivora chrysoptera* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20

NAME	BREEDING SEASON
Henslow's Sparrow *Ammodramus henslowii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3941	Breeds May 1 to Aug 31
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Pectoral Sandpiper *Calidris melanotos* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9561	Breeds elsewhere
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9478	Breeds elsewhere
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

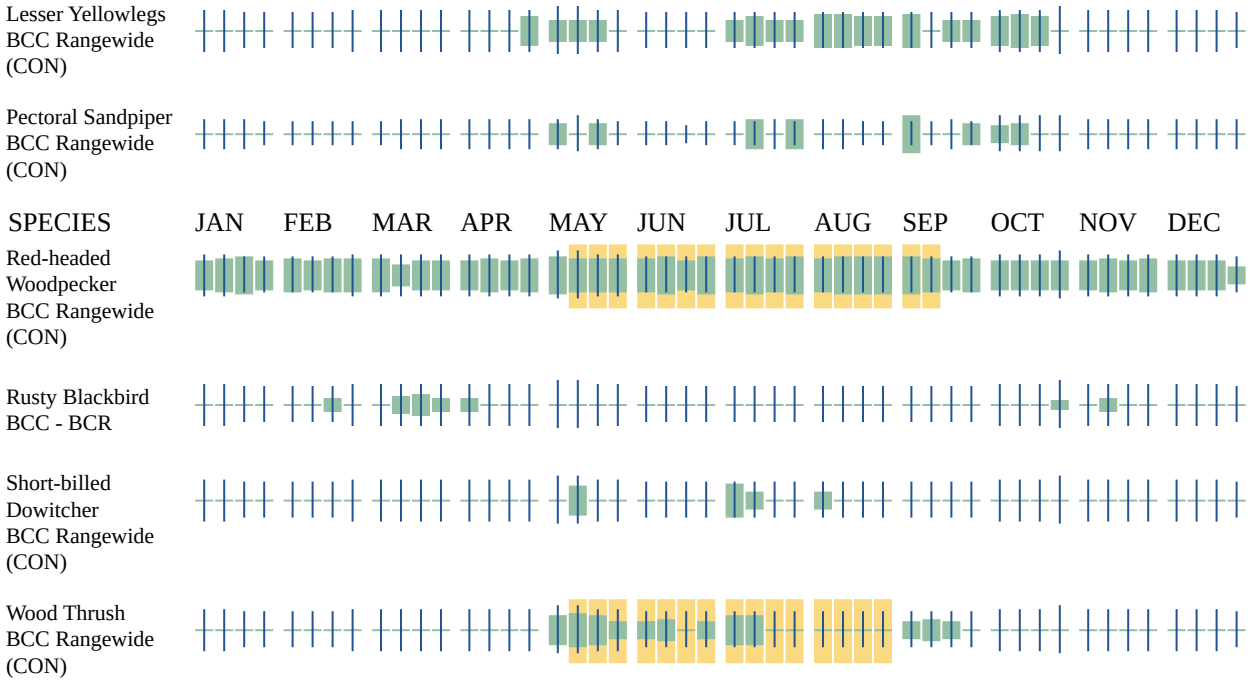
Breeding Season (■)

Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.





Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER POND

- PUBGx

- PABF
- PUBG

FRESHWATER EMERGENT WETLAND
- PEM1F
- PEM1C

FRESHWATER FORESTED/SHRUB WETLAND
- PFO1C

RIVERINE
- R5UBH

IPAC USER CONTACT INFORMATION

Agency: Kalamazoo city
Name: John Standinger
Address: 3355 EVERGREEN DR NE
City: Grand Rapids
State: MI
Zip: 49525
Email jstandinger@preinnewhof.com
Phone: 6163648491

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Michigan Department of Environment, Great Lakes, and Energy
Name: Willard Thomas
Phone: 2693373900

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

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Project information

NAME

FY 2025 Richland Ross Townships Water Main

LOCATION

Kalamazoo County, Michigan



DESCRIPTION

Some(The Kalamazoo water system is proposed to be extended into Richland and Ross Townships. The new water main will be installed within the road right-of-way, and services will be constructed using directional drill technology.)

Local office

Michigan Ecological Services Field Office

(517) 351-2555
(517) 351-1443

2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360

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Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of

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Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Indiana Bat Myotis sodalis Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat Myotis septentrionalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat Perimyotis subflavus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS
Whooping Crane Grus americana No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/758	EXPN

Reptiles

NAME	STATUS
Eastern Massasauga (=rattlesnake) Sistrurus catenatus Wherever found This species only needs to be considered if any of the following conditions apply: • For all Projects:Project is within Tier1 Habitat • For all projects:Project is within Tier2 Habitat • For all Projects: Project is within EMR Range No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2202	Threatened

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Insects

NAME	STATUS
Mitchell's Satyr Butterfly Neonympha mitchellii mitchellii Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8062	Endangered
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

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Bald & Golden Eagles

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds

- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

There are bald and/or golden eagles in your project area.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Dec 1 to Aug 31
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere

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Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

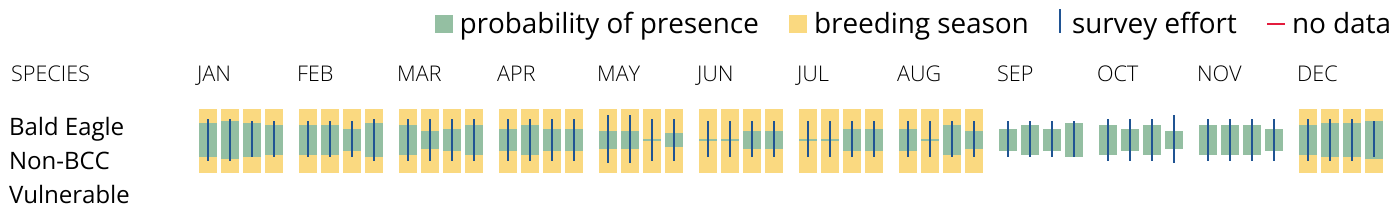
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



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Golden Eagle
Non-BCC
Vulnerable



What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply). To see a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

NOT FOR CONSULTATION

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

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NAME	BREEDING SEASON
American Golden-plover Pluvialis dominica This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Dec 1 to Aug 31

Black Tern Chlidonias niger — Breeds May 15 to Aug 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3093

Black-billed Cuckoo Coccyzus erythropthalmus — Breeds May 15 to Oct 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9399

Bobolink Dolichonyx oryzivorus — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Canada Warbler Cardellina canadensis — Breeds May 20 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Chimney Swift Chaetura pelagica — Breeds Mar 15 to Aug 25
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Golden Eagle Aquila chrysaetos — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Golden-winged Warbler Vermivora chrysoptera — Breeds May 1 to Jul 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8745

Henslow's Sparrow Ammodramus henslowii — Breeds May 1 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3941

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Lesser Yellowlegs Tringa flavipes This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Pectoral Sandpiper Calidris melanotos This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Red-headed Woodpecker Melanerpes erythrocephalus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird Euphagus carolinus This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Short-billed Dowitcher Limnodromus griseus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

NOT FOR CONSULTATION

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

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How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

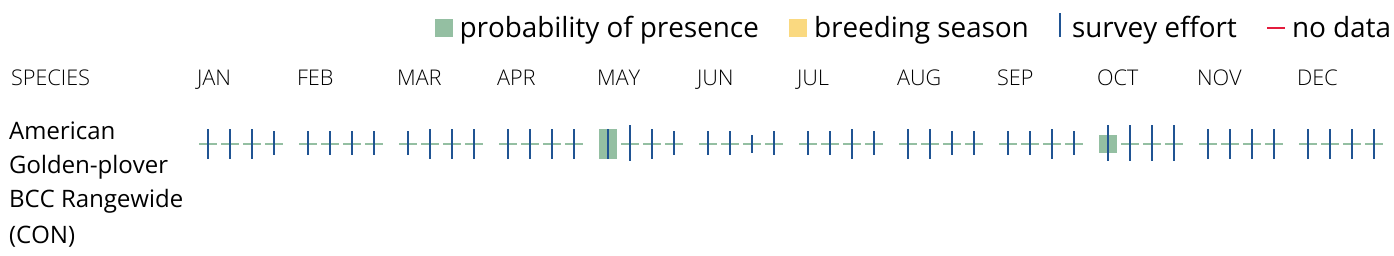
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



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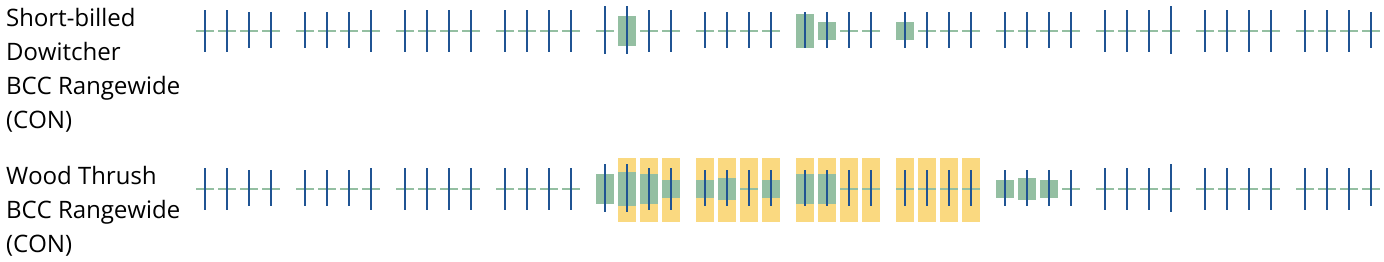

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

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To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of

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presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

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Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

PEM1C
PEM1F

FRESHWATER FORESTED/SHRUB WETLAND

PFO1C

FRESHWATER POND

PUBGx
PUBG
PABF

RIVERINE

R5UBH

A full description for each wetland code can be found at the National Wetlands Inventory website

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

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Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or

submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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Appendix D

Project Costs

City of Kalamazoo
FY2025 DWRF Project Plan
Richland/Ross Water Main Extension

Item	Description	Qty	Unit	UNIT PRICE	TOTAL
1	Mobilization (5% max)	1	LS	$500,800.00	$500,800.00
2	Testing	1	Allowanc	$42,500.00	$42,500.00
3	Traffic Control	1	LS	$463,000.00	$463,000.00
4	Soil Erosion Control	1	LS	$127,000.00	$127,000.00
5	Removal, Curb and Gutter	1,000	LF	$15.00	$15,000.00
6	Removal, Sidewalk	1,000	LF	$10.00	$10,000.00
7	Removal, HMA Roadway	48,000	LF	$22.00	$1,056,000.00
8	Remove and Replace Unsuitable Soil	1,000	CYD	$50.00	$50,000.00
9	Removal, Driveway	260	EA	$350.00	$91,000.00
10	Removal, Tree, 8-18"	1,000	EA	$900.00	$900,000.00
11	Removal, Tree, 19"-24"	500	EA	$2,300.00	$1,150,000.00
12	Removal, Tree, 25"+	200	EA	$3,700.00	$740,000.00
13	Removal, Stump	50	EA	$525.00	$26,250.00
14	Water Main, 8" DI	4,800	LF	$140.00	$672,000.00
15	Water Main, 12" DI	42,000	LF	$235.00	$9,870,000.00
16	Directional drilling	3,200	LF	$1,000.00	$3,200,000.00
17	Water Main, 8" Fitting	50	EA	$1,400.00	$70,000.00
18	Water Main, 12" Fitting	120	EA	$2,200.00	$264,000.00
19	Water Main, 8" Valve and Box	20	EA	$3,500.00	$70,000.00
20	Water Main, 12" Valve and Box	50	EA	$6,900.00	$345,000.00
21	Fire Hydrant	157	EA	$10,000.00	$1,570,000.00
22	Water Main, Air Release Chamber	10	EA	$13,600.00	$136,000.00
23	Water Main, 1-1/4" Service, Short Side	130	EA	$2,500.00	$325,000.00
24	Water Main, 1-1/4" Service, Long Side	130	EA	$3,650.00	$474,500.00
25	Water Main, 1-1/4" Service, Outside of ROW	52,000	LF	$45.00	$2,340,000.00
26	Polyethylene Service Encasement	300	LF	$50.00	$15,000.00
27	Water Main, 2" Service	30,000	LF	$73.00	$2,190,000.00
28	Water Main, 1-1/4" Meter Pit	100	EA	$1,500.00	$150,000.00
29	Water Main, House Service Connection	260	EA	$1,600.00	$416,000.00
30	Water Main, Polyethylene Encasement	46,800	LF	$32.00	$1,497,600.00
31	Auto-Flusher	4	EA	$61,000.00	$244,000.00
32	Restoration, HMA Roadway	48,000	LF	$152.00	$7,296,000.00
33	Restoration, Drive Replacement	260	EA	$3,600.00	$936,000.00
34	Restoration, Turf Over Water Main	28,000	LF	$20.00	$560,000.00
35	Restoration, Landscape Area	40	EA	$7,300.00	$292,000.00
36	Remove and Replace Drive Culvert	50	EA	$1,400.00	$70,000.00
37	Restoration, Concrete Curb and Gutter	1,000	LF	$65.00	$65,000.00
38	Restoration, Sidewalk	1,000	LF	$60.00	$60,000.00
				Construction	$38,299,650.00
				Engineering (15%)	$5,744,947.50
				Contingency (5%)	$1,914,982.50
				TOTAL	**$45,959,580.00**

Appendix E

Public Meeting

NOTICE OF PUBLIC MEETING

City of Kalamazoo, Richland Township, and Ross Township
Potential Public Water Main Extension

The City of Kalamazoo will present the Project Plan for the Fiscal Year 2025 Drinking Water Revolving Fund application for the purpose of receiving comments from interested persons.

The meeting will be held on Monday, April 15, 2024 at 6 p.m. EST at Gracespring Bible Church located at 8643 Gull Rd, Richland, MI 49083.

The purpose of the proposed project is to extend the existing Kalamazoo Area Public Water System in sections of both Richland Township and Ross Township in response to PFAS contamination in some areas of the local groundwater. The project would also extend individual water services to each resident requesting service (or as required due to well contamination) in the project area.

The project will have temporary impacts to individual homes while their water service is installed. There will also be temporary traffic impacts in the areas of work.

The full project plan includes lead service replacements and water treatment upgrades in other areas of the water system. If fully loan funded, the estimate costs to water system customers is expected to be around $11.24 per billing quarter.

The Project Plan document is available for viewing on the City website at www.kalamazoocity.org

Written comments received in writing before the meeting or received verbally during the meeting will receive responses in the final Project Plan. Written comments should be sent to:

Kalamazoo Public Service Department
c/o Department Director
415 East Stockbridge Avenue
Kalamazoo MI 49007

MLive Media Group
169 Monroe Ave NW Suite 200
Grand Rapids, MI 49503

Kalamazoo Gazette

CITY OF KALAMAZOO, ACCOUNTS PAYABLE
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Date	Position	Description	P.O. Number	Ad Size	Costs
04/06/2024	Public Notices MI	NOTICE OF PUBLIC MEETING City of Kalamazoo, Richland Township, and	Sue Borgeson, Prein & Newhof	1 x 79 L	
				Affidavit Notary Fee - 04/06/2024	$10.00
				Basic Ad Charge - 04/06/2024	$101.67
				Total	$111.67

FOR QUESTIONS CONCERNING THIS AFFIDAVIT, PLEASE CALL 616-254-2030 or 877-222-5423

Kalamazoo Gazette

LEGAL AFFIDAVIT

AD#: 0010851213 Total $111.67

State of Michigan,) ss
County of Kalamazoo)

Nancy Block being duly sworn, deposes that he/she is principal clerk of MLive Media Group; that Kalamazoo Gazette is a public newspaper published in the city of Kalamazoo, with general circulation in Kalamazoo county, and this notice is an accurate and true copy of this notice as printed in said newspaper, was printed and published in the regular edition and issue of said newspaper on the following date(s):

Kalamazoo Gazette 04/06/2024

Nancy Block

Principal Clerk of the Publisher

Sworn to and subscribed before me this 15th day of April 2024

Teasha R Payne

Notary Public

TEASHA R. PAYNE
NOTARY PUBLIC, STATE OF MI
COUNTY OF MECOSTA
COMMISSION EXP FEB 24 2026
ACTING IN COUNTY OF Kent

NOTICE OF PUBLIC MEETING
City of Kalamazoo, Richland Township, and Ross Township
Potential Public Water Main Extension

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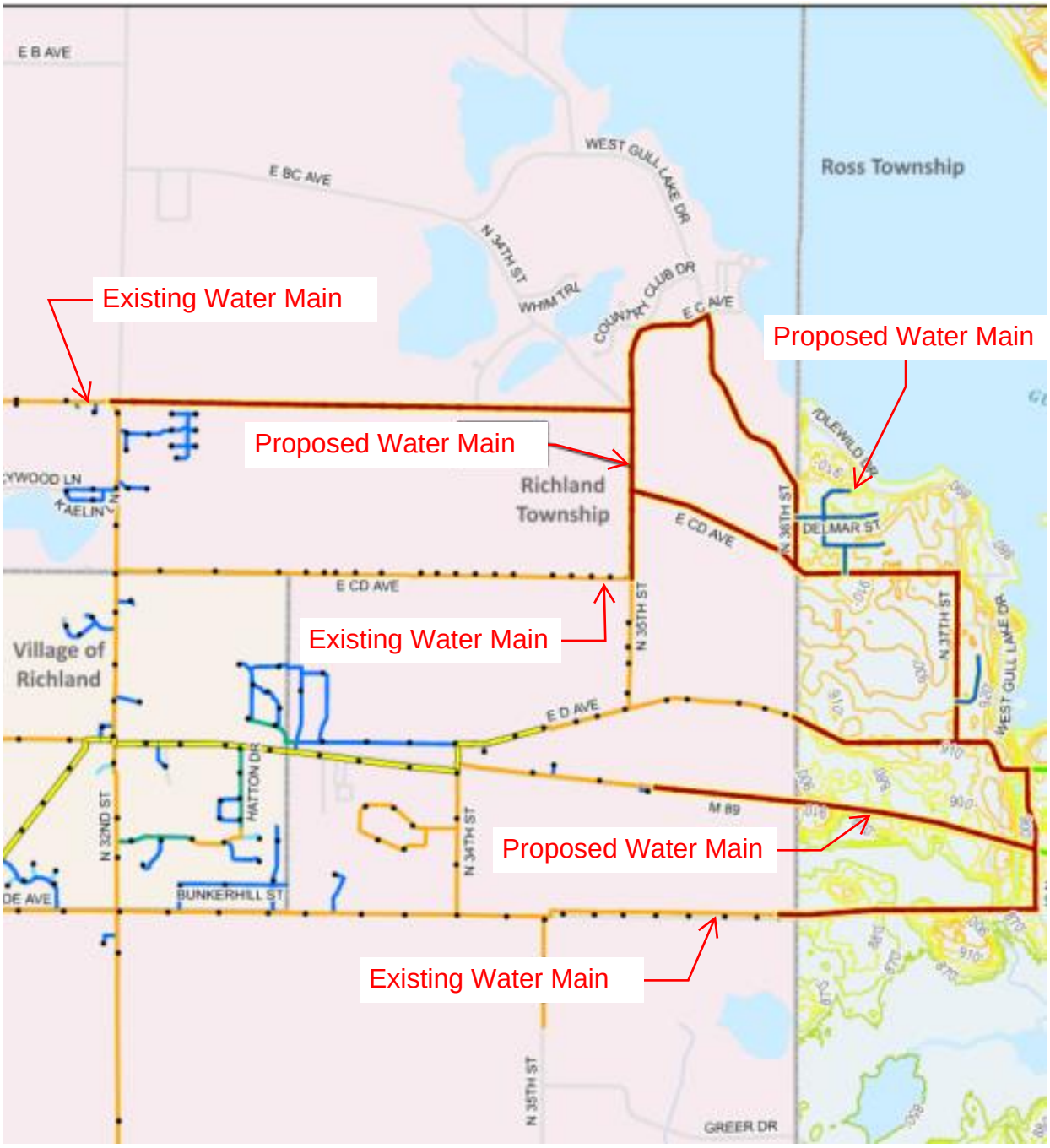
Kalamazoo Public Service
Department
c/o Department Director
415 East Stockbridge Avenue
Kalamazoo MI 49007

City of Kalamazoo Fiscal Year 2025 Drinking Water State Revolving Loan Program

Richland/Ross Public Water Main Extensions

- Purpose of the meeting – April 15, 2025
    - Review and receive comments on the Project Plan which is a funding application to the State of Michigan
- Drinking Water State Revolving Loan Program
    - Low interest loan program to help fund water system projects
    - Competitive process – Often more communities apply than can be funded
    - Targeted Funding – Some portions of the funding are targeted to lead service replacements and contamination response
    - Funding may cover all or portions of the project cost
    - Funding may be in the form of low interest loan, grant or a mix of both
    - Application due May 1, 2024 and a final funding list should be available by September 2024.
- Project Overview
    - Previous public meetings reviewed the discovery of PFAS in the groundwater which is moving eastward from the closed Production Plated Plastics facility on M-89.
    - The proposed project plan includes water main extensions through Richland Township and into Ross Township to make public water available to those impacted by the contamination or those desiring public water.
    - Water services will be installed from the water main to the property line for all existing homes so that service extensions are readily available.
    - For those desiring or needing to connect, water service will be extended from the property line and into the home, with a water meter being set and connection to the existing house plumbing made. At that time, the project will also remove the in-home pressure tank and take care of the well abandonment.
- Project Impacts
    - Watermains are typically placed approximately 10 feet off the edge of the roadway pavement and on either the north or east side of a road. Driveways and lawn areas affected by the open trench installation of the water mains will be repaired/replaced with like materials.
    - Trees within the public right-of-way in the influence of the water main alignment will be removed.
    - There will be travel/access delays in the immediate area of the water main installation crews. Final surface restoration will take place after water main segments have passed both pressure and bacteriological testing.
    - Clean and safe public water will be available once the project is completed.
    - Construction could begin in fall of 2025.
    - Once connected to the public water system, a resident will receive a quarterly water bill.


Existing Water Main
Proposed Water Main
Proposed Water Main
Existing Water Main
Proposed Water Main
Existing Water Main
E B AVE
E BC AVE
WEST GULL LAKE DR
Ross Township
N 34TH ST
WHM TRL
COUNTRY CLUB DR
E C AVE
IDLEWILD DR
Richland Township
E CD AVE
N 36TH ST
DELMAR ST
N 35TH ST
N 37TH ST
WEST GULL LAKE DR
Village of Richland
E D AVE
M 89
N 32ND ST
HATTON DR
N 34TH ST
BUNKERHILL ST
N 35TH ST
GREER DR

City of Kalamazoo FY25 DWSRF

Richland/Ross Water Main Extension Public Meeting

Monday, April 15, 2024 at 6 p.m. EST at Gracespring Bible Church located at 8643 Gull Rd, Richland, MI 49083.

Q: Where are lead service lines proposed for replacement?

A: For this project plan application, the replacements will be in the corporate limits of the City of Kalamazoo.

Q: Who pays for the project?

A: It depends on if and what type of funding is awarded. Once that is decided, the municipal entities will decide if the project will move forward. If the project, or portion thereof is loan, then the loan payments are put into the user rates of everyone in the water system.

Q: Will anyone from the State reach out about the project?

A: No. The purpose of this public meeting is to receive input on the project plan.

Q: Will my taxes be raised to pay for the project?

A: No. If a loan is required, the loan payments will be put into the water use rates.

Q: Where exactly is the PFAS plume?

A: The State of Michigan has done sampling and identified the locations and depths of the PFAS at specific points. The project plan has a map of those points. Any additional or more detailed information would need to come from the State.

Q: What's to stop the Township or City in the future from mandating connections to pay for the project?

A: The Utility Policy Committee, made up of representative from the City and the partner communities, will be the deciding body regarding the project either moving forward and how it is funded.

Q: Will this water main project require additional wells to be drilled for supply?

A: No. Existing wells have enough supply for the projected demand.

Q: What is being done to get closure on the Production Plated Plastics facility?

A: That information would need to come from the State of Michigan as it is not part of this project plan.

Q: Is the City of Kalamazoo pursuing this application on their own?

A: No. The City has been asked by the UPC to prepare this Project Plan because the City has the resources to fund the PP.

Q: Why are we going to put in the water mains and instead use the money for site remediation at Production Plated Plastics?

A: The DWRF funding is for water system work. The State of Michigan is reviewing what remedial action may be taken at the PPP facility.

Q: Is it mandatory that private wells are tested for PFAS.

A: No

Q: Are farm field wells tested?

A: High capacity wells are permitted through the State so testing requirements are dictated by the State and not part of this project.

Q: Is the UPC taking comments on the project from the public?

A: UPC meetings are held at Oshtemo Township hall and those are open to the public.

Q: How many contaminated wells need to be shut down?

A: Current testing coordination between the Health Department and the State indicate around 5 residential wells above current MCLs.

Q: Will this project get grant funding?

A: We don’t know until we apply.

Q: Is Gull Lake Sewer Water Authority involved in this project?

A: GLSWA is part of the UPC and is involved to that extent.

Q: How is the work done so far been funded?

A: The City of Kalamazoo has volunteered to fund the preliminary engineering and the Project Plan preparation.

Q: What is the total project cost?

A: Current cost estimates show $80M for the three project PP, $27M for Richland/Ross portion

Q: Can people put in Reverse Osmosis or stick with carbon filters?

A: The State has decided that filters are not a preferred long term solution.

Appendix F

Project Plan Resolution

CITY OF KALAMAZOO

RESOLUTION NO. _____

A RESOLUTION ADOPTING A FINAL PROJECT PLAN FOR WATER SYSTEM IMPROVEMENTS AND DESIGNATING AN AUTHORIZED PROJECT REPRESENTATIVE

Minutes of a regular meeting of the City Commission of the City held on May 20, 2024, at 7:00 o'clock p.m., local time, at City Hall.

PRESENT, Commissioners:

ABSENT, Commissioners:

WHEREAS, the City of Kalamazoo recognizes the need to make improvements to its existing water treatment and distribution system; and

WHEREAS, the City of Kalamazoo authorized Prein&Newhof, Inc. to prepare a Project Plan, which recommends the extension of public water main in Richland and Ross Townships; and

WHEREAS, said Project Plan was presented at a Public Meeting held on April 15, 2024 and all public comments have been considered and addressed; and

NOW THEREFORE BE IT RESOLVED, that the City of Kalamazoo formally adopts said Project Plan and agrees to implement the extension of public water main in Richland and Ross Townships.

BE IT FURTHER RESOLVED, that the City Engineer, a position currently held by James J. Baker, P.E., is designated as the authorized representative for all activities associated with the project referenced above, including the submittal of said Project Plan as the first step in applying to the State of Michigan for a Drinking Water Revolving Fund Loan to assist in the implementation of the selected alternative.

The above resolution was offered by _____ and supported by_____.
Yeas:

Nays:

I certify that the above Resolution was adopted the City of Kalamazoo on May 20, 2024.

BY: _____
Name and Title *(please print or type)*

_____
Signature Date

SAMPLE

Appendix G

Water Modeling Memorandum

Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

Memorandum

Date:	September 5, 2023
To:	James Baker, P.E.
Company:	City of Kalamazoo – Department of Public Services
From:	Julie Feria, P.E.
Project #:	2180076
Re:	Model Analysis for Proposed Transmission and Distribution Main Extensions in Richland and Ross Townships

Purpose

The City of Kalamazoo's water distribution system hydraulic model was used to analyze projected pressures, available fire flow, and water age for a proposed water main extension in Richland and Ross Townships. This water main extension is intended to expand the municipal drinking water supply to properties with groundwater wells that could be impacted by PFAS contamination.

The proposed water main extension is in the East Side High pressure district and is shown in Figure 1. Transmission and distribution main between North 37th Street and the existing Richland Township water distribution system was modeled as "Phase 1", and includes five connection points to existing 12-inch water main. An additional transmission loop west of North 37th Street through Yorkville to the intersection of North 40th Street and M-89 was modeled as "Phase 2".

Model Development

The proposed water main was added to the City of Kalamazoo's InfoWater model as future pipe in two phases. The proposed water main was split every 300 feet to allow for analysis of available hydrant flow and system pressures along the proposed water main. The USGS 1-meter digital elevation model was used to assign elevations to new model nodes.

Current Demands

Potential new customers along the proposed water main extension route were divided into two categories: Current and Buildout. Existing homes and businesses along the proposed water main extension were incorporated into the model as current demands, and were modeled as existing demands in the proposed scenarios. Houses were counted as 1 Residential Equivalence Unit (REU), and other structures were assigned an estimated REU based on size and function.

Buildout Demands

Vacant parcels adjacent to the proposed water main extension were counted as future buildout customers. The zoning category for each parcel and the minimum lot size in the

zoning ordinance for Richland and Ross Townships was used to estimate an REU per acre for each vacant parcel. Zoning categories predicted a higher customer demand than Future Land Use categories, and therefore were used for estimating future buildout demands. For the buildout demand scenarios, the existing Kalamazoo distribution system was modeled using the 20-year projected demands from the 2017 Water System Reliability Study.

Demand Assumptions

Using an estimated 210 gallons per day per REU of average day water use, and an assumed maximum day demand multiplier of 2.5 times the average day demand, the demands from current structures and potential buildout were determined as shown in Table 1. Demands from each parcel were assigned to the closest model node.

Table 1. Estimated Demands from Current Structures and Future Buildout

	Current Demand (gpm)		Buildout Demand (gpm)	
Township and Phase	**ADD**	**MDD**	**ADD**	**MDD**
Richland Township (Phase 1)	11	27	122	306
Ross Township (Phase 1)	27	69	67	168
Ross Township (Phase 2)	16	39	101	252
Total Demand (Phase 1)	38	95	190	474
Total Demand (Phases 1 & 2)	54	135	291	727

Notes:
1. Richland Township REU per acre assumptions based on zoning are as follows: A-Single Family Residential (3.5 REUs/acre), A-1 (1 REU/acre), B-1 (11 REUs/acre), D (3.5 REUs/acre).
2. Ross Township REU per acre assumptions based on zoning are as follows: R-R (1 REU/acre), R-1 (2.5 REUs/acre), R-2 (3 REUs/acre), R-3 (5.5 REUs/acre), C-1 (3.5 REUs/acre), A (0 REUs/acre).

Hydraulic Analysis Assumptions

Pressures at the connection points and within the proposed development were modeled under steady state average day demand and maximum day demand conditions. Tanks were assumed to be at 5 feet below full for the steady state pressure and available fire flow scenarios. Available fire flows were modeled assuming maximum day demand conditions. Water age was modeled using average day demand conditions.

Modeled Scenarios

The proposed water main extension was modeled using both existing and projected future demands to analyze system pressures and available fire flow. The system was modeled both with and without the additional Yorkville transmission loop (Phase 2), and with and without the 33rd Street High / East Side High water main connection in place.

Water age was also modeled to estimate the impact of new transmission main with potentially low water demands on water age and therefore water quality.

Model Results

Pressure

Tables 2 and 3 provide the model results for average day and maximum day pressures at select nodes with the proposed water main extensions in place. Existing system pressures are also shown for comparison. Average day pressures in the proposed system range from 45 to 74 psi under current demand conditions, and maximum day pressures range from 44 to 73 psi. A map of maximum day pressures is provided in Figure 2.

Under buildout maximum day demand conditions, the minimum pressure drops to 41 psi at the high elevation point along West Gull Lake Road. As demands increase in Richland and Ross Townships and throughout the Kalamazoo distribution system, improvements in pumping capacity and/or transmission may be needed to maintain normal operating pressures above 35 psi both in the proposed main and in the existing system serving the Village of Richland.

The model results show that system pressures in the proposed system are adequate under current conditions. In addition, the proposed transmission main extension had a negligible impact on the existing filling and emptying rate of the Gull Road Tank.

Table 2. Average Day Pressure at Select Locations

Node ID	Location	Municipality	Existing System	Current Demands (Phase 1)	Current Demands (Phase 2)	Buildout Demands (Phase 1)	Buildout Demands (Phase 2)
J15238	N 32nd St. & E D Ave.	Village of Richland	46	46	46	45	45
J16580	N 30th St. & E C Ave.	Village of Richland	46	46	46	46	46
J14990	N 30th St. & Gull Rd.	Richland Twp.	52	52	52	52	52
J15182	M-89 existing dead end	Richland Twp.	59	59	59	58	58
J16902	E D Ave. existing dead end	Richland Twp.	59	59	59	59	59
J16904	N 35th St. & E CD Ave.	Richland Twp.	49	49	49	49	48
J15350	N 32nd St. & E C Ave.	Richland Twp.	42	42	42	41	41
J16544	E DE Ave. existing Dead end	Richland Twp.	73	73	73	73	73
J16982	E C Ave. & West Gull Lake Dr.	Richland Twp.	*NA*	55	55	55	55
J17106	Merrimac St. dead end	Ross Twp.	*NA*	64	64	64	63
J17108	Delmar St. dead end	Ross Twp.	*NA*	62	62	61	61
J17110	Littlefield Ave. dead end	Ross Twp.	*NA*	48	48	47	47
J17112	N 37th St. & E CD Ave.	Ross Twp.	*NA*	47	47	47	46
J17146	N 37th St & E D Ave. (East)	Ross Twp.	*NA*	58	58	58	58
J16912	N 37th St. & M89	Ross Twp.	*NA*	60	60	60	60
J16930	Lake Vista Dr. dead end	Ross Twp.	*NA*	48	48	48	47
J17268	E D Ave. between 39th St. & 40th St.	Ross Twp.	*NA*	*NA*	50	*NA*	50
J17070	West Gull Lake Drive high elevation point	Richland Twp.	*NA*	45	45	45	45
J17124	N 37th Street high elevation point	Ross Twp.	*NA*	46	46	46	45
J17214	E DE Ave. low elevation point	Ross Twp.	*NA*	74	74	74	74

Notes:

1. Average day demand conditions were modeled both with and without the 33rd Street transmission main in service. The difference in pressures with the main in service and out of service was negligible.
2. For future buildout demand scenarios, no water main, booster station, or pump station improvements in the remainder of the distribution system were included in the simulation.

Table 3. Maximum Day Pressure at Select Locations

Node ID	Location	Municipality	Existing System	Current Demands (Phase 1)	Current Demands (Phase 2)	Buildout Demands (Phase 1)	Buildout Demands (Phase 2)
J15238	N 32nd St. & E D Ave.	Village of Richland	45	45	45	43	42
J16580	N 30th St. & E C Ave.	Village of Richland	46	46	46	44	43
J14990	N 30th St. & Gull Rd.	Richland Twp.	52	52	52	51	50
J15182	M-89 existing dead end	Richland Twp.	58	58	58	56	55
J16902	E D Ave. existing dead end	Richland Twp.	58	58	58	56	55
J16904	N 35th St. & E CD Ave.	Richland Twp.	48	48	48	46	45
J15350	N 32nd St. & E C Ave.	Richland Twp.	41	41	41	39	38
J16544	E DE Ave. existing Dead end	Richland Twp.	73	72	72	70	69
J16982	E C Ave. & West Gull Lake Dr.	Richland Twp.	*NA*	54	54	53	52
J17106	Merrimac St. dead end	Ross Twp.	*NA*	63	63	61	60
J17108	Delmar St. dead end	Ross Twp.	*NA*	61	61	59	58
J17110	Littlefield Ave. dead end	Ross Twp.	*NA*	47	47	45	44
J17112	N 37th St. & E CD Ave.	Ross Twp.	*NA*	46	46	44	43
J17146	N 37th St & E D Ave. (East)	Ross Twp.	*NA*	57	57	55	54
J16912	N 37th St. & M89	Ross Twp.	*NA*	60	60	58	57
J16930	Lake Vista Dr. dead end	Ross Twp.	*NA*	47	47	45	44
J17268	E D Ave. between 39th St. & 40th St.	Ross Twp.	*NA*	*NA*	49	*NA*	42
J17070	West Gull Lake Dr. high elevation point	Richland Twp.	*NA*	44	44	42	41
J17124	N 37th St. high elevation point	Ross Twp.	*NA*	45	45	43	42
J17214	E DE Ave. low elevation point	Ross Twp.	*NA*	73	73	72	70

Notes:

1. Maximum day demand conditions were modeled both with and without the 33rd Street transmission main in service. The difference in pressures with the main in service and out of service was at most 1 psi lower with the 33rd Street Transmission Main in service.
2. For future buildout demand scenarios, no water main, booster station, or pump station improvements in the remainder of the distribution system were included in the simulation.

Available Fire Flow

Available fire flow results are provided in Table 4 for select nodes and mapped in Figure 3 for all hydrant locations. Fire flows range from 1,500 gpm at the proposed 8-inch dead end of Lake Vista Drive to 3,300 gpm at N 37th Street and M-89, assuming all 12-inch transmission main.

Table 4. Available Fire Flow at Select Locations

Node ID	Location	Municipality	Existing System	Current Demands (Phase 1)	Current Demands (Phase 2)	Buildout Demands (Phase 1)	Buildout Demands (Phase 2)
J15238	N 32nd St. & E D Ave.	Village of Richland	4,180	4,080	4,040	3,080	2,840
J16580	N 30th St. & E C Ave.	Village of Richland	2,640	2,760	2,740	2,230	2,110
J14990	N 30th St. & Gull Rd.	Richland Twp.	6,550	6,460	6,410	5,160	4,880
J15182	M-89 existing dead end	Richland Twp.	2,470	3,430	3,420	2,870	2,630
J16902	E D Ave. existing dead end	Richland Twp.	2,620	3,460	3,440	2,710	2,480
J16904	N 35th St. & E CD Ave.	Richland Twp.	2,980	3,370	3,340	2,630	2,420
J15350	N 32nd St. & E C Ave.	Richland Twp.	2,420	2,800	2,780	2,190	2,040
J16544	E DE Ave. existing Dead end	Richland Twp.	2,040	3,050	3,030	2,500	2,340
J16982	E C Ave. & West Gull Lake Dr.	Richland Twp.	*NA*	2,850	2,830	2,300	2,140
J17106	Merrimac St. dead end	Ross Twp.	*NA*	2,010	2,000	1,840	1,790
J17108	Delmar St. dead end	Ross Twp.	*NA*	1,900	1,890	1,740	1,690
J17110	Littlefield Ave. dead end	Ross Twp.	*NA*	1,630	1,630	1,450	1,380
J17112	N 37th St. & E CD Ave.	Ross Twp.	*NA*	2,880	2,860	2,350	2,180
J17146	N 37th St & E D Ave. (East)	Ross Twp.	*NA*	3,360	3,320	2,680	2,460
J16912	N 37th St. & M89	Ross Twp.	*NA*	3,420	3,370	2,780	2,520
J16930	Lake Vista Dr. dead end	Ross Twp.	*NA*	1,530	1,530	1,370	1,300
J17268	E D Ave. between 39th St. & 40th St.	Ross Twp.	*NA*	*NA*	2,350	*NA*	1,860

Notes:

1. Available fire flow was modeled with maximum day demands, tanks at 5 feet below full, and with a minimum residual pressure of 20 psi.
2. Available fire flows were modeled both with and without the 33rd Street transmission main in service. The difference in available fire flows with the main in service and out of service was at most 3% lower with the 33rd Street Transmission Main in service.
3. For future buildout demand scenarios, no water main, booster station, or pump station improvements in the remainder of the distribution system were included in the simulation.
4. Available fire flow values are color coded using the following groups: 1,000 gpm to 1,999 gpm; 2,000 to 3,499 gpm; greater than 3,500 gpm.

Water Age

Water age results are provided in Table 5. Water age is simulated based on current, automated operations. It does not account for changes in operation, and it has not been calibrated to data which can represent water age, such as chlorine residual concentrations in the distribution system. The age data in Table 5 provides a comparison between different scenarios and can illustrate which locations are more susceptible to higher water age. The model results show that the transmission main extension does not have a significant impact on water age in the existing distribution system, except at the existing transmission main dead ends on E D Avenue and E DE Avenue, where water age is significantly improved.

Transmission Main Sizing Analysis

Smaller transmission main reduces the volume of the water system and therefore reduces overall water age and improves water quality. Additional analysis was performed with 8-inch water main on M-89 between the existing system and North 37th Street and on West Gull Lake Drive between East C Avenue and East CD Avenue. Available fire flows remain above 1,500 gpm at all locations in the Existing Demands (Phase 2) scenario. Table 6 shows the available fire flow comparison with the reduced water main diameter at select nodes.

The water age analysis shown in Table 5 illustrates that reducing the proposed water main size on on M-89 between the existing system and North 37th Street and on West Gull Lake Drive between East C Avenue and East CD Avenue does not have a significant impact on water age in the Richland and Ross Township distribution system. Smaller diameter water main will reduce the overall age of the water system, but the model simulations show the impact within the proposed transmission area is not significant.

Table 5. Modeled Water Age (Days) at Select Locations

Node ID	Location	Municipality	Existing System	Current Demands (Phase 1) without 33rd St. Transmission	Current Demands (Phase 1) with 33rd St. Transmission	Current Demands (Phase 1) with 33rd St. Transmission and Reduced Main Size[2]
J15238	N 32nd St. & E D Ave.	Village of Richland	12	11	12	12
J16580	N 30th St. & E C Ave.	Village of Richland	12	11	12	12
J14990	N 30th St. & Gull Rd.	Richland Twp.	11	10	11	11
J15182	M-89 existing dead end	Richland Twp.	12	11	8	9
J16902	E D Ave. existing dead end	Richland Twp.	85	9	10	11
J16904	N 35th St. & E CD Ave.	Richland Twp.	12	10	12	9
J15350	N 32nd St. & E C Ave.	Richland Twp.	13	23	23	24
J16544	E DE Ave. existing Dead end	Richland Twp.	61	5	4	13
J16982	E C Ave. & West Gull Lake Dr.	Richland Twp.	*NA*	17	14	14
J17106	Merrimac St. dead end	Ross Twp.	*NA*	20	22	21
J17108	Delmar St. dead end	Ross Twp.	*NA*	20	17	20
J17110	Littlefield Ave. dead end	Ross Twp.	*NA*	24	20	22
J17112	N 37th St. & E CD Ave.	Ross Twp.	*NA*	14	11	12
J17146	N 37th St & E D Ave. (East)	Ross Twp.	*NA*	12	11	10
J16912	N 37th St. & M89	Ross Twp.	*NA*	10	11	13
J16930	Lake Vista Dr. dead end	Ross Twp.	*NA*	18	17	17

Notes:

1. Water age was modeled with existing average day demands and current system pump and tank controls.
2. See description of modeled water main sizing alternative in the next section: Transmission Main Sizing Analysis. The proposed 12-inch transmission on M-89 between the existing system and N 37th Street and on West Gull Lake Drive was modeled as 8-inch main to determine the impact on available fire flow and water age.
3. Water age has not been calibrated or compared to chlorine residual data. Age results should only be used for comparison between scenarios and to identify potential problem areas.

Table 6. Available Fire Flow at Select Locations with Less Transmission Main

Node ID	Location	Municipality	Current Demands (Phase 2) – All 12"	Current Demands (Phase 2) – 8" on West Gull Lake Dr. and M-89	Available Fire Flow Change in gpm (% Change)
J15182	M-89 existing dead end	Richland Twp.	3,390	2,880	510 (15%)
J16902	E D Ave. existing dead end	Richland Twp.	3,400	3,310	90 (3%)
J16904	N 35th St. & E CD Ave.	Richland Twp.	3,310	3,290	20 (1%)
J15350	N 32nd St. & E C Ave.	Richland Twp.	2,750	2,740	10 (0%)
J16544	E DE Ave. existing Dead end	Richland Twp.	3,000	2,950	50 (2%)
J16982	E C Ave. & West Gull Lake Dr.	Richland Twp.	2,790	2,530	260 (9%)
J17106	Merrimac St. dead end	Ross Twp.	1,990	1,920	70 (4%)
J17108	Delmar St. dead end	Ross Twp.	1,880	1,820	60 (3%)
J17110	Littlefield Ave. dead end	Ross Twp.	1,610	1,580	30 (2%)
J17112	N 37th St. & E CD Ave.	Ross Twp.	2,830	2,750	80 (3%)
J17146	N 37th St & E D Ave. (East)	Ross Twp.	3,290	3,090	200 (6%)
J16912	N 37th St. & M89	Ross Twp.	3,340	3,100	240 (7%)
J16930	Lake Vista Dr. dead end	Ross Twp.	1,510	1,500	10 (1%)
J17268	E D Ave. between 39th St. & 40th St.	Ross Twp.	2,330	2,250	80 (4%)

Notes:

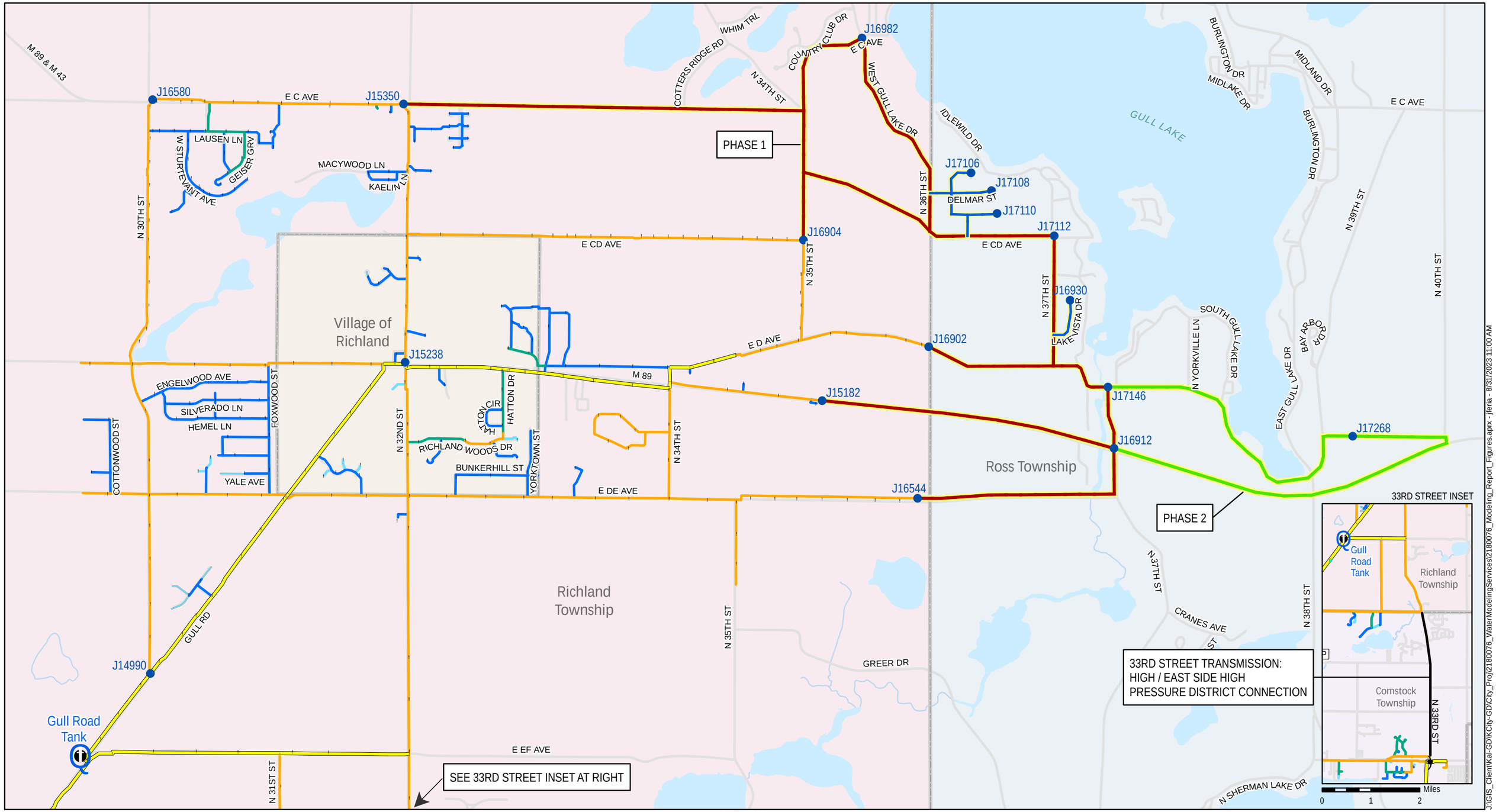
1. Available fire flow was modeled with maximum day demands, tanks at 5 feet below full, and with a minimum residual pressure of 20 psi.
2. Available fire flows in this table were modeled with the 33rd Street transmission main in service.

Conclusions

Under existing demand conditions, pressures are maintained above 44 psi in the proposed system extension, and available fire flows are above 1,500 gpm at all locations. The addition of the Phase 2 water main loop through Yorkville has a negligible impact on pressures and available fire flow.

Future buildout demand scenarios show pressures dropping to 38 psi in the existing Richland Township system and 41 psi in the proposed system extension. As demands increase, pressures should be monitored and improvements to the pumping capacity or transmission capacity of the water distribution system should be considered to maintain normal operating pressures above 35 psi. Available fire flows are maintained above 1,000 gpm at all locations in the proposed system extension under future demands.

Water age at the existing dead end mains is improved with the proposed transmission extension, although the overall age of water in the distribution system as a whole will increase if additional demands are smaller than the added volume of the new transmission main.



LEGEND

Select Model Node

Proposed Water Main (Phase 1)
- 8"
- 12"

Proposed Water Main (Phase 2)
- 12"

Existing Water Main
- 4" and Smaller
- 6"
- 8"
- 10"
- 12"
- 16"
- 20"
- 24"
- 30"

Existing Hydrant

Bleeder Station

Miles
0 0.25 0.5 0.75 1

CITY OF KALAMAZOO
KALAMAZOO COUNTY, MICHIGAN

FIGURE 1: PROPOSED WATER MAIN EXTENSION

SEPTEMBER 2023

Prein&Newhof

2180076

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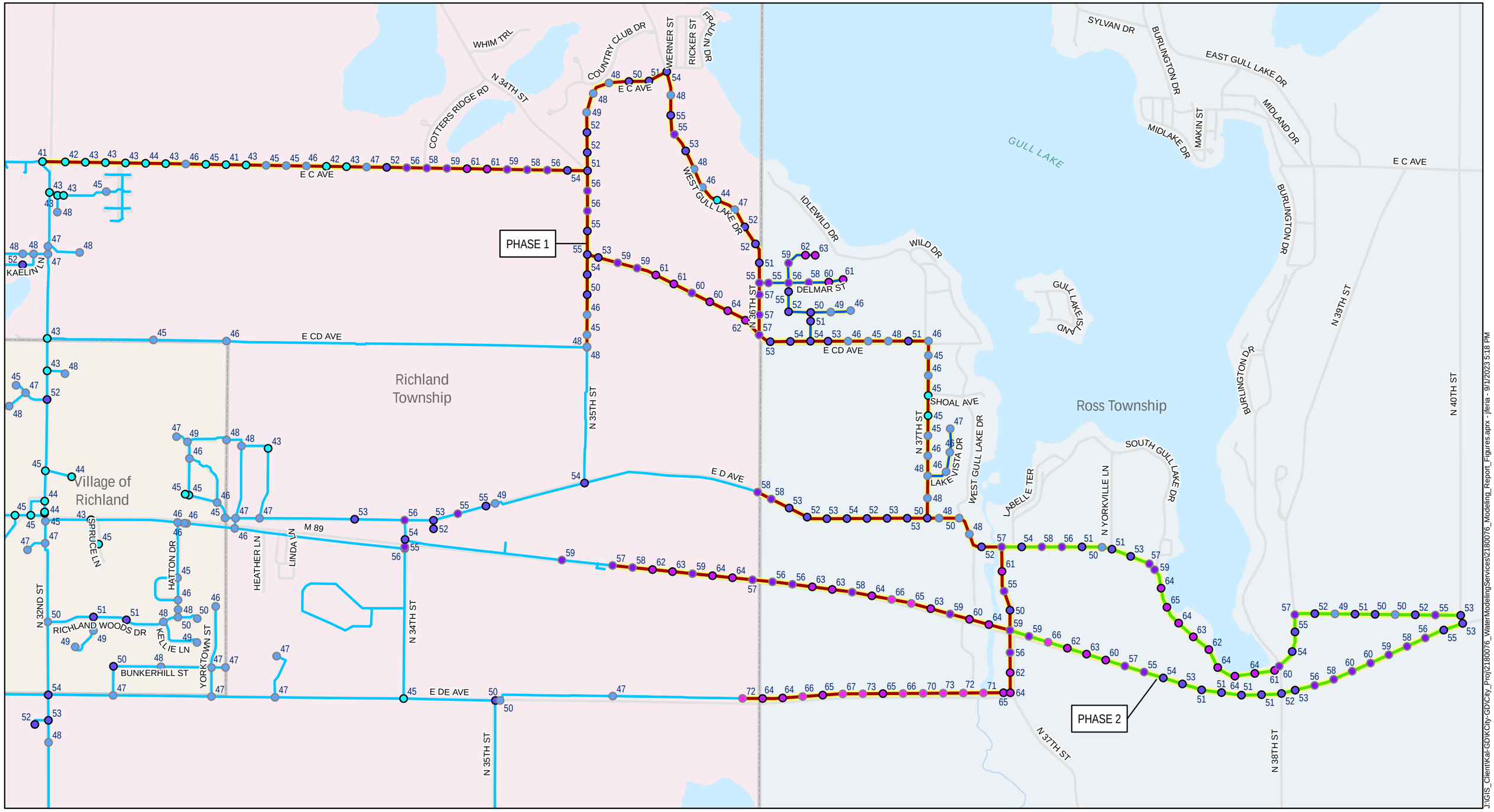

LEGEND

Maximum Day Pressure at Model Nodes

- 40 to 45 psi
- 45 to 50 psi
- 50 to 55 psi
- 55 to 60 psi
- 60 to 65 psi
- 65 to 80 psi

Proposed Water Main (Phase 1)

- 8"
- 12"

Proposed Water Main (Phase 2)

- 12"

Existing Water Main

0 1,000 2,000 3,000 4,000 Feet

CITY OF KALAMAZOO
KALAMAZOO COUNTY, MICHIGAN

FIGURE 4: MODELED PRESSURE

SEPTEMBER 2023

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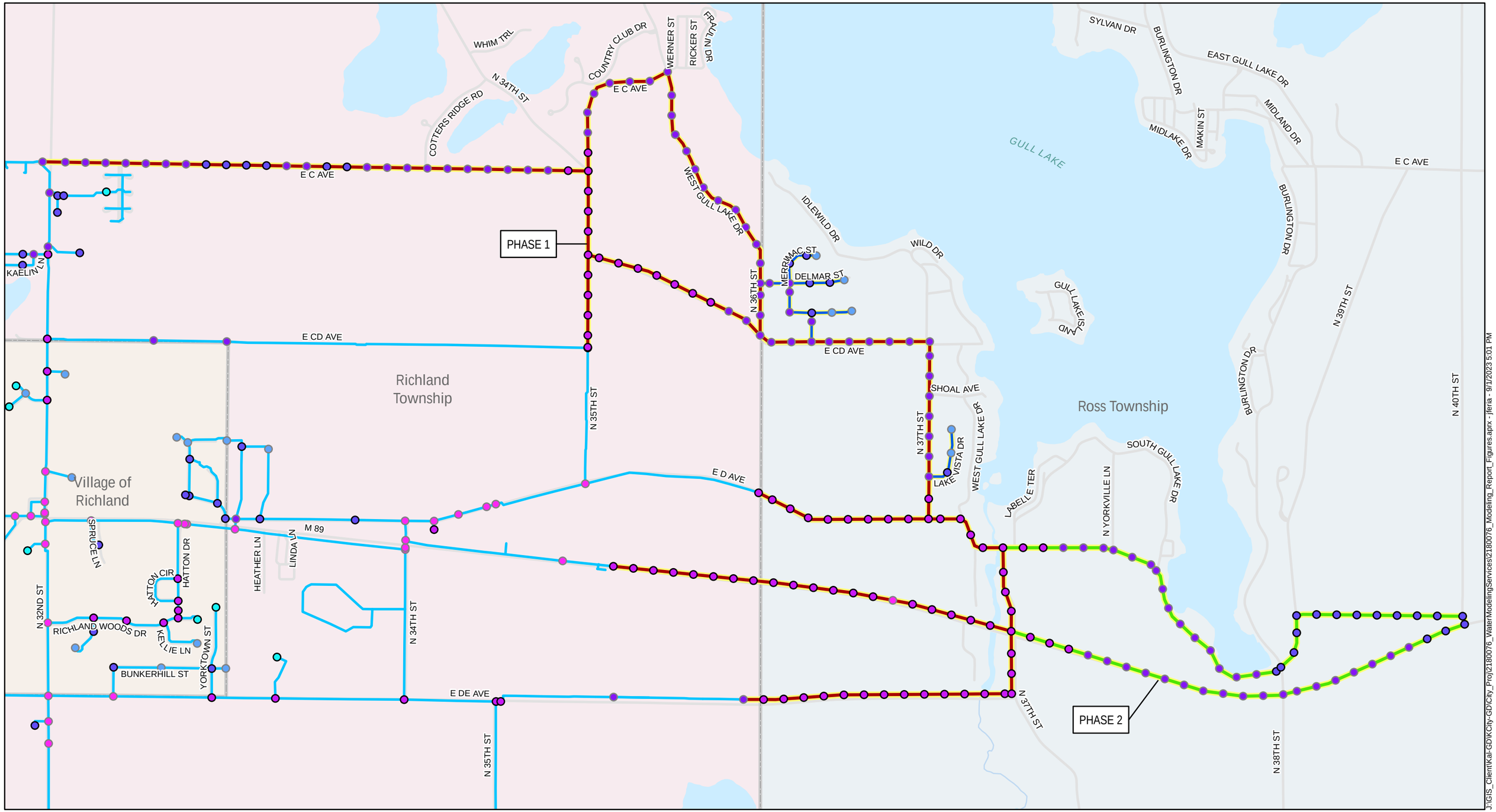

LEGEND

Available Fire Flow at Model Nodes

- Less than 1,500 gpm
- 1,501 to 2,000 gpm
- 2,001 to 2,500 gpm
- 2,501 to 3,000 gpm
- 3,001 to 3,500 gpm
- Greater than 3,500 gpm

Proposed Water Main (Phase 1)

- 8"
- 12"

Proposed Water Main (Phase 2)

- 12"

Existing Water Main

0 1,000 2,000 3,000 4,000 Feet

CITY OF KALAMAZOO
KALAMAZOO COUNTY, MICHIGAN

FIGURE 3: MODELED AVAILABLE FIRE FLOW

SEPTEMBER 2023

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Appendix H

Environmental Corridor Memorandum

Prein&Newhof
Engineers ▪ Surveyors ▪ Environmental ▪ Laboratory

Memorandum

Date:	March 29, 2024
To:	Mr. John Standinger and Mr. Brian Vilmont, P.E.
Company:	Prein&Newhof
From:	Tim Woodburne, CPG and Chris Cruickshank, P.E.
Project #:	2230982 – Ross Township Water Main
Re:	Environmental Corridor Study – Ross Township Water Main

1 INTRODUCTION

The purpose of this Environmental Corridor Study is to determine if known sites of environmental contamination exist along or in the vicinity of the construction area for water main proposed in Ross Township located west of Gull Lake. The Environmental Corridor Study has two main components that include a site visit along the proposed route to view adjacent sites from the road right-of-way, and a search of environmental sites of known or suspected environmental contamination on the Michigan Environmental Mapper maintained by the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The environmental sites identified were evaluated to determine the potential environmental impact to the proposed Project. The preliminary construction location is shown on maps in Appendix A.

2 SITE VISIT

Adjacent properties were reviewed by driving with occasional walking along the proposed route on March 12, 2024. Photographs were taken as the survey progressed with selected photographs included in Appendix B.

The site visit began at the south end of project near address 10921 East DE Avenue at the west end of East DE Avenue and proceeded east to N 37 Street. This area had wooded land and occasional residences and some farmland.

The visit proceeded north along N 37 Street to M-89 and this section had residences on the west side of the street and vacant wooded land on the east side of the street.

The portion of the project along M-89 was mostly vacant land and two residences at the west end of M-89 at the west end of the project.

The section along N 37 Street north of M-89 to E D Avenue had residential homes.

The Project turns west on E D Avenue from N 37th Street and extends over Gull Creek, then turns north and then turns west at the intersection of West Gull Lake Drive. At this intersection Mac's Garage, an automotive repair shop, was observed at the address of 11574 E D Avenue. As shown below this site is a closed UST site. A pump dispenser island presumably for the closed USTs was observed between the building and the road, as shown in the photographs. Review of the UST closure documents is included below because this site is adjacent to the project.

The inspection continued along East D Avenue to approximately the address of 10876 East D Avenue. This section of the project is entirely residential parcels.

At N 37th Street the Project turns north from E D Avenue to E CD Avenue. A church was observed on the northeast corner of N 37th Street at E D Avenue. Agricultural land is along the west side of the street and residential homes are along the east side of the street. The north end of the street has residences on both sides of the street.

E CD Avenue from N 37 Street to N 35 Street had residential parcels and vacant land. A residence at the address of 11272 E CD Avenue had orchards on the east and west sides of the house. Fruit orchards are an environmental concern due to the potential for the application of the spray known as lead-arsenate, which is no longer allowed to be used. Given that the project will be in the road right of way the impact from the orchards is not expected.

N 36 the Street north of E CD Avenue becomes West Gull Lake Drive and extends north to E C Avenue. The area is entirely residential.

E C Avenue to N 32nd Street has agricultural land and residential parcels, and no environmental issues were identified.

N 35 Street extends south from E C Av to E CD Avenue and has agricultural and residential parcels. A farm with cattle is located at the northwest corner of E CD Avenue and N 35 Street.

3 ENVIRONMENTAL MAPPER REVIEW

Sites of known or suspected contamination on the EGLE Environmental Mapper were reviewed to identify sites along or within the vicinity of the Project. The map from Environmental Mapper identifying the environmental sites is shown in Appendix C. The sites labeled as "Closed USTs" and Closed LUST are not expected to have a direct environmental impact on the Project. A UST site adjacent to the project is reviewed as noted below. The BEA site and open LUST east of the project are not expected to have a direct environmental impact based on the distance of greater than ½ mile and their location adjacent to Gull Lake where the groundwater flow would be expected to be toward Gull Lake or away from the Project. Only one site with a restrictive covenant was located within the Village of Richland boundary and this site was not included in the review due to the distance of greater than 1/2 mile from the project. The remaining sites within approximately one to the west of the Project were reviewed. The sites reviewed are tabulated below with summaries following for these sites.

Summary of Environmental Sites Reviewed

Database Listed	*Site Name and Address*	*Location relative to the Project*
Part 201 MPART	North 34th Street - MPART Production Plated Plastics 9899 E D Ave	Address located approximately 3/4 mile west-northwest of Project at M-89
BEA and Part 201	145 Acres of Agricultural Land north of M-89 and west of N 32nd Street	1/4 – 1/2 mile west of E C Ave and N 32nd Street intersection
BEA	9776 E D Ave	Approximately 0.9 mile west of Project at M-89

Database Listed	*Site Name and Address*	*Location relative to the Project*
BEA and Part 201	Gull Lake Community Schools 9724 - 9766 East M-89	Approximately 0.9 Miles west of the project
BEA and Part 201	Village Laundry 7800 N. 34th Street	Approximately 1/2 Miles west of the project
BEA and Part 201	Gull Lake Animal & Boarding 7820 North 34th Street	Approximately 1/2 Miles west of the project
UST – Closed	Mac's Automotive 11574 E D Ave	South side of D Avenue at Gull Lake Road
UST – Closed	Gilmore Enterprises Farm 7966 E C Ave	Site is miss plotted on EGLE Mapper – actual location is ± 1.1 miles west of Project at E C Ave.

MPART Site – North 34th Street, Production Plated Plastics, 9899 East D Avenue

The Michigan PFAS Action Response Team (MPART) has included the Production Plated Plastics site in a larger area being investigated known as North 34th Street. This is the only MPART site in the area of the Project as shown on the MPART Map in Appendix C. A request under FOIA was made for the most up-to-date information and the information was provided on March 22, 2024.

Production Plated Plastics manufactured painted and chrome-plated plastic parts primarily for the automotive industry. Production Plated Plastics operated at this address from approximately 1966 until bankruptcy in 1991. Historic releases of waste treatment and process solutions into the facility subsurface soils has resulted in elevated concentrations of hexavalent chromium (Cr VI) and nickel in soil and groundwater.

Chlorinated volatile organic compounds were identified in 1985 in the area and determined to be originating from Production Plated Plastics as well as the Village Cleaners site, a dry-cleaning business. The groundwater flow direction was determined to be east-southeasterly generally toward the proposed Project. The heavy metals nickel and hexavalent chromium were delineated to the east of the proposed Project.

In the 1980s, the Production Plated Plastics started operating a groundwater extraction and treatment system. Municipal water was extended to the Production Plated Plastics area in 1988 and the water wells were abandoned after connecting to the municipal water. In 1991 Production Plated Plastics declared bankruptcy, so the State of Michigan took over the environmental response activities.

Polyfluoroalkyl substances (PFAS) were discovered from this site in April 2018 from a surface water investigation when a sample was collected from an Industrial Pretreatment Program a.k.a. "IPP" sample from an extraction well designed to capture the chromium and nickel plumes in the shallow and deep aquifers at the site. The extraction system was permitted to discharge to the City of Kalamazoo Water Reclamation plant. The sample detected 9,640 ng/L perfluorooctanesulfonic acid (PFOS) in the discharge sample. After this sample result, an emergency PFAS treatment system consisting of granulated activated

carbon (GAC) was installed and started operating by July 31, 2018 with the treated water discharged to the publicly owned Kalamazoo Water Reclamation Plant.

As a result, additional remedial investigation phases have been conducted by EGLE including soil and groundwater investigations, surface water sampling, and residential well sampling. Other than an incremental sampling report of soil sampling at the PPP site, no other reports of the PFAS results were provided. Several draft maps and cross sections from the investigations were provided as a result of the FOIA and select documents are attached in Appendix D. Two groundwater contour maps show a shallow and deeper interval of groundwater. The groundwater in the area is generally flows towards the Project in the east-southeasterly direction and then gradually turns and flows to the southeast direction, as shown on the maps in Appendix. As shown in several maps and cross sections, the groundwater is impacted with PFAS. The most recent map showing the locations compared to their Part 201 PFAS Criteria shows that exceedances extent to the project area as shown on the draft map dated March 29, 2021 by AECOM. Based on this review the PFAS is impacting groundwater in the area of the Project. Attached for review are two groundwater contour maps from measurements in February 2023; the most recent March 2021 PFAS map showing groundwater concentrations; 2023 maps showing groundwater sampling results for PFAS, VOCs, chromium, and nickel; and several cross sections. The VOCs, Cr VI, and nickel appear to be defined and do not appear to be impacting groundwater in the area of the Project.

BEA on Village Laundry 7800 N. 34th Street, Richland, Michigan

The BEA site had been used as a laundry business. The BEA was prepared for Dr. Michael Sharp, DDS, which intended to occupy the parcel for a dentist office. The BEA was completed on May 18, 1998 by American Hydrogeology Corporation (AHC). The BEA was based on previous contamination from the uses as Village Laundry. The contamination identified in the BEA was identified in environmental reports by Brown & Root Environmental, which detected chlorinated VOCs from the past laundry usage including perchloroethylene (PCE) trichloroethylene (TCE) 1,1-dichloroethane, 1,1-dichloroethylene (1,1-DCE) and cis 1,2-dichloroethylene, and trans 1,2- dichloroethylene, chloroform, and toluene. The depth to groundwater was not provided in the BEA. Given the location of the subject property at least 1/4 mile from the project site, this BEA site and contamination are not expected to have a direct impact on the project site.

BEA on Gull Lake Animal & Boarding 7820 N. 34th Street, Richland, Michigan

The BEA site was a veterinary hospital and animal boarding facility. The intended use of the parcel is for National Veterinary Associates to continue to operate a veterinary hospital and boarding facility in the subject building. The BEA was completed on March 25, 2022 by Partner Engineering and Science, Inc. The BEA was based on previous contamination identified in environmental reports by Brown & Root Environmental (1994 report) which detected chlorinated VOCs from the Village Cleaners Site in the area and heavy metals from the nearby Production Plated Plastics facility at 9899 East D Avenue. The BEA reported on the subject parcel that recent groundwater sampling from the subject parcel had 1,1,1-TCA and 1,1-dichloroethylene (1,1-DCE) and 1,1-dichloroethane (1,1-DCA) detected in the groundwater at levels that exceeded their Part 201 GRCC. the heavy metals arsenic and lead, and hexavalent chromium and nickel were also detected in groundwater samples above Part 201 GRCC. The BEA report also indicated that PFAS contamination in groundwater have been detected in the area of the subject parcel

being investigated by EGLE and associated with Production Plated Plastics property. The depth to groundwater was not provided in the BEA. Given the location of the subject property at least 1/4 mile from the project site, this BEA site and contamination are not expected to have a direct impact on the project site.

BEA – 145 Acres of Agricultural Land, north of M-89, Richland Township

The BEA site and a Part 201 Site on the Michigan's Environmental Mapper is located at north of E C Avenue and approximately 1/4 mile west of North 32nd Street and so this site is not directly adjacent to the project. The BEA was completed on February 24, 2004 by Soil and Materials Engineers, Inc (SME). The Phase 1 Environmental Site Assessment (ESA) on the Property identified residential well supplies on the adjoining parcels had historically high levels of nitrates identified as the sole REC. A limited Phase II ESA involving soil and groundwater samples from two drilling locations identified nitrate in the groundwater samples from the subject property at levels the exceeded the Part 201 Generic residential cleanup criteria, so the BEA was submitted to the State of Michigan. The depth to groundwater was between 29 and 31 feet below ground level when the samples were collected. Given the depth to groundwater and the location of the subject property at least 1/4 mile from the project site, this BEA site and contamination are not expected to have a direct impact on the project site.

BEA on Gull Lake Community Schools, 9724 - 9766 East M-89

The environmental site located at is located on the south side of East M-89, approximately 0.7 miles east of the Village of Richland's central business district. A Phase 1 ESA was conducted on this property June 16, 2023 by SES for the benefit of Gull Lake Community Schools which purchased the property. According to the Phase I ESA, the following RECs were identified at the subject parcel, as paraphrased: soil contamination from arsenic, cobalt, and iron identified in a 2012 BEA; heating oil UST(s) identified in 2012 BEA; and commercial small engine service operations building connected to a septic system creating the potential source of subsurface contamination by discharge to the septic system.

To assess the RECs identified, SES completed eight soil borings (i.e., SB-1 through SB-8) on July 13, 2023. Sixteen soil samples were collected and submitted for laboratory chemical analysis of volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PNAs), polychlorinated biphenyls (PCBs), and Michigan 10 Metals (i.e., arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc), or some combination thereof, to assess the RECs described previously. Soil borings were drilled to 20 feet and no groundwater was encountered. The subject property is classified as a "facility" because concentrations of the arsenic, cobalt, iron, and selenium were detected in soil exceeding EGLE Part 201 Residential Generic Cleanup Criteria.

The contamination was reported to be in the soil from this site. No groundwater samples were collected and the depth to groundwater was reported greater than 20 feet at this site. While the potential for groundwater contamination cannot be ruled out, this site is not expected to have a direct environmental impact to the Project due to the horizontal distance of approximately 0.9 miles from the project.

BEA site located at 9776 E D Avenue

A BEA was completed on this parcel by Superior Environmental Corp (SEC) on October 19, 2007. According to the BEA, this parcel had a single-family residence that had been converted for retail purposes. The potential for migrating contamination from the adjacent site Production Plated Plastics Inc. at 9899 East D Avenue was the only environmental concern identified. SEC

advanced three borings on the northeast portion of the property to evaluate the potential migrating contamination. A total of three groundwater samples were collected for VOCs PNAs, and metals testing. Groundwater was encountered at approximately 29.5 feet bgs. Based on the analysis, concentration of lead in one groundwater sample exceeded the current EGLE clean-up criteria. In a follow up letter, the Michigan Department of Environmental Quality (now EGLE), indicated that the BEA was not accepted, as there was insufficient information to demonstrate that the property is a facility as defined by Part 201. As such, this site is not expected to have an environmental impact on the proposed project.

Closed UST site at Mac's Automotive, 11574 E D Avenue

The according to the EGLE's Remediation Information Data Exchange (RIDE) database listing this underground storage tank (UST) was registered to Carl M. Waldorf and last used in May 20, 1991. The UST was removed from the ground on May 22, 1991. RIDE reported four USTs of 1,000-gallon capacity for gasoline storage. Three of these USTs were installed on April 26, 1956 and one was installed April 27, 1971. Each UST was removed from the ground on November 5, 1990. No release was reported from the tanks; therefore, it was closed by the State of Michigan. When a tank is closed and there is no release, the site is not considered a site of environmental contamination. Based on the closed status of this UST, this site is not expected to have an environmental impact on the Project.

Closed UST site at Gilmore Enterprises Farm, 7966 East C Avenue

This site is incorrectly plotted at the corner of 32nd Street and East C Avenue on the EGLE Environmental Mapper, which appeared to be adjacent to the Project. Because EGLE Environmental Mapper plotted this site adjacent to the Project, the LARA file for this UST Closure was obtained and reviewed. Based on the information in the LARA file, it was determined that the actual location is near the intersection of 30th Street and East C Avenue, which is more than 1 mile west of the Project and not adjacent to the Project. Given that this is a closed UST and more than one mile away from the Project, it is not expected to have a direct environmental impact to the project.

4 CONCLUSIONS

The proposed Project will be constructed along the route referenced in this report. Soil will need to be excavated and temporarily stockpiled while the utility is constructed, and then the area will be backfilled. The sites reviewed are not expected to have soil contamination that will impact the construction of the water main. This site visit and the review of the environmental contamination has the following findings:

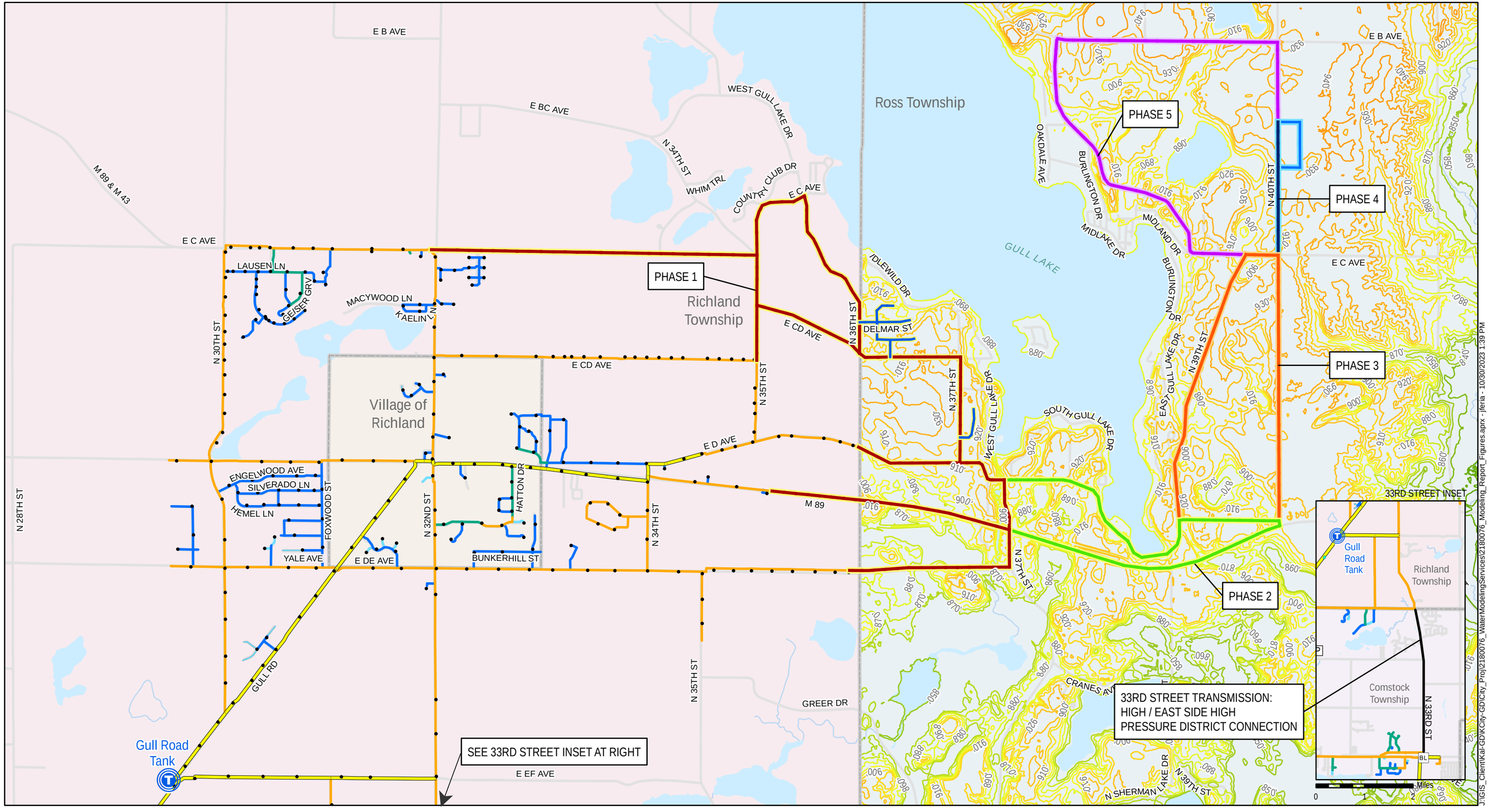
1. The MPART site known as North 34th Street area at Production Plated Plastics, 9899 East D Avenue, is being investigated for PFAS contamination. The PFAS has migrated in groundwater easterly toward the project. For this reason, the water main associated with this Project is being designed and will be constructed as a remedy. Because of the potential impact to the project, three temporary well locations are planned for PFAS testing to determine management of dewatering water.
2. Fruit orchards were observed south of East CD Avenue on east and west sides of the residence at the address of 11272 E CD Avenue. Fruit orchards are an environmental concern due to the potential for the application of the spray known as lead-arsenate,

which is no longer allowed to be used. Given that the project will be in the road right of way, and not directly through the orchard, the impact from the orchards is not expected in the road right of way, and no further evaluation is warranted in the road right of way.

3. A UST site along the project known as Mac's Automotive at 11574 E D Avenue has a pump dispenser island visible from the site visit. A pump dispenser is considered a part of the "UST System". This UST is closed by the State of Michigan, so the pump dispenser is also closed, so no contamination is expected from this closed UST site.

Appendix A

Figure for Ross Township Water Main Extensions



LEGEND

Proposed Water Main (Phase 1)
- 8"
- 12"

Proposed Water Main (Phase 2)
- 12"

Proposed Water Main (Phase 3)
- 12"

Proposed Water Main (Phase 4)
- 8"
- 12"

Proposed Water Main (Phase 5)
- 12"

Existing Water Main
- 4" and Smaller
- 6"
- 8"
- 10"
- 12"
- 16"
- Hydrant

0 0.25 0.5 0.75 1 Miles

CITY OF KALAMAZOO
KALAMAZOO COUNTY, MICHIGAN

FIGURE 1
ROSS TOWNSHIP WATER MAIN EXTENSIONS
OCTOBER 2023

Prein&Newhof
2180076

J:\GIS_Client\Kal-GDI\City-GDI\City_Proj\2180076_WaterModelingServices\2180076_Modeling_Report_Figures\Report_Figures.aprx - jferia - 10/30/2023 1:39 PM

Appendix B

Photographic Log

2230982 - Photographic log of site visit for Phase I water main, Ross Township, Kalamazoo County, Michigan.
Photographs taken March 12, 2024 by Tim Woodburne.



Looking northerly along E D Avenue.



Mac's Automotive at 11574 E D Avenue.



View of a pump dispenser island at Mac's Garage.



Looking west along E CD Avenue.



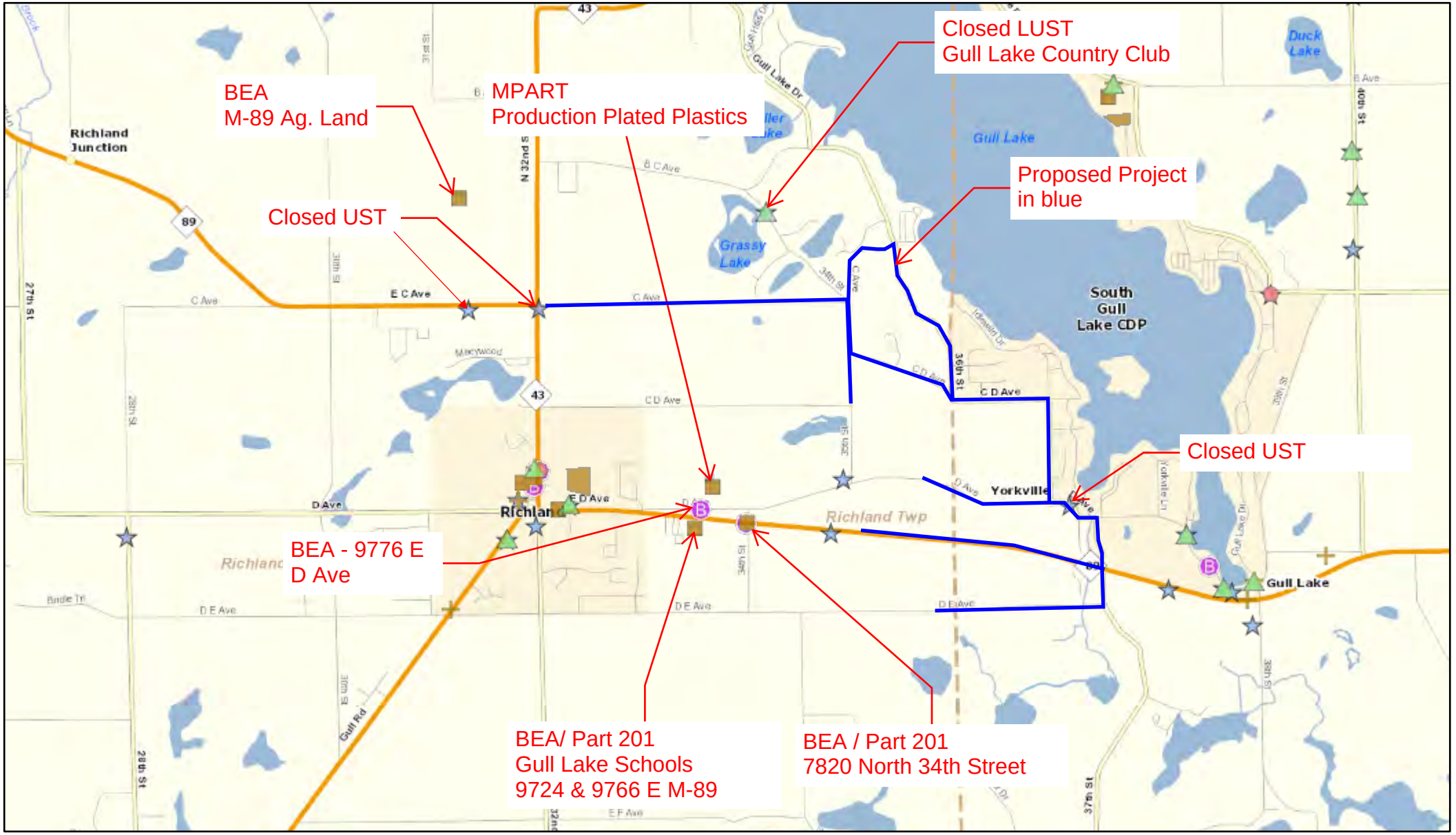


These two photographs form a panoramic view of orchards looking easterly and then south near 11272 E CD Avenue.

Appendix C

EGLE Environmental Mapper and MPART Map

Environmental Mapper



March 29, 2024

- Notice of Corrective Action - Polygon
- Restrictive Covenant - Polygon
- Baseline Environmental Assessment
- Closed Tanks
- Active Tanks
- Sites of Environmental Contamination (Part 201)
- Open
- Closed

1:40,708

0 0.35 0.7 1.4 mi

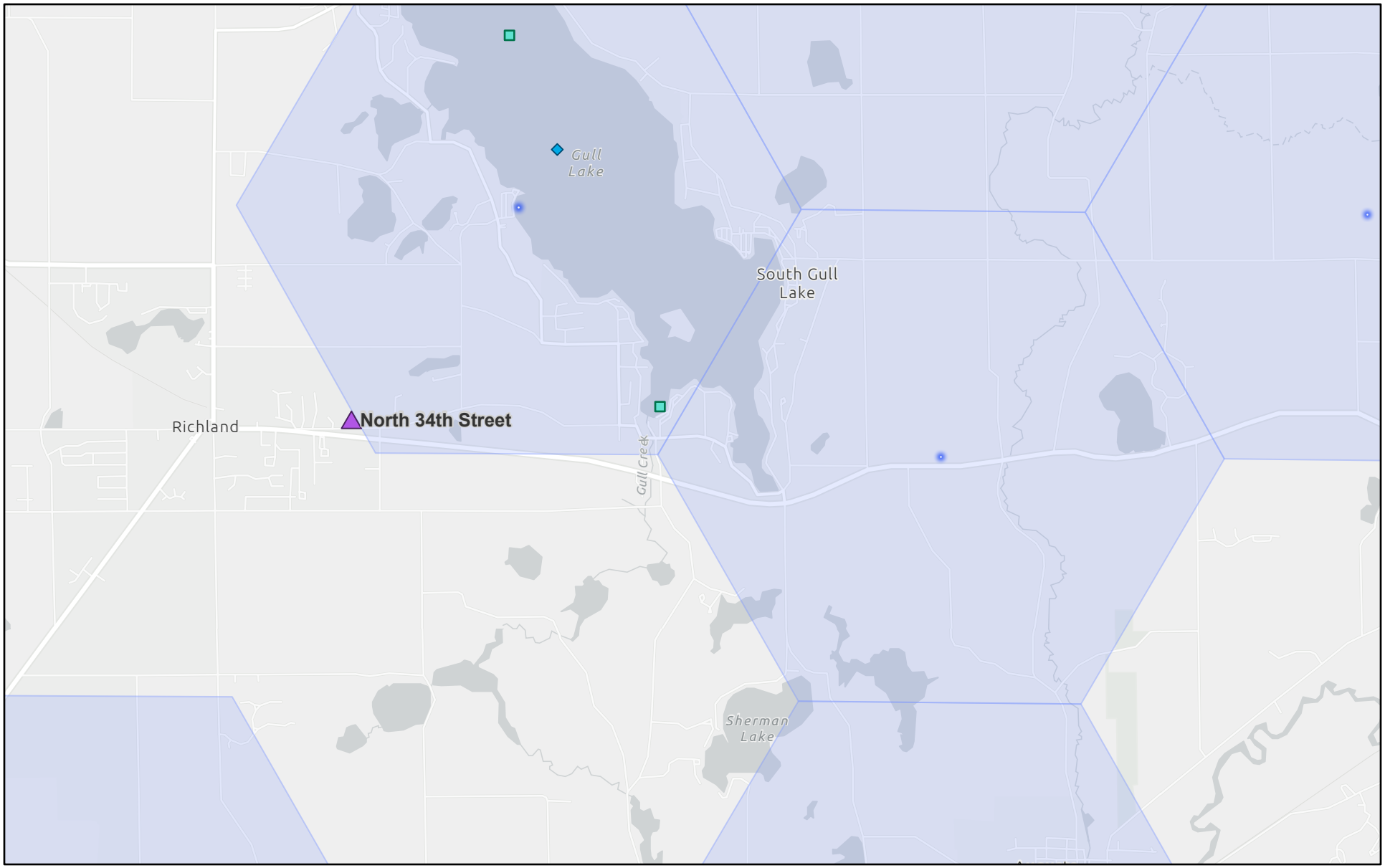
0 0.5 1 2 km

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: State of Michigan, EGLE

copyright 2015

MPART: PFAS Information System



3/29/2024, 1:05:58 PM

Public Water Supply Sampling Hexbins and Results

1

5

10

50

100

PFAS Sites

PFAS Surface Water Sampling

Fish Contaminant Monitoring Program Sampling Sites and Select Results

1:72,224

0 0.45 0.9 1.8 mi

0 0.75 1.5 3 km

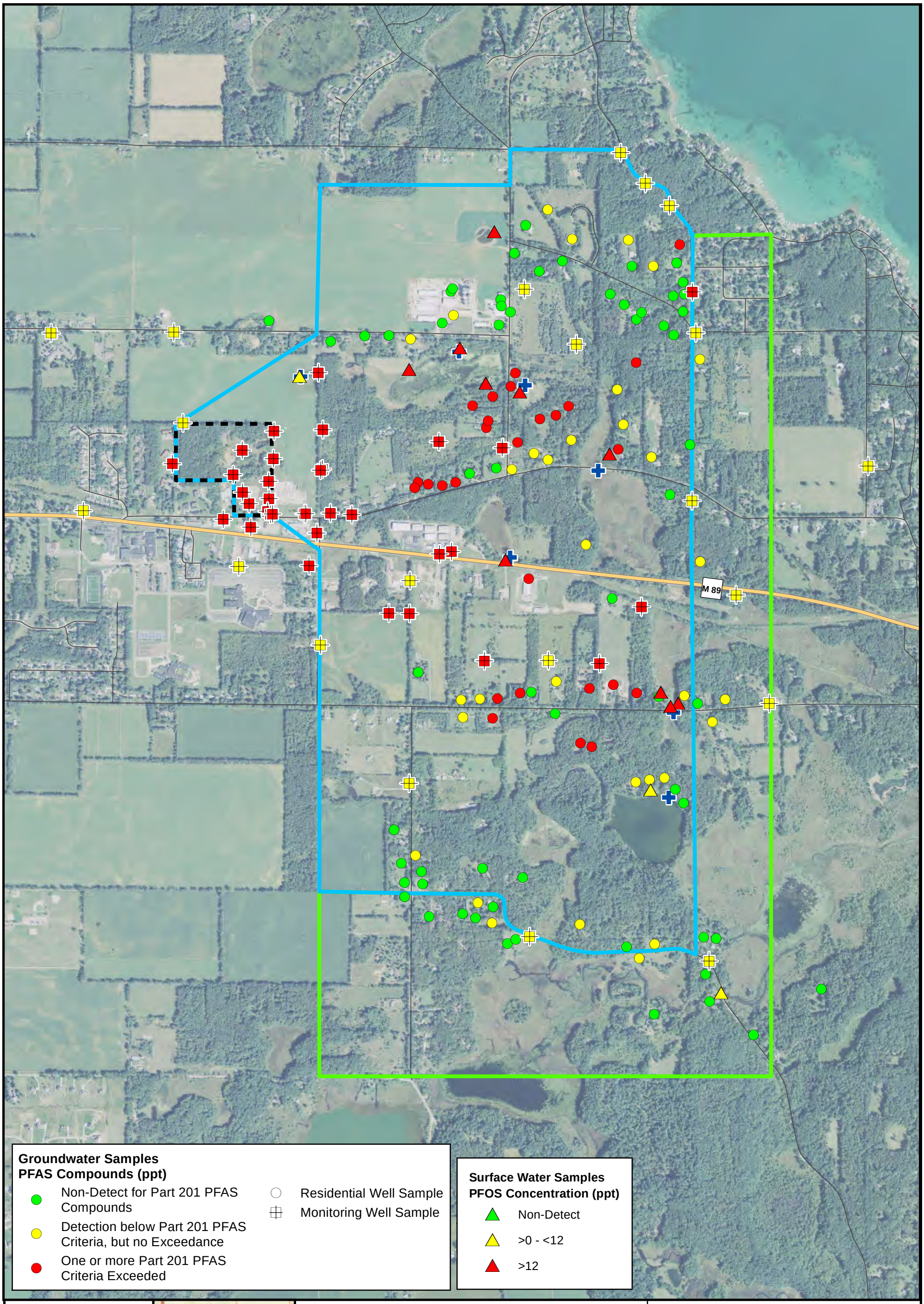
Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

EGLE

Copyright 2021 State of Michigan

Appendix D

Select Maps from North 34th Street – MPART – Production Plated Plastics Environmental Investigations



Groundwater Samples
PFAS Compounds (ppt)

- Non-Detect for Part 201 PFAS Compounds
- Detection below Part 201 PFAS Criteria, but no Exceedance
- One or more Part 201 PFAS Criteria Exceeded
- Residential Well Sample
- Monitoring Well Sample

Surface Water Samples
PFOS Concentration (ppt)

- Non-Detect
- >0 - <12
- >12

AECOM

Drawn: DP Date: 3/29/2021

Approved: JB Date: 3/29/2021

Project #: 60582450

Kalamazoo

Portage

Legend

- Staff Gauge Location
- Production Plated Plastics
- Study Area
- Buffer Zone

N

0 0.2 0.4 Miles

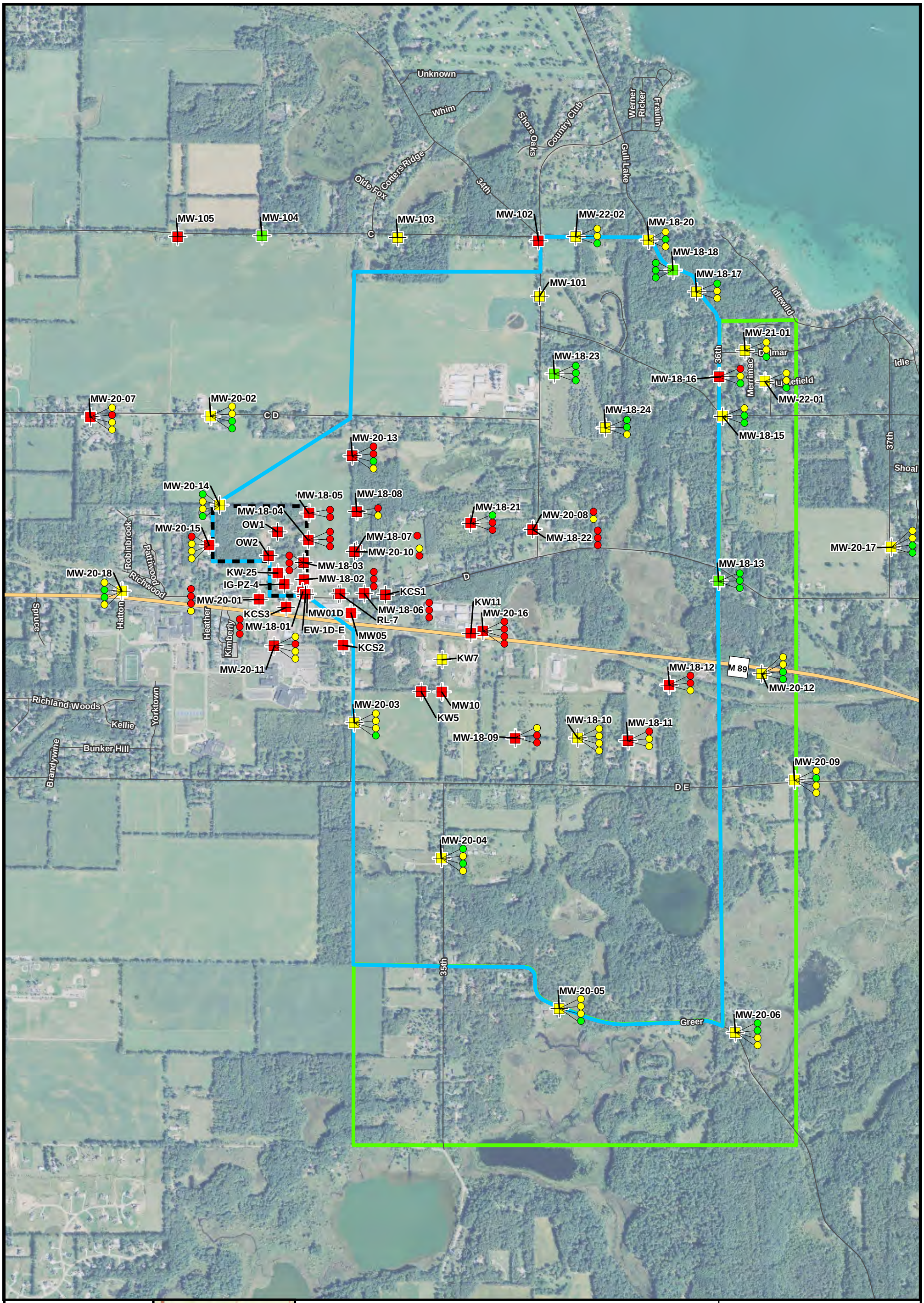
CONCENTRATIONS OF PFAS COMPOUNDS (ppt) COMPARED TO PART 201 CRITERIA

DRAFT

RICHLAND, MI

Document Path: L:\DCS\GIS\ArcMap_GeoDB_Projects\ENV\GIS_Data\GIS\Richland\MXDs\Part201_PFAS_heatmap.mxd

Aerial imagery 2015 NAIP Imagery



AECOM	
Drawn: DP	Date: 10/21/2022
Approved: JB	Date: 10/21/2022
Project #: 60582450	



Legend

Monitoring Well

- Non-Detect for Part 201 PFAS Compounds
- Detection below Part 201 PFAS Criteria, but no Exceedance
- One or more Part 201 PFAS Criteria Exceeded
- Production Plated Plastics
- Study Area
- Buffer Zone

Results from nested monitoring wells:
- Top = Shallow
- Middle = Intermediate
- Bottom = Deep

*Locations without depth indicators have only one monitoring well.

N

0 0.2 0.4 Miles

PFAS HEAT MAP AS OF NOVEMBER 2022

DRAFT

RICHLAND, MI

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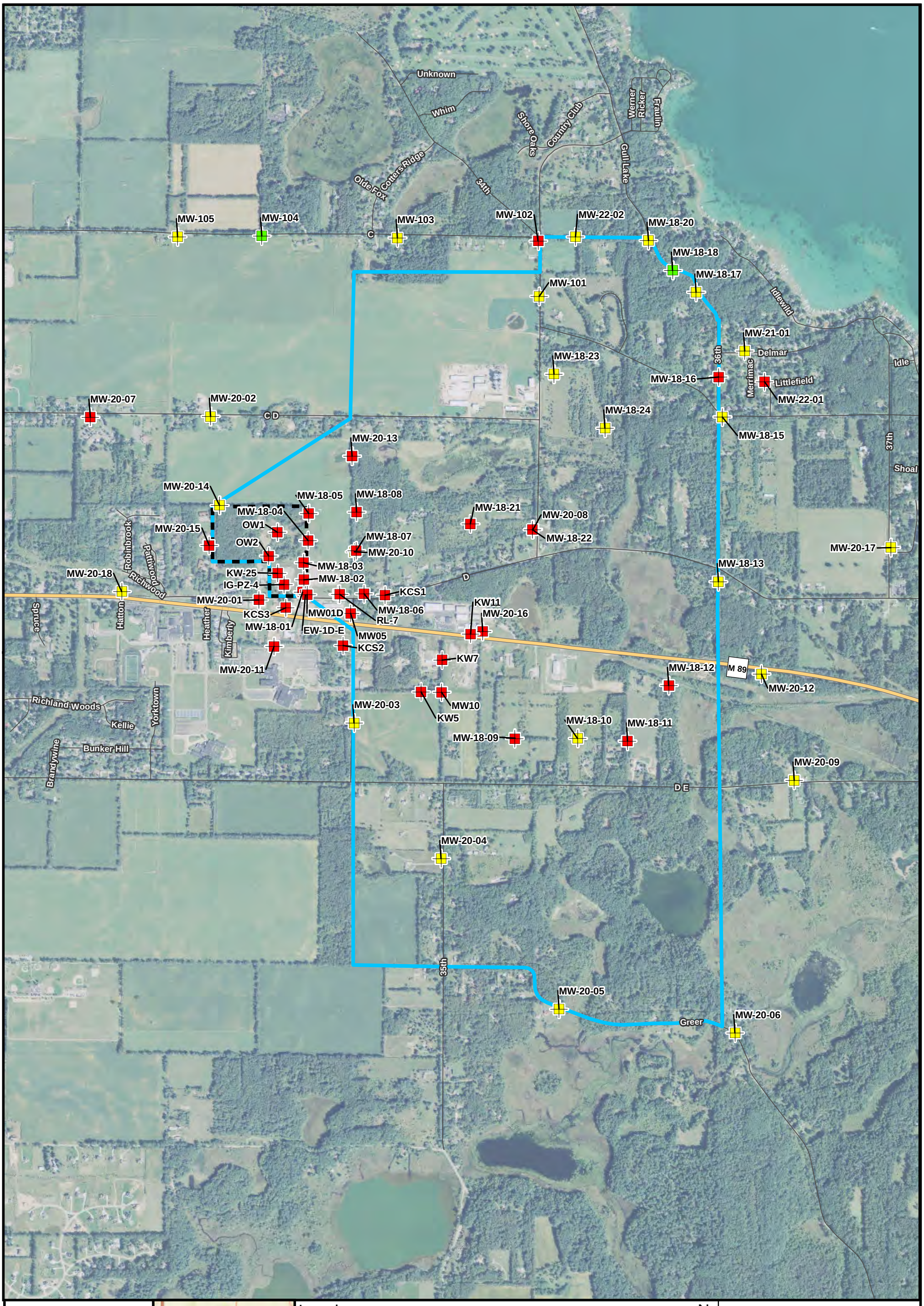
Unknown
Whim
Shore Oaks
Country Club
Werner
Ricker
Fraulin
Gull Lake
Olde Fox
Cotters Ridge
34th
MW-105
MW-104
MW-103
C
MW-102
MW-22-02
MW-18-20
MW-18-18
MW-18-17
MW-101
Idlewild
MW-21-01
Delmar
36th
Merrimac
Littlefield
MW-22-01
MW-18-23
MW-18-16
MW-18-24
MW-18-15
Idle
37th
Shoal
MW-20-07
MW-20-02
C D
MW-20-13
MW-20-14
MW-18-05
MW-18-08
MW-18-04
OW1
OW2
MW-18-21
MW-20-08
MW-18-22
MW-20-15
MW-18-07
MW-20-10
MW-18-03
MW-18-02
KW-25
IG-PZ-4
MW-20-17
MW-18-13
D
MW-20-18
Robinbrook
Richwood
Pattiwood
MW-20-01
KCS3
MW-18-01
MW01D
EW-1D-E
MW05
KCS2
KCS1
MW-18-06
RL-7
KW11
MW-20-16
Spruce
Hatton
Heather
Kimberly
MW-20-11
KW7
MW-18-12
M 89
MW-20-12
Richland Woods
Kellie
Yorktown
Bunker Hill
Brandywine
MW-20-03
KW5
MW10
MW-18-10
MW-18-11
MW-18-09
MW-20-09
D E
MW-20-04
35th
MW-20-05
Greer
MW-20-06
Kalamazoo
Portage
Legend
Monitoring Well
Non-Detect for Part 201 PFAS Compounds
Detection below Part 201 PFAS Criteria, but no Exceedance
One or more Part 201 PFAS Criteria Exceeded
Production Plated Plastics
Study Area
N
0
0.2
0.4
Miles
AECOM
Drawn: DP Date: 8/30/2022
Approved: JB Date: 8/30/2022
Project #: 60582450
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PFAS HEAT MAP
DRAFT
RICHLAND, MI
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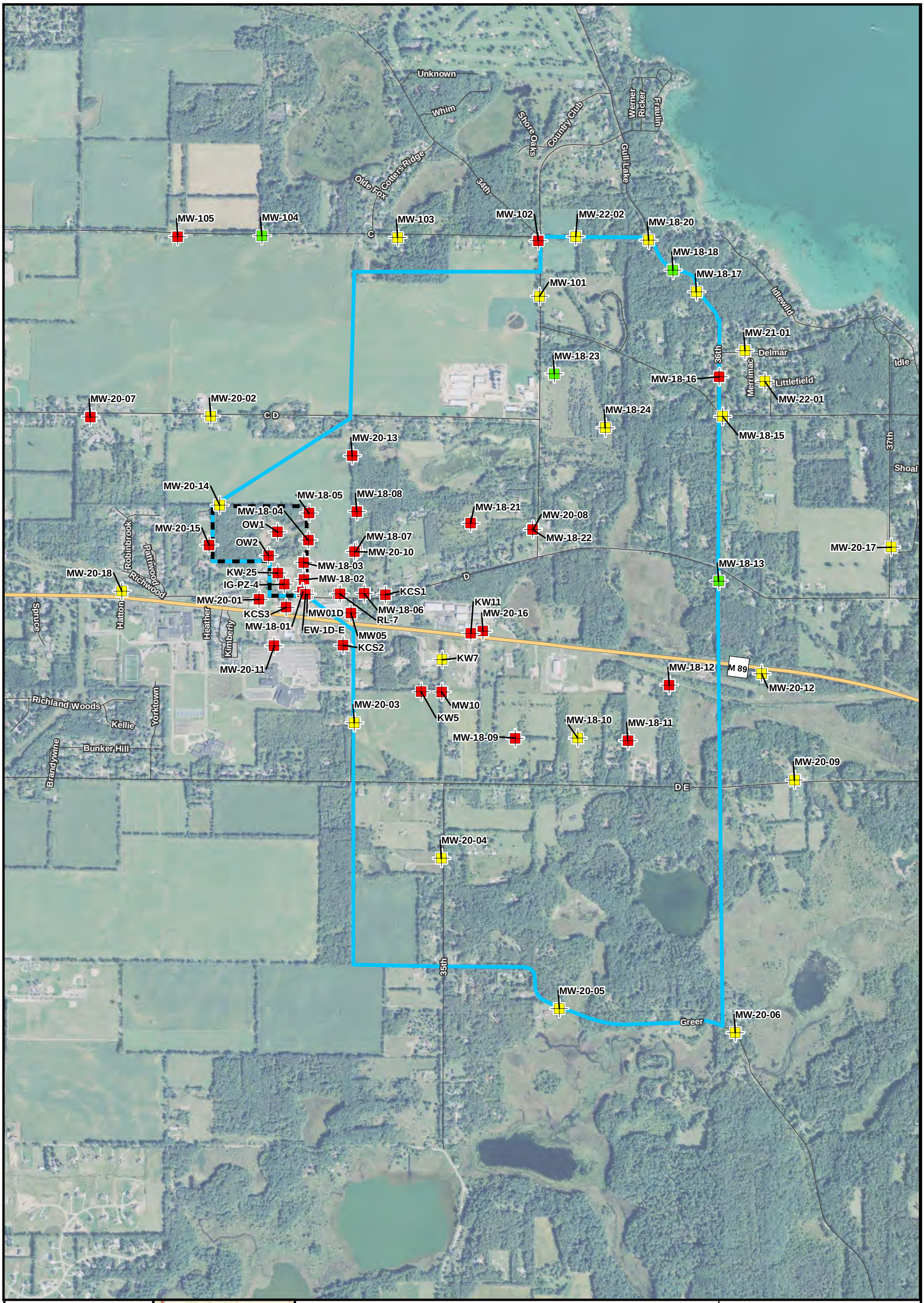
Unknown
Whim
Shore Oaks
Country Club
Werner
Ricker
Fraulin
Gull Lake
Olde Fox
Cotters Ridge
34th
MW-105
MW-104
MW-103
MW-102
MW-22-02
MW-18-20
MW-18-18
MW-18-17
MW-101
Idlewild
MW-21-01
Delmar
36th
Merrimac
Idle
MW-18-23
MW-18-16
Littlefield
MW-22-01
MW-20-07
MW-20-02
C D
MW-18-24
MW-18-15
MW-20-13
37th
MW-20-14
MW-18-05
MW-18-08
MW-18-04
MW-18-21
MW-20-08
MW-18-22
MW-20-15
OW1
OW2
MW-18-07
MW-20-10
MW-20-17
Robinbrook
Pattiwood
Richwood
MW-18-03
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KW-25
MW-18-02
MW-18-13
IG-PZ-4
KCS1
D
MW-20-01
KW11
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KCS3
MW01D
MW-18-06
RL-7
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EW-1D-E
MW05
KCS2
Spruce
Hatton
Heather
Kimberly
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KW7
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M 89
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Richland Woods
Kellie
Yorktown
MW-20-03
MW10
KW5
MW-18-10
MW-18-11
Bunker Hill
Brandywine
MW-18-09
MW-20-09
D E
MW-20-04
35th
MW-20-05
Greer
MW-20-06
Kalamazoo
Portage
Legend
Monitoring Well
Non-Detect for Part 201 PFAS Compounds
Detection below Part 201 PFAS Criteria, but no Exceedance
One or more Part 201 PFAS Criteria Exceeded
Production Plated Plastics
Study Area
N
0
0.2
0.4
Miles
AECOM
Drawn: DP Date: 10/21/2022
Approved: JB Date: 10/21/2022
Project #: 60582450
QUARTER 2 SAMPLING
PFAS HEAT MAP
DRAFT
RICHLAND, MI
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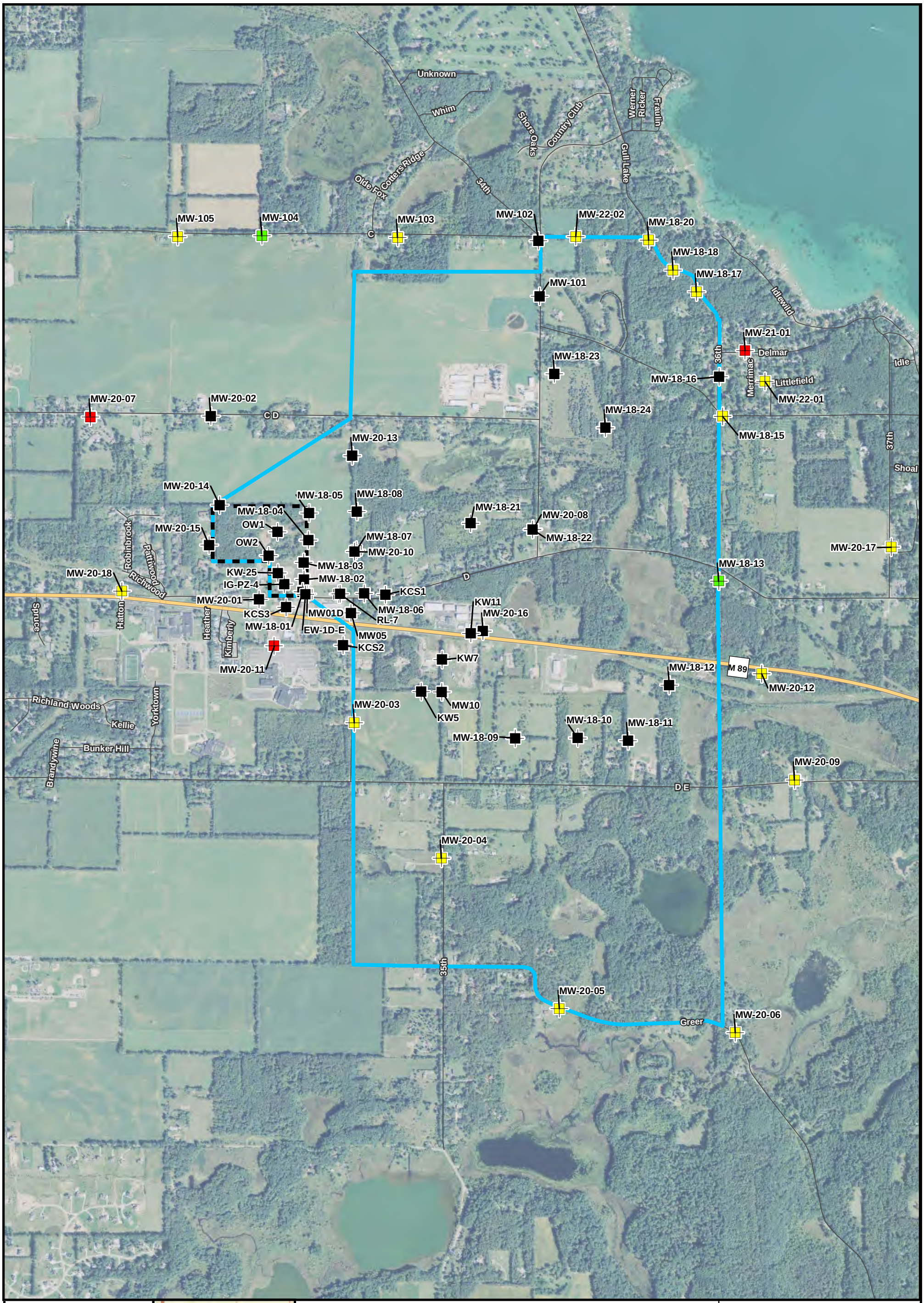

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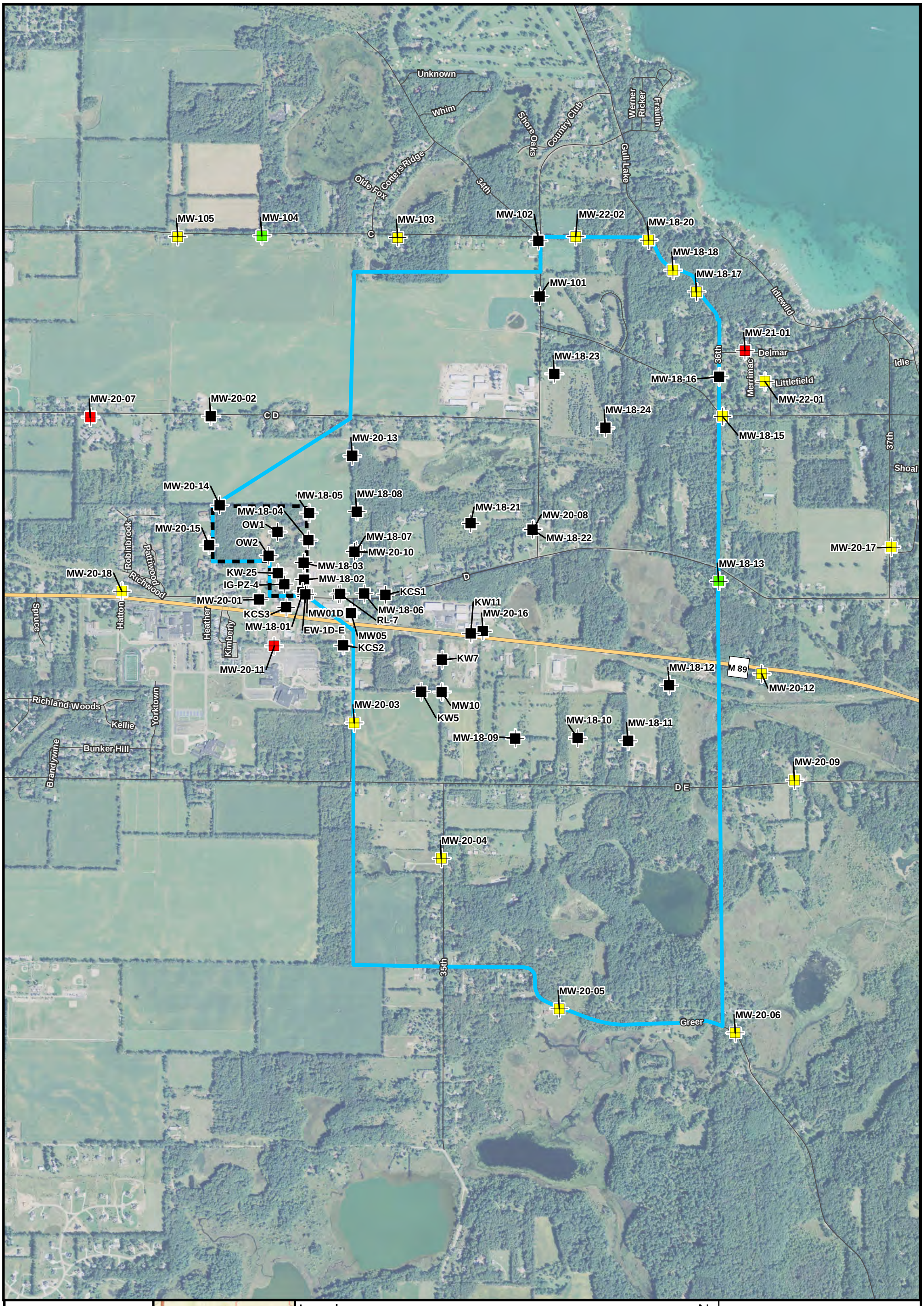

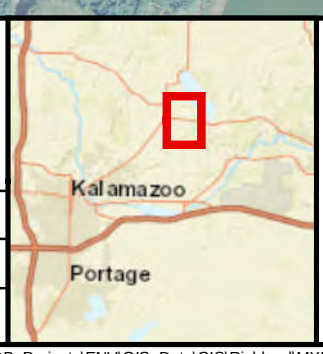

AECOM

Drawn: DP Date: 5/1/2023

Approved: JB Date: 5/1/2023

Project #: 60582450

Legend

Monitoring Well

- Non-Detect for Part 201 PFAS Compounds
- Detection below Part 201 PFAS Criteria, but no Exceedance
- One or more Part 201 PFAS Criteria Exceeded
- Not Sampled

Production Plated Plastics Study Area

N

0 0.2 0.4 Miles

QUARTER 4 SAMPLING PFAS HEAT MAP

DRAFT

RICHLAND, MI

Document Path: L:\DCS\GIS\ArcMap_GeoDB_Projects\ENV\GIS_Data\GIS\Richland\MXDs\Fourth_Quarter_Sampling_PFAS.mxd

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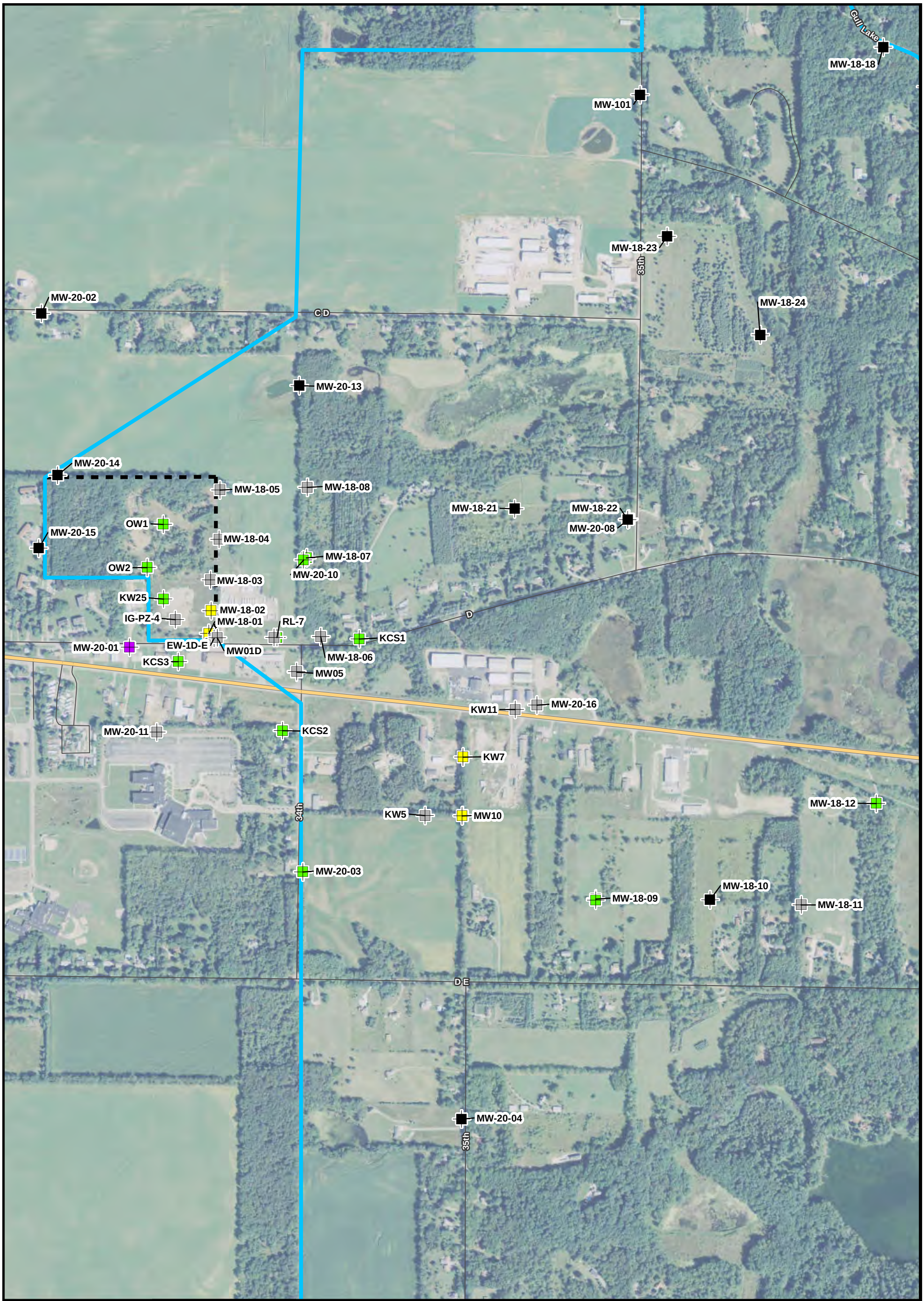

AECOM

Drawn: DP Date: 5/2/2023

Approved: JB Date: 5/2/2023

Project #: 60582450

QUARTER 4 SAMPLING VOC HEAT MAP

DRAFT

RICHLAND, MI

Document Path: L:\DCS\GIS\ArcMap_GeoDB_Projects\ENV\GIS_Data\GIS\Richland\MXDs\Fourth_Quarter_Sampling_VOCs.mxd

Aerial imagery: 2021 NAIP Imagery

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MW-104
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MW-103
888.74
MW-102
885.02
MW-22-02A
882.73
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MW-18-18A
879.45
MW-101
886.40
MW-18-17A
879.34
MW-21-01A
879.34
MW-18-16A
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MW-18-23A
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MW-22-01A
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892.07
MW-20-02A
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888.19
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KCS-1
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MW-20-01A
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KCS3
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RL-7S
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KW-7
880.29
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MW-20-12A
870.00
KW-5
884.79
MW10S
882.14
MW-20-03A
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864.25
MW-20-04A
871.18
SG-7
863.27
MW-20-05A
854.84
MW-20-06A
853.88
892
890
888
886
884
882
880
878
876
874
872
870
868
866
864
862
860
858
856
854

AECOM

Drawn: DP Date: 5/8/2023

Approved: MW Date: 5/8/2023

Project #: 60582450

Kalamazoo

Portage

Legend

Monitoring Well

- Non-Detect for Part 201 PFAS Compounds
- Detection below Part 201 PFAS Criteria, but no Exceedance
- One or more Part 201 PFAS Criteria Exceeded
- Not Sampled for PFAS
- Staff Gauge
- Lake (Elevation Estimated)
- February 2023 Groundwater Contour (2' interval)
- Production Plated Plastics
- Study
- Buffer Zone

N

0 0.15 0.3 Miles

SHALLOW GROUNDWATER CONTOURS FEBRUARY 2023 ELEVATIONS USING ESTIMATED LAKE ELEVATIONS

DRAFT

RICHLAND, MI

Document Path: L:\DCS\GIS\ArcMap_GeoDB_Projects\ENV\GIS_Data\GIS\Richland\MXDs\Feb2023_Shallow_GW_Contours.mxd

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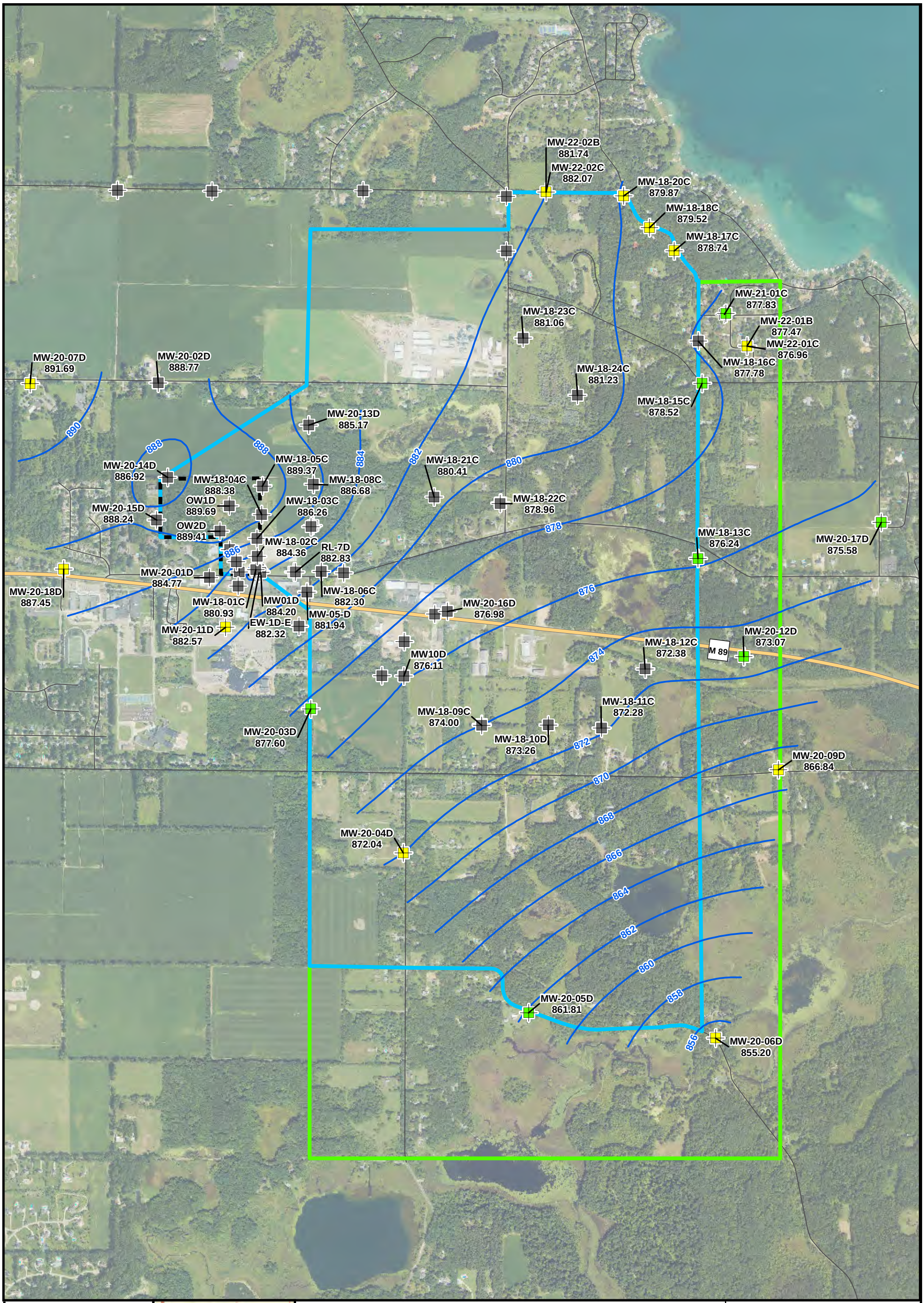

AECOM

Drawn: DP Date: 5/9/2023

Approved: MW Date: 5/9/2023

Project #: 60582450



Legend

Monitoring Well

- Non-Detect for Part 201 PFAS Compounds
- Detection below Part 201 PFAS Criteria, but no Exceedance
- One or more Part 201 PFAS Criteria Exceeded
- Not Sampled for PFAS

- February 2023 Groundwater Contour (2' interval)
- Production Plated Plastics
- Study
- Buffer Zone

N

0 0.15 0.3 Miles

DEEP GROUNDWATER CONTOURS FEBRUARY 2023 ELEVATIONS

DRAFT

RICHLAND, MI

Document Path: L:\DCS\GIS\ArcMap_GeoDB_Projects\ENV\GIS_Data\GIS\Richland\MXDs\Feb2023_Deep_GW_Contours.mxd

Aerial imagery 2020 NAIP Imagery

MW-101
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35th
C D
MW-18-24
MW-20-13
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MW-18-21
MW-18-22
MW-20-08
OW1
MW-18-04
MW-18-07
MW-20-10
OW2
MW-18-03
KW25
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MW-20-01
KCS3
MW05
D
KW11
MW-20-16
MW-20-11
KCS2
KW7
MW-18-12
34th
KW5
MW10
MW-20-03
MW-18-09
MW-18-10
MW-18-11
D E
35th
MW-20-04

AECOM

Drawn: DP Date: 11/2/2023

Approved: JB Date: 11/2/2023

Project #: 60627149

Kalamazoo

Portage

Legend

Monitoring Well

- Non-Detect for Chromium
- Detection of Chromium, but no Exceedance
- Chromium exceeds GSIC
- Chromium exceeds multiple criteria- DWC, GSIC, GVIIC, and/or FAV
- Not Sampled

Study

Production Plated Plastics

N

0 0.095 0.19 Miles

SEMI-ANNUAL 1 SAMPLING CHROMIUM HEAT MAP

DRAFT

RICHLAND, MI

Aerial imagery: 2020 NAIP Imagery



AECOM

Drawn: DP Date: 11/2/2023

Approved: JB Date: 11/2/2023

Project #: 60627149



Legend

Monitoring Wells

- Non-Detect for Nickel
- Detection of Nickel, but no Exceedance
- Nickel Exceeds DWC
- Not Sampled

- Study
- Production Plated Plastics

N

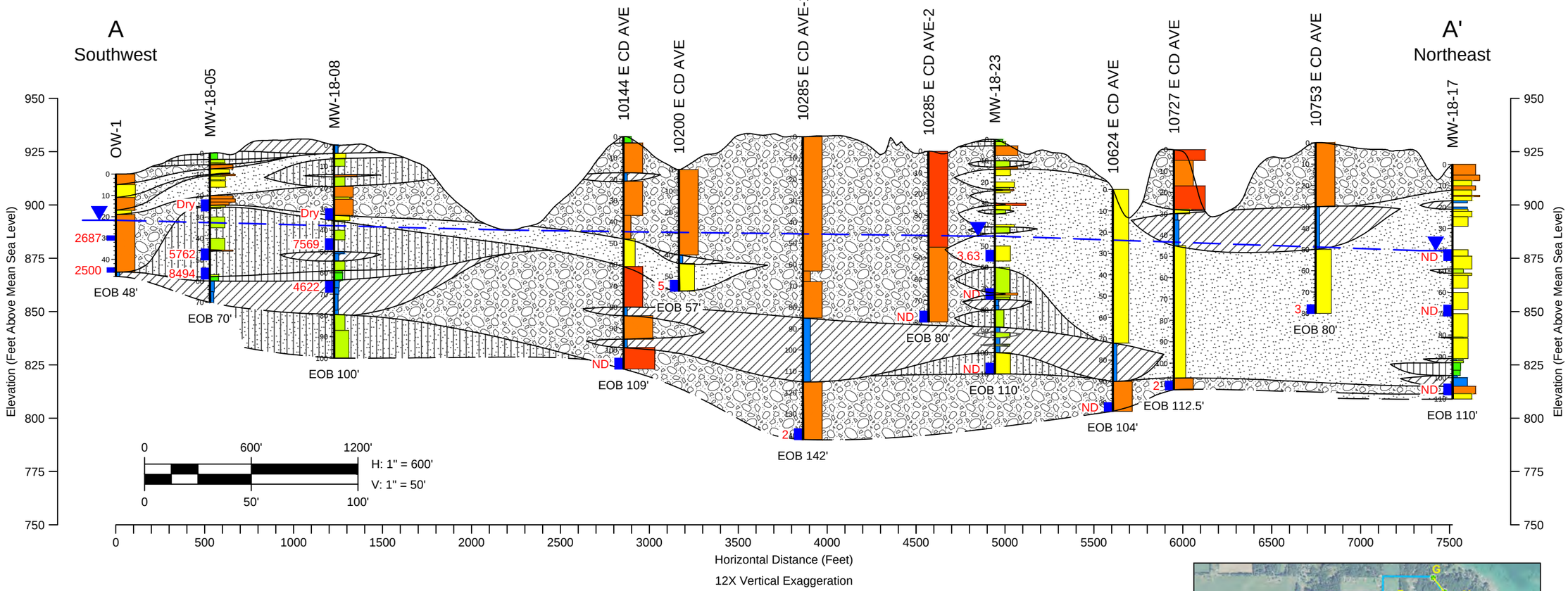
0 0.095 0.19 Miles

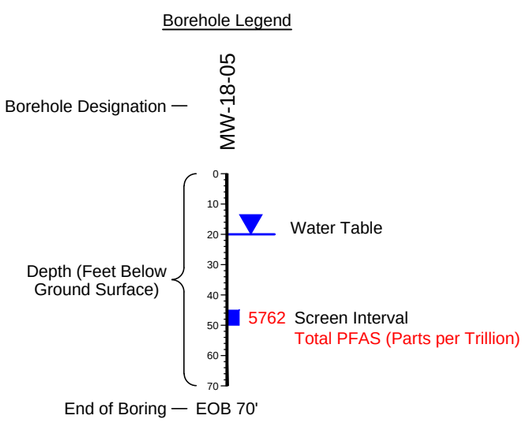
SEMI-ANNUAL 1 SAMPLING NICKEL HEAT MAP

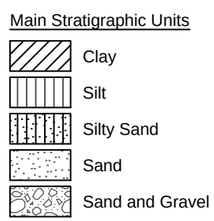
DRAFT

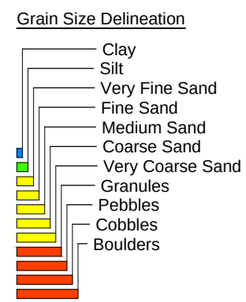
RICHLAND, MI

Aerial imagery: 2021 NAIP Imagery



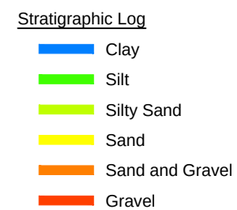


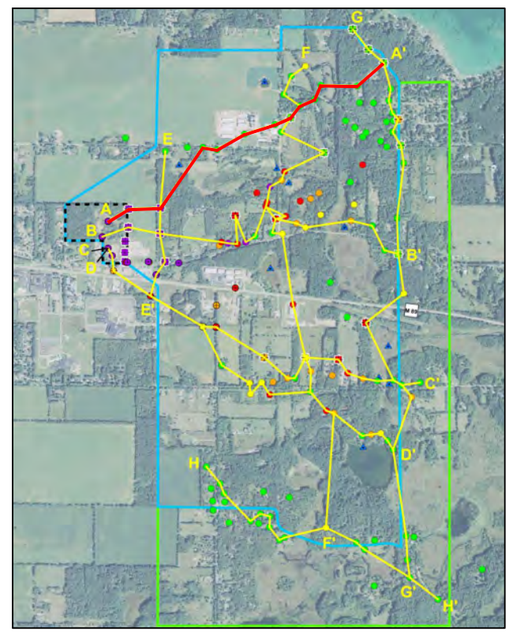




Horizontal Length of Grain Size Bar Denotes Predominant Grain Size. Bar Color Denotes Stratigraphy. For Example:

= Coarse Sand
= Fine Sand
= Silty Fine Sand
= Gravelly Fine Sand





Index Map

Figure: 1

GEOLOGIC CROSS SECTION A - A'

RICHLAND PFAS EVALUATION
RICHLAND, MICHIGAN

Project No.: 60582450 Date: 2019-06-22

Project Management Initials: Designer: NLW Checked: MW Approved: ____ ANSI B 11" x 17"

Last saved by: WILZBACHERN(2019-06-22) Last Plotted: 2019-06-22
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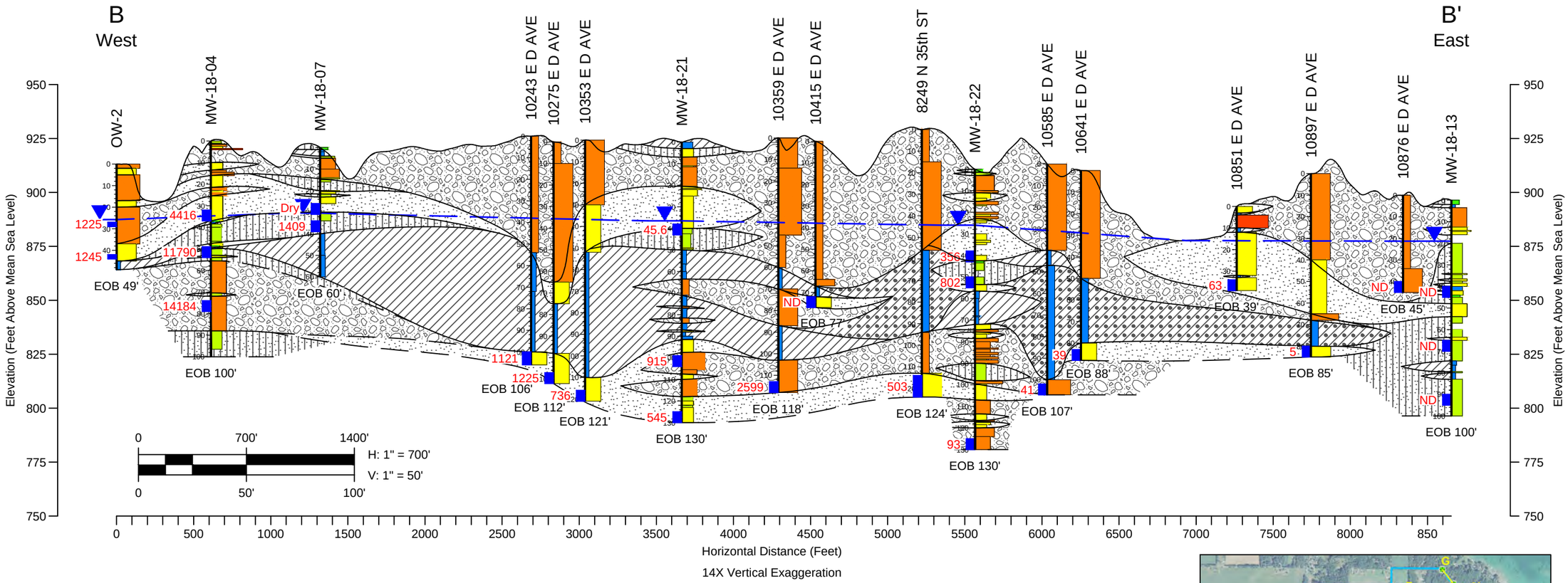

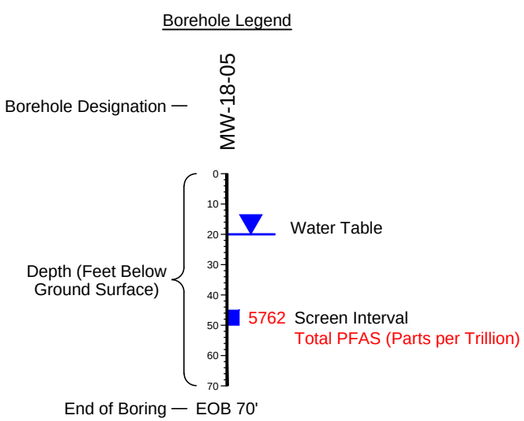

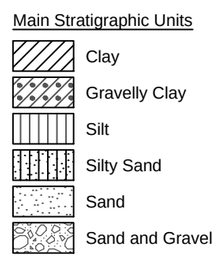

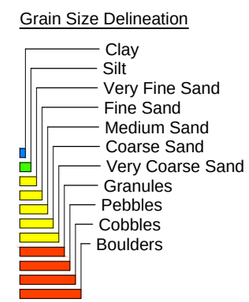

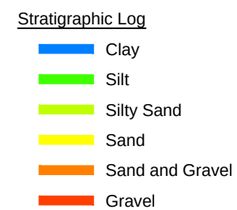

Horizontal Length of Grain Size Bar Denotes Predominant Grain Size. Bar Color Denotes Stratigraphy. For Example:

= Coarse Sand
= Fine Sand
= Silty Fine Sand
= Gravelly Fine Sand

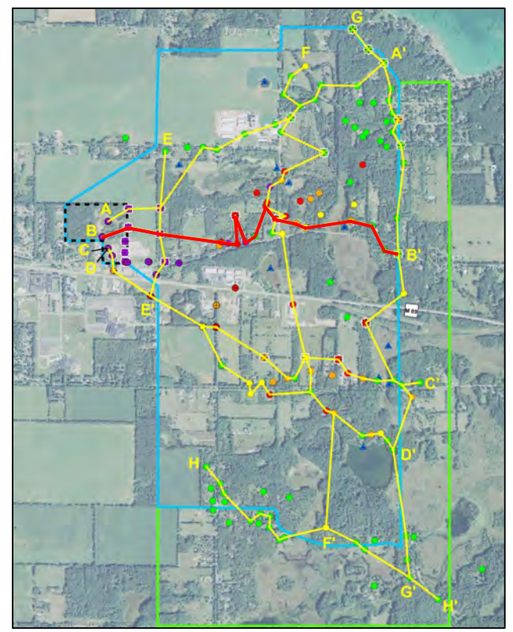

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Figure: 2

GEOLOGIC CROSS SECTION B - B'

RICHLAND PFAS EVALUATION
RICHLAND, MICHIGAN

Project No.: 60582450 Date: 2019-06-22

Project Management Initials: Designer: NLW Checked: MW Approved: ANSI B 11" x 17"

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Project Management Initials: Designer: NLW Checked: MW Approved:____ ANSI B 11" x 17"

C
Northwest

C'
Southeast

KW-25 | IG-PZ-4 | KCS3 | KCS2 | KW-5 | MW10 | MW-18-09 | 10529 E DE AVE | 10577 E DE AVE | MW-18-10 | MW-18-11 | 10769 E DE AVE | 10865 E DE AVE | 10921 E DE AVE | 10989 E DE AVE | 11249 E DE AVE | 11299 E DE AVE

1094 | 2067 | EOB 29' | EOB 32' | 38.8 | EOB 67.5' | 88.5 | EOB 52' | 15.2 | 424 | EOB 52' | 84.5 | 7.59 | 24.3 | EOB 130' | EOB 122' | ND | 57 | EOB 132' | 16.5 | 1.98 | 25.0 | 31.9 | EOB 130' | 125 | 16.4 | 1.61 | EOB 130' | 114 | 26 | EOB 58' | ND | 2 | EOB 90' | ND | EOB 58' | 8 | EOB 82'

Elevation (Feet Above Mean Sea Level)

950 | 925 | 900 | 875 | 850 | 825 | 800 | 775 | 750

0 | 700' | 1400'
H: 1" = 700'
V: 1" = 50'
0 | 50' | 100'

0 | 500 | 1000 | 1500 | 2000 | 2500 | 3000 | 3500 | 4000 | 4500 | 5000 | 5500 | 6000 | 6500 | 7000 | 7500 | 8000

Horizontal Distance (Feet)

14X Vertical Exaggeration

Borehole Legend

Borehole Designation — MW-18-05

Depth (Feet Below Ground Surface)

Water Table

5762 Screen Interval
Total PFAS (Parts per Trillion)

End of Boring — EOB 70'

Main Stratigraphic Units

- Clay
- Silt
- Silty Sand
- Sand
- Sand and Gravel

Grain Size Delineation

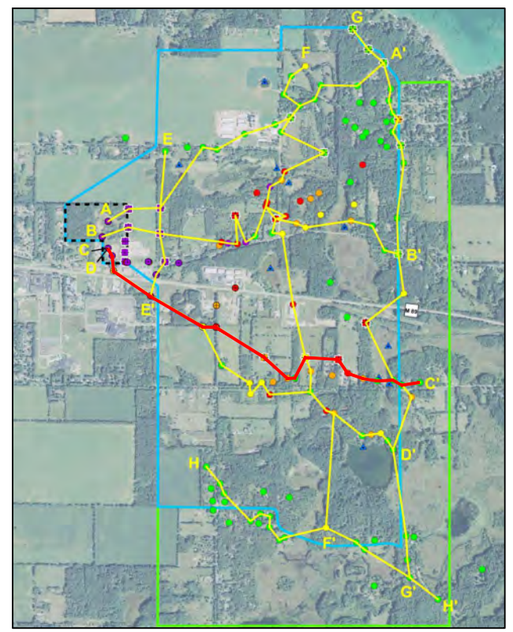
- Clay
- Silt
- Very Fine Sand
- Fine Sand
- Medium Sand
- Coarse Sand
- Very Coarse Sand
- Granules
- Pebbles
- Cobbles
- Boulders

Stratigraphic Log

- Clay
- Silt
- Silty Sand
- Sand
- Sand and Gravel
- Gravel

Horizontal Length of Grain Size Bar Denotes Predominant Grain Size. Bar Color Denotes Stratigraphy. For Example:

- = Coarse Sand
- = Fine Sand
- = Silty Fine Sand
- = Gravelly Fine Sand



Index Map

GEOLOGIC CROSS SECTION C - C'

RICHLAND PFAS EVALUATION
RICHLAND, MICHIGAN

Project No.: 60582450 Date: 2019-06-22

Figure: 3

Last saved by: WILZBACHERN(2019-06-22) Last Plotted: 2019-06-22
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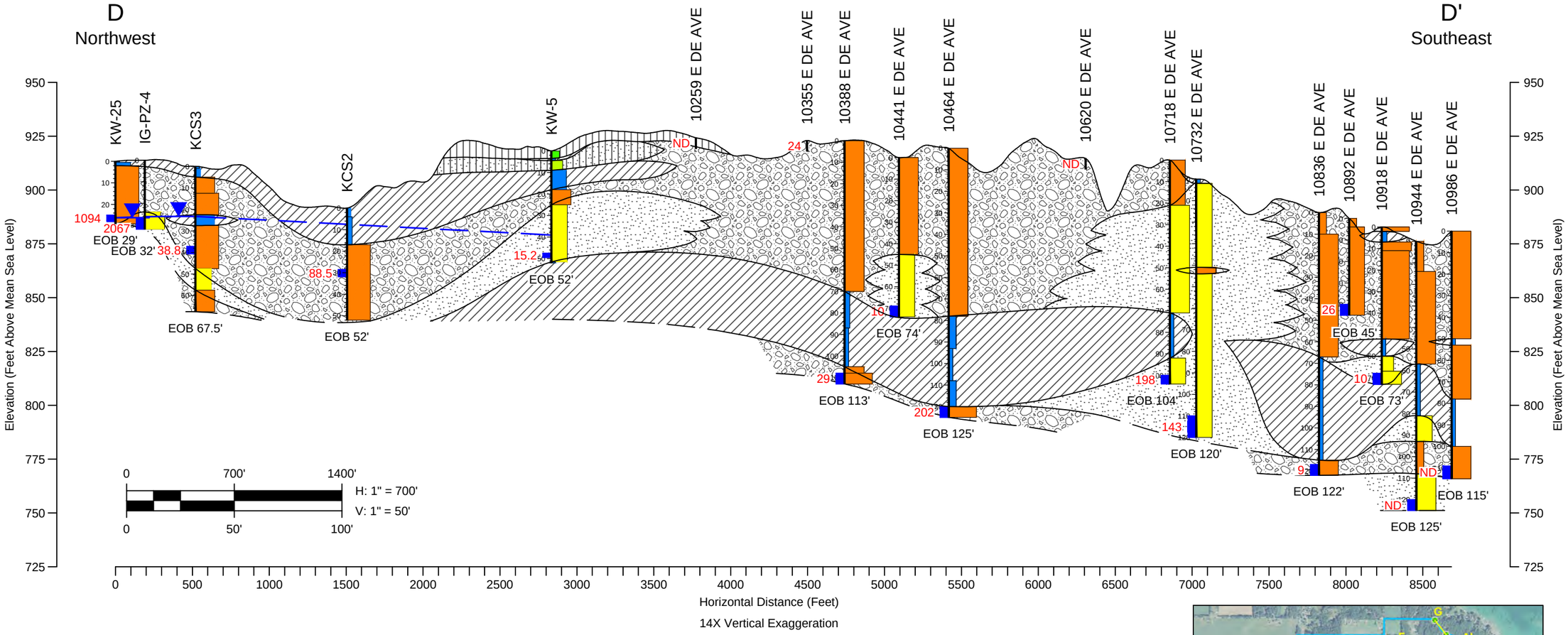

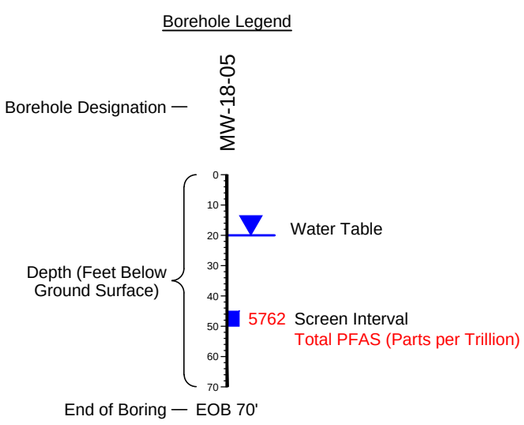

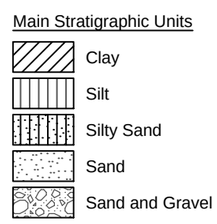

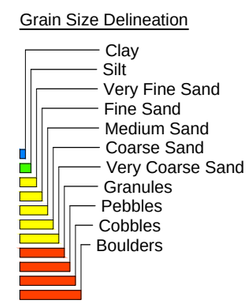

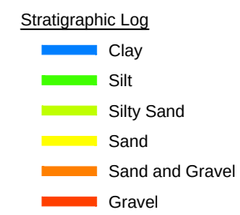

Horizontal Length of Grain Size Bar Denotes Predominant Grain Size. Bar Color Denotes Stratigraphy. For Example:

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= Fine Sand
= Silty Fine Sand
= Gravelly Fine Sand

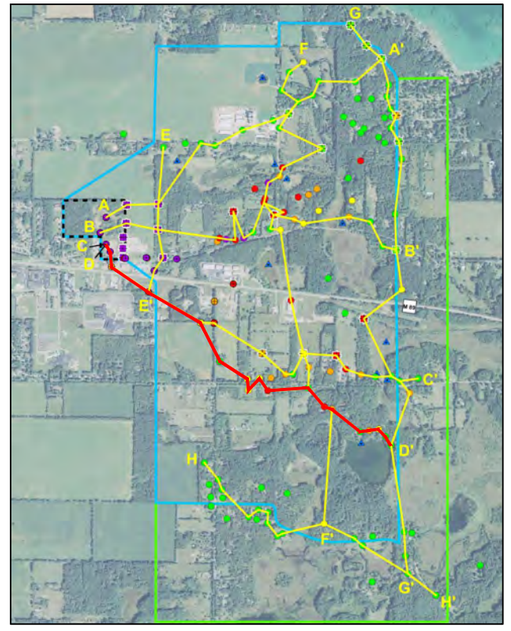

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Figure: 4

GEOLOGIC CROSS SECTION D - D'

RICHLAND PFAS EVALUATION
RICHLAND, MICHIGAN

Project No.: 60582450 Date: 2019-06-22

Project Management Initials: Designer: NLW Checked: MW Approved: ANSI B 11" x 17"

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Project Management Initials: Designer: NLW Checked: MW Approved:____ ANSI B 11" x 17"

E
North

E'
South

10000 E CD AVE

MW-18-08

MW-18-07

MW-18-06

MW05

KCS2

Dry

7569

4622

Dry

1409

5931

1588

88.58

441

142

ND

EOB 121'

EOB 100'

EOB 60'

EOB 100'

EOB 92'

EOB 52'

Elevation (Feet Above Mean Sea Level)

950
925
900
875
850
825
800
775
750

0 250' 500'
H: 1" = 250'
V: 1" = 50'
0 50' 100'

0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2500 2600 2700 2800 2900 3000 3100 3200

Horizontal Distance (Feet)

5X Vertical Exaggeration

Borehole Legend

Borehole Designation — MW-18-05

Depth (Feet Below Ground Surface)

Water Table

5762 Screen Interval
Total PFAS (Parts per Trillion)

End of Boring — EOB 70'

Main Stratigraphic Units

- Clay
- Silt
- Silty Sand
- Sand
- Sand and Gravel

Grain Size Delineation

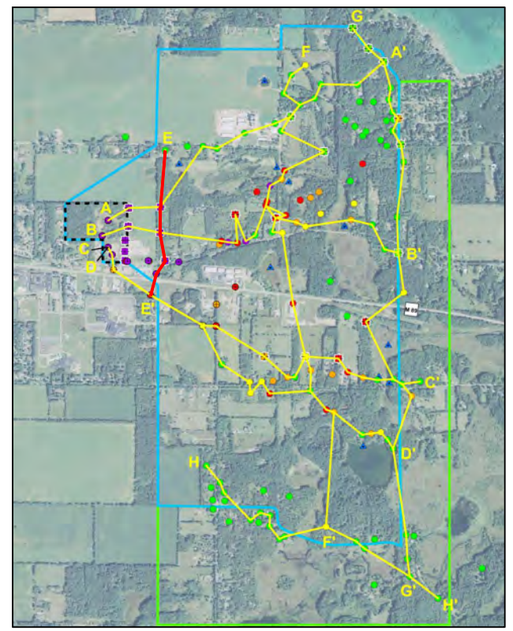
- Clay
- Silt
- Very Fine Sand
- Fine Sand
- Medium Sand
- Coarse Sand
- Very Coarse Sand
- Granules
- Pebbles
- Cobbles
- Boulders

Stratigraphic Log

- Clay
- Silt
- Silty Sand
- Sand
- Sand and Gravel
- Gravel

Horizontal Length of Grain Size Bar Denotes Predominant Grain Size. Bar Color Denotes Stratigraphy. For Example:

- = Coarse Sand
- = Fine Sand
- = Silty Fine Sand
- = Gravelly Fine Sand



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GEOLOGIC CROSS SECTION E - E'

RICHLAND PFAS EVALUATION
RICHLAND, MICHIGAN

Project No.: 60582450 Date: 2019-06-22

Figure: 5

Last saved by: WILZBACHERN(2019-06-22) Last Plotted: 2019-06-22
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Project Management Initials: Designer: NLW Checked: MW Approved:____ ANSI B 11" x 17"

GEOLOGIC CROSS SECTION F - F'

RICHLAND PFAS EVALUATION
RICHLAND, MICHIGAN

Project No.: 60582450 Date: 2019-06-22

Figure: 6

F
North

F'
South

Elevation (Feet Above Mean Sea Level)

950
925
900
875
850
825
800
775
750

10727 E CD AVE-2
8770 N 35th ST
8698 N 35th ST
8612 N 35th ST
MW-18-23
10285 E CD AVE-3
MW-18-24
8386 N 35th ST
8338 N 35th ST
8345 N 35th ST
8279 N 35th ST
8249 N 35th SR
MW-18-22
10527 E D AVE
10538 M-89
MW-18-10
10647 E DE AVE
10620 E DE AVE
10718 E DE AVE
10625 GREER DR

ND
EOB 58
ND
ND
EOB 79'
46
EOB 112.5'
3.63
ND
ND
ND
EOB 110'
EOB 118'
ND
EOB 130'
ND
1,52
EOB 100'
160
EOB 40'
49
EOB 56'
1373
356
802
18
EOB 67.5'
772
503
EOB 115'
EOB 124'
93
EOB 1:EOB 110'
181
EOB 105'
16.52
1.98
24.97
31.85
53
EOB 110'
EOB 130'
ND
198
EOB 104'
27
EOB 77'

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000 8500 9000 9500 10000 10500 11000 11500 12000

Horizontal Distance (Feet)

20X Vertical Exaggeration

0 1000' 2000'
H: 1" = 1000'
V: 1" = 50'
0 50' 100'

Borehole Legend

Borehole Designation — MW-18-05

Depth (Feet Below Ground Surface)

Water Table

5762 Screen Interval
Total PFAS (Parts per Trillion)

End of Boring — EOB 70'

Main Stratigraphic Units

- Clay
- Gravelly Clay
- Silt
- Silty Sand
- Gravelly Silt
- Sand
- Sand and Gravel

Grain Size Delineation

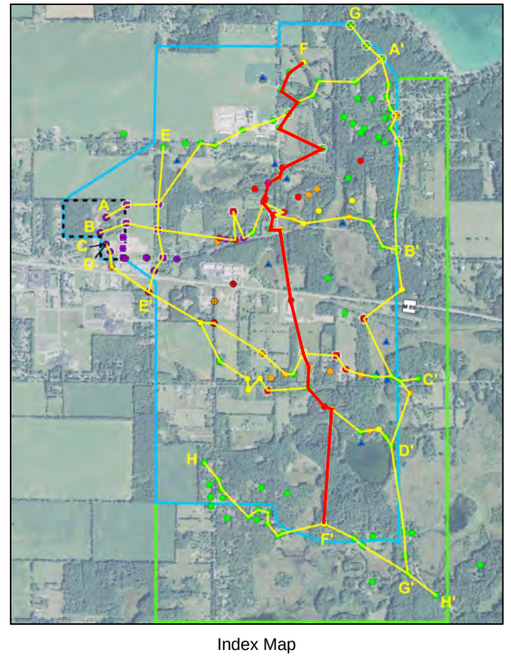
- Clay
- Silt
- Very Fine Sand
- Fine Sand
- Medium Sand
- Coarse Sand
- Very Coarse Sand
- Granules
- Pebbles
- Cobbles
- Boulders

Horizontal Length of Grain Size Bar Denotes Predominant Grain Size. Bar Color Denotes Stratigraphy. For Example:

- = Coarse Sand
- = Fine Sand
- = Silty Fine Sand
- = Gravelly Fine Sand

Stratigraphic Log

- Clay
- Silt
- Silty Sand
- Sand
- Sand and Gravel
- Gravel



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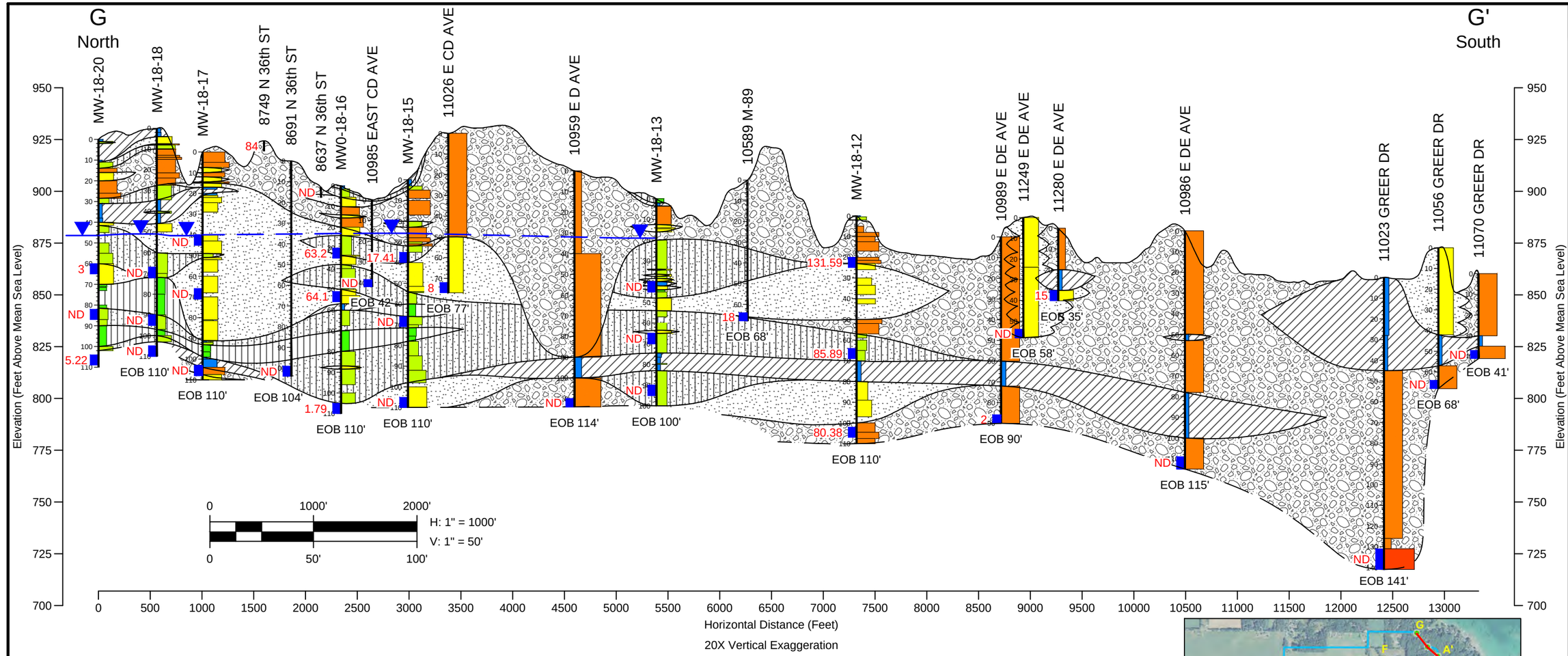
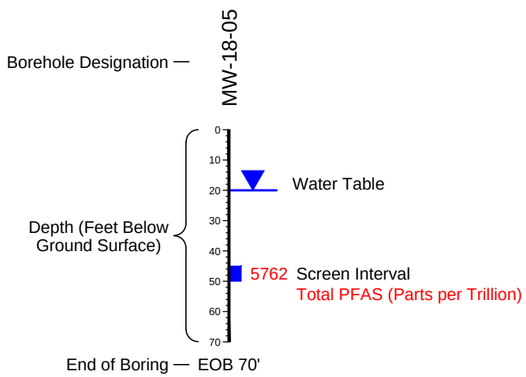
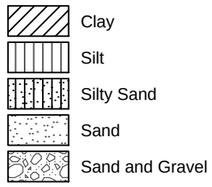


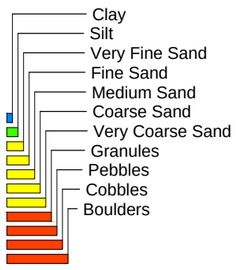
Borehole Legend



Main Stratigraphic Units



Grain Size Delineation

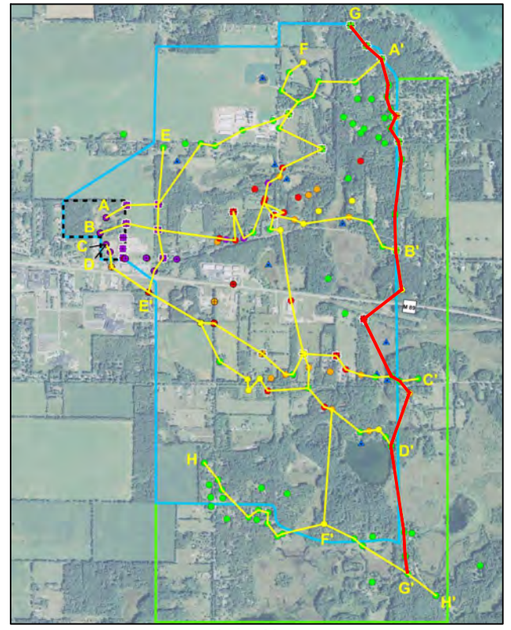


Stratigraphic Log



Horizontal Length of Grain Size Bar Denotes Predominant Grain Size. Bar Color Denotes Stratigraphy. For Example:

= Coarse Sand
= Fine Sand
= Silty Fine Sand
= Gravelly Fine Sand



Index Map

GEOLOGIC CROSS SECTION G - G'

RICHLAND PFAS EVALUATION
RICHLAND, MICHIGAN

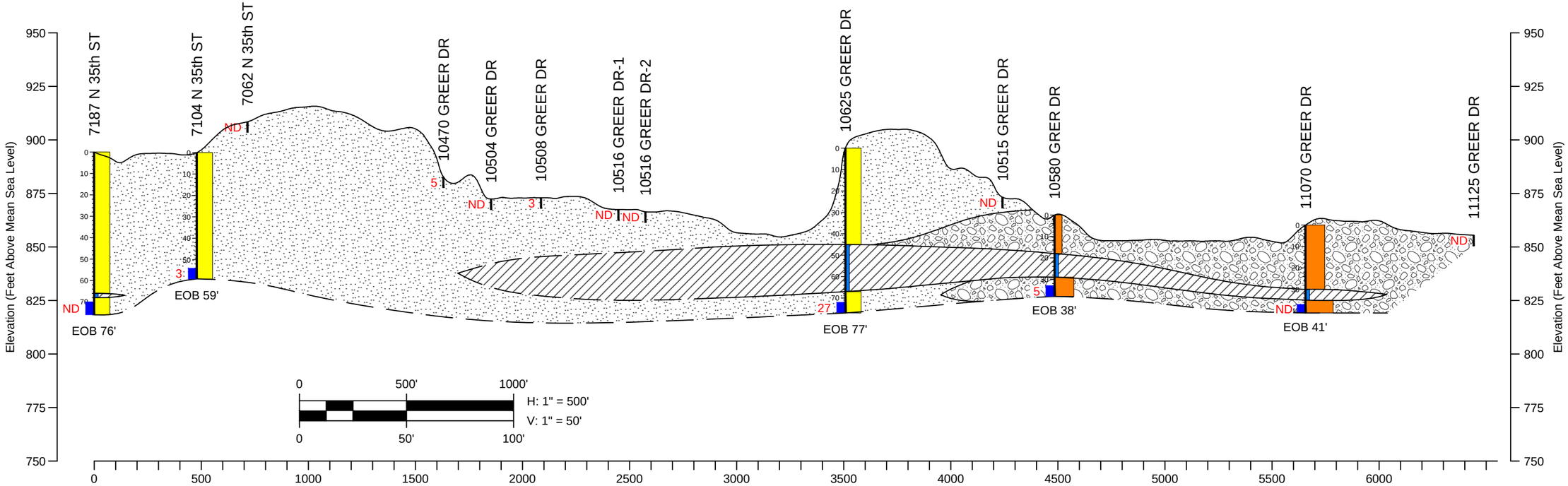
Project No.: 60582450 Date: 2019-06-22

Figure: 7

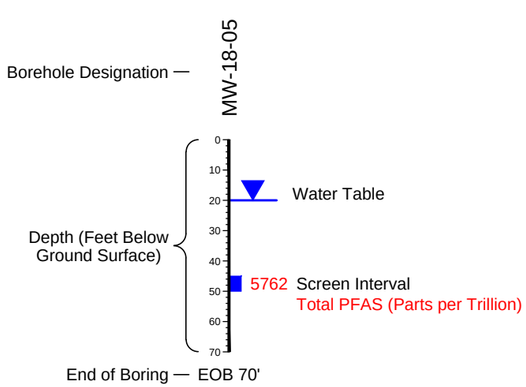
Project Management Initials: Designer: NLW Checked: MW Approved:____ ANSI B 11" x 17"

H
West

H'
East



Borehole Legend



Main Stratigraphic Units

- Clay
- Silt
- Silty Sand
- Sand
- Sand and Gravel

Grain Size Delineation

- Clay
- Silt
- Very Fine Sand
- Fine Sand
- Medium Sand
- Coarse Sand
- Very Coarse Sand
- Granules
- Pebbles
- Cobbles
- Boulders

Horizontal Length of Grain Size Bar Denotes Predominant Grain Size. Bar Color Denotes Stratigraphy. For Example:

- = Coarse Sand
- = Fine Sand
- = Silty Fine Sand
- = Gravelly Fine Sand

Stratigraphic Log

- Clay
- Silt
- Silty Sand
- Sand
- Sand and Gravel
- Gravel

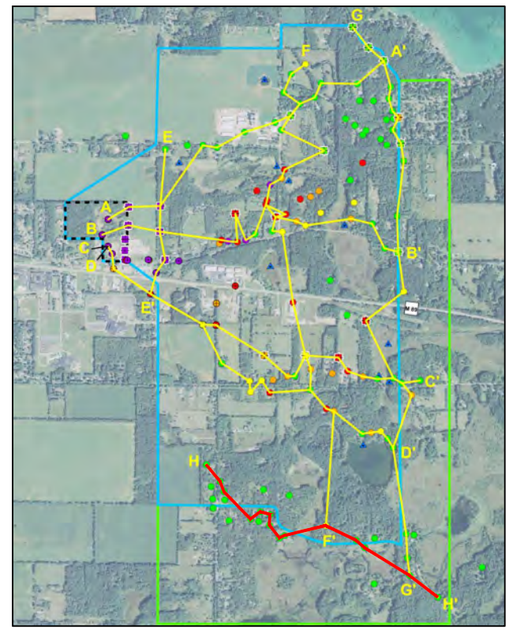


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Figure: 8

GEOLOGIC CROSS SECTION H - H'

RICHLAND PFAS EVALUATION
RICHLAND, MICHIGAN

Project No.: 60582450 Date: 2019-06-22

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Appendix I

Overburdened Calculation

SEE OVERBURDENED WORKSHEET PROVIDED IN THE FRONT END OF THE COMPILED THREE AREA PROJECT PLAN

NFP Review Board
Staff Report

City of Kalamazoo

TO: The Natural Features Protection Review Board

FROM: Nolan Bergstrom, NFP Board Liaison

DATE: May 28, 2025

SUBJECT: 669 Gull Road (Verburg Park Improvement Project)

RECOMMENDATION:

It is recommended the Natural Features Protection (NFP) Review Board approve the NFP Site Plan application for 669 Gull Road conditioned upon:

- Full Approval by the Site Plan Review Committee
- Required Permits related to Natural Features by any Local, State, or Federal Agencies be on-file with the City of Kalamazoo

BACKGROUND:

The subject parcel is Verburg Park, a public green space, owned by the City of Kalamazoo and is located along the western bank of the Kalamazoo River at 669 Gull Road. The parcel is located within the Northside Neighborhood and is zoned LW-2 or Live-Work 2. Parks, open space, and preserves are permitted on parcels zoned Live-Work 2 (LW-2). Verburg Park has bike and walking paths, a canoe/kayak launch, a Kalamazoo River Valley Trail trailhead, bike racks, and fishing access. Improvements have been planned since 2017 but were put on hold to facilitate the EPA Clean-up effort on the Kalamazoo River. The Park was used for staging equipment.

The City of Kalamazoo Parks and Recreation Department is looking to install additional amenities:

- An accessible kayak launch
- Visitor shelter
- And a bicycle pump track.

The project is seeking NFP Board approval to obtain full site plan approval and site permits.

FINDINGS:

The applicant's design team evaluated the site to identify all protected natural features on the property. The site was placed in the NFP Overlay District due to the following:

Primary Natural Feature: Adjacent to Hydrology (Kalamazoo River)
Secondary Natural Feature: Hydrology (a pond is present on-site & some wetland areas)
Tertiary Natural Feature: Protected Trees & Woodlands
MNFI Rare Species Review: Yes

The following NFP Site Development Standards Apply to this project:

- **Water Resources Standard** – The site is sensitive due to its proximity to the Kalamazoo River and public access to the Kalamazoo River. The proposed ADA-accessible kayak launch will be installed on poles and will float on the water's surface. The overall square footage area of the kayak launch over the water is 301 SF. The kayak launch will be seasonal and pulled out of the water before winter and re-installed in the spring each year. Per § 50-6.2D(2)(c)[2] of the NFP Ordinance, this is permitted within the water resource setback pending approval of any local, state, or federal permits. Applications have been submitted to EGLE for wetlands, floodplains, and lakes/streams permits. These permits will be required to be on-file for full Site Plan Approval.

- **Wetland Standard** – EGLE Permits are required. See details above in the Water Resources Standard Section. Delineated Wetland areas are shown on the NFP Site Plan. The proposed ADA-accessible kayak launch is proposed to span over the wetland area next to the existing boat launch. Approximately 51 square feet of existing wetland will continue to live underneath the gangway. No wetlands will be removed as part of the proposed improvements to the
park. The new ADA-accessible 4' wide walkway will be within the 25' setback from the wetlands. Per § 50-6.2C(3)(c)[1] of the NFP Ordinance, this is permitted within the wetland setback pending approval of any local, state, or federal permits. These permits will be required to be on-file for full Site Plan Approval.

- **Protected Tree Standard** – Protected Trees were inventoried for the site by Species and Size (DBH). Temporary Tree Protection fencing locations are shown as well as specifications for Tree protection fencing. The tree protection fencing shown is different than the NFP Ordinance language but is less invasive requiring no ground disturbance. Photos of protected trees have also been provided. An Aborist's Report conducted by **Arborwise** also provides detail about the health of protected trees on-site and management recommendations. No protected trees will be impacted by the proposed improvements.

- **Woodland Protection Standard** – Woodland areas were delineated by Niswander Environmental. They exist on the northern edge of the Park and will not be impacted by the proposed improvements.

- **Natural Heritage Areas Standard** – The parcel was identified in the **MNFI** Database as potentially hosting rare species and required a Rare Species Review to be conducted. BMPs are listed within the NFP Site Plan. An assessment was completed by **Niswander Environmental** and submitted to staff. *All other T&E species documented by USFWS and MNFI received a determination of No Effect or No Take due to the following reasons:*

  - *A lack of suitable habitat within the Review Area.*
  - *The project's scope will not impact species or suitable habitat within the Review Area (e.g., no work in the Kalamazoo River or forested areas, no tree clearing, no new temporary or permanent lighting).*
  - *Implementation of construction BMPs.*
  - *Recent mussel survey, relocation, and dredging.*

Niswander Environmental conducted an on-site habitat assessment within two miles of the Verburg Park in November 2024. This site visit determined the proposed project is Not Likely to Adversely Affect EMR, provided the EMR BMPs are implemented. If it is later determined that minor tree clearing is required, avoid tree clearing from April 15 through September 30 to avoid the potential take of protected bats. Any scope change to the proposed work requires reevaluation of potential impacts, including consultation with USFWS.

Overall, Niswander Environmental's site investigation confirmed that no natural heritage areas are present within the Review Area, as defined by the NFP. It is NE's professional opinion that the proposed project will not result in impacts to or Take of state or federal rare, threatened, or endangered species, provided that general project design guidelines and BMPs for protected bats, EMR, mussels/clams, osprey, and peregrine falcon are implemented. Additionally, work proposed at/below the OHWM should be conducted outside the fish spawning work closure which extends from March 1 through June 30. Proposed work below the OHWM may be allowed during the fish spawning closure with further coordination with MDNR to determine appropriate construction BMPs.

- **Plant Selection** – 16 new trees are proposed to be planted on-site per Zoning Requirements. Selected species are all native species.

- **Stormwater Management** – Stormwater management is handled by the Public Works Stormwater Engineer Reviewer during the Site Plan Review process. Soil Erosion & Soil Control measures are shown on the NFP Plans including BMPs for potential rare, endangered, or threatened species.

- **Public Notice Requirement** - The site is a publicly accessible greenspace so public notice per § 50-6.2K(1)(c)[1] was required. Public Notice was sent in November 2024 and a public meeting was held on Tuesday, November 19th at Mayor's Riverfront Park for residents to attend and learn more about the project. A copy of the Public Notice letter was provided to staff.

Since the project is located within the NFP Overlay District and requires Site Plan, the project needs full NFP Board Approval to proceed through the Development and Permitting Process.

After staff review, the plan appears to meet NFP standards and qualifies for conditional approval based upon the following:

- Full Approval by the Site Plan Review Committee
- Required Permits related to Natural Features by any Local, State, or Federal Agencies be on-file with the City of Kalamazoo

SECTION 015639

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes: General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary site fencing.
2. Section 311000 "Site Clearing" for removing existing trees and shrubs.

1.2 DEFINITIONS

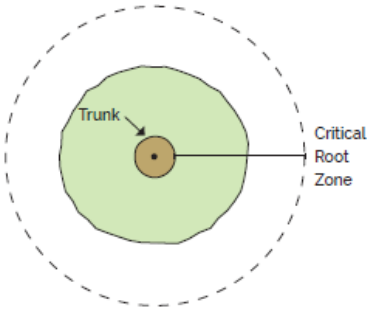
A. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape at a height 54 inches (1372 mm) above the ground line for trees with caliper of 8 inches (200 mm) or greater as measured at a height of 12 inches (300 mm) above the ground.

B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

C. Protected Tree: Refer to Landscape Plans and Protected Tree Spreadsheet, included at the end of this document. These trees are protected by the City of Kalamazoo's Natural Features Protection Overlay zoning ordinance and cannot be impacted by construction. Replacement of any damaged trees from construction process must follow City of Kalamazoo Natural Features Protection Overlay zoning ordinance standards.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, as indicated on Drawings, and as shown for a tree's critical root zone.

E. Critical Root Zone (CRZ): The zone encompassing the majority of a tree's roots. It is calculated by measuring the diameter of a tree trunk at breast height and measuring outward from the trunk 18-inches for every inch of trunk diameter. No work permitted within any protected tree's critical root zone. Refer to figure below.



F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

G. Woodland Protection Plan: Refer to Woodland Protection Plan Report, included at the end of this document. Protection of the Protected Trees and Woodland areas must follow this document and the City of Kalamazoo Natural Features Protection Overlay zoning ordinance standards.

H. Woodlands: Refer to Landscape Plans for woodland delineation areas as protected from construction per the City of Kalamazoo Natural Features Protection Overlay zoning ordinance. Replacement of any damaged trees within the protected area must refer to the City of Kalamazoo Natural Features Protection Overlay zoning ordinance standards.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:

a. Tree-service firm's personnel, and equipment needed to make progress and avoid delays.
b. Arborist's responsibilities.
c. Quality-control program.
d. Coordination of Work and equipment movement with the locations of protection zones.
e. Field quality control.
f. City of Kalamazoo Natural Features Protection Overlay zoning ordinance standards.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.
2. Detail fabrication and assembly of protection-zone fencing and signage.

C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1. Species and size of tree.
2. Location on site plan. Include unique identifier for each.
3. Reason for pruning.
4. Description of pruning to be performed.
5. Description of maintenance following pruning.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For arborist and tree service firm.

B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work. Refer to Woodland Protection Plan, included at the end of this section.

D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

E. Quality-control program.

1.6 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA and Certified Tree Risk Assessment Qualified as certified by ISA.

B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.

C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.7 FIELD CONDITIONS

A. The following practices are prohibited within protection zones and critical root zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Soil: Stockpiled soil from location shown on Drawings of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood
2. Size Range: 3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum
3. Color: Natural.

C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements:

1. Chain-Link Protection-Zone Fencing: Galvanized-steel fabricated from minimum 2-inch (50-mm) opening, 0.148-inch- (3.76-mm-) diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- (60-mm-) OD line posts, and 2-7/8-inch- (73-mm-) OD corner and pull posts; with 1-5/8-inch- (42-mm-) OD top rails and 0.177-inch- (4.5-mm-) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

a. Height: 72 inches (1800 mm)

D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:

1. Size and Text: As provided by Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain Tie a 1-inch (25-mm) blue vinyl tape around each tree trunk at 54 inches (1372 mm) above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.3 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Chain-Link Fencing: Install to comply with ASTM F567 and with manufacturer's written instructions.
2. Posts: Install steel tube stand base weighted with sand bags to keep posts in place. Do not drive posts into the ground where tree roots within the critical root zone can be damaged.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 50 feet (15 m) on protection-zone fencing, but no fewer than four signs with each facing a different direction.

C. Maintain protection zones free of weeds and trash.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones and Critical Root Zones: Not Allowed.

C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.

D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Cut Ends: Do not paint cut root ends
3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."

B. Root Pruning at Edge of Protection Zone and Critical Root Zone: Prune tree roots 6 inches (150 mm) outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone and Critical Root Zone: Not Allowed.

3.6 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.

1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Pruning Standards: Prune trees according to ANSI A300 (Part 1) and as directed by arborist.

B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.

C. Cut branches with sharp pruning instruments; do not break or chop.

D. Do not paint or apply sealants to wounds.

E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.

F. Chip removed branches and spread over areas identified by Architect

3.7 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Lowering Grade within Protection Zone and Critical Root Zone: Not Allowed.

C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

D. Minor Fill within Protection Zone and Critical Root Zones: Not Allowed.

3.8 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect. Refer to Woodland Protection Plan for additional information.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.

3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern. Refer to City of Kalamazoo's Natural Features Protection Overlay zoning ordinance for replacement species, quantity, and size information.

1. Plant and maintain new trees as specified in Section 329300 "Plants."

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

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November 29, 2024

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To: Ms. Rachel Hughes Nilsson
OCBA Landscape Architects
141 E Michigan Ave., Suite #500
Kalamazoo, MI 49007
rhnilsson@ocba.com
269.760.2142

From: Jeffrey Ling RCA TPAQ
jeff@arborwise.com

Re: Report on Protected Tree Survey at Verburg Park, Patterson Rd, Kalamazoo

Executive Summary:
Verburg Park contains three different urban forests. Two were the subject of this inspection and report. The. Northeast sector of the property is an active Riparian Woodlot. This is the section north of the reservoir and along the river. The second is an open parkland on the south edge of the property.

Forty trees, meeting the definition of "Protected Species", as declared by 6.2-4 in Chapter 50 of the City Zoning Code, were discovered.

The "Riparian Woodlot" holds few trees with generational values, even though there are over thirty-three trees that meet the size declaration. Fast growing native species dominate this site as well as non-native species. Throughout the site are the remains of trees which have failed structurally in the past.

The south section, "South Lawn", is an "installed landscape" of Norway Maples, Thornless Honey Locust and Douglas Fir. Six trees meet the size declaration for "Protected Species". All three species are considered "non-native" to southwest Michigan and Norway Maples are invasives.

Procedure:
On November 7, the park was visited. The site was dissected for the inspection and tagging of "Protected Trees". The message sign at the parking lot was considered the starting point and the tag #1, was installed with the progressive application of tags, eastward to the River. Then, the trees growing between the river and the reservoir, to the channel. There are #01- #25.

The trees, west of the message sign, along the north shore of the reservoir 26- #34, were inspected.

Moving further to the south, one large Cottonwood on the south side of the channel was tagged.

The "South Lawn" does not meet the tree density requirement of the 6.2-3 definition of a declared "Woodland". Nine trees, #34-#40 on the south lawn area were tagged as their size exceeded the declared dbh for "Protected Tree".

Data:
Forty trees on the property were tagged as "Protected Trees". They are identified on page 4.

The Riparian Woodlot holds few trees with generational values, even though there are over **thirty trees** which meet the size requirement. Fast growing species dominate this site as well as non-native species. Throughout the site are the remains of trees which have failed structurally in the recent past.

Discussion:
All the trees on this site must be declared wild, even those trees installed. There is no evidence of management, or prescriptive care. The citizen use of the north site is very evident: both by site design, footprints, observations on the day of inspection and by the accumulation of debris in the woodlot.

Other than the Sycamores and Locusts, all the trees observed are "soft wooded, which are species more prone to tissue failures in weather events. Concurrently, many trees found in the Riparian Woodlot are holding deficient structural body language and decay. These have higher potential for structural failures.

Commentary:
The desire to have this site open to the public: the walking trail along Paterson and river crossing, and the clear usage of it as a fishing site, and in several locations used as a "squatter site", means people are adjacent to the large, and structurally compromised trees, each holding thousands of pounds of wood in the air. Past failure of trees is clear evidence of this risk. The potential for it to happen again, is probable.

The Woodlot is in dramatic flux. It should not be considered "mature", or "climax". Large trees are in varied weakened states and small trees are growing taller. Even those trees not large enough for "Protected" designation, pose risks to guests. The Silver Maples and the Siberian Elms, throughout the property, are of concern for structural failure.

Along the River, several trees are leaning into the water line, and progressive riverbank erosion is evident.

Likewise, the trees along the walking path and the parking lot have body language, with indicated elevated risks. This must be a high concern and acted on by Park Management. "Risk Signage" should be installed!

According to the ISA -Tree Risk Assessment Manual, the evaluation of tree failure risks, has two prime considerations: Tree Condition and Targets (site usage). As the site holds higher valued targets, the analysis of tree condition escalates. At Verburg Park, the usage by citizens, for walking, fishing and boating produces exposure, the trees' conditions and their elevate risk of failure and causing personal injury/death!

Conclusion:
The park offers recreational opportunities for visitors and a new canoe launch feature will only increase the volume of guests. This inspection was not tasked to codify the risks associated with the large trees, however as an RCA, I am ethically charged to report the potential of future events.

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Verburg Park Protected Tree Inventory

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Tag#	Tree Name		DBH in "	Location	Condition Comments
1	*Cottonwood*	Populus deltroides	24	South of Bulletin Board	Average, very tall.
2	*Black Locust*	Robinia pseudeoacadia	20	East of #1	Large deadwood in tree
3	*Red Elm*	Ulnus rubra	20	East of #1	Codominant
4	*Cottonwood*	Populus deltoides	41	East of #1	Average, very tall.
5	*Silver Maple*	Acer saccharinum	29,20,21	East of #1	Rotten Main Trunk! Co-Dominate
6	*Willow*	Salix nigra	38	East of #1	1/2 dead, rotting
7	*Willow*	Salix nigra	42	East of #1	Deadwood in canopy
8	*Silver Maple*	Acer saccharinum	21,19	East of #1	Decay in trunk, Co-dominate
9	*Silver Maple*	Acer saccharinum	33	East side of Reservoir	Low vigor, deadwood
10	*Cottonwood*	Populus deltoides	20	East side of Reservoir	Hollow, deadwood
11	*Cottonwood*	Populus deltoides	38	East side of Reservoir	Low vigor, deadwood
12	*Silver Maple*	Acer saccharinum	33	East side of Reservoir	low vigor, deadwood
13	*Red Elm*	Ulnus rubra	20	East side of Reservoir	Co-dominate
14	*Cottonwood*	Populus deltoides	38	East side of Reservoir	Average, very tall.
15	*Cottonwood*	Populus deltoides	28	East side of Reservoir	Average, very tall.
16	*Cottonwood*	Populus deltoides	34	East side of Reservoir	Average, very tall.
17	*Silver Maple*	Acer saccharinum		East side of Reservoir	Average, very tall.
18	*Cottonwood*	Populus deltoides	28	East side of Reservoir	Average, very tall.
19	*Catalpa*	Catalpa spp.	20	East side of Reservoir	Average, very tall.
20	*Silver Maple*	Acer saccharinum	30	East side of Reservoir	weak, very tall.
21	*Silver Maple*	Acer saccharinum	41	East side of Reservoir	weak, very tall.
22	*Silver Maple*	Acer saccharinum	20	East side of Reservoir	weak, very tall.
23	*Silver Maple*	Acer saccharinum	20	East side of Reservoir	weak, very tall.
24	*Cottonwood*	Populus deltoides	32	East side of Reservoir	Average, very tall.
25	*Sycamore*	Platanus occidentalis	28	East side of Reservoir	Good
26	*Mulberry*	Morus spp.	21,20	West of Bulletin Board	Codominant
27	*Red Elm*	Ulnus rubra	21	West of Bulletin Board	Codominant
28	*Cottonwood*	Populus deltoides	24	West of Bulletin Board	Average
29	*Hackberry*	Celtis occidentilis	20	West of Bulletin Board	Average
30	*Siberian Elm*	Ulnus pumula	30	West of Bulletin Board	Non-native, Deadwood, codominant
31	*Silver Maple*	Acer saccharinum	22,25	West of Bulletin Board	Codominant
32	*Black Willow*	Salix nigra	38	West of Bulletin Board	by path, deadwood
33	*Cottonwood*	Populus deltoides	35	South of Channel	average
34	*Sycamore*	Platanus occidentalis	34	South Lawn	good
35	*Honey Locust*	Gleditsia triacanthos	21	South Lawn	average
36	*Honey Locust*	Gleditsia triacanthos	23	South Lawn	average
37	*Honey Locust*	Gleditsia triacanthos	26	South Lawn	average
38	*Dougla Fir*	Pseudotsuga menziesii)	11	South Lawn	average
39	*Dougla Fir*	Pseudotsuga menziesii)	15	South Lawn	average
40	*Dougla Fir*	Pseudotsuga menziesii)	12	South Lawn	average

ARBORWISE, LTD. is a leading Midwest consulting firm providing a full range of arboricultural and urban forestry information and support services for design and construction professionals, golf course managers, local governments, utilities, insurance and the legal profession dealing with horticulture issues, urban forestry concerns and tree preservation projects.

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MEMORANDUM

Date: March 26, 2025

To: Nolan Bergstrom, City of Kalamazoo

From: Rachel Hughes-Nilsson, OCBA Landscape Architects

Project: Verburg Park Improvements
Kalamazoo, Michigan

Project Summary:

Verburg Park is an existing park on the northeast side of Kalamazoo. It is 15.48 acres in size and contains the existing Kalamazoo Valley River Trailway (KRVT) and trailhead with parking. There is also an existing boat launch on site to the Kalamazoo River inlet.

The Verburg Park Improvements project consists of the installation of a new ADA accessible kayak launch, a 20'x20' picnic shelter, a new playground area, and a new asphalt paved bicycle pump track. Verburg Park already contains the existing Kalamazoo Valley River Trailway (KRVT) and trailhead on site and an existing boat launch.

The summary of improvements is:

1. New construction of an ADA accessible kayak launch adjacent to the existing boat launch.
2. New construction of a 20'x20' standing metal seam roofed picnic shelter.
3. New construction of a new playground area with engineered wood fiber safety surfacing.
4. New construction of an asphalt paved bicycle pump track.

ISA Certified Arborist Information:

Arborwise, Inc.
P.O. Box 6553, Fort Wayne, IN 46896

- Jeffrey Ling, RCA, TPAQ
- ISA Certified Arborist #IN 3322-A

certified WBENC WOMEN'S BUSINESS ENTERPRISE

MNFI Scientist and Wetland Delineation Information:

Niswander Environmental
9436 Maltby Road, Brighton, MI 48116

- Todd Losee
- Professional Wetland Scientist #1733
- Michigan Threatened/Endangered Species Permit Holder #2044

Woodlands:

The existing woodlands existing on the north side of the park between the KRVT trailhead parking lot and the Kalamazoo River inlet. There are no woodlands required to be removed for the proposed improvements in the park.

Trees:

There are many existing protected trees around the park; refer to attached plans, photos, and spreadsheets. There are no protected trees required to be removed for the proposed improvements in the park.

Wetlands:

Refer to attached wetland delineation report and plans. The proposed ADA accessible kayak launch is proposed to span over the wetland area next to the existing boat launch. Approximately 51SF of existing wetland will continue to live underneath the gangway for the existing wetlands. No wetlands will be removed as part of the proposed improvements to the park. The new ADA accessible 4' wide walkway will be within the 25' setback from the wetlands.

Water Resources:

Refer to the attached plans. The proposed ADA accessible kayak launch will be installed on poles and will float on the water's surface. The overall square footage area of the kayak launch over the water is 301 SF. The kayak launch will be seasonal and pulled out of the water before winter and re-installed in the spring each year.

Natural Feature Standards:

Refer to the attached MNFI report. The majority of the proposed improvements will occur in the existing lawn area on the south end of the park and will not impact any threatened or endangered species. The kayak launch installation is small next to the existing boat launch and will not impact any threatened or endangered species.

THE CITY OF Kalamazoo
Community Planning & Economic Development
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(269) 337-8000 • www.kalamazoocity.org

SUPPLEMENTAL SITE PLAN REVIEW APPLICATION

FOR NATURAL FEATURES PROTECTION

For projects located within the Natural Features Protection (NFP) Overlay District, separate site plan approval is required before the full site plan can be approved. This review is done either by the NFP Review Board or administratively by staff to verify conformance with NFP Overlay District zoning code (Chapter 50, NFP). The NFP Overlay District map can be found on the City's GIS mapping website (select "Planning & Zoning" layer and make sure "NFP Overlay" is clicked on).

The NFP Supplemental Application must be completed and submitted with the regular Site Plan Review Application and checklists. The NFP Review Board meets monthly to review and approve applications. City staff can assist in scheduling a project at an upcoming NFP Review Board meeting. While the review process offers some flexibility, projects often seek NFP approval between the Pre-Application meeting and regular Site Plan Review meeting.

Section I. Project & Applicant Information

All projects must complete Section I. If the project will not impact any natural features on the site, and does not trigger additional stormwater controls or treatment, applicants should sign and submit Section I only. Staff will review and determine if the application can be approved administratively.

Section II. Natural Features Checklist & Attachments

For projects proposing improvements or changes to the site that impact natural features, change grading, or involve work in or near NFP setbacks, Sections II and III must be completed. Section II identifies which natural features are present and standards apply. Section III will assist you in determining what documentation and additional plan sets are needed for a complete application. Once a complete application is submitted to the City, the project will be scheduled for the next available NFP Review Board meeting and an application fee of $110 will apply.

QUESTIONS

Contact the NFP staff liaison with any questions about your NFP Supplemental Application at (269) 337-8045 or development@kalamazoocity.org .

THE CITY OF Kalamazoo

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SECTION I. PROJECT AND APPLICANT INFORMATION

Please provide all of the project and applicant information requested below. Include the date of your regular site plan review meeting, if one has been scheduled or already taken place.

APPLICANT NAME:	(first) Rachel	(last) Hughes-Nilsson	
APPLICANT ADDRESS:	141 (number)	East Michigan Avenue, Ste. #500 (street name)	
	(city) Kalamazoo	(state) MI	(Zip) 49007
APPLICANT EMAIL:	rhnilsson@ocba.com	**PHONE:**	(269)381-3357
PARCEL ADDRESS/PIN:	669 Gull Road, Kalamazoo, MI, 49007, PIN: 06-15-282-001		
PROJECT DESCRIPTION:	See attached narrative		
OWNER NAME: *(if different)*	(first) City of Kalamazoo	(last) Parks & Recreation Dept.	
HAS REGULAR SITE PLAN REVIEW MEETING OCCURRED?	☐ Yes ■ No	**DATE OF SITE PLAN REVIEW MEETING:**	

NFP APPLICATION REQUIRED?

Is the project limited to interior work only with no exterior ground changes or increase in impervious coverage?	
☐ **YES**	If YES, Sections II & III of this application are not needed. Sign below & submit only this page with your site plan review or permit application.
☑ **NO**	If NO, proceed to Sections II & III. Do **NOT** sign below.

By signing below, the applicant certifies that no natural features will be disturbed as part of this project.

Print name: Only sign if No is selected above

Signature: _____ Date: _____

SECTION II. NFP SITE PLAN CHECKLIST & ATTACHMENTS

Use the checklist to determine what documentation and addition plans sets must be prepared for this application. All plan sets, maps, and additional information must be attached to this application to be considered complete. If you checked "no" to certain NFP items in questions 1-7 in Section II, record "N/A" on the checklist.

REQUIRED: NFP SITE PLAN SET

All applications must include separate sheets in the plan set showing the following:

1. Existing conditions map showing an inventory of all protected natural features and any associated natural features setbacks with distances (use checklist below)

2. Future development plan overlaid onto the existing conditions and natural features inventory; indicate where and to what extent protected natural features will be disturbed, removed, altered, or impacted in any way and which natural features will be protected during and after construction

   Future development plan must include:

   - **Boundary with extent of re-grading**, construction, or site preparation activities
   - **All existing and new building footprints** (mark whether existing buildings will be removed or maintained)
   - **New and existing parking** surfaces or structures, sidewalks, trails, and other impervious or semi-impervious surfaces including decks, patios, viewing platforms, etc. (list proposed surface materials and whether existing surfaces will be maintained or removed)
   - **Proposed location of fencing and screening**, whether permanent, natural, or construction silt fencing and/or natural feature protection fencing (with specifications)
   - **Stormwater facilities** showing boundary of ground disturbance, grading or construction activities, if located near natural features
   - **New utilities** and/or relocation of existing utilities showing corridors that could impact natural features

3. Landscape plan detailing the minimum elements needed to meet zoning code requirements and all proposed additional landscaping elements or features (include table with species name)

4. Any additional plans or tables detailing which natural features will be restored or replaced after construction, if required (e.g., riparian buffer installation or slope restoration plan may be required under certain circumstances when the ordinance allows changes within these protected areas)

WETLANDS	Present:	Included on page #:	Notes:
Mark existing wetland boundaries with notes about wetland conditions. *Attach a copy of EGLE permit or permit application for work impacting Part 303 wetlands regulated by the State.*	■ Yes ☐ No	L1.6	
WATER RESOURCES	**Present:**	**Included on page #:**	**Notes:**
Mark the location of all water resources on the parcel and those within 25 feet of the parcel boundaries. *Attach a copy of EGLE permit or permit application for work impacting Part 301 waters regulated by the State.*	■ Yes ☐ No	L1.6	
Show required setbacks with dimensions; describe existing or future ground cover within riparian setbacks.		L1.6	
TREES	**Present:**	**Included on page #:**	**Notes:**
Mark the location of all "protected" trees that are proposed to be removed and those that will remain and require protection fencing.	■ Yes ☐ No	L1.3, L1.4, L1.5	
Include a table with species name, size (DBH and height), and condition of "protected" trees that are proposed to be removed and list replacement tree information.		L1.3, L1.4 L1.5	
Provide a note with justification for removal.		N/A	No Removals
WOODLANDS	**Present:**	**Included on page #:**	**Notes:**
Delineate the boundary of all woodlands on the parcel noting where woodlands likely extend onto adjacent parcels.	■ Yes ☐ No	L1.6	
Mark all areas of woodland that will be retained and removed (i.e., cleared).		L1.6	No Removals
Include a table or note with the required preservation ratio (based on existing woodland coverage), percentage proposed to be removed, and rationale for selecting area for removal.		L1.6	
SLOPES	**Present:**	**Included on page #:**	**Notes:**
Provide a slope analysis that shows the boundaries of all "protected" slopes and mark the required setback(s).	☐ Yes ■ No	if yes, include	if yes, include
Include a note with co-existing feature that triggers "protected" slope status (e.g., wooded, within 500 ft of water resource.		if yes, include	if yes, include

NATURAL HERITAGE AREAS	Present:	
Is an MNFI* rare species review required? *Parcels can be pre-screened using the City's GIS website, click on the "Planning & Zoning" layer and "NFP Overlay" layer; then click on parcel and see MNFI status.*	☒ Yes ☐ No	
If an MNFI rare species review is required, attach the resulting report.		

*Michigan Natural Features Inventory (MNFI) Rare Species Reviews can be requested at: https://mnfi.anr.msu.edu/services/rare-species-reviews

ACCEPTED DATA SOURCES & ANALYSIS

All data sources, analysis, and professionals are subject to approval by the City Planner according to Chapter 50-6.2. The following guidance may be useful when selecting a professional or methodology for inventorying natural features.

1. **WETLANDS**
   - Wetland delineation report performed by a qualified consultant including a map denoting delineated boundary of all wetlands, OR
   - Most recent US Fish & Wildlife Service's National Wetlands Inventory boundary (State of Michigan mapper: https://www.michigan.gov/egle/about/organization/water-resources/wetlands/inventory-maps)

2. **PROTECTED TREE IDENTIFICATION**
   - May be performed by an qualified professional (including ISA Certified Arborist or similar); a full tree inventory is not required if all necessary information can be obtained and communicated using another survey, inventory, or site assessment methodology

3. **WOODLANDS**
   - A qualified professional, such as an ISA Certified Arborist, landscape architect, or license engineer may perform a desktop analysis or field survey to delineate woodlands
   - When a variances is being requests to remove more woodland cover than is allowed under the preservation ration, the following is required
     - Woodland assessment report with determination that the Trees per Area (TPA) meets the NFP definition of a woodland and mapped delineation of woodland
     - Woodland assessment report with a determination that Basal Area is equivalent to the TPA in the NFP definition and meets definition of a woodland and mapped delineation of woodland
     - In addition to determination of whether stand of trees meets NFP definition of a woodland, assessment must include information on general species diversity,
     -

composition of species, any notable trees (either notable species or size), invasive species composition, and general health and age observations of tree stand

4. **PROTECTED SLOPES**
   - Topographic survey performed in the field by a qualified consultant to delineate areas of a slope with grade of 20% or greater
   - Desktop analysis performed using U.S. Geological Survey digital topographic maps, LIDAR, digital elevation map, or equivalent data showing 2’ intervals or finer resolution, performed by a qualified consultant or engineer

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NOTICE OF UPCOMING PROJECT

City of Kalamazoo Verburg Park Improvements

Project Information:

This project consists of new construction of park amenities at Verburg Park located at 669 Gull Road, Kalamazoo, Michigan 49007. Currently the park contains bike and walking paths, canoe/kayak launch, KRVT trailhead and bike racks, and fishing access on the Kalamazoo River. The Parks and Recreation Department would like to install additional amenities such an accessible kayak launch, shelter, and bicycle pump track.

Plan Information:

Plans can be viewed online here: https://www.kzooparks.org/Home Click on the "News" tab in the middle of the page and look for the Verburg Park Improvements new.

Project Questions/Comments:

Any project related questions or comments can be emailed to Ashton Anthony, Deputy Director at anthonya@kalamazoocity.org

Project Schedule:

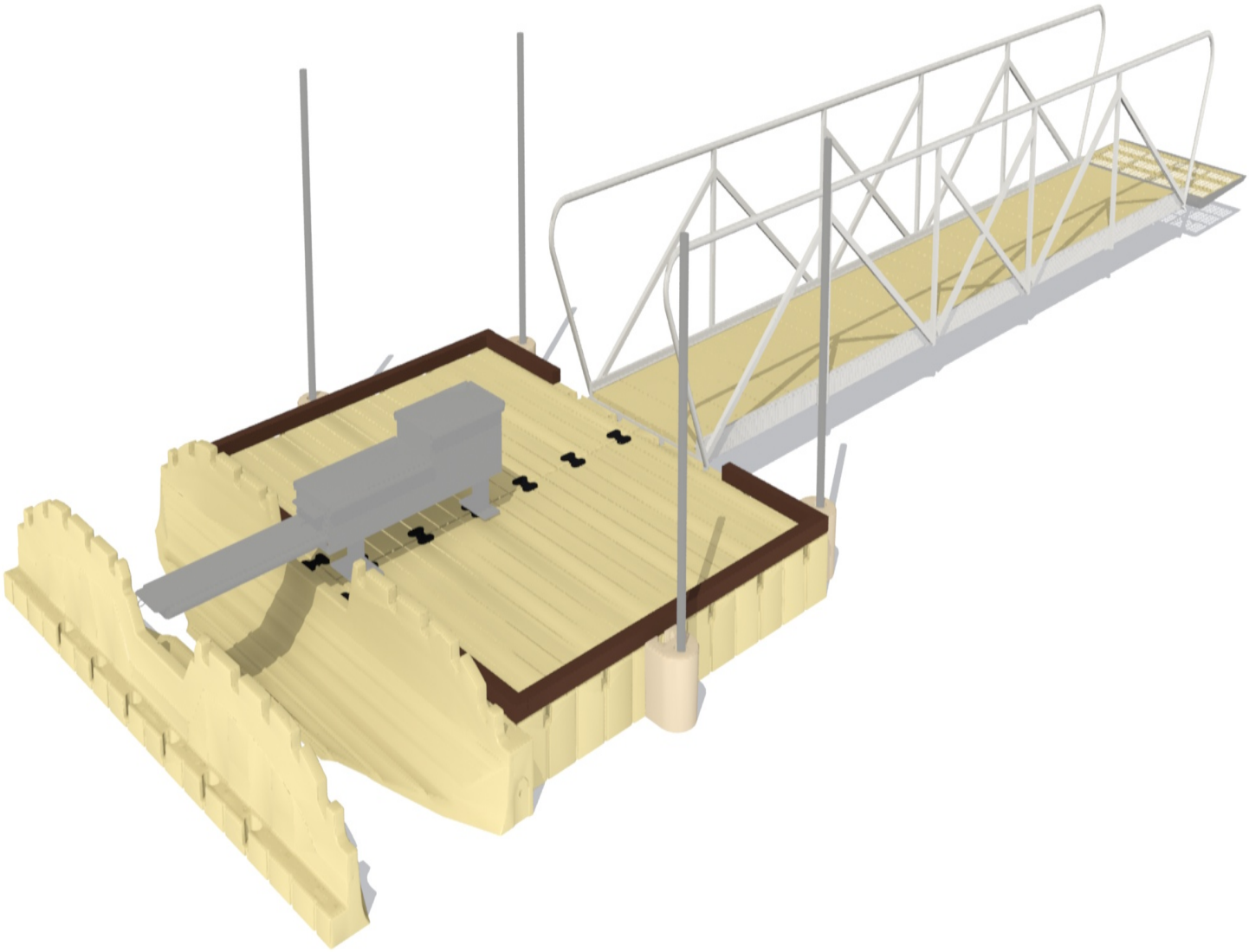
City of Kalamazoo NFP Review Meeting: Approximately February 2025

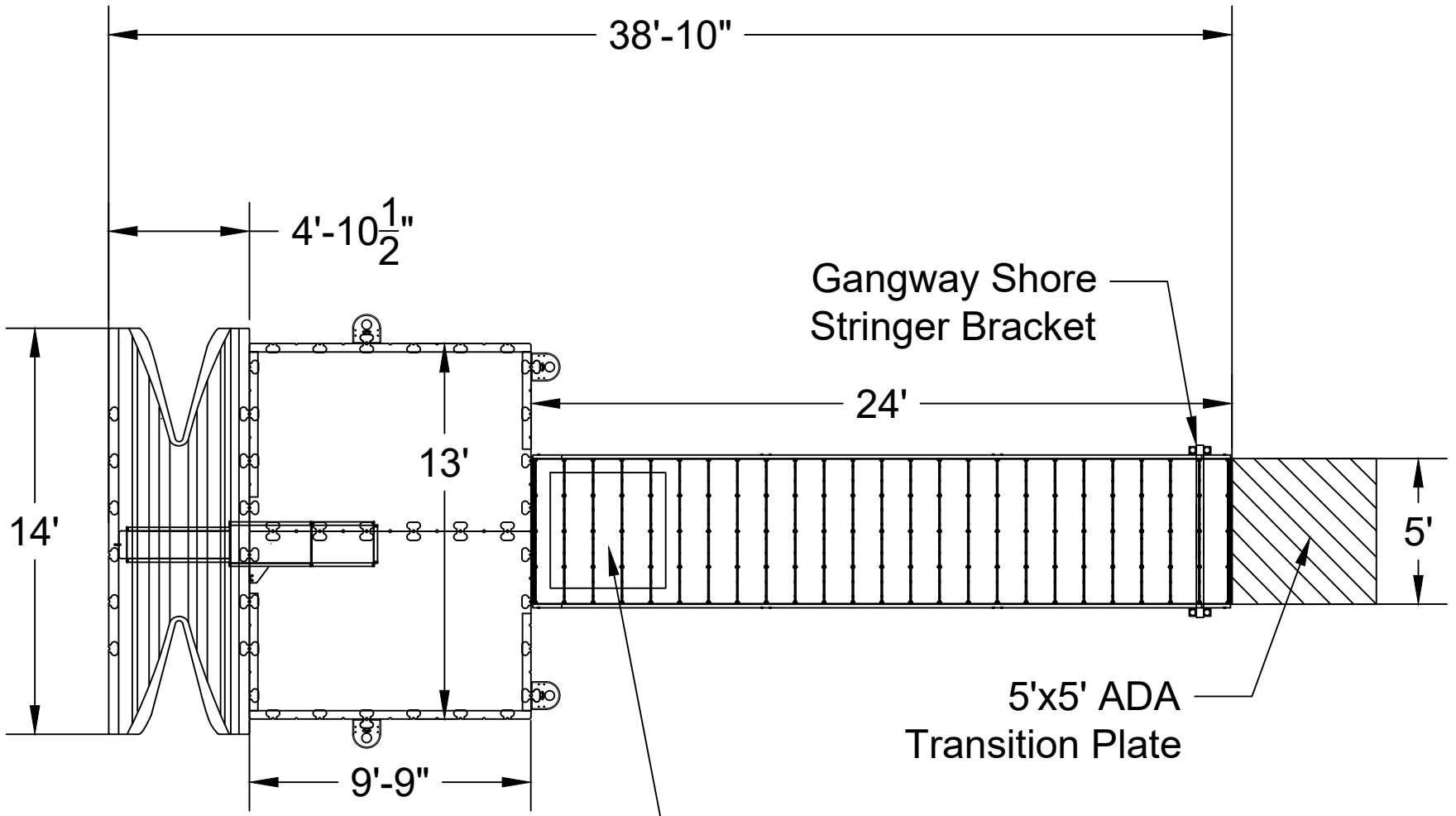
- NFP Standards to be reviewed: Wetlands, Water Resources, Trees, Woodlands, and Natural Features Inventory

City of Kalamazoo Site Plan Review Submittal: Approximately February 2025

Construction Timeline: June 2025 – June 2026

certified WBENC WOMEN'S BUSINESS ENTERPRISE





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OCBA-Kalamazoo	**EZ Dock of Mid America**
Prepared For: Camp & Cruise	3253 W. 1000 N. Fortville, IN 46040
Drawing Number: EZ011325OCBA	PHONE NO: (317) 747-4934
Drawn By: RKU / Date: 1/13/2025	EMAIL: sales@ezdocks.com WEBSITE: ezdocks.com

December 2024

Wetland Delineation Report

Verburg Park Wetland Delineation
City of Kalamazoo, Kalamazoo Co., MI
OCBA Landscape Architects



NISWANDER ENVIRONMENTAL
9436 Maltby Road, Brighton, MI 48116
810.225.0539 *office* | 810.225.0653 *fax*

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I. INTRODUCTION

In November 2024, Niswander Environmental (NE) conducted a wetland delineation for O'Boyle, Cowell, Blalock & Associates, Inc. (OCBA) of an approximately 18.18-acre Review Area known as Verburg Park, located in the City of Kalamazoo (City), Kalamazoo County, Michigan (Site Location Map, **Appendix A**). It is our understanding that the City is proposing to enhance the park property, which therefore requires an accurate delineation of any wetland boundaries and regulated waters.

Our on-site assessment identified one (1) wetland (Wetland A) within the Review Area, which includes the Kalamazoo River and a small pond that outlets directly to the river via a narrow but navigable channel (Wetland Location Map, **Appendix A**). It is NE's professional opinion that Wetland A is regulated under the authority of Part 301, Inland Lakes and Streams, and Part 303, Wetlands Protection of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended (NREPA). Please note that the Michigan Department of Environment, Great Lakes, and Energy (EGLE) has the final authority of the location and regulatory status of wetlands in the State of Michigan. **The wetland delineation was conducted outside of the growing season, therefore, EGLE will require verification of the wetland boundaries in the Spring 2025 prior to site development.**

The Review Area is located within the floodplain of the Kalamazoo River according to the Federal Emergency Management Agency (FEMA) National Flood Insurance Program maps. The potential presence of state-regulated floodplains under the floodplain authority found in Part 31, Water Resources Protection, of NREPA, should be reviewed by an engineer familiar with floodplain regulations prior to development of site plans.

To verify the wetland boundaries and the regulatory determination in this report, it is recommended that an EGLE Wetland Identification Program (WIP) application be submitted to EGLE. In addition, if any proposed development has the potential to impact wetlands, streams, or floodplains, it is recommended that a preapplication request be submitted to EGLE prior to submitting a permit application to review the project and any impacts.

II. METHODS

Potential wetland areas were evaluated in the field using the procedures outlined in the U.S. Army Corps of Engineers (USACE) *1987 Wetland Delineation Manual* ('*87 Manual*), and the Northcentral and Northeast Regional Supplement to the '*87 Manual* as required by EGLE, under NREPA. According to these procedures, wetlands are identified by the presence of hydric soils, signs of hydrology indicators, and dominant hydrophytic vegetation.

Hydric soil indicators are assessed in the field through soil pits that are dug in and around potential wetland areas. The Natural Resource Conservation Service (NRCS) defines a hydric soil as a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. To assist in field identification of hydric soils, the NRCS developed the *Field Indicators of Hydric Soils in the United States* (Version 9.0, 2024), which specifies parameters such as soil matrix color, amount and contrast of redox

concentrations or depletions, and depth and thickness for a specific soil type such as loamy, clayey, or sandy soils.

Signs of hydrology within potential wetland areas are also investigated. Standing water or saturated soils, water marks on trees, drift lines, sediment deposits, and water-stained leaves (among others) are examples of primary indicators of hydrology, while secondary indicators include drainage patterns, moss trim lines, crayfish burrows, and surface soil cracks. Either one primary or two secondary indicators are necessary in determining the presence of wetland hydrology.

Dominant vegetation for wetland areas is determined by estimating the percent cover for all species in the tree, shrub, forb, and vine stratums. Based on using the percent cover and the "50/20 rule" as defined in the '*87 Manual*, dominant species are determined for each stratum. The USACE *National Wetland Plant List* has assigned every species that occurs in wetland an indicator status as to the likelihood that it will occur in wetland areas. These indicator statuses are obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), and upland (UPL). Those species with ratings of FAC, FACW, and OBL are considered to be hydrophytes (most likely to occur in wetland environments). Wetland vegetation is confirmed when, under normal circumstances, more than 50 percent of the dominant species from all strata are FAC, FACW, and/or OBL. An area has non-hydrophytic (non-wetland) vegetation when 50 percent or more of the dominant species from all strata are rated as FACU and/or UPL. Areas that meet the three criteria of hydric soils, wetland hydrology, and hydrophytic vegetation are considered wetlands. There are certain cases where only two of the criteria are required to be met (for more explanation, see Chapter 5, Difficult Wetland Situations, of the Northcentral and Northeast Regional Supplement).

During an on-site delineation, the boundary of the wetland is identified by verifying the presence/absence of the three criteria and marking this boundary with pink Wetland Delineation flagging labeled using an alpha-numbering system (A1, A2, A3, etc.).

III. AVAILABLE MAPPING & DATA

USGS The National Map

The U.S. Geological Survey (USGS) The National Map indicates that elevations in the Review Area are generally flat, at approximately 760 feet above mean sea level (**Appendix A** USGS The National Map). The USGS The National Map depicts the Kalamazoo River and the small pond within Verburg Park, along with wetland between the river and pond. USGS topographic maps typically show only the more distinct wetland and water features and should be utilized for preliminary analysis only. Field mapping is necessary to determine the actual existence, type, and boundaries of wetlands and water features.

USFWS National Wetland Inventory

The U.S. Fish & Wildlife Service (USFWS) National Wetlands Inventory (NWI), a national wetland mapping program, was reviewed prior to the site inspection (**Appendix A** NWI Map). The NWI map depicts freshwater forested/shrub wetlands, the Kalamazoo River, and the pond

within the Review Area. However, since NWI maps are remotely compiled from aerial photography, they may not show all wetlands in a given area, nor accurately characterize all wetlands shown. These maps should be used only for preliminary analysis, and field mapping is necessary to determine the on the ground presence, type, and boundaries of wetlands.

USDA NRCS Soils Map

The USDA-NRCS Soil Survey was reviewed prior to the site inspection. The soil report identified one (1) soil type (Urban complex) within the Review Area, as presented in Table 1 below. This soil type is not listed as hydric, which is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (USDA-NRCS 2024). Hydric soils are one of three diagnostic criteria used to determine whether or not an area is a wetland. Field soil analysis is necessary to accurately identify hydric soil conditions.

Table 1. USDA NRCS Soils Map Units

Soil Unit Symbol	Soil Unit Name	Drainage Class	Hydric Rating
Ub	Urban land	NA	No

FEMA Flood Map

The FEMA Flood Maps were reviewed prior to the site inspection (**Appendix A** FEMA National Flood Hazard Map). The Flood Map (FEMA Panel 26077C0187E) depicts a mapped 100-Year floodplain boundary (Zone AE), a 500-Year floodplain boundary, and mapped floodway within the Review Area, adjacent to the Kalamazoo River. The State of Michigan's floodplain Regulatory authority found in Part 31, Water Resources Protection, of NREPA, 1994 PA 451, as amended, requires that a permit be obtained prior to any alteration or occupation of the 100-year floodplain of a river, stream or drain. The potential presence of state-regulated floodplains under the authority of Part 31 should be reviewed by an engineer familiar with floodplain regulations prior to development of site plans.

IV. RESULTS

Wetlands & Streams

The 18.18-acre Review Area is a City-owned park known as Verburg Park, consisting of mowed grass, a paved and gravel parking lot, a paved bike trail, natural forest/scrubland, a small pond, and the west side of the Kalamazoo River. The on-site assessment identified one (1) wetland (Wetland A) within the Review Area, which includes the banks of the river and a small pond with a navigable channel to the river. The total area of the onsite wetland within the Review Area is 1.17 acres, not including the open water pond or Kalamazoo River. The wetland location is depicted in the Wetland Location Map provided in **Appendix A**.

Site Photographs depicting conditions at the time of the site investigation are provided in **Appendix B** and Wetland Data Forms are provided in **Appendix C**. The flagged wetland boundaries were GPS located in the field using a sub-meter Trimble DA2 unit.

A description of the wetlands located within the Review Area is provided below.

WETLAND A

Wetland A within the Review Area consists of the wooded floodplain, bankfull shelf and open water associated with the Kalamazoo River, as well as the forested (PFO) and scrub-shrub (PSS) wetland fringe of the adjacent pond. Portions of Wetland A appear to be both historically and recently disturbed; areas along the banks of the river show signs that it has been burned, as evidenced by ash and charred fill material in soil samples. Additionally, the southern end of Wetland A along the small pond and Kalamazoo River appears to have been restored recently, with NE staff observing bank stabilization materials along the slopes of the river and pond (i.e., erosion control matting, live stakes, root wads, etc). NE confirmed wetland hydrology, hydric soils, and dominant wetland vegetation at sample points SP1 and SP3.

In general, Wetland A's boundary follows topography, particularly the bankfull shelf of the river and pond. Forested portions of Wetland A exist along the west bank of the Kalamazoo River, and along the northern and western bank of the small pond. Canopy trees such as silver maple (*Acer saccharinum*), American elm (*Ulmus americana*), black willow (*Salix nigra*), cottonwood (*Populus deltoides*), and box elder (*Acer negundo*) dominate, with an understory consisting of green ash (*Fraxinus pennsylvanica*), catalpa (*Catalpa speciosa*), highbush cranberry (*Viburnum opulus*), purple loosestrife (*Lythrum salicaria*), moneywort (*Lysimachia nummularia*), rough avens (*Geum laciniatum*) calico aster (*Symphyotrichum lateriflorum*), late goldenrod (*Solidago gigantea*), and reed canary grass (*Phalaris arundinacea*).

Scrub-shrub habitat associated with Wetland A is present in the northern portion of the Review Area (an area along the river that is largely void of mature trees), and around the eastern and southern bank of the pond. As mentioned, the edge of the pond has been restored in recent years and is transitioning to a scrub-shrub buffer. Sandbar willow (*Salix nigra*) and silky dogwood (*Cornus amomum*) are common along the pond, and species such as purple loosestrife, reed canary grass, calico aster, swamp rose mallow (*Hibiscus moscheutos*), big bluestem (*Andropogon gerardii*), and sedge (*Carex* sp.) are present as well.

Signs of hydrology present at the time of inspection within Wetland A included Saturation, Stunted or Stressed Plants, Geomorphic Position, and a positive FAC-Neutral Test.

Soils within this wetland consist of historic fill material along the banks of the river, and non-native soils around portions of the pond due to restoration activities. Where possible, native soils were determined to be hydric when a Redox Dark Surface (F6) hydric soil indicator was revealed.

It is NE's professional opinion that Wetland A is regulated under Parts 301 and 303 since it is hydrologically connected to a regulating body of water (Kalamazoo River).

STREAMS

The Kalamazoo River makes up the eastern boundary of the Review Area. This stream is a major river system in southwest Michigan, and generally flows north in this location ultimately turning west and flowing into Lake Michigan. The river in this area averages approximately 130 – 150

feet in width, with a substrate consisting of sand, rock, and silt. The average depth at the time of inspection could not be determined due to turbid water.

Ordinary High Water Mark (OHWM) elevations of the Kalamazoo River and adjacent pond were collected by NE. The OHWM elevations along the Kalamazoo River vary between 752.54 and 755.20 depending on location, but average approximately 754 feet above mean sea level. The OHWM elevations around the pond range between 752.26 to 755.09, but also generally average 754 feet above mean sea level. When the exact location of the proposed activities are identified, NE can provide specific OHWM elevations. The OHWM location was identified and GPS'ed in the field as depicted in Figures 6/7.

UPLAND AREAS

Verburg Park is an urban park located near industrial sites, commercial properties, and high-density residential parcels. Upland, non-wetland areas within the Review Area largely consist of typical urban park habitat such as open mowed fields, natural forest/scrubland, parking lots, and a bike path. Naturalized upland areas along the river and pond are within the floodplain of the Kalamazoo River and thus contain typical floodplain species, including silver maple, elm, black walnut (*Juglans nigra*), honeysuckle (*Lonicera mackii*), catalpa, common buckthorn (*Rhamnus cathartica*), tall goldenrod (*Solidago altissima*), thistle (*Cirsium arvense*), calico aster, mullein (*Verbascum thapsus*), garlic mustard (*Alliaria petiolata*), motherwort (*Leonurus cardiaca*), and burdock (*Arctium lappa*). NE determined these areas to be upland based on vegetation, lack of hydrology indicators, and topographic position.

V. REGULATORY CONSIDERATIONS

Inland Lakes and Streams Regulation by the State of Michigan

Inland lakes and Streams are defined, in pertinent part, by Part 301 of NREPA as: "natural or artificial lake, pond, or impoundment; a river, stream, or creek which may or may not be serving as a drain as defined by the drain code of 1956, 1956 PA 40, MCL 280.1 to 280.630; or any other body of water that has definite banks, a bed, and visible evidence of a continued flow or continued occurrence of water, including the St. Marys, St. Clair, and Detroit Rivers…"

Inland lakes and streams are protected under Part 301, Inland Lakes, and Streams, of the NREPA. EGLE assumes authority over natural or artificial inland lakes that are greater than five acres in size, and natural or created streams that have definite banks, a bed, and visible evidence of a continued flow or continued occurrence of water.

The following activities are prohibited within regulated inland lakes and streams without an EGLE permit:

- Dredging or filling bottomland;
- Constructing, enlarging, extending, removing, or placing a structure on bottomland;
- Erecting, maintaining, or operating a marina;
- Creating, enlarging, or diminishing an inland lake or stream;
- Structurally interfering with the natural flow of an inland lake or stream;
- Constructing, dredging, commencing, extending, or enlarging an artificial canal, channel, ditch, lagoon, pond, lake, or similar waterway where the purpose is ultimate connection

with an existing inland lake or stream, or where any part of the artificial waterway is located within 500 feet of the ordinary high-water mark of an existing inland lake or stream;
- Connecting any natural or artificially constructed waterway, canal, channel, ditch, lagoon, pond, lake or similar water with an existing inland lake or stream for navigation or any other purpose.

Wetland Regulations by the State of Michigan

Wetlands are defined, in pertinent part, by Part 303 of NREPA as: "...land characterized by the presence of water at a frequency and duration sufficient to support and that under normal circumstances does support wetland vegetation or aquatic life and is commonly referred to as a bog, swamp, or marsh..."

Wetlands are regulated under Part 303. In accordance with Part 303, wetlands are regulated if they are any of the following:

(i) Is a water of the United States as that term is used in section 502(7) of the federal water pollution control act, 33 USC 1362.
(ii) Is contiguous to the Great Lakes, Lake St. Clair, an inland lake or pond, or a stream. As used in this subparagraph, "pond" does not include a farm or stock pond constructed consistent with the exemption under section 30305(2)(g).
(iii) Is more than 5 acres in size.
(iv) Has the documented presence of an endangered or threatened species under part 365 or the endangered species act of 1973, Public Law 93-205.
(v) Is a rare and imperiled wetland.

The following activities are prohibited within regulated wetlands without an EGLE permit:

- Deposit or permit the placing of fill material in a wetland.
- Dredge, remove, or permit the removal of soil or minerals from a wetland.
- Construct, operate, or maintain any use or development in a wetland.
- Drain surface water from a wetland.

A summary of the wetlands within the Review Area is provided in Table 2 below:

Table 2. Summary of Wetlands within the Review Area

Wetland ID	Wetland Flags	Wetland Type	State Regulated?
Wetland A	A1 – A95	Forested and Scrub-Shrub Open Water	**YES**
Kalamazoo River	N/A	River	**YES**

Local Regulations

City of Kalamazoo

According to EGLE, the City of Kalamazoo does not have a local wetland ordinance. However, Section 50-6.2 (Natural Features Protection Overlay Standards) of the City of Kalamazoo's Code of Ordinances requires a wetland and water resources setback of 25 feet for parcels greater than one acre in size. The wetland setback is measured from the outer edge of wetland vegetation

(delineated wetland boundary) or the ordinary high water mark of streams, inland lakes, and ponds where a wetland fringe is not present. The City of Kalamazoo's Natural Features Protection Overlay Standards should be reviewed prior to development of site plans.

VI. FINDINGS AND RECOMMENDATIONS

As indicated in this report, NE identified one (1) wetland (Wetland A) encompassing a pond and the Kalamazoo River within the Review Area (Wetland Location Map, **Appendix A**). It is NE's professional opinion that Wetland A, including the pond and the Kalamazoo River, is regulated under the authority of Part 301 and Part 303 of NREPA. *The wetland delineation was conducted outside of the growing season, therefore, EGLE will require verification of the wetland boundaries in Spring 2025 prior to site development.*

The Review Area is located within the floodplain of the Kalamazoo River according to FEMA National Flood Insurance Program maps. The potential presence of state-regulated floodplains under the Floodplain Authority of Part 31, Water Resources Protection, of NREPA should be reviewed by an engineer familiar with floodplain regulations prior to development of site plans.

Please note that EGLE has the final authority of the location and regulatory status of wetlands and streams in the state of Michigan. An EGLE permit may be required for any proposed work (*e.g.*, filling, dredging, construction, draining, discharging storm water, and/or other wetland development) that takes place within the boundaries of a regulated wetland/stream. To verify the wetland boundaries and the regulatory determination(s) in this report, it is recommended that an EGLE WIP application be submitted to EGLE. In addition, if any proposed development has the potential to impact wetlands, streams, or floodplains, it is recommended that a preapplication request be submitted to EGLE prior to submitting a permit application to review the project and any impacts.

VII. REFERENCES

Environmental Laboratory, 1987 Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, United States Army Engineer Waterways Experiment Station, Vicksburg, MS.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. The National Wetland Plant List: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X.

United States Army Corps of Engineers (USACE). 2011. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0), ed. J. S. Wakeley, R. W. Lichvar, C. V. Noble, and J. F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

United States Department of Agriculture, Natural Resources Conservation Service. 2024. Field Indicators of Hydric Soils in the United States, Version 9.0.

USDA-NRCS. 2024. Web Soil Survey of Kalamazoo County, Michigan.

U.S. Fish and Wildlife Service (USFWS). 2024. National Wetlands Inventory website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. http://www.fws.gov/nwi/.

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Appendix A

SITE MAPPING

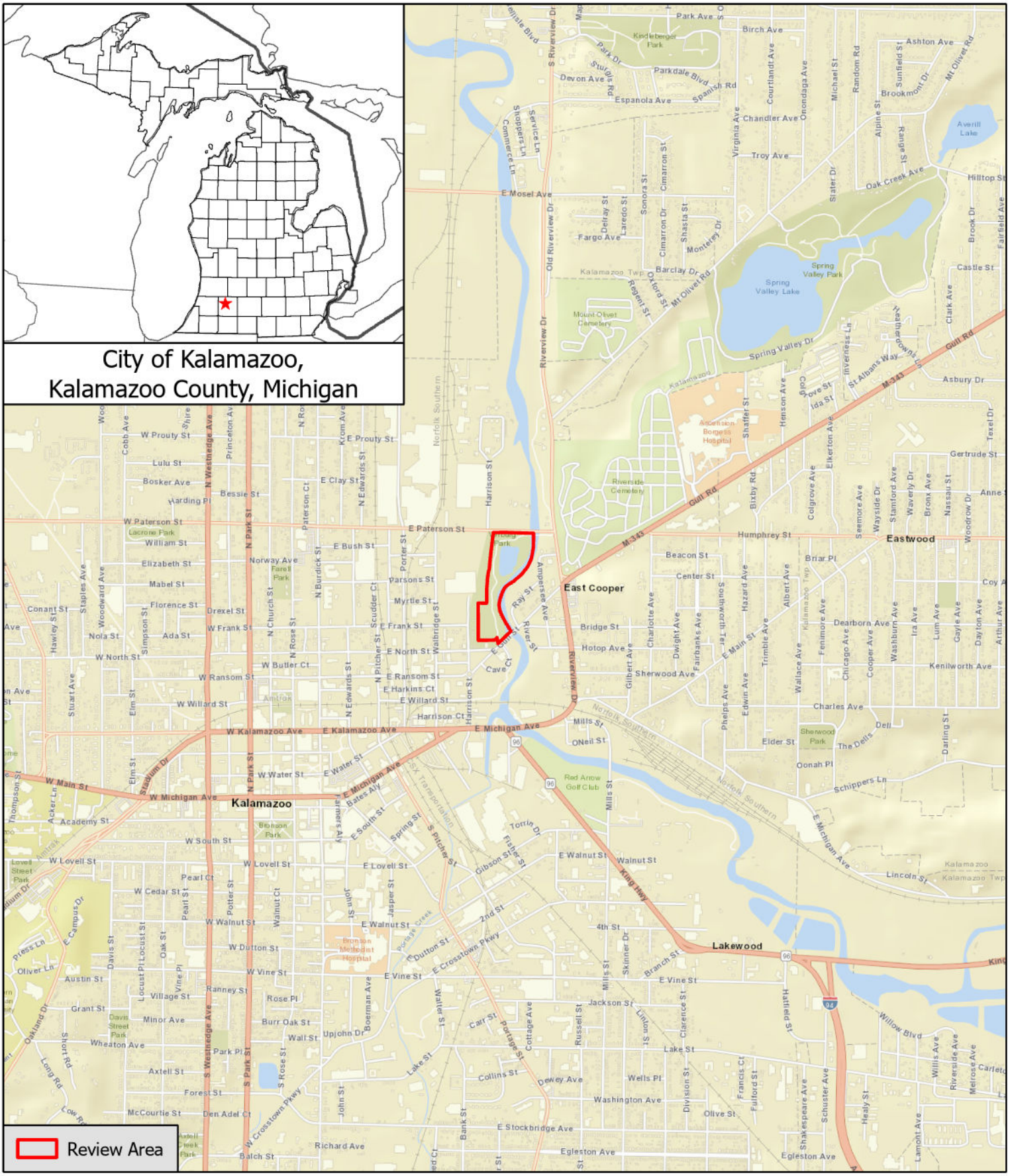

Figure 1. Site Location Map

NE 1768-4 Verburg Park
S.15, T.02S, R.11W
City of Kalamazoo, Kalamazoo County, Michigan
Delineation Date: November 25, 2024
Map Date: December 4, 2024

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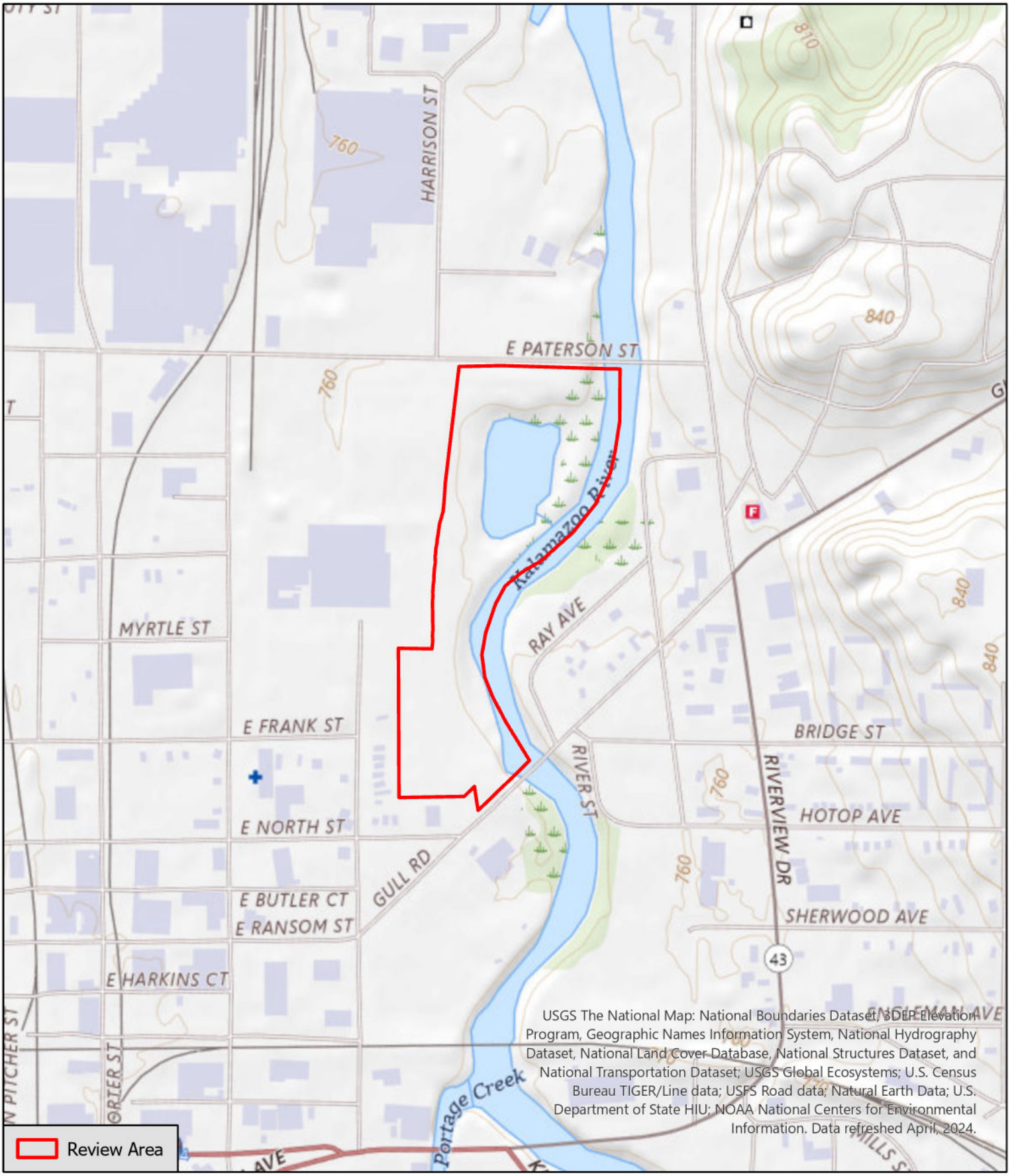

Figure 2. USGS The National Map

NE 1768-4 Verburg Park
S.15, T.02S, R.11W
City of Kalamazoo, Kalamazoo County, Michigan
Delineation Date: November 25, 2024
Map Date: December 4, 2024

0 250 500 1,000 Feet

N W E S

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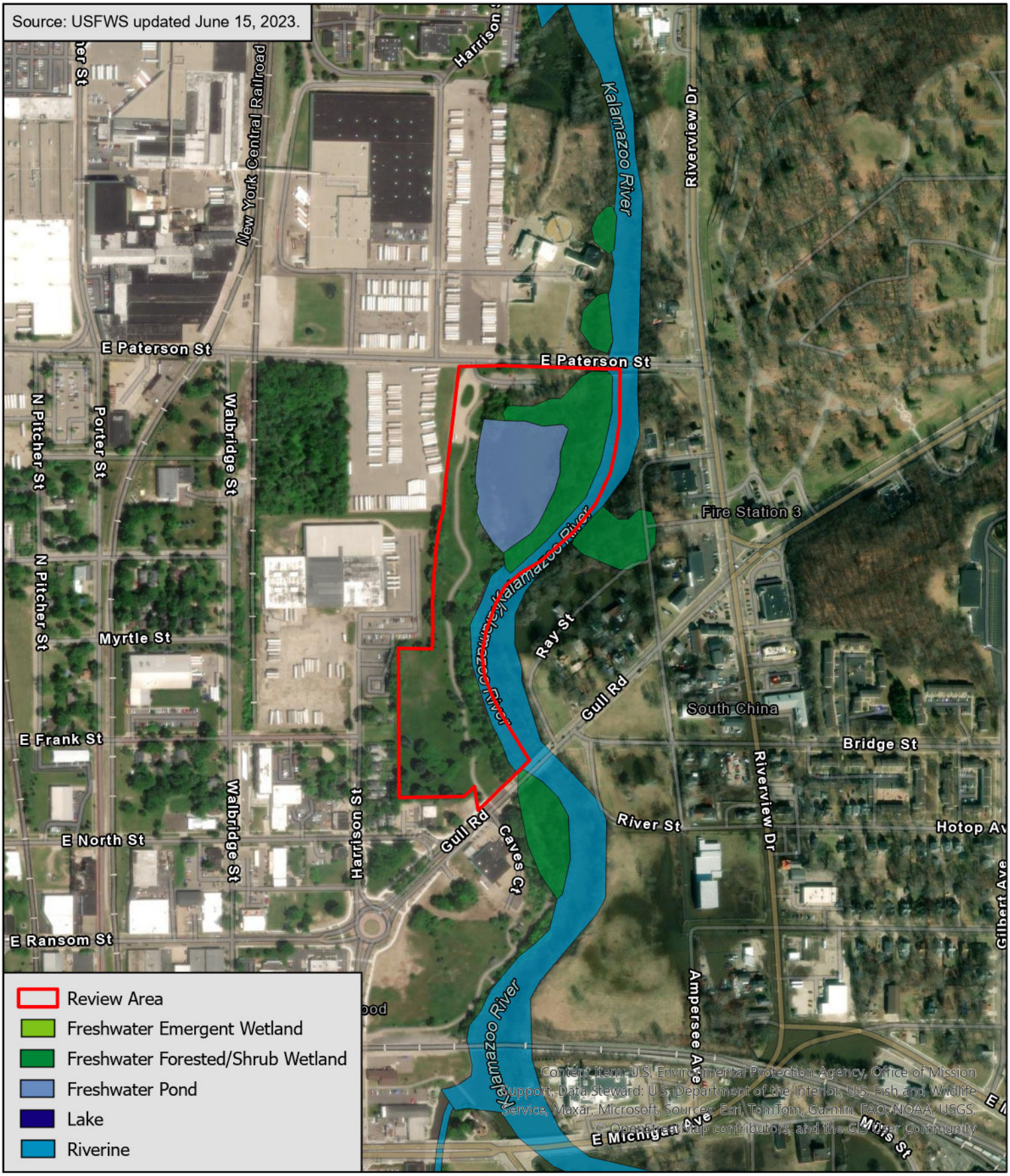

Figure 3. USFWS NWI Map

NE 1768-4 Verburg Park
S.15, T.02S, R.11W
City of Kalamazoo, Kalamazoo County, Michigan
Delineation Date: November 25, 2024
Map Date: December 4, 2024

0 250 500 1,000 Feet

N W E S

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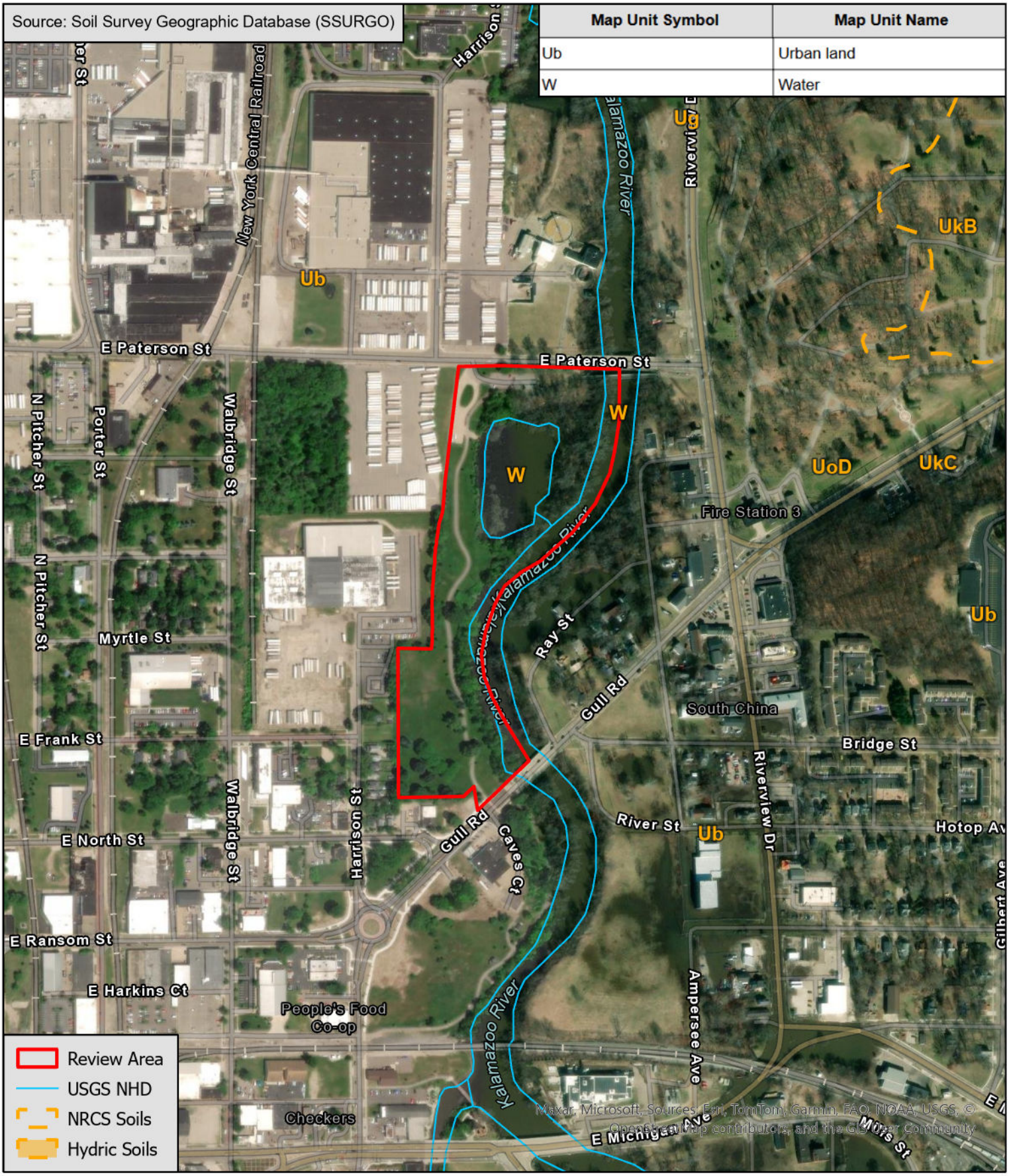

Figure 4. USDA-NRCS Soils Map

NE 1768-4 Verburg Park
S.15, T.02S, R.11W
City of Kalamazoo, Kalamazoo County, Michigan
Delineation Date: November 25, 2024
Map Date: December 4, 2024

0 250 500 1,000 Feet

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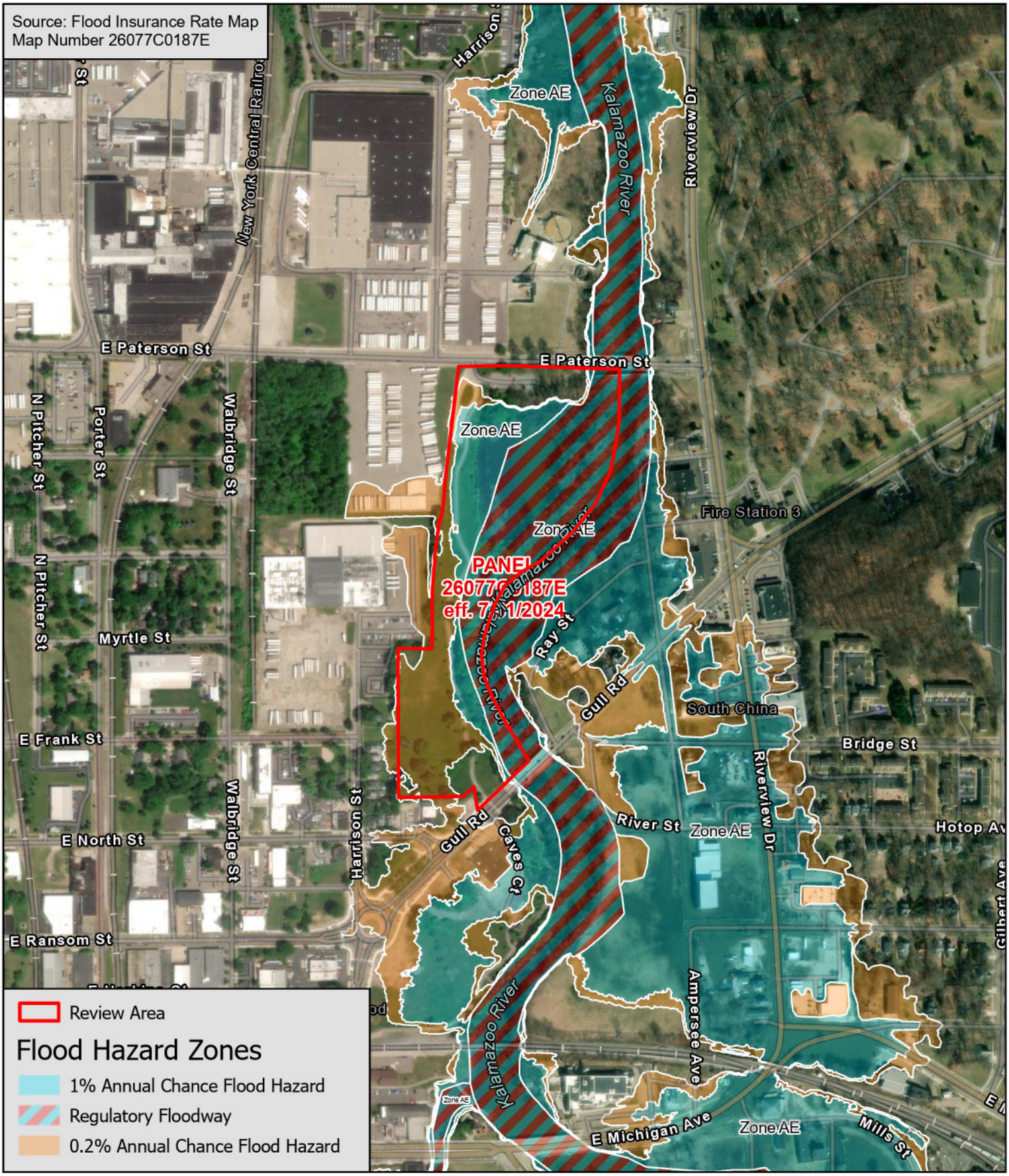

Figure 5. FEMA National Flood Hazard Map

0 250 500 1,000 Feet

NE 1768-4 Verburg Park
S.15, T.02S, R.11W
City of Kalamazoo, Kalamazoo County, Michigan
Delineation Date: November 25, 2024
Map Date: December 4, 2024

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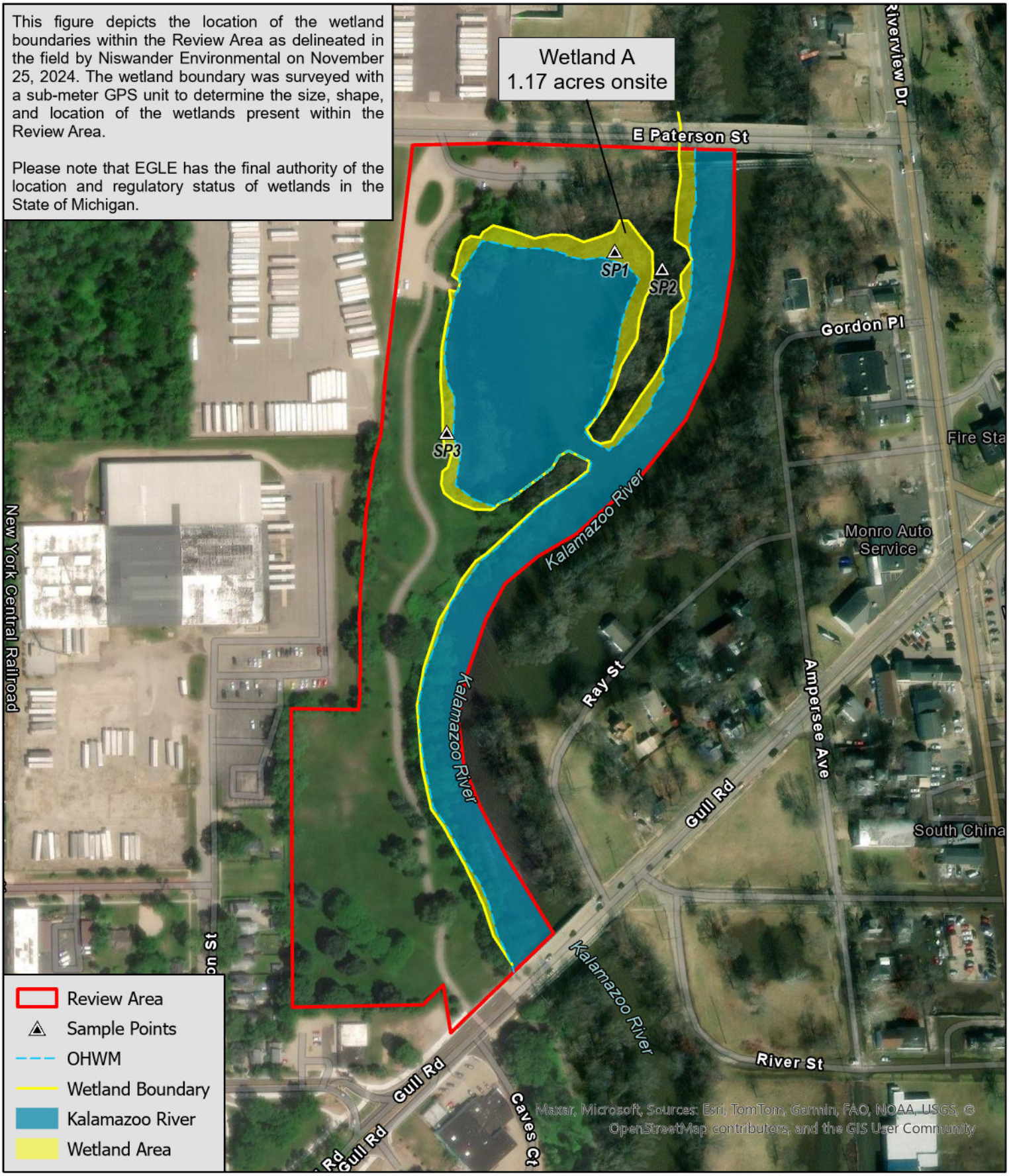

Figure 6. Wetland Location Map

NE 1768-4 Verburg Park
S.15, T.02S, R.11W
City of Kalamazoo, Kalamazoo County, Michigan
Delineation Date: November 25, 2024
Map Date: December 4, 2024

0 125 250 500 Feet

N W E S

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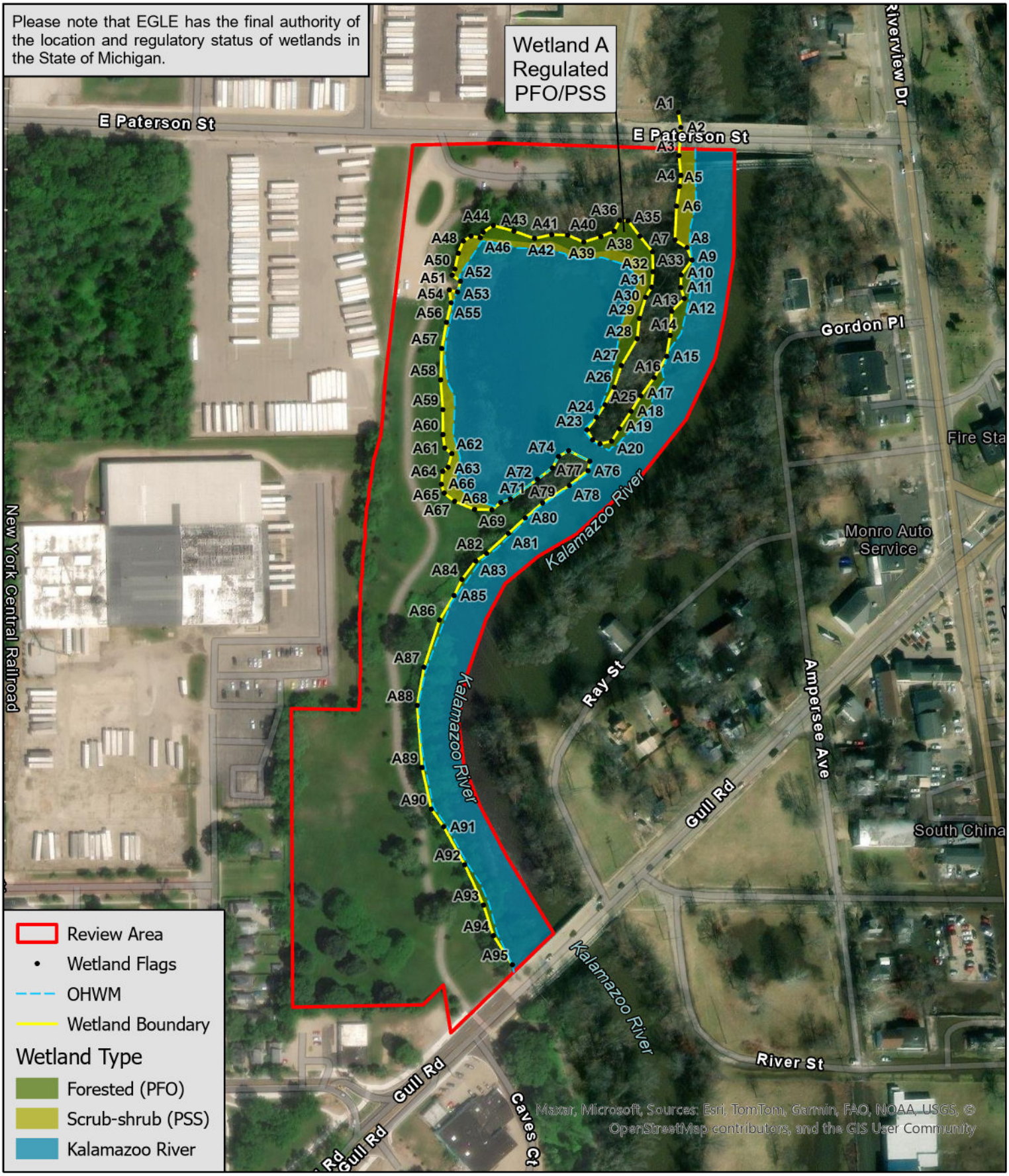

Figure 7. Wetland Type Map

NE 1768-4 Verburg Park
S.15, T.02S, R.11W
City of Kalamazoo, Kalamazoo County, Michigan
Delineation Date: November 25, 2024
Map Date: December 4, 2024

0 125 250 500 Feet

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Appendix B

SITE PHOTOGRAPHS

Verburg Park Wetland Delineation
Site Photographs
Photos taken November 25, 2024



Photo 1
View facing south showing the banks of the Kalamazoo River (Wetland A), which constitutes the eastern boundary of the Review Area.



Photo 2
Representative photo of Wetland A, taken from the northern sections of the Review Area. Much of Wetland A is comprised of the bankfull shelf associated with the Kalamazoo River.

Site Photographs



Photo 3
View facing south showing the forested (PFO) portion of Wetland A, along the east edge of the Review Area.



Photo 4
Representative photo showing the habitat of Wetland A along the banks of a small pond that outlets to the Kalamazoo River.

Site Photographs



Photo 5
Representative photo showing the north bank of the small pond, in the northern portion of the Review Area.



Photo 6
View facing south from the northwest corner of the small pond. Wetland A in this portion of the Review Area is a narrow scrub-shrub (PSS) strip of wetland that buffers the pond.

Site Photographs



Photo 7
Representative photo showing the willow and dogwood PSS buffer along the edge of the small pond.



Photo 8
Representative photo showing typical PFO habitat associated with the southern portion of the Review Area, along the Kalamazoo River.

Site Photographs



Photo 9
Boat launch associated with the small pond adjacent to the river.



Photo 10
NE staff collecting Ordinary High Water Mark readings along the banks of the small pond. This photo also depicts PSS habitat along the banks of the pond.

Site Photographs



Photo 11
Soil Pit #1, a representative PFO data plot collected from Wetland A. Soils here were determined to be hydric when a Redox Dark Surface hydric soil indicator was revealed.

Site Photographs



Photo 12
Soil Pit #2, a representative upland data plot collected from a wooded area adjacent to Wetland A and the Kalamazoo River. Soils here are historically disturbed and consist of ash, fill material, and sand.

Site Photographs



Photo 13
Soil Pit #3, a representative PSS data plot collected from the portion of Wetland A that buffers the small pond. Areas surrounding the pond have been recently restored, and it appears that the soil layer is not native, and is non-hydric.

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Appendix C

WETLAND DATA FORMS

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Verburg Park (Parcel No. 06-15-282-001) City/County: City of Kalamazoo/Kalamazoo County Sampling Date: 2024-11-25

Applicant/Owner: City of Kalamazoo State: Michigan Sampling Point: SP1 PFO

Investigator(s): Nicole Stewart and Jeff Bridgland - Niswander Environmental Section, Township, Range: S15 T2S R11W

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 5

Subregion (LRR or MLRA): L 98 Lat: 42.30262 Long: -85.57220 Datum: WGS 84

Soil Map Unit Name: Ub - Urban land NWI classification: PFO1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No _____	**Is the Sampled Area within a Wetland?** **Yes ✔** **No _____**
Hydric Soil Present?	Yes ✔	No _____	
Wetland Hydrology Present?	Yes ✔	No _____	If yes, optional Wetland Site ID: Wetland A

Remarks: (Explain alternative procedures here or in a separate report.)

SP1 is representative of the forested portion of Wetland A, collected from the north end of a small pond in the northern portion of the Review Area; Wetland A is regulated due to hydrologic connection to the Kalamazoo River.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Vis ble on Aerial Imagery (C9)
- ✔ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✔ No _____ Depth (inches): 0

Wetland Hydrology Present? **Yes ✔** **No _____**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Shallow roots on silver maple and green ash.

VEGETATION – Use scientific names of plants. Sampling Point: SP1 PFO

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	65	✔	FACW
2. Salix nigra	25	✔	OBL
3. Fraxinus pennsylvanica	20		FACW
4. Acer negundo	5		FAC
5.			
6.			
7.			
	115	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Fraxinus pennsylvanica	25	✔	FACW
2. Populus deltoides	5		FAC
3.			
4.			
5.			
6.			
7.			
	30	= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Symphyotrichum lateriflorum	50	✔	FAC
2. Calamagrostis canadensis	35	✔	OBL
3. Iris virginica	10		OBL
4. Rhamnus cathartica	5		FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1. Toxicodendron radicans	5	✔	FAC
2. Vitis riparia	5	✔	FAC
3.			
4.			
	10	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	70	x 1 =	70
FACW species	110	x 2 =	220
FAC species	75	x 3 =	225
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	255 (A)		515 (B)

Prevalence Index = B/A = 2.01

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✔ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

Wetland/Upland boundary determined by topography and the transition between wetland vegetation and upland vegetation such as honeysuckle, catalpa, common buckthorn, garlic mustard, and motherwort.

SOIL

Sampling Point: SP1 PFO

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 12	2.5Y 2.5/1	95	7.5YR 3/4	5	C	M	Sandy Clay Loam	
12 - 14	2.5Y 5/2	80	7.5YR 3/4	5	C	M	Sand	Contains shells.
12 - 14			10YR 2/1	15	D	M	Sand	Contains shells.
14 - 17	10YR 2/1	100					Sandy Clay	
-								
-								
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✔ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ✔ **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Verburg Park (Parcel No. 06-15-282-001) City/County: City of Kalamazoo/Kalamazoo County Sampling Date: 2024-11-25

Applicant/Owner: City of Kalamazoo State: Michigan Sampling Point: SP2 UPL

Investigator(s): Nicole Stewart and Jeff Bridgland - Niswander Environmental Section, Township, Range: S15 T2S R11W

Landform (hillslope, terrace, etc.): Upland Local relief (concave, convex, none): Convex Slope (%): _____

Subregion (LRR or MLRA): L 98 Lat: 42.30250 Long: -85.57158 Datum: WGS 84

Soil Map Unit Name: Ub - Urban land NWI classification: PFO1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No ✔ (If no, explain in Remarks.)

Are Vegetation _____, Soil ✔, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No ✔

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	If yes, optional Wetland Site ID: UPL
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks: (Explain alternative procedures here or in a separate report.)

Representative upland data plot collected from a wooded upland area between the Kalamazoo River and the banks of a small pond adjacent to the river; area appears to have been burned and/or filled historically as soils consist of ash and coarse material.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Vis ble on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No ✔	Depth (inches): _____
Water Table Present?	Yes _____	No ✔	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No ✔	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

no hydrology observed at time of inspection, but area in general is prone to flooding

VEGETATION – Use scientific names of plants. Sampling Point: SP2 UPL

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Ulmus americana	35	✔	FACW
2. Acer saccharinum	30	✔	FACW
3. Populus deltoides	30	✔	FAC
4. Juglans nigra	25	✔	FACU
5.			
6.			
7.			
	120	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Lonicera maackii	65	✔	FACU
2. Ligustrum vulgare	5		FACU
3.			
4.			
5.			
6.			
7.			
	70	= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Leonurus cardiaca	10	✔	UPL
2. Lonicera maackii	10	✔	UPL
3. Scrophularia marilandica	10	✔	FACU
4. Alliaria petiolata	5		FACU
5. Solidago gigantea	5		FACW
6. Verbascum thapsus	5		UPL
7.			
8.			
9.			
10.			
11.			
12.			
	45	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1. Vitis riparia	5	✔	FAC
2.			
3.			
4.			
	5	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 44.44 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	70	x 2 =	140
FAC species	35	x 3 =	105
FACU species	110	x 4 =	440
UPL species	25	x 5 =	125
Column Totals:	240 (A)		810 (B)

Prevalence Index = B/A = 3.37

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✔ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

Area in general is dominated by hydrophytic canopy trees, with an understory of honeysuckle and weedy upland species (i.e., motherwort, thistle, garlic mustard, catalpa seedlings, figwort, strawberry, etc).

SOIL

Sampling Point: SP2 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 2	10YR 2/1	100					Loam	Organic duff layer
2 - 7	10YR 2/1	100					Loam	Burned, ash
7 - 10	7.5YR 2.5/1	100						Apparent fill, coarse material.
10 - 17	10YR 2/2	100					Loam	Includes fill material.
17 - 23	2.5Y 5/3	100					Sand	Includes fill material.
-								
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** ✔

Remarks:

historic fill material and ash in soil pit

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Verburg Park (Parcel No. 06-15-282-001) City/County: City of Kalamazoo/Kalamazoo County Sampling Date: 2024-11-25

Applicant/Owner: City of Kalamazoo State: Michigan Sampling Point: SP3 PSS

Investigator(s): Nicole Stewart and Jeff Bridgland - Niswander Environmental Section, Township, Range: S15 T2S R11W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Undulating Slope (%): _____

Subregion (LRR or MLRA): L 98 Lat: 42.30157 Long: -85.5731 Datum: NAD83_2011

Soil Map Unit Name: Ub - Urban land NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil ✔, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No ✔

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No _____	**Is the Sampled Area within a Wetland?** Yes ✔ No _____
Hydric Soil Present?	Yes _____	No ✔	If yes, optional Wetland Site ID: Wetland A
Wetland Hydrology Present?	Yes ✔	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

Representative PSS data plot collected from sloping edge of small pond that discharges to adjacent Kalamazoo River; appears to be a recent restoration area (planted vegetation; coir and jute erosion blanket, live stakes, etc); potentially new non-native soil

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Vis ble on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No ✔	Depth (inches): _____
Water Table Present?	Yes _____	No ✔	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ✔	No _____	Depth (inches): 7

Wetland Hydrology Present? Yes ✔ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

saturated at depth of 7" at time of inspection

VEGETATION – Use scientific names of plants. Sampling Point: SP3 PSS

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Salix interior	35	✔	FACW
2. Cornus amomum	25	✔	FACW
3.			
4.			
5.			
6.			
7.			
	60 = Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Carex stricta	65	✔	OBL
2. Geum laciniatum	30	✔	FACW
3. Solidago gigantea	20		FACW
4. Lythrum salicaria	15		OBL
5. Lysimachia nummularia	5		FACW
6. Rudbeckia triloba	2		FACU
7.			
8.			
9.			
10.			
11.			
12.			
	137 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	80	x 1 =	80
FACW species	115	x 2 =	230
FAC species	0	x 3 =	0
FACU species	2	x 4 =	8
UPL species	0	x 5 =	0
Column Totals:	197 (A)		318 (B)

Prevalence Index = B/A = 1.61

Hydrophytic Vegetation Indicators:

✔ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

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Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

edge of pond; appears to be a recent bank restoration

SOIL

Sampling Point: SP3 PSS

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 7	10YR 3/1						Sandy Clay	
7 - 17	10YR 3/2	95	10YR 3/6	5	C	M	Loamy Sand	Gravelly
-								
-								
-								
-								
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** ✔

Remarks:

Apparent restoration area; likely non-native soils

January 2025

Threatened & Endangered Species Assessment

Verburg Park
City of Kalamazoo, Kalamazoo County, MI
OCBA Landscape Architects











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Appendices

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- Figure 1. Site Location Map
- Figure 2. USGS The National Map
- Figure 3. USFWS National Wetlands Inventory Map
- Figure 4. Two Mile Search Radius

Appendix B: MNFI Information Request

Appendix C: USFWS IPaC and Coordination
- Official Species List
- Verification Letter Michigan All Species Determination Key
- USFWS Email Notification

Appendix D: Site photos

Appendix E: MDNR Email Correspondence

Appendix F: Mussel Survey and Relocation Report, 2/13/2024, EnviroScience

Appendix G: Environmental Screening for EMR in Michigan, 3/14/2017

I. INTRODUCTION

In November 2024, Niswander Environmental (NE) conducted a Threatened and Endangered (T&E) Species Assessment of Verburg Park (Review Area), a public green space owned by the City of Kalamazoo. Verburg Park is located on the western bank of the Kalamazoo River within Section 15, Town 2 South, Range 11 West, in the City of Kalamazoo, Kalamazoo County, Michigan (Site Location Map, **Appendix A**).

The City of Kalamazoo plans to enhance Verburg Park with recreational amenities. Proposed improvements may occur at the edge of small inlet/pond that is connected to the Kalamazoo River, extending below the pond's ordinary high water mark (OHWM). Other improvements are located within the park's maintained lawn or otherwise developed areas. Tree clearing and work directly within the Kalamazoo River's channel are not proposed. No work is proposed within Verburg Park's forested areas. No new temporary or permanent lighting is proposed.

In order to meet due diligence guidelines prior to park improvements, NE assessed the Review Area for the potential presence of rare, threatened, or endangered species and associated habitats. The T&E Species Assessment was completed to ensure compliance with the state of Michigan laws administered by the Michigan Department of Natural Resources (MDNR) and the federal laws administered by the United States Fish and Wildlife Service (USFWS).

Furthermore, the Natural Features Protection Overlay (NFP), included as Section 50-6.2 in the City of Kalamazoo's Municipal Code, protects natural heritage areas. Section 50-6.2(I)(1) of the NFP defines natural heritage areas as either:

- Any species considered to be rare, threatened, or endangered by the state of Michigan, federal government, or listed on the Michigan Natural Features Inventory (MNFI) Natural Heritage Database.
- Any remnant of a natural community listed on the Michigan Natural Features Inventory (MNFI) Michigan's Natural Communities List.

The NFP requires the use of MNFI's Natural Heritage Database to determine if any rare species have been located within a two-mile radius of the project parcel(s). If MNFI identifies a rare species within two miles of the project parcel, then an on-site survey conducted by a consultant with a Michigan endangered species permit or another qualified professional approved by the City of Kalamazoo Planner is required.

Threatened and Endangered species are regulated by both the state and federal governments. State-listed T&E species are protected under Part 365, Endangered Species Protection, of NREPA. Federally-listed T&E species are protected under the Endangered Species Act of 1973 (ESA). Simply stated, agency authorization is required for any activity that results in a "Take" or causes harm to a listed species and in some cases habitat of protected species. State-listed special concern species, federal candidate species, federal proposed threatened species, or federal proposed endangered species, and rare natural communities receive no statutory protections under state or federal endangered species legislation until rules to list are finalized. However, regulatory agencies may review impacts to these species or communities under other regulatory authorities (e.g., wetland protection regulations). Although not afforded protections under endangered species legislation, some Michigan reptiles and amphibians receive protection under the MDNR's Director's Order, Regulations on the Take of Reptiles and Amphibians, dated October 12, 2001

(Section 324 of PA 451), and some birds receive protection under the federal Migratory Bird Treaty Act of 1918 and/or the Bald and Golden Eagle Protection Act of 1940 (BGEPA).

NE's site investigation confirmed that no natural heritage areas are present within the Review Area, as defined by the NFP. It is NE's professional opinion that there will be no impacts to state or federally-listed rare, threatened, or endangered species, and implementing construction best management practices (BMPs) will satisfy USFWS and MDNR requirements, thereby avoiding the need to obtain state and federal T&E permits.

II. METHODS

OCBA Landscape Architects, on behalf of their client, the City of Kalamazoo, obtained an Information Request (IR) for Verburg Park from MNFI. The IR summarizes MNFI's search of its Natural Heritage Database for known occurrences of natural communities and state special concern, state-threatened, or state-endangered species within a four-mile radius of Verburg Park. A four-mile search buffer is standard for IRs, but the City of Kalamazoo's NFP stipulates a two-mile search buffer. The IR for Verburg Park, dated October 25, 2024, is included as **Appendix B**. The IR contains tabular occurrence data for listed species and natural communities, including location information at the scale of the Public Land Survey System (i.e., Section, Town, and Range). In accordance with the NFP, NE used GIS to identify and map a search radius extending two miles from Verburg Park (Two Mile Search Radius Map, **Appendix A**). The two-mile search radius is completely located within Town 2 South, Range 11 West, and includes Sections 1-4, 8-17, 20-24, and 26-28. Through GIS analysis, NE refined occurrence data provided in the IR by identifying the Sections, Town, and Range within a two-mile search radius, aligning with NFP requirements. Species occurring within two miles of Verburg Park (i.e., within Sections 1-4, 8-17, 20-24, and 26-28, Town 2 South, Range 11 West) are summarized in Table 1.

To assess federally-listed T&E species, NE obtained an Official Species List (OSL) from USFWS' Information for Planning and Consultation (IPaC), a project planning tool that streamlines the USFWS environmental review process. The OSL, dated January 16, 2025, summarizes federally-listed T&E species known to occur within Kalamazoo County, Michigan, and is included as **Appendix C**.

On November 25, 2024, NE conducted an on-site investigation to search for state-listed species in the IR with known occurrences within two miles of Verburg Park, as well as federally-listed species from the OSL. Qualitative habitat data collected during the field investigation were compared to listed species' habitat requirements (suitable habitat), as defined by MNFI and USFWS, to evaluate the likelihood of species presence/absence and make Effect Determinations, a likelihood analysis and determination of potential impacts to each listed species.

NE assessed potential impacts to state-listed species based on the refined IR and habitat within the Review Area. NE completed USFWS' IPaC All-Species Michigan Endangered Species Determination Key (DKey) to assess potential impacts to and obtain Effect Determinations for federal T&E species. The DKey is a logically structured set of questions designed to assist users in determining if a project qualifies for a pre-determined consultation outcome based on existing programmatic consultations or internal USFWS standing analyses. As part of the DKey, NE indicated that the project agrees to implement certain construction BMPs and that tree clearing will not occur and new temporary or permanent lighting will not be installed. The Effect

Determinations and associated BMPs for federally listed species are documented in the USFWS-generated Verification Letter (Project Code 2025-0043601), dated January 28, 2025, included as Appendix C.

If USFWS does not provide notification within 30 days of completing the DKey and submitting the Verification Letter through IPaC, then the Verification Letter remains valid, confirming that the project has fulfilled federal consultation requirements for T&E species. On January 29, 2025, USFWS provided email notification regarding the Verification Letter to confirm that the proposed project does not include temporary or permanent lighting. The email notification is included as Appendix C. Question Number 36 in the DKey was answered correctly, the proposed action does not include temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s). Therefore, the Verification Letter and Effect Determinations within are valid and no further action is needed. The project has fulfilled federal consultation requirements for T&E species.

III. RESULTS

III. A. Threatened & Endangered Species Database Review

State of Michigan T&E Species

For the state of Michigan T&E species review process and the City of Kalamazoo's NFP, NE refined occurrence data provided in MNFI's IR to includes those in Sections located within a two-mile radius of Verburg Park. MNFI's IR lists 57 state species, of which, 34 have known occurrences in Sections located within two miles of Verburg Park. Known species occurrences in Sections falling within two miles of Verburg Park (i.e., within Sections 1-4, 8-17, 20-24, and 26-28, Town 2 South, Range 11 West) are summarized in Table 1. Sections falling within the two-mile search radius are shown in **Appendix A**.

NE also reviewed MNFI's Michigan Mussels Map Viewer. The Michigan Mussels Map Viewer identifies Mussel Protocol Stream Groups—streams potentially supporting federally-listed, state-listed, or state special concern mussels, based on known occurrences or modeled habitat suitability. The Kalamazoo River, where it flows past Verburg Park, and its inlet/pond are mapped as Mussel Protocol Stream Group 1. Mussel Protocol Group 1 streams may contain state special concern mussels.

Table 1. State-Listed Species Known to Occur in Sections within 2 Miles of the Review Area

Common Name	Scientific Name	Status	Category	Suitable Habitat
Creek heelsplitter	*Lasmigona compressa*	Special Concern	Mussel	Creeks and small rivers in a variety of substrates.
Elktoe	*Alasmidonta marginata*	Special Concern	Mussel	Small to large sized streams and small to medium rivers, in riffles and swifter currents over packed sand and gravel substrates. It is typically only found in clean, clear water.

Common Name	Scientific Name	Status	Category	Suitable Habitat
Ellipse	*Venustaconcha ellipsiformis*	Special Concern	Mussel	Swift currents of riffles or runs of clear, small to medium sized streams in gravel or sand and gravel substrates.
Flutedshell	*Lasmigona costata*	Special Concern	Mussel	Small and medium rivers, and in Lake St. Clair and Lake Erie. It is often found in sandy mud and cobble substrates.
Paper pondshell	*Utterbackia imbecillis*	Special Concern	Mussel	Most often observed in lakes, ponds and impoundments with soft mud or sand substrates.
Purple wartyback	*Cyclonaias tuberculata*	State Threatened	Mussel	Medium to large rivers with gravel or mixed sand and gravel substrates.
Rainbow	*Cambarunio iris*	Special Concern	Mussel	In coarse sand or gravel in small to medium streams.
Round pigtoe	*Pleurobema sintoxia*	Special Concern	Mussel	Occurs in mud, sand, or gravel substrates of medium to large rivers.
Slippershell	*Alasmidonta viridis*	State Threatened	Mussel	Creeks and headwaters of rivers, in sand or gravel substrates. Occasionally, it occurs in larger rivers and lakes and in mud substrates.
River fingernail clam	*Sphaerium fabale*	Special Concern	Clam	Occurs in coarse sand or gravel in both creeks and rivers.
Copper button	*Mesomphix cupreus*	Special Concern	Land Snail	In leaf litter in mesic to dry-mesic forests with calcareous soils.
American bumble bee	*Bombus pensylvanicus*	State Endangered	Insect	It favors prairies and grasslands and is rarely associated with extensive forests. As a foraging generalist, it will forage in dunes, marshes, forest edges, farmland and urban areas. Known foraging resources include milk-vetches (*Astragalus spp.*), thistles (*Cirsium spp.*), dogwoods (*Cornus spp.*), prairie-clovers (*Dalea spp.*), and sunflowers (*Helianthus spp.*), among other species.
Black and gold bumble bee	*Bombus auricomus*	Special Concern	Insect	It favors prairies and grasslands and is rarely associated with extensive forests. As a foraging generalist, this bumble bee will forage in dunes, marshes, forest edges, farmland, and urban areas. Known foraging resources include bergamots and horse-mints (*Monarda spp.*), clovers (*Trifolium spp.*), thistles (*Cirsium spp.*), and vetches (*Vicia spp.*), among other species.

Common Name	Scientific Name	Status	Category	Suitable Habitat
Rusty-patched bumble bee	*Bombus affinis*	State Endangered	Insect	A habitat generalist that occupies dunes, marshes, forests, farmland and urban areas.
Blue-eyed Mary	*Collinsia verna*	State Threatened	Plant	On moist soil rich beech-maple forests with a rich humus layer, and on levees and terraces within floodplain forests.
Compass plant	*Silphium laciniatum*	State Endangered	Plant	In mesic and dry-mesic prairie remnants, but also in degraded habitats along rights-of-ways.
Cut-leaved water parsnip	*Berula erecta*	Special Concern	Plant	In cold headwater streams and seeps within a variety of non-forested and forested wetlands, including prairie fens, southern wet meadow, southern shrub-carr, rich tamarack swamp, hardwood-conifer swamp, and rich conifer swamp.
Ginseng	*Panax quinquefolius*	State Threatened	Plant	In rich shaded forests with loamy soils and heavy canopies.
Hairy venenosa	*Angelica venenosa*	Special Concern	Plant	Open, upland oak forests, savanna and prairie remnants, and open, sandy woodlots.
Leiberg's panic grass	*Dichanthelium leibergii*	State Threatened	Plant	In dry to wet-mesic prairies, savannas, and openings in oak forest.
Prairie coreopsis	*Coreopsis palmata*	State Endangered	Plant	In remnant dry to mesic prairie and savanna habitats, especially along railroad rights-of-ways.
Prairie dropseed	*Sporobolus heterolepis*	Special Concern	Plant	In prairie fens in the southern Lower Peninsula, in mesic sand prairies surrounded by pine barrens in the northern Lower Peninsula, and in alvar grasslands in the Upper Peninsula.
Rattlesnake-master	*Eryngium yuccifolium*	State Endangered	Plant	Occurs in sedge and grass-dominated portions of prairie fen complexes. Also found in sandy soils and wet prairies in former oak savannas and oak barrens, often occurring in small remnants along power lines and railroad rights-of-ways.
Rosinweed	*Silphium integrifolium*	State Threatened	Plant	In prairie remnants along roads and railroad tracks or in cemeteries, in wet-mesic prairies and fens on peaty mucks and loams, and on dry-mesic to mesic loams and sandy loams.
Starry campion	*Silene stellata*	State Threatened	Plant	In dry, open woodlands on sandy soils, dry-mesic forest on or just above the upper margin of river floodplains, and

Common Name	Scientific Name	Status	Category	Suitable Habitat
				savanna and prairie remnants in the southern Lower Peninsula.
Tall green milkweed	*Asclepias hirtella*	State Threatened	Plant	Wet-mesic to dry sandy loam soils at inland sites as well as on alkaline clay in lakeplain prairies.
White or prairie false indigo	*Baptisia lactea*	State Threatened	Plant	In dry to mesic prairies and savannas, dry open roadsides, along railroads, and in fencerows.
Merlin	*Falco columbarius*	Special Concern	Avian	Nests are frequently near lakeshores or other semi-open areas where prey (small to medium birds) may be captured. Merlins will rarely nest in cavities or on cliffs.
Osprey	*Pandion haliaetus*	Special Concern	Avian	Nests in trees or snags or on cliffs, but they have adapted to use some man-made structures such as utility poles and towers, chimneys, windmills, buoys, and platforms. Preferred nest sites are above or near water.
Peregrine falcon	*Falco peregrinus*	State Threatened	Avian	Nests on cliff faces but also use tall man-made structures in cities.
Red-shouldered hawk	*Buteo lineatus*	Special Concern	Avian	Nests in a variety of habitats but seem to be closely associated with mature forests in or adjacent to wet meadows and swamps.
Eastern box turtle	*Terrapene carolina carolina*	State Threatened	Reptile	The Eastern Box Turtle is Michigan's only truly terrestrial turtle. It typically occurs in forested habitats with sandy soils near a source of water such as a stream, pond, lake, marsh or swamp. They also may be found in adjacent thickets, old fields, pastures, or vegetated dunes. Access to unshaded nesting sites in sandy, open areas, is critical for successful reproduction.
Kirtland's snake	*Clonophis kirtlandii*	State Endangered	Reptile	Usually found in open wetlands such as wet prairies, prairie fens, wet meadows and marshes, but they also occur in openings or along the edges of forested wetlands and floodplains (e.g., grass/sedge openings in tamarack swamps), where soils are loose and organic. This species can be in suitable open habitats in urban centers or large metropolitan areas such as open, grassy areas in parks, cemeteries, and vacant

Common Name	Scientific Name	Status	Category	Suitable Habitat
				lots. Kirtland's Snakes are frequently found in burrows or under leaf litter, logs, boards, rocks or other cover objects within their habitats.
Pickerel frog	*Lithobates palustris*	Special Concern	Amphibian	In a variety of freshwater aquatic and wetland habitats with cool, clear water that is not polluted or stagnant. They prefer aquatic margins that are dense with herbaceous vegetation, like grassy stream banks. Upon spring emergence, Pickerel Frogs move to shallow, quiet, warm water for breeding. Breeding habitat includes forested ponds, vernal pools, bog ponds, stream pools, impoundments, and flooded ditches. They tend to not move far from water . They spend the winter buried in the mud or beneath submerged logs or rocks on the bottoms or in the deeper parts of streams, springs, ponds, and bogs.

Federal T&E Species

NE obtained an OSL (Appendix C) which includes federally-listed species known to occur in Kalamazoo County, Michigan, and may occur within the within the Review Area if suitable habitat is present. Species included in the OSL are summarized in Table 2. The OSL indicates that there are no critical habitats within the Review Area.

According to USFWS' *Project Design Guidelines for Federally Listed Bats in Michigan*, *Version 1*, dated April 2023, the Review Area overlaps with Listed Bat Conservation Planning Zone 5, which includes areas in Michigan's lower peninsula containing high potential summer habitat for both Indiana bat and northern long-eared bat. To avoid Take of protected bats in Zone 5, USFWS recommends avoiding tree clearing from April 15 through September 30.

Table 2. USFWS Official Species List of Federally Threatened & Endangered Species

Common Name	Scientific Name	Status	Category	Suitable Habitat
Indiana bat	*Myotis sodalis*	Federally Endangered	Mammal	Summer habitat includes stream corridors, woodlots, and forests. Indiana bats primarily use dead or dying trees for roosting; however, USFWS defines potential roost trees as any live tree or snag ≥5 inches DBH with exfoliating bark or cracks/crevices. Individual trees may be considered suitable habitat when they meet the definition of a potential roost tree and are within 1,000 feet of other wooded habitat. Indiana bat typically hibernate in caves and mines during the winter.
Whooping crane	*Grus americana*	Experimental Population, Non-Essential	Avian	Variety of habitats including marshes, lakes, open ponds, shallow bays, upland swales, wet meadows, pastures, and agricultural fields.
Eastern massasauga	*Sistrurus catenatus*	Federally Threatened	Reptile	Occupies a variety of wetland habitats, including wet prairies, marshes, fens, sedge meadows, peatlands, and low areas along rivers and lakes. In southern Michigan, EMR primarily occurs in open wetlands like prairie fens, with seasonal use of adjacent, open uplands or forest openings. Suitable habitat is characterized by (1) open, sunny areas intermixed with shaded areas for thermoregulation, (2) the presence of the water table near the surface, (3) and variable elevations between adjoining lowland and upland habitats. Microtopography (e.g., downed woody debris, small mammal burrows, or pit and mounds) is a critical component of EMR habitat.
Mitchell's Satyr butterfly	*Neonympha mitchellii mitchellii*	Federally Endangered	Insect	Inhabits calcareous wetlands containing numerous sedge species (e.g., prairie fens).
Monarch butterfly	*Danaus plexippus*	Proposed Threatened	Insect	Found across North America wherever suitable feeding, breeding, and overwintering habitat exists. They primarily occur in prairies, meadows, grasslands and along roadsides containing milkweed species, their host plant.

III. B. On-Site Habitat Assessment

NE conducted an on-site habitat assessment of the Review Area on November 25, 2024. Site photos are included as **Appendix D**. The Review Area is bound by industrial properties to the north and west, residential and commercial properties to the east, and fragmented green space to the south. It primarily consists of mowed lawn with scattered park trees. It also contains paved and gravel parking lots and a bike trail. Upland forest/scrubland is located at the northeast end of the

park, adjacent to a parking lot off of East Paterson Street. The Kalamazoo River flows north past Verburg Park. The river's western bank contains forested and scrub-shrub wetland. An inlet/pond connected to the Kalamazoo River contains open surface water with a scrub-shrub and forested wetland fringe. There is an existing boat launch on the northwest edge of the inlet/pond.

Forested wetland is adjacent to the Kalamazoo River and its small inlet/pond. The Review Area's forested wetland is not expansive, as it is confined by parking lots, routinely mowed lawn, and fencing. The forest canopy is dominated by silver maple (*Acer saccharinum*), American elm (*Ulmus americana*), black willow (*Salix nigra*), cottonwood (*Populus deltoides*), and box elder (*Acer negundo*). The understory primarily contains green ash (*Fraxinus pennsylvanica*), catalpa (*Catalpa speciosa*), highbush cranberry (*Viburnum opulus*), purple loosestrife (*Lythrum salicaria*), moneywort (*Lysimachia nummularia*), rough avens (*Geum laciniatum*) calico aster (*Symphyotrichum lateriflorum*), late goldenrod (*Solidago gigantea*), and reed canary grass (*Phalaris arundinacea*).

Forested areas within the Review Area contain trees greater than 3 inches diameter at breast height (DBH), a preferred habitat requirement for federally-listed bats. Individual trees greater than 3 inches DBH and within 1,000 feet of the Kalamazoo River's forested riparian corridor are also located at the southern end of Verburg Park. Trees within the Review Area contain exfoliating bark (e.g., silver maple and American elm bark) or cracks/crevices.

Scrub-shrub wetland within the Review Area contains the understory species noted above, in addition to sandbar willow (*Salix nigra*), silky dogwood (*Cornus amomum*), and swamp rose mallow (*Hibiscus moscheutos*). Big bluestem (*Andropogon gerardii*) and sedges (*Carex spp.)* are also present in scrub-shrub wetland fringe that has been restored recently, as evidenced by episodic coir fabric adjacent to the Kalamazoo River and its inlet/pond.

Soils within the upland forest/scrubland, forested wetland, and scrub-shrub wetland are disturbed; they contain ash, charred fill, and sandy fill. Areas containing mowed turfgrass are flat, and although not assessed in the field, these areas likely contain disturbed and compacted soil due to grading, routine mowing, and park use.

The Kalamazoo River has a gravel and sand substrate where it flows north past Verburg Park. According to EnviroScience's *Final Report: Freshwater Mussel Survey and Relocation on the Kalamazoo River for the Proposed Sediment Remediation Project in Kalamazoo and Allegan Counties*, dated February 13, 2024, substrate within the inlet/pond includes mud, silt, sand, and woody debris.

IV. REGULATORY CONSIDERATIONS

IV. A. T&E Species Effect Determinations

T&E species are regulated by both state and federal governments. MNFI's IR provides state-listed species that, based on recorded occurrences, could potentially occur within the Review Area and be impacted by the project if the species or its suitable habitat is present. NE's determinations for potential impacts (i.e., Take or No Take) to state-listed species are summarized in Table 3.

Obtaining an OSL fulfills the first procedural step of the Section 7 consultation process required for projects with a federal nexus. The second step in the federal Section 7 consultation process is to verify that the proposed project meets criteria to utilize the DKey. If eligible, completing the DKey provides Effect Determinations, which are outlined in the USFWS-generated Verification Letter and are contingent upon compliance with the construction BMPs included in the letter. Effect Determinations for federally-listed species are summarized in Table 4.

Table 3. Threatened & Endangered Species Determination of Effects (State)

Common Name	Scientific Name	Status	Suitable Habitat Present?	NE Determination of Effect
Creek heelsplitter	*Lasmigona compressa*	Special Concern	No – Dredging	No Take
Elktoe	*Alasmidonta marginata*	Special Concern	No – Dredging	No Take
Ellipse	*Venustaconcha ellipsiformis*	Special Concern	No – Dredging	No Take
Flutedshell	*Lasmigona costata*	Special Concern	No – Dredging	No Take
Paper pondshell	*Utterbackia imbecillis*	Special Concern	No – Dredging	No Take
Purple wartyback	*Cyclonaias tuberculata*	State Threatened	No – Dredging	No Take
Rainbow	*Cambarunio iris*	Special Concern	No – Dredging	No Take
Round pigtoe	*Pleurobema sintoxia*	Special Concern	No – Dredging	No Take
Slippershell	*Alasmidonta viridis*	State Threatened	No – Dredging	No Take
River fingernail clam	*Sphaerium fabale*	Special Concern	No – Dredging	No Take
Copper button	*Mesomphix cupreus*	Special Concern	No	No Take
American bumble bee	*Bombus pensylvanicus*	State Endangered	No	No Take
Black and gold bumble bee	*Bombus auricomus*	Special Concern	No	No Take
Rusty-patched bumble bee	*Bombus affinis*	State Endangered	No	No Take
Blue-eyed Mary	*Collinsia verna*	State Threatened	No	No Take
Compass plant	*Silphium laciniatum*	State Endangered	No	No Take
Cut-leaved water parsnip	*Berula erecta*	Special Concern	No	No Take
Ginseng	*Panax quinquefolius*	State Threatened	No	No Take
Hairy venenosa	*Angelica venenosa*	Special Concern	No	No Take
Leiberg's panic grass	*Dichanthelium leibergii*	State Threatened	No	No Take
Prairie coreopsis	*Coreopsis palmata*	State Endangered	No	No Take
Prairie dropseed	*Sporobolus heterolepis*	Special Concern	No	No Take

Common Name	Scientific Name	Status	Suitable Habitat Present?	NE Determination of Effect
Rattlesnake-master	*Eryngium yuccifolium*	State Endangered	No	No Take
Rosinweed	*Silphium integrifolium*	State Threatened	No	No Take
Starry campion	*Silene stellata*	State Threatened	Yes	No Take - If proposed work avoids forested areas or a species-specific survey confirms presence or probable absence.
Tall green milkweed	*Asclepias hirtella*	State Threatened	No	No Take
White or prairie false indigo	*Baptisia lactea*	State Threatened	No	No Take
Merlin	*Falco columbarius*	Special Concern	No	No Take
Osprey	*Pandion haliaetus*	Special Concern	Yes	No Take - If noisy construction avoids the nesting season within one-quarter-mile of a nest, or a survey confirms no osprey nests within one-quarter mile.
Peregrine falcon	*Falco peregrinus*	State Threatened	No	No Take - If noisy construction avoids the nesting season within one-quarter-mile of a nest.
Red-shouldered hawk	*Buteo lineatus*	Special Concern	No	No Take
Eastern box turtle	*Terrapene carolina carolina*	State Threatened	No	No Take
Kirtland's snake	*Clonophis kirtlandii*	State Endangered	No	No Take
Pickerel frog	*Lithobates palustris*	Special Concern	No	No Take

Table 4. Threatened & Endangered Species Determination of Effects (Federal)

Common Name	Scientific Name	Status	Suitable Habitat Present?	DKey Effect Determination
Indiana bat	*Myotis sodalis*	Federally Endangered	Yes	No Effect - If no tree clearing occurs. If no new temporary or permanent lighting is installed.
Whooping crane	*Grus americana*	Experimental Population, Non-Essential	No	No Effect
Eastern massasauga	*Sistrurus catenatus*	Federally Threatened	Possibly - USFWS maps Tier 2 EMR habitat approximately 715 feet north of the Review Area.	Not Likely to Adversely Affect - If EMR BMPs are implemented.
Mitchell's Satyr butterfly	*Neonympha mitchellii mitchellii*	Federally Endangered	No	No Effect
Monarch butterfly	*Danaus plexippus*	Proposed Threatened	Yes – marginal	No Effect

IV.B. State- and Federally-Listed Species Review

State of Michigan T&E Species

Of the 34 state species with known occurrences in Sections located within two miles of Verburg Park, 12 species have the potential to occupy the Review Area based on the presence of suitable or marginally suitable habitat. Of which, only 3 are threatened or endangered, with the other species being special concern. State-listed species with the potential to occur within the Review Area include:

- Elktoe, Ellipse, Flutedshell, Paper pondshell, Purple wartyback, Rainbow, Creek heelsplitter, Round pigtoe, and Slippershell (mussels)
- River fingernail clam (clam)
- Starry campion (plant)
- Osprey (avian)

Freshwater mussels

State Threatened & Special Concern

Nine mussels have known occurrences in Sections located within two miles of the Review Area. Seven mussels are state special concern, including Elktoe, Ellipse, Flutedshell, Creek heelsplitter, Paper pondshell, Rainbow, and Round pigtoe. Two mussels, Slippershell and Purple wartyback, are state-threatened. Suitable habitat for these nine mussels include medium streams with sand and gravel substrates or ponds with soft mud or sand substrates. The Review Area's inlet/pond may constitute suitable habitat for Paper pondshell and Flutedshell. The Kalamazoo River may be suitable habitat for the other 7 mussels, but no work is proposed within the river channel.

In 2022, 2023, and 2024, Georgia-Pacific LLC and International Paper Company conducted sediment cleanup (dredging) under the oversight of the Environmental Protection Agency to remove polychlorinated biphenyls (PCB) from the Kalamazoo River adjacent to Verburg Park and in the inlet/pond. Email correspondence with Matt Diana, MDNR staff, on January 29, 2025 (**Appendix E)**, confirmed that a mussel survey and relocation were conducted in 2021 prior to extensive dredging in the Review Area. The results of the mussel survey and relocation are detailed in EnviroScience's *Final Report: Freshwater Mussel Survey and Relocation on the Kalamazoo River for the Proposed Sediment Remediation Project in Kalamazoo and Allegan Counties*, dated February 13, 2024 (**Appendix F**). The inlet/pond has since been capped with clean material.

Due to the inlet/pond's poor mussel habitat and recent Superfund cleanup activities, MDNR staff indicated that mussel surveys or relocations will not be required for any work conducted in the inlet/pond for at least 5 years following the completion of recent dredging. This aligns with *Michigan Freshwater Mussel Survey Protocols and Relocation Procedures for Rivers and Streams, Version 3*, dated May 2021, which states "survey data collected on a specific site will generally be considered valid for 5 years from the date the survey was conducted". Further, "facilities/areas that have been dredged within the past 5 years do not need to be resurveyed unless the dredged area is to be expanded or moved". MDNR staff also indicated that due to poor habitat and recent dredging, it is likely that the 5-year time limit could be extended. Notably, MDNR staff stated that projects with small footprints or limited bottom disturbance in the inlet/pond would not require mussel survey work.

Due to the recent mussel relocation and extensive dredging within the Review Area, it is NE's professional opinion that work proposed at/below the OHWM of Verburg Park's inlet/pond will have No Take of freshwater mussels. In accordance with MDNR staff's email, avoid work below the OHWM during fish spawning work closures, which extend from March 1 through June 30. Proposed work below the OHWM may be allowed during the fish spawning closure with further coordination with MDNR to determine appropriate construction BMPs.

River fingernail clam (*Sphaerium fabale*)
State Special Concern
River fingernail clam occurs in coarse sand or gravel in both creeks and rivers, thus could potentially inhabit the Kalamazoo River within the Review Area. However, its presence within the Review Area is extremely unlikely due to the recent PCB contamination, mussel relocation, and extensive dredging in the Kalamazoo River and its inlet/pond. Therefore, the proposed project will have No Take of river fingernail clam.

Starry campion (*Silene stellata*)
State Threatened
According to MNFI, starry campion inhabits dry-mesic forest on or just above the upper margin of river floodplains. The Review Area contains marginally suitable habitat (forest along the Kalamazoo River) for starry campion. However, forested areas within the Review Area have a full canopy. MNFI indicates that fire suppression and subsequent canopy closure has adversely affected starry campion, so the likelihood it occurs on-site is low.

Although it is unlikely, starry campion may occur within the Review Area's forest. Work is not proposed within the Review Area's forests; therefore, Take is not anticipated. If work within forested areas is proposed at a later date, NE recommends that a random meander search be

conducted prior to construction. The survey period for starry campion occurs from the first week of July to the fourth week of August.

Osprey (*Pandion haliaetus*)
State Special Concern
According to the Cornell Lab of Ornithology's online eBird Species Mapper, a citizen/public observer documented two osprey and one osprey nest on a tall utility tower outside of the Review Area. Osprey nest in trees or snags, but they have adapted to use some man-made structures such as utility poles and towers. Their preferred nest sites are above or near water. Osprey often return to the same nest in successive years.

The Review Area contains suitable habitat for osprey, and osprey may forage over or nest within the Review Area. NE did not observe osprey within the Review Area during the site investigation. Tree clearing is not proposed; therefore, the proposed project will have no direct impacts to osprey. However, human activity near nesting birds may interfere with nesting success, constituting Take. To avoid potential Take of osprey, avoid construction projects generating loud noise within one-quarter mile radius around active nests, between the onset of courtship in April and fledging of young birds in July. Nesting occurs from the third week of April to fourth week of July.

Alternatively, a species-specific visual survey within the Review Area and within a one-quarter mile radius of the proposed work can be conducted to determine nest presence/absence. The survey period for osprey occurs from the second week of May to the first week of August.

Peregrin falcon (*Falco peregrinus*)
State Threatened
Peregrine falcon inhabit cliff dwellings, but more commonly, they occur on an array of man-made structures in urban settings. Suitable habitat for peregrine falcon is not present within the Review Area; however, tall man-made structures like utility towers are located on industrial properties adjacent to the Review Area. Further, Cornell Lab of Ornithology's online eBird Species Mapper shows numerous citizen observations of peregrine falcon approximately 0.25-mile south of the Review Area. Peregrine falcons are tolerant of human activity, but sensitive to disturbance during the nesting season. Construction projects generating loud noise must also avoid the peregrine falcon nesting season, which extends from the first week of April to the fourth week of June.

Kirtland's snake (*Clonophis kirtlandii)*
State Endangered
Kirtland's snakes are usually found in open wetlands such as wet prairies, prairie fens, wet meadows and marshes, or along the edges of forested wetlands and floodplains (e.g., grass/sedge openings in tamarack swamps), where soils are loose and organic. These are high quality habitats that are not present within the Review Area. Although Kirtland's snake can occur in urban, open grassy areas, it is unlikely that it occurs within the Review Area because grassy areas within the Review Area are maintained through routine mowing and soils are historically disturbed, as evidenced by Google Earth aerial imagery dated July 2022, showing PCB cleanup efforts at Verburg Park.

Federally-Listed T&E Species
Of the 5 species listed in the OSL, only 3 species have the potential to occupy the Review Area based on the presence of suitable habitat. Federal species listed in the OSL with the potential to occur within the Review Area include:

- Indiana bat
- Eastern massasauga
- Monarch butterfly

Indiana Bat (*Myotis sodalis*)
State-Endangered & Federally-Endangered
Forested areas and individual park trees within the Review Area constitute suitable habitat for Indiana bat. Although not listed in the OSL, these areas are also suitable habitat for northern long-eared bat (*Myotis septentrionalis*) and tricolored bat (*Perimyotis subflavus*). The northern longed-eared bat is federally-endangered and state-threatened. The tricolored bat is state threatened federally proposed endangered.

USFWS defines potential roost trees for Indiana bat as any live tree or snag greater than or equal to 5 inches DBH with exfoliating bark or cracks/crevices. USFWS defines potential roost trees for northern long-eared bat as any live tree or snag greater than or equal to 3 inches DBH with exfoliating bark or cracks/crevices. Individual trees may be considered suitable habitat when they meet the definition of a potential roost tree and are within 1,000 feet of other wooded habitat.

The proposed project does not include tree clearing or new temporary or permanent lighting; therefore, the project has No Effect on Indiana bat. If tree clearing is proposed at a later date and the project implements USFWS tree clearing restrictions for protected bats, then NE anticipates the project is Not Likely to Adversely Affect (NLAA) Indiana bat, but potential impacts would need to be reevaluated in IPaC to confirm. In accordance with USFWS' recommendations for Listed Bat Conservation Planning Zone 5, avoid tree clearing during the bat active season, which extends from April 15 through September 30. These conservation measures are also protective of northern long-eared bat and tricolored bat, and therefore, these Effect Determinations would likely apply to northern long-eared bat and tricolored bat as well. If new temporary or new permanent lighting is proposed at a later date, potential impacts to federally protected bats will need to be reevaluated prior to installation.

Eastern Massasauga (*Sistrurus catenatus*)
State-Threatened & Federally-Threatened
The project is NLAA Eastern massasauga rattlesnake (EMR), provided the 3 EMR BMPs noted below are implemented.

EMR have been found in a variety of wetland habitats in Michigan. Populations in southern Michigan are typically associated with open wetlands, particularly prairie fens, while those in northern Michigan are known to occur in open wetlands and lowland coniferous forests, such as cedar swamps. Some populations of EMR also utilize open uplands and/or forest openings for foraging, basking, gestation, and parturition (i.e., giving birth to young). EMR habitats generally appear to be characterized by the following: (1) open, sunny areas intermixed with shaded areas, presumably for thermoregulation; (2) presence of the water table near the surface for hibernation; and (3) variable elevations between adjoining lowland and upland habitats.

EMR habitats and potential habitats have been estimated throughout Michigan using on the ground and remote sensing technologies, and use the following Tiers to approximate the potential presence of EMR habitat on any particular site:

> **Tier 1 Habitat:** Areas known to be occupied by EMR or highly likely to be occupied by EMR.
>
> **Tier 2 Habitat:** Areas with high potential habitat and may be occupied by EMR.

Although the Review Area does not contain characteristics generally associated with suitable habitat for EMR, it is located within the range of EMR and is approximately 715 feet south of Tier 2 Habitat. To maintain the Effect Determination that the project is NLAA EMR, the project must implement the following EMR BMPs in project planning, design, and construction:

1. Materials used for erosion control and site restoration must be wildlife-friendly. Do not use erosion control products containing plastic mesh netting or other similar material that could entangle EMR.

2. To increase human safety and awareness of EMR, those implementing the project must first review the EMR factsheet (available at https://www.fws.gov/media/eastern-massasauga-rattlesnake-fact-sheet), and watch MDNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake" video (available at https://www.youtube.com/watch?v=-PFnXe_e02w).

3. During project implementation, report sightings of any federally-listed species, including EMR, to the USFWS within 24 hours. This contact should be made to NE and we will make the notification to USFWS should EMR be encountered.

These BMPs should be required on project plans and for any on-site contractors. For a complete list of project-specific BMPs, see the "Environmental Screening for Eastern Massasauga Rattlesnake in Michigan (March 14, 2017)" included as **Appendix G**.

Monarch Butterfly (*Danaus plexippus*)
Proposed Threatened
Monarch butterfly prefers prairies, meadows, grasslands, open fields and rights-of-ways containing milkweed species, their host plant. NE did not observe milkweeds within the Review Area, but they are a cosmopolitan species. If present, it is NE's professional opinion that milkweed abundances within the Review Area are low and limited to non-mowed areas, and that the proposed project is not likely to jeopardize the continued existence of monarch butterfly. Therefore, NE determined the proposed project has No Effect on monarch butterfly.

Monarch butterfly is proposed threatened, meaning USFWS has determined that it is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and USFWS has proposed a draft rule to list it as threatened. Proposed threatened species are not protected by the take prohibitions of Section 9 of the ESA, consistent with any protective regulations finalized under Section 4(d) of the ESA, until the rule to list is finalized. USFWS is gathering public comments through March 12, 2025. After reviewing public comments, USFWS will write the final decision, and if listed as threatened, monarch butterfly will receive federal

protections under Section 4(d) of the ESA. Protections for the monarch butterfly would apply after the effective date of a final rule. However, as is the case for proposed species or candidate species under Section 7(a)(4) of the ESA, federal agencies must confer with USFWS if their action will jeopardize the species' continued existence.

The proposed project is not likely to jeopardize the continued existence of monarch butterfly. At this time, no further action is required under the ESA, however, if a final rule lists the monarch butterfly, and the ongoing project is likely to result in Take of the monarch, the developer will need to coordinate with the USFWS to ensure any action remains compliant with the ESA.

USFWS encourages implementing measures that will remove or reduce threats to this species and possibly make listing unnecessary. Planting a diverse group of native plant species will help support the nutritional needs of Michigan's pollinators. For more information, please visit https://www.fws.gov/initiative/pollinators/monarchs.

Rare Natural Communities
No rare natural communities are located within the Review Area.

Bald and Golden Eagles
Bald eagles (*Haliaeetus leucocephalus*) are protected under the Bald and Golden Eagle Protection Act (16 U.S. Code 668-668c) and the Migratory Bird Treaty Act, which prohibits anyone from taking, possessing, or transporting a bald eagle or the parts, nests, or eggs of the bird without prior authorization. The BGEPA includes active as well as inactive eagle nests and prohibits Take including eagle and nest disturbance, without first obtaining a permit from USFWS. NE's on-site assessment found no evidence of bald eagle use or nests within or adjacent to the Review Area. However, due to the wide variety of habitats used by bald eagles in Michigan, there is potential for the bald eagle to be present within the Review Area at certain times of the year (i.e., migration, nesting, feeding, resting). It is recommended that NE be contacted should any bald eagles or their nests be encountered during construction of the proposed project. Eagle nests are constructed with large sticks and may be lined with moss, grass, plant stalks, lichens or sod. Nests are usually about 4 to 6 feet in diameter and 3 feet deep, although larger nests exist. If eagle nests are present, construction should maintain a one-quarter mile buffer zone around the nest during the nesting season, which extends from the third week of March to the second week of July.

V. SUMMARY

In November 2024, NE conducted a Threatened and Endangered Species Assessment of Verburg Park. As part of the evaluation, NE coordinated with USFWS utilizing the Michigan DKey within the IPaC planning tool. NE also coordinated with MDNR and MNFI by requesting the IR to assess the potential presence of state-listed T&E species and associated habitats within the Review Area.

Applying the information obtained from state and federal agencies, NE conducted an on-site habitat assessment for species identified by USFWS and species identified by MNFI occurring in Sections located within two miles of the Verburg Park.

NE determined the proposed project is Not Likely to Adversely Affect EMR, provided the EMR BMPs are implemented. All other T&E species documented by USFWS and MNFI received a determination of No Effect or No Take due to the following reasons:

- A lack of suitable habitat within the Review Area.
- The project's scope will not impact species or suitable habitat within the Review Area (e.g., no work in the Kalamazoo River or forested areas, no tree clearing, no new temporary or permanent lighting).
- Implementation of construction BMPs.
- Recent mussel survey, relocation, and dredging.

If it is later determined that minor tree clearing is required, avoid tree clearing from April 15 through September 30 to avoid potential Take of protected bats. Any scope change to the proposed work requires reevaluation of potential impacts, including consultation with USFWS via the IPaC DKey.

NE's site investigation confirmed that no natural heritage areas are present within the Review Area, as defined by the NFP. It is NE's professional opinion that the proposed project will not result in impacts to or Take of state or federal rare, threatened, or endangered species, provided that general project design guidelines and BMPs for protected bats, EMR, mussels/clams, osprey, and peregrine falcon are implemented. Additionally, work proposed at/below the OHWM should be conducted outside the fish spawning work closure which extends from March 1 through June 30. Proposed work below the OHWM may be allowed during the fish spawning closure with further coordination with MDNR to determine appropriate construction BMPs.

The implementation of project design guidelines and BMPs will satisfy USFWS and MDNR requirements and avoid the need to obtain state and federal T&E permits. If the scope of proposed work changes or a listed species is encountered during construction, a reevaluation of potential impacts to T&E species will be required.

Please contact us if you have any questions or require further assistance.



Todd Losee
President
Professional Wetland Scientist #1733
Michigan Threatened/Endangered
Species Permit Holder #2044



Nicole Stewart
Ecologist

Attachments: Appendix A. Site Mapping
Appendix B. MNFI IR
Appendix C. IPaC OSL, Verification Letter, and Email Notification
Appendix D. Site Photos
Appendix E. MDNR Email Correspondence
Appendix F. Mussel Survey and Relocation Report, 2/13/2024, EnviroScience
Appendix G. Environmental Screening for EMR in Michigan, 3/14/2017

VI. REFERENCES

"eBird Species Map." *Cornell Lab of Ornithology, Ithaca, New York*, 2025, https://ebird.org/map

"Find Endangered Species." *Official Web Page of the U.S. Fish and Wildlife Service*, 2023, https://fws.gov/program/endangered-species

"IPaC: Information for Planning and Consultation." *IPaC: Home*, 2025, https://ipac.ecosphere.fws.gov/

Hanshue, S., et al. 2021. *Michigan Freshwater Mussel Survey Protocols and Relocation Procedures for Rivers and Streams, Version 3.*

"Michigan Natural Features Inventory." *Michigan's Rare Plants and Animals - Michigan Natural Features Inventory*, 2025, www.mnfi.anr.msu.edu/species.

"Michigan Natural Features Inventory." *MNFI Michigan Mussels Web Application,* 2025, https://www.arcgis.com/apps/webappviewer/index.html?id=3860be5d7f28471396d44e0b384abb12

"Monarchs: U.S. Fish & Wildlife Service." 2023, www.fws.gov/initiative/pollinators/monarchs

"Natural Features Protection Overlay standards, §50-6.2." *Code of Ordinances, City of Kalamazoo, Michigan*, 2025, https://ecode360.com/34021217

"Superfund Site: Allied Paper, Inc./Portage Creek/Kalamazoo River Kalamazoo, MI Announcements and Key Topics." *Environmental Protection Agency*, 2025, https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0502325

"U.S. Fish and Wildlife Service Michigan Ecological Services Field Office." *Official Web Page of the U S Fish and Wildlife Service*, 2025, https://www.fws.gov/office/michigan-ecological-services

U.S. Fish and Wildlife Service Michigan Ecological Services Field Office. 2023. *Project Design Guidelines for Federally Listed Bats in Michigan*, *V1*.

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Appendix A

SITE MAPPING

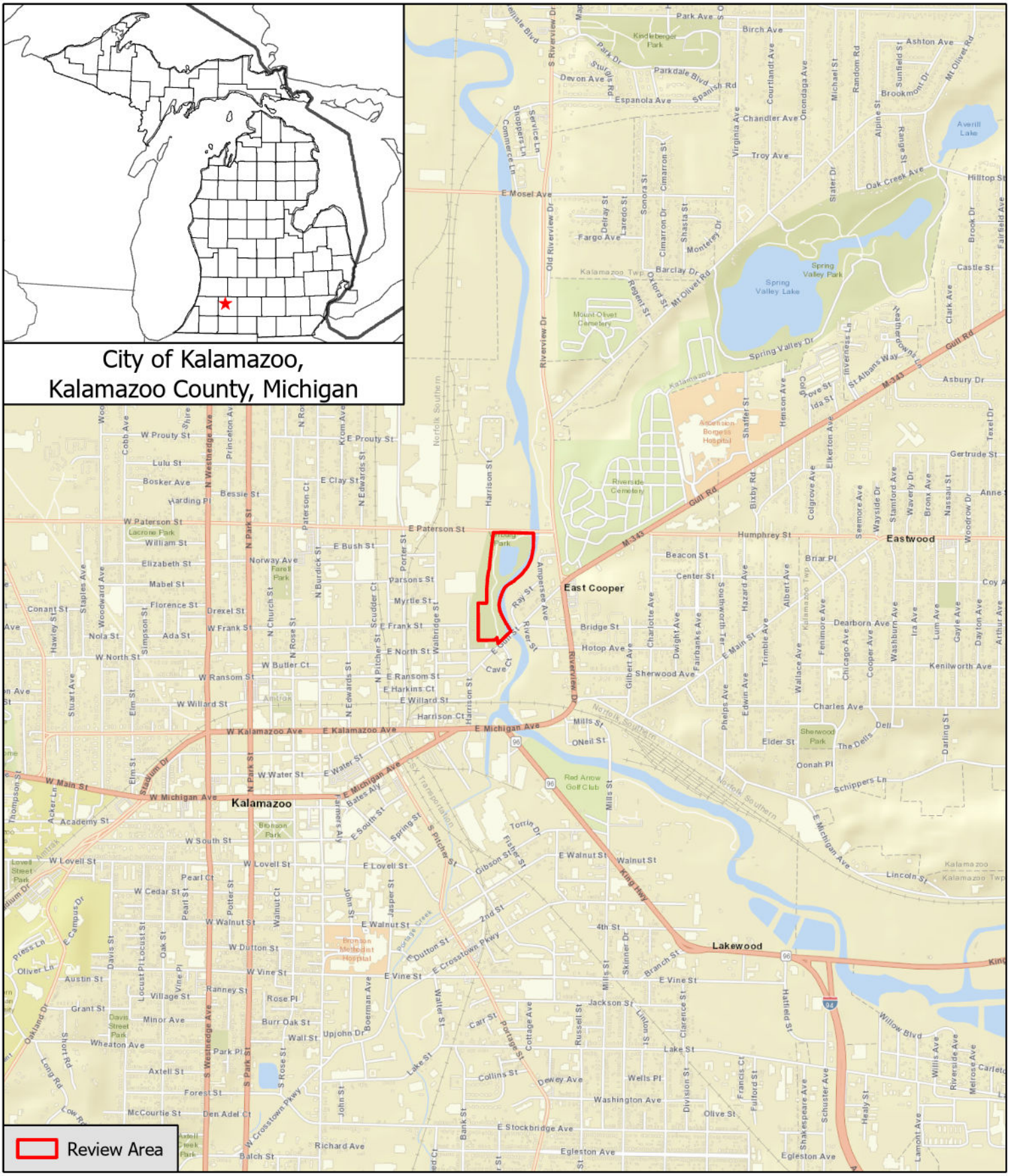

Figure 1. Site Location Map

NE 1768-4 Verburg Park
S.15, T.02S, R.11W
City of Kalamazoo, Kalamazoo County, Michigan
Delineation Date: November 25, 2024
Map Date: January 14, 2025

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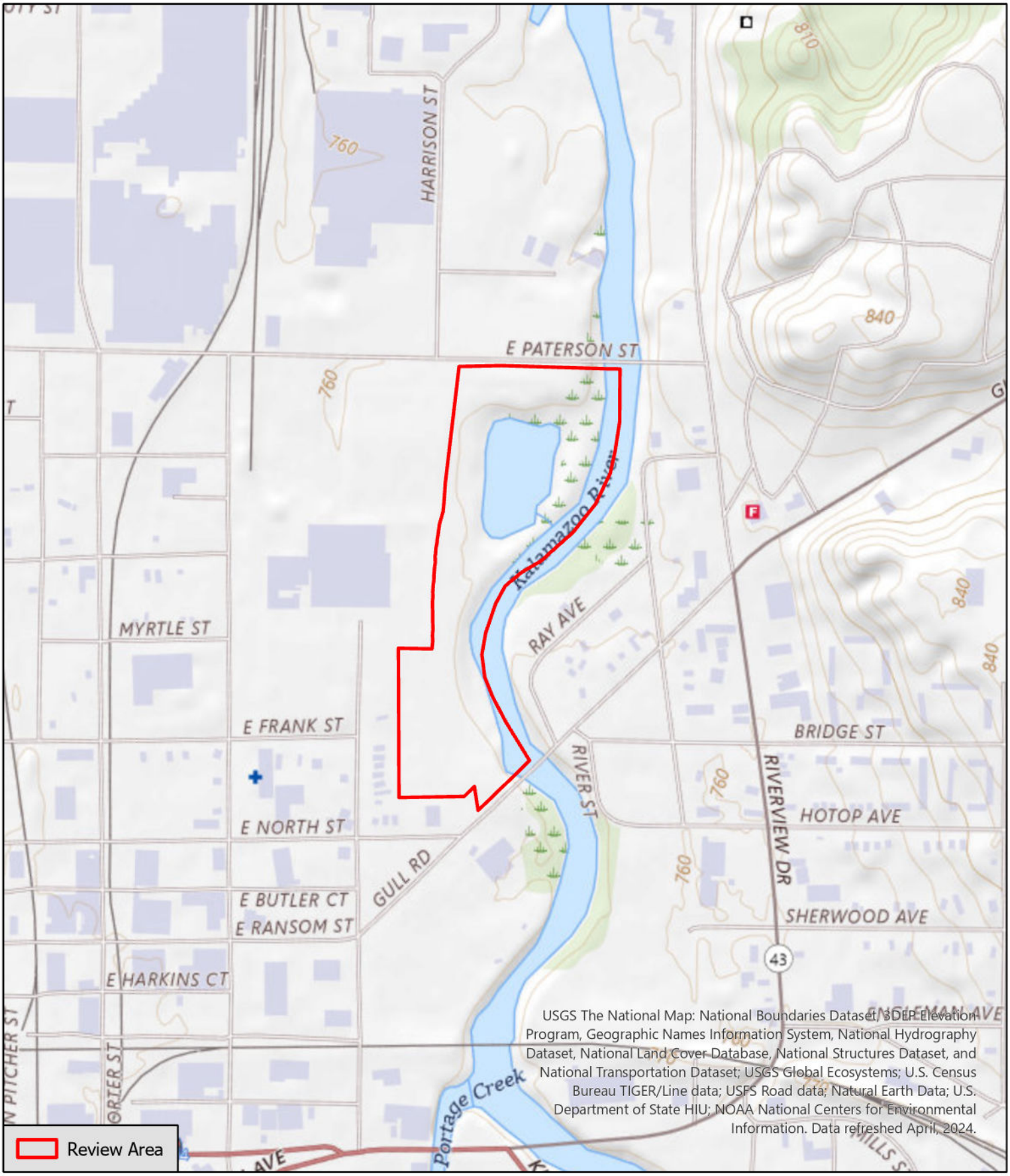

Figure 2. USGS The National Map

NE 1768-4 Verburg Park
S.15, T.02S, R.11W
City of Kalamazoo, Kalamazoo County, Michigan
Delineation Date: November 25, 2024
Map Date: January 14, 2025

0 250 500 1,000 Feet

NISWANDER ENVIRONMENTAL
9436 Maltby Road, Brighton, MI 48116
810.225.0539 *office* | 810.225.0653 *fax*

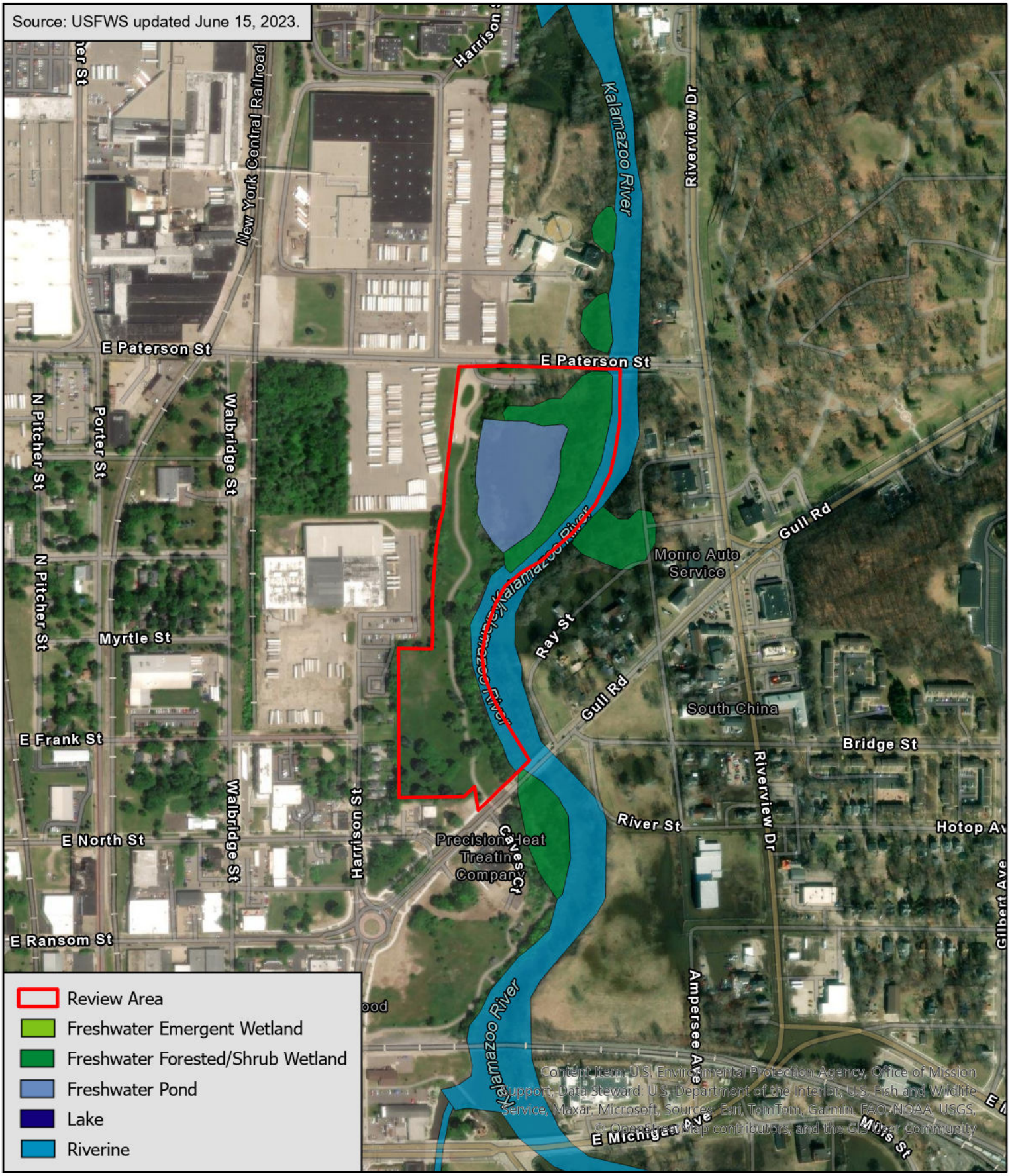

Figure 3. USFWS NWI Map

NE 1768-4 Verburg Park
S.15, T.02S, R.11W
City of Kalamazoo, Kalamazoo County, Michigan
Delineation Date: November 25, 2024
Map Date: January 14, 2025

0 250 500 1,000 Feet

N W E S

NISWANDER ENVIRONMENTAL
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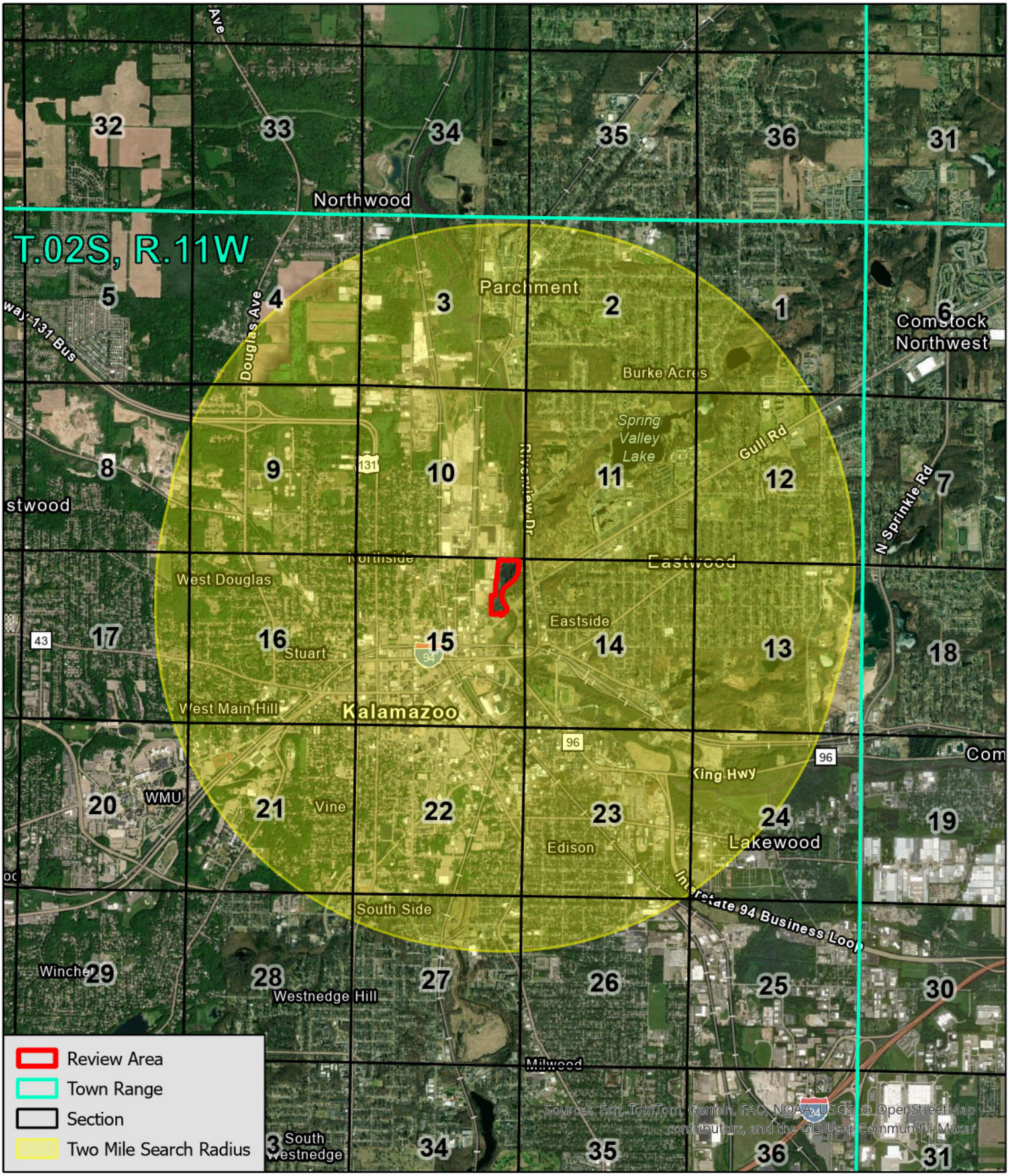

Figure 4. Two Mile Search Radius

NE 1768-4 Verburg Park
S.15, T.02S, R.11W
City of Kalamazoo, Kalamazoo County, Michigan
Delineation Date: November 25, 2024
Map Date: January 14, 2025

0 2,000 4,000 8,000 Feet

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Appendix B

MNFI INFORMATION REQUEST

Michigan Natural Features Inventory Information Request

Requestor: Rachel Hughes-Nilsson

Project Name: Verberg Park in Kalamazoo, Michigan

Project Location: Verberg Park in Kalamazoo, Michigan

Date Created: 10/25/2024

Use of Data

By acceptance of the information services made available through MNFI the recipient understands that access to the information is provided for primary use only. MNFI requests that the user respect the confidential and sensitive nature of the information. There should be no redistribution of the information. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection. Additionally, since the information is constantly being updated MNFI requests that any information service provided by MNFI is destroyed upon completion of the primary use. This information is valid for one year only.

The recipient(s) of the information understand that state endangered and threatened species are protected under state law (Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection). Any questions, observations, new findings, violations or clearance of project activities should be conducted with the Michigan Department of Natural Resources, Wildlife Division. Contact the Endangered Species Coordinator at (517) 284-9453. The recipient(s) of the information understand that federally endangered and threatened species are protected under federal law (Endangered Species Act of 1973). Any questions, observations, new findings, violations or clearance of project activities should be conducted with the U.S. Fish and Wildlife Service in East Lansing at (517) 351-2555. Recipients of the information are responsible for ensuring the protection of protected species and obtaining proper clearance before project activities begin.

Description of Data

The species in this report are listed alphabetically by scientific name. Each record from the database is listed individually. Therefore you may see multiple listings for the same species. The locational and survey date information may be the only differentiating factors when looking at multiple occurrences for a given species. Heritage methodology is followed when entering species occurrences into the MNFI database. Detailed information on heritage methodology can be obtained from NatureServe's website at http://www.natureserve.org. Detailed information on the species listed in this report can be found in abstracts and the rare species explorer on the MNFI website at https://mnfi.anr.msu.edu.

The MNFI database is an ongoing and continuously updated information base. The database is the only comprehensive single source of existing information on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. This database cannot provide a definitive statement on the presence, absence, or condition of the natural features in any given locality, since most sites have not been specifically or thoroughly surveyed for their occurrence. Some of the element records are historical. While this historical information may not be important for regulatory purposes, it is important for management and restoration purposes and for scientific use. Furthermore, plant and animal populations and natural communities change with time. Therefore, the information services provided should not be regarded as a complete statement on the occurrence of special natural features of the area in question. In many cases the information may require the interpretation of a trained scientist.

Any comments or questions can be directed to MNFI via our e-mail at mnfi@msu.edu or by calling 517-284-6200.

Plants and Animals

Scientific Name	Common Name	State Status	Federal Status	Count
Acris blanchardi	Blanchard's cricket frog	T		1
Alasmidonta marginata	Elktoe	SC		10
Alasmidonta viridis	Slippershell	T		1
Ammodramus savannarum	Grasshopper sparrow	SC		1
Amorpha canescens	Leadplant	SC		1
Angelica venenosa	Hairy angelica	SC		2
Arnoglossum plantagineum	Prairie indian-plantain	SC		2
Asclepias hirtella	Tall green milkweed	T		1
Baptisia lactea	White or prairie false indigo	T		4
Berula erecta	Cut-leaved water parsnip	SC		4
Besseya bullii	Kitten-tails	E		1
Boechera missouriensis	Missouri rock-cress	T		1
Bombus affinis	Rusty-patched bumble bee	E	LE	2
Bombus auricomus	Black and gold bumble bee	SC		4
Bombus pensylvanicus	American bumble bee	E		4
Bouteloua curtipendula	Side-oats grama grass	E		1
Buteo lineatus	Red-shouldered hawk	SC		1
Cambarunio iris	Rainbow	SC		5
Centronyx henslowii	Henslow's sparrow	E		2
Clemmys guttata	Spotted turtle	T		6
Clonophis kirtlandii	Kirtland's snake	E		1
Collinsia verna	Blue-eyed Mary	T		2
Coreopsis palmata	Prairie coreopsis	E		2
Cyclonaias tuberculata	Purple wartyback	T		2
Cyperus acuminatus	Cyperus, Nut grass	T		1
Dichanthelium leibergii	Leiberg's panic grass	T		2
Dryopteris celsa	Small log fern	T		1
Eleocharis equisetoides	Horsetail spike rush	SC		1
Emydoidea blandingii	Blanding's turtle	SC		1
Eryngium yuccifolium	Rattlesnake-master or button snakeroot	E		2
Erynnis persius persius	Persius dusky wing	T		1

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Plants and Animals
(continued)

Scientific Name	Common Name	State Status	Federal Status	Count
Falco columbarius	Merlin	SC		1
Falco peregrinus	Peregrine falcon	T		1
Filipendula rubra	Queen-of-the-prairie	T		1
Haliaeetus leucocephalus	Bald eagle	SC		1
Lasmigona compressa	Creek heelsplitter	SC		2
Lasmigona costata	Flutedshell	SC		11
Linum sulcatum	Furrowed flax	SC		1
Lithobates palustris	Pickerel frog	SC		2
Mesomphix cupreus	Copper button	SC		1
Panax quinquefolius	Ginseng	T		1
Pandion haliaetus	Osprey	SC		5
Pantherophis spiloides	Gray rat snake	SC		1
Pleurobema sintoxia	Round pigtoe	SC		7
Potamilus alatus	Pink heelsplitter	SC		1
Silene stellata	Starry campion	T		3
Silphium integrifolium	Rosinweed	T		3
Silphium laciniatum	Compass plant	E		1
Sistrurus catenatus	Eastern massasauga	T	LT	5
Sphaerium fabale	River fingernail clam	SC		1
Spiranthes ovalis	Lesser ladies'-tresses	SC		1
Spiza americana	Dickcissel	SC		1
Sporobolus heterolepis	Prairie dropseed	SC		2
Terrapene carolina carolina	Eastern box turtle	T		11
Utterbackia imbecillis	Paper pondshell	SC		5
Venustaconcha ellipsiformis	Ellipse	SC		5
Zizania aquatica	Wild rice	T		1

Number of Species: 57 **Number of Occurrences: 145**

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Natural Communities

Community Type	Count
No Communities Found	

Number of Occurrences: 0

Michigan Natural Features Inventory
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Acris blanchardi

Blanchard's cricket frog

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2S3

Last Observed Date: 1963-06-30

County: Barry, Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01NR09W	29, 30, 31, 32, 33, 34, 35
T01NR10W	34, 35, 36
T01SR09W	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36
T01SR10W	1, 2, 3, 4, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36
T02SR09W	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 15, 16, 17, 18
T02SR10W	1, 2, 3, 4, 5, 9, 10, 11, 12, 13, 14, 15

Alasmidonta marginata

Elktoe

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3?

Last Observed Date: 2018-07-19

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	19
T02SR11W	23, 24

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Alasmidonta marginata

Elktoe

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3?

Last Observed Date: 1973-07-27

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	17

Alasmidonta marginata

Elktoe

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3?

Last Observed Date: 2018-08-13

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	22

Alasmidonta marginata

Elktoe

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3?

Last Observed Date: 2019-07-17

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	3

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Alasmidonta marginata

Elktoe

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3?

Last Observed Date: 2019-07-16

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	20

Alasmidonta marginata

Elktoe

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3?

Last Observed Date: 2019-07-17

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	24

Alasmidonta marginata

Elktoe

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3?

Last Observed Date: 2017

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	14

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Alasmidonta marginata

Elktoe

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3?

Last Observed Date: 2017

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	3

Alasmidonta marginata

Elktoe

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3?

Last Observed Date: 2017

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	3

Alasmidonta marginata

Elktoe

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3?

Last Observed Date: 2017

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	3

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Alasmidonta viridis

Slippershell

Federal Status: **State Status:** T **Global Rank:** G4G5 **State Rank:** S2S3

Last Observed Date: 2017

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	14

Ammodramus savannarum

Grasshopper sparrow

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2007-06-25

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	27

Amorpha canescens

Leadplant

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3

Last Observed Date: 1990

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T03SR11W	5

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Angelica venenosa

Hairy angelica

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3

Last Observed Date: 1947-07-26

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	16, 17, 18, 19, 20, 21
T02SR11W	13, 24

Angelica venenosa

Hairy angelica

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3

Last Observed Date: 2009-08-07

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR12W	25

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Arnoglossum plantagineum

Prairie indian-plantain

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S3

Last Observed Date: 2002-07-15

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	31

Arnoglossum plantagineum

Prairie indian-plantain

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S3

Last Observed Date: 1838-07-25

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	7, 8, 17, 18, 19

Asclepias hirtella

Tall green milkweed

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 2001-06-04

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	13

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Baptisia lactea

White or prairie false indigo

Federal Status: **State Status:** T **Global Rank:** G4Q **State Rank:** S3

Last Observed Date: 1947

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	30, 31
T01SR12W	25, 36

Baptisia lactea

White or prairie false indigo

Federal Status: **State Status:** T **Global Rank:** G4Q **State Rank:** S3

Last Observed Date: 1978

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	7, 8, 17, 18, 19, 20
T02SR12W	12, 13, 24

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Baptisia lactea

White or prairie false indigo

Federal Status: **State Status:** T **Global Rank:** G4Q **State Rank:** S3

Last Observed Date: 1979-07-17

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T03SR11W	11

Baptisia lactea

White or prairie false indigo

Federal Status: **State Status:** T **Global Rank:** G4Q **State Rank:** S3

Last Observed Date: 1966-07-08

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR10W	30

Berula erecta

Cut-leaved water parsnip

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S2

Last Observed Date: 2002-07-15

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	31

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Berula erecta

Cut-leaved water parsnip

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S2

Last Observed Date: 1947

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR10W	33, 34, 35
T02SR10W	2, 3, 4, 5, 9, 10, 11

Berula erecta

Cut-leaved water parsnip

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S2

Last Observed Date: 1947

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	30
T02SR11W	25, 26, 36

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Berula erecta

Cut-leaved water parsnip

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S2

Last Observed Date: 2005-08-08

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	27, 28

Besseya bullii

Kitten-tails

Federal Status: **State Status:** E **Global Rank:** G3 **State Rank:** S1

Last Observed Date: 1932-05-20

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	30

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Boechera missouriensis

Missouri rock-cress

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1947

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	31, 32
T03SR11W	5, 6

Bombus affinis

Rusty-patched bumble bee

Federal Status: LE **State Status:** E **Global Rank:** G2 **State Rank:** SH

Last Observed Date: 1975-07-12

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	9, 10, 14, 15, 16, 17, 20, 21, 22, 23, 27, 28, 29

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Bombus affinis

Rusty-patched bumble bee

Federal Status: LE **State Status:** E **Global Rank:** G2 **State Rank:** SH

Last Observed Date: 1963-08-12

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	17, 18, 19, 20, 29, 30
T02SR11W	13, 24

Bombus auricomus

Black and gold bumble bee

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1960-07-04

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	17, 18, 19, 20, 29, 30
T02SR11W	13, 24

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Bombus auricomus

Black and gold bumble bee

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1963-08-02

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	9, 10, 14, 15, 16, 21, 22, 23

Bombus auricomus

Black and gold bumble bee

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 2017-08-29

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	22

Bombus auricomus

Black and gold bumble bee

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 2015-08-03

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	27

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Bombus pensylvanicus

American bumble bee

Federal Status: **State Status:** E **Global Rank:** G3G4 **State Rank:** S1

Last Observed Date: 1965-08-09

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	9, 10, 14, 15, 16, 21, 22, 23

Bombus pensylvanicus

American bumble bee

Federal Status: **State Status:** E **Global Rank:** G3G4 **State Rank:** S1

Last Observed Date: 1963-08-12

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	17, 18, 19, 20, 29, 30
T02SR11W	13, 24

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Bombus pensylvanicus

American bumble bee

Federal Status: **State Status:** E **Global Rank:** G3G4 **State Rank:** S1

Last Observed Date: 1963-09-09

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	16, 17, 20, 21

Bombus pensylvanicus

American bumble bee

Federal Status: **State Status:** E **Global Rank:** G3G4 **State Rank:** S1

Last Observed Date: 1963-09-04

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	34, 35
T02SR11W	1, 2, 3, 10, 11

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Bouteloua curtipendula

Side-oats grama grass

Federal Status: **State Status:** E **Global Rank:** G5 **State Rank:** S1

Last Observed Date: 2005-11-16

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	30, 31

Buteo lineatus

Red-shouldered hawk

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2022-04-15

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	28

Cambarunio iris

Rainbow

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S3

Last Observed Date: 1929

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	22

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Cambarunio iris

Rainbow

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S3

Last Observed Date:

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	15

Cambarunio iris

Rainbow

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S3

Last Observed Date: 1934

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	19

Cambarunio iris

Rainbow

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S3

Last Observed Date: 2019-07-17

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	3

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Cambarunio iris

Rainbow

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S3

Last Observed Date: 2019-07-16

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	20

Centronyx henslowii

Henslow's sparrow

Federal Status: **State Status:** E **Global Rank:** G4 **State Rank:** S3

Last Observed Date: 2007-07-01

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	9

Centronyx henslowii

Henslow's sparrow

Federal Status: **State Status:** E **Global Rank:** G4 **State Rank:** S3

Last Observed Date: 2007-06-25

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	21, 22, 27

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Clemmys guttata

Spotted turtle

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1990-10-04

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	8

Clemmys guttata

Spotted turtle

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1958-04-21

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	29, 32, 33

Clemmys guttata

Spotted turtle

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1991

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	8, 17

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Clemmys guttata

Spotted turtle

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 2016-03-09

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	8, 17, 18

Clemmys guttata

Spotted turtle

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1991-05-20

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	28

Clemmys guttata

Spotted turtle

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1987

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	21, 22, 28

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Clonophis kirtlandii

Kirtland's snake

Federal Status: **State Status:** E **Global Rank:** G2 **State Rank:** S1

Last Observed Date: 1879-07-11

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	15

Collinsia verna

Blue-eyed Mary

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 2017-05-28

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	22, 27

Collinsia verna

Blue-eyed Mary

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 1877-05-06

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	9, 10, 14, 15, 16, 21, 22, 23

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Coreopsis palmata

Prairie coreopsis

Federal Status: **State Status:** E **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 2014-09-24

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	21

Coreopsis palmata

Prairie coreopsis

Federal Status: **State Status:** E **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1838-07-23

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	7, 8, 17, 18, 19, 20
T02SR12W	12, 13, 24

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Cyclonaias tuberculata

Purple wartyback

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1981-08-31

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	18, 19, 20

Cyclonaias tuberculata

Purple wartyback

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 2017

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	3

Cyperus acuminatus

Cyperus, Nut grass

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S1

Last Observed Date: 2021-08-24

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T03SR11W	5

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Dichanthelium leibergii

Leiberg's panic grass

Federal Status: **State Status:** T **Global Rank:** G4 **State Rank:** S2

Last Observed Date: 1997

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	20

Dichanthelium leibergii

Leiberg's panic grass

Federal Status: **State Status:** T **Global Rank:** G4 **State Rank:** S2

Last Observed Date: 2013-07-03

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	29

Dryopteris celsa

Small log fern

Federal Status: **State Status:** T **Global Rank:** G4 **State Rank:** S2

Last Observed Date: 1983-06-09

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	22, 27

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Eleocharis equisetoides

Horsetail spike rush

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3

Last Observed Date: 1936-08-04

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	33

Emydoidea blandingii

Blanding's turtle

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S2S3

Last Observed Date: 2019-08-07

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	30

Eryngium yuccifolium

Rattlesnake-master or button snakeroot

Federal Status: **State Status:** E **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1979-10-31

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	30

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Eryngium yuccifolium

Rattlesnake-master or button snakeroot

Federal Status: **State Status:** E **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1980-06-16

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	20

Erynnis persius persius

Persius dusky wing

Federal Status: **State Status:** T **Global Rank:** G5T1T3 **State Rank:** S3

Last Observed Date: 1989

County: Kalamazoo

Watershed: ST. JOSEPH, KALAMAZOO

Town Range	Section
T02SR12W	2

Falco columbarius

Merlin

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3

Last Observed Date: 2010-08-15

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	17

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Falco peregrinus

Peregrine falcon

Federal Status: **State Status:** T **Global Rank:** G4 **State Rank:** S3

Last Observed Date: 2022

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	15

Filipendula rubra

Queen-of-the-prairie

Federal Status: **State Status:** T **Global Rank:** G4G5 **State Rank:** S2

Last Observed Date: 1936-07-22

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	19, 20, 21, 28, 29

Haliaeetus leucocephalus

Bald eagle

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2021

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	14, 15, 22

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Lasmigona compressa

Creek heelsplitter

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3

Last Observed Date: 2018-07-16

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	34

Lasmigona compressa

Creek heelsplitter

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3

Last Observed Date: 2019-07-17

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	3

Lasmigona costata

Flutedshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 1912-04-12

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	8

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Lasmigona costata

Flutedshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 2000-08-01

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	23

Lasmigona costata

Flutedshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 2018-08-13

County: Allegan, Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01NR11W	19
T01NR12W	7, 17, 20, 21, 24
T01NR13W	12
T01SR11W	10, 22

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Lasmigona costata

Flutedshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 2018-07-19

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR09W	19
T02SR10W	19

Lasmigona costata

Flutedshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 2018-07-12

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	22

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Lasmigona costata

Flutedshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 2019-07-17

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	3

Lasmigona costata

Flutedshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 2019-07-16

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	20

Lasmigona costata

Flutedshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 2019-07-17

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	24

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Lasmigona costata

Flutedshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 2017

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	14

Lasmigona costata

Flutedshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 2017

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	3

Lasmigona costata

Flutedshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 2017

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	3

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Linum sulcatum

Furrowed flax

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S2S3

Last Observed Date: 1838-08-01

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR12W	13, 14, 23, 24

Lithobates palustris

Pickerel frog

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3S4

Last Observed Date: 1911-08-30

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	10, 11, 14, 15

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Lithobates palustris

Pickerel frog

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3S4

Last Observed Date: 1949-06-29

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR10W	17, 18, 19, 20
T01SR11W	22, 23, 24, 26, 27

Mesomphix cupreus

Copper button

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S1

Last Observed Date:

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR10W	6, 7, 18, 19, 30, 31
T01SR11W	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36
T01SR12W	24
T02SR10W	6
T02SR11W	1, 2, 3, 4, 5, 6

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Panax quinquefolius

Ginseng

Federal Status: **State Status:** T **Global Rank:** G3G4 **State Rank:** S2S3

Last Observed Date: 1838-07-27

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35

Pandion haliaetus

Osprey

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2023-08-01

County: Kalamazoo, Van Buren

Watershed: ST. JOSEPH, KALAMAZOO

Town Range	Section
T02SR11W	3, 10
T02SR13W	14, 15

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Pandion haliaetus

Osprey

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2022-07-10

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	20, 21

Pandion haliaetus

Osprey

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2023-06-29

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	18
T02SR11W	13, 14, 23, 24

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Pandion haliaetus

Osprey

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2023-08-18

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	25, 36
T03SR11W	12

Pandion haliaetus

Osprey

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2022-07-20

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	28, 29

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Pantherophis spiloides

Gray rat snake

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S2S3

Last Observed Date: 2000-08-28

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	30

Pleurobema sintoxia

Round pigtoe

Federal Status: **State Status:** SC **Global Rank:** G4? **State Rank:** S3

Last Observed Date: 2000-07

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	3, 10, 22, 27

Pleurobema sintoxia

Round pigtoe

Federal Status: **State Status:** SC **Global Rank:** G4? **State Rank:** S3

Last Observed Date: 1934

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	19

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Pleurobema sintoxia

Round pigtoe

Federal Status: **State Status:** SC **Global Rank:** G4? **State Rank:** S3

Last Observed Date: 2018-07-19

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR09W	19
T02SR10W	19

Pleurobema sintoxia

Round pigtoe

Federal Status: **State Status:** SC **Global Rank:** G4? **State Rank:** S3

Last Observed Date: 2018-08-14

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	14

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Pleurobema sintoxia

Round pigtoe

Federal Status: **State Status:** SC **Global Rank:** G4? **State Rank:** S3

Last Observed Date: 2019-07-17

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	3

Pleurobema sintoxia

Round pigtoe

Federal Status: **State Status:** SC **Global Rank:** G4? **State Rank:** S3

Last Observed Date: 2019-07-16

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	20

Pleurobema sintoxia

Round pigtoe

Federal Status: **State Status:** SC **Global Rank:** G4? **State Rank:** S3

Last Observed Date: 2019-07-17

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	24

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Potamilus alatus

Pink heelsplitter

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date: 2018-07-19

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	19

Silene stellata

Starry campion

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1975-07

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	17, 20

Silene stellata

Starry campion

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 2019-07-02

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	30

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Silene stellata

Starry campion

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1947

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	19

Silphium integrifolium

Rosinweed

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1983-07-28

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	30

Silphium integrifolium

Rosinweed

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 2019-09-18

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	20, 29

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Silphium integrifolium

Rosinweed

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2

Last Observed Date: 1999-10-08

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	13, 24

Silphium laciniatum

Compass plant

Federal Status: **State Status:** E **Global Rank:** G5 **State Rank:** S1S2

Last Observed Date: 1980-06-16

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	20

Sistrurus catenatus

Eastern massasauga

Federal Status: LT **State Status:** T **Global Rank:** G3 **State Rank:** S3

Last Observed Date: 2021-05

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	21, 22, 27, 28, 33, 34

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Sistrurus catenatus

Eastern massasauga

Federal Status: LT **State Status:** T **Global Rank:** G3 **State Rank:** S3

Last Observed Date: 1995

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	8

Sistrurus catenatus

Eastern massasauga

Federal Status: LT **State Status:** T **Global Rank:** G3 **State Rank:** S3

Last Observed Date: 2004

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	31
T03SR11W	6

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Sistrurus catenatus

Eastern massasauga

Federal Status: LT **State Status:** T **Global Rank:** G3 **State Rank:** S3

Last Observed Date: 1995-08-23

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T03SR11W	10

Sistrurus catenatus

Eastern massasauga

Federal Status: LT **State Status:** T **Global Rank:** G3 **State Rank:** S3

Last Observed Date: 2016-07

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	27, 34

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Sphaerium fabale

River fingernail clam

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** SNR

Last Observed Date:

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	15, 22, 27, 34
T03SR11W	3, 10, 15, 16, 19, 20, 21, 29

Spiranthes ovalis

Lesser ladies'-tresses

Federal Status: **State Status:** SC **Global Rank:** G5? **State Rank:** S1

Last Observed Date: 2016-09-22

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR12W	25

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Spiza americana

Dickcissel

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3

Last Observed Date: 2007-06-25

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	27

Sporobolus heterolepis

Prairie dropseed

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3

Last Observed Date: 1933-07-21

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	20, 21, 29

Sporobolus heterolepis

Prairie dropseed

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3

Last Observed Date: 1940-08-01

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	29

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 1978-06-21

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	20

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 2021-05-21

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	22, 27

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 2021-04-04

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR10W	18, 19, 20
T01SR11W	13, 24

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 2024-05-23

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	17, 20

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 2019-05-22

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	8, 17, 20

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 2020-05-22

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	31, 32

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 2005-06-08

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T01SR11W	27

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 1999-08-10

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	13

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 2024-06-14

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	29, 30, 31
T02SR12W	25

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 2019-08-08

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	28

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 2021-06-08

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T03SR11W	3

Utterbackia imbecillis

Paper pondshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S2S3

Last Observed Date:

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	8

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Utterbackia imbecillis

Paper pondshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S2S3

Last Observed Date: 2012-07-25

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	19

Utterbackia imbecillis

Paper pondshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S2S3

Last Observed Date: 2018-08-14

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	14

Utterbackia imbecillis

Paper pondshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S2S3

Last Observed Date: 2018-07-25

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	32

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Utterbackia imbecillis

Paper pondshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S2S3

Last Observed Date: 2019-07-17

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	24

Venustaconcha ellipsiformis

Ellipse

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3

Last Observed Date: 1934

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR10W	18, 19, 20

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Venustaconcha ellipsiformis

Ellipse

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3

Last Observed Date: 2012-07-23

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR09W	19
T02SR10W	19

Venustaconcha ellipsiformis

Ellipse

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3

Last Observed Date: 2019-07-17

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	24

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Venustaconcha ellipsiformis

Ellipse

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3

Last Observed Date: 2017

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	3

Venustaconcha ellipsiformis

Ellipse

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S3

Last Observed Date: 1929-09-09

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	24

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

Zizania aquatica

Wild rice

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2S3

Last Observed Date: 2005-09-15

County: Kalamazoo

Watershed: KALAMAZOO

Town Range	Section
T02SR11W	31
T03SR11W	6

Michigan Natural Features Inventory
Discover. Define. Deliver.

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

MICHIGAN STATE UNIVERSITY | Extension

Federal Protection Status Code Definitions

LE = Listed endangered
LT = Listed threatened
LE/LT = Partly listed endangered and partly listed threatened
PDL = Proposed delist
E(S/A) = Endangered based on similarities/appearance
PS = Partial status (federally listed in only part of its range)
C = Species being considered for federal status

State Protection Status Code Definitions

E = Endangered
T = Threatened
SC = Special concern
X = Presumed extirpated (legally 'threatened' if rediscovered)

Global Heritage Status Rank Definitions

The priority assigned by NatureServe 's national office for data collection and protection based upon the element's status throughout its entire world-wide range. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences range-wide or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g. a single western state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.
G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
GH = Of historical occurrence throughout its range, i.e. formerly part of the established biota, with the expectation that it may be rediscovered (e.g. Bachman's Warbler).
GU = Possibly in peril range-wide, but status uncertain; need more information.
GX = Believed to be extinct throughout its range (e.g. Passenger Pigeon with virtually no likelihood that it will be rediscovered).
G? = Incomplete data
Q = Taxonomy uncertain
T = Subspecies
U = Unmappable through out the global geographic extent
? = Questionable

Subnational Heritage Status Rank Definitions

The priority assigned by the Michigan Natural Features Inventory for data collection and protection based upon the element's status within the state. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.

S1 = Critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state.
S2 = Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.
S3 = Rare or uncommon in state (on the order of 21 to 100 occurrences).
S4 = Apparently secure in state, with many occurrences.
S5 = Demonstrably secure in state and essentially ineradicable under present conditions.
SA = Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range.
SE = An exotic established in the state; may be native elsewhere in North America (e.g. house finch or catalpa in eastern states).
SH = Of historical occurrence in state and suspected to be still extant.
SN = Regularly occurring, usually migratory and typically nonbreeding species.
SR = Reported from state, but without persuasive documentation which would provide a basis for either accepting or rejecting the report.
SRF = Reported falsely (in error) from state but this error persisting in the literature.
SU = Possibly in peril in state, but status uncertain; need more information.
SX = Apparently extirpated from state.

There should be no redistribution of these data. MNFI requests that the user respect the confidential and sensitive nature of these data. Indiscriminate distribution of information regarding locations of many rare species represents a threat to their protection.

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Appendix C

USFWS IPAC OFFICIAL SPECIES LIST, VERIFICATION LETTER, EMAIL CORRESPONDENCE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
Phone: (517) 351-2555 Fax: (517) 351-1443

In Reply Refer To: 01/16/2025 20:43:56 UTC
Project Code: 2025-0043601
Project Name: Verburg Park Improvements

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

Official Species List
The attached species list identifies any Federally threatened, endangered, proposed and candidate species that may occur within the boundary of your proposed project or may be affected by your proposed project. The list also includes designated critical habitat if present within your proposed project area or affected by your project. This list is provided to you as the initial step of the consultation process required under section 7(c) of the Endangered Species Act, also referred to as Section 7 Consultation.

Under 50 CFR 402.12(e) (the regulations that implement section 7 of the Endangered Species Act), the accuracy of this species list should be verified after 90 days. You may verify the list by visiting the IPaC website (https://ipac.ecosphere.fws.gov/) at regular intervals during project planning and implementation. To update an Official Species List in IPaC: from the My Projects page, find the project, expand the row, and click Project Home. In the What's Next box on the Project Home page, there is a Request Updated List button to update your species list. Be sure to select an "official" species list for all projects.

Consultation requirements and next steps
Section 7 of the Endangered Species Act of 1973 requires that actions authorized, funded, or carried out by Federal agencies not jeopardize Federally threatened or endangered species or adversely modify designated critical habitat. To fulfill this mandate, Federal agencies (or their designated non-Federal representative) must consult with the Fish and Wildlife Service if they determine their project may affect listed species or critical habitat.

There are two approaches to evaluating the effects of a project on listed species.

Approach 1. Use the All-species Michigan determination key in IPaC. This tool can assist you in making determinations for listed species for some projects. In many cases, the determination key

will provide an automated concurrence that completes all or significant parts of the consultation process. Therefore, we strongly recommend screening your project with the **All-Species Michigan Determination Key (Dkey)**. For additional information on using IPaC and available Determination Keys, visit https://www.fws.gov/media/mifo-ipac-instructions (and click on the attachment), or for a video overview, please visit: https://www.youtube.com/watch?v=FfcerNCiL0I. Please carefully review your Dkey output letter to determine whether additional steps are needed to complete the consultation process.

Approach 2. Evaluate the effects to listed species on your own without utilizing a determination key. Once you obtain your official species list, you are not required to continue in IPaC, although in most cases using a determination key should expedite your review. If the project is a Federal action, you should review our section 7 step-by-step instructions before making your determinations: https://www.fws.gov/office/midwest-region-headquarters/midwest-section-7-technical-assistance. If you evaluate the details of your project and conclude "no effect," document your findings, and your listed species review is complete; you do not need our concurrence on "no effect" determinations. If you cannot conclude "no effect," you should coordinate/consult with the Michigan Ecological Services Field Office. The preferred method for submitting your project description and effects determination (if concurrence is needed) is electronically to EastLansing@fws.gov. Please include a copy of this official species list with your request.

For all **wind energy projects**, please contact this field office directly for assistance, even if no Federally listed plants, animals or critical habitat are present within your proposed project area or may be affected by your proposed project.

Migratory Birds
Please see the "Migratory Birds" section below for important information regarding incorporating migratory birds into your project planning. Our Migratory Bird Program has developed recommendations, best practices, and other tools to help project proponents voluntarily reduce impacts to birds and their habitats. The Bald and Golden Eagle Protection Act prohibits the take and disturbance of eagles without a permit. If your project is near an eagle nest or winter roost area, see our Eagle Permits website at https://www.fws.gov/program/eagle-management to help you avoid impacting eagles or determine if a permit may be necessary.

Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your consideration of threatened and endangered species during your project

planning. Please include a copy of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
(517) 351-2555

PROJECT SUMMARY

Project Code: 2025-0043601
Project Name: Verburg Park Improvements
Project Type: Recreation - New Construction
Project Description: Park improvements under consideration include:

• Installation of an accessible kayak launch in a small inlet/pond that is connected to the Kalamazoo
River.
• A new kayak storage pod.
• A new pavilion/shelter.
• A new pump track and tot track, or athletic fields (e.g. soccer field)

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.30078555,-85.57320328167685,14z



Counties: Kalamazoo County, Michigan

ENDANGERED SPECIES ACT SPECIES

There is a total of 5 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949 General project design guidelines: https://ipac.ecosphere.fws.gov/project/JMEZTKRKMNFRZJOQPR3O22DHZQ/documents/generated/6982.pdf	Endangered

BIRDS

NAME	STATUS
Whooping Crane *Grus americana* Population: U.S.A. (AL, AR, CO, FL, GA, ID, IL, IN, IA, KY, LA, MI, MN, MS, MO, NC, NM, OH, SC, TN, UT, VA, WI, WV, western half of WY) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/758	Experimental Population, Non-Essential

REPTILES

NAME	STATUS
Eastern Massasauga (=rattlesnake) *Sistrurus catenatus* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ For all Projects: Project is within EMR Range Species profile: https://ecos.fws.gov/ecp/species/2202 General project design guidelines: https://ipac.ecosphere.fws.gov/project/JMEZTKRKMNFRZJOQPR3O22DHZQ/documents/generated/5280.pdf	Threatened

INSECTS

NAME	STATUS
Mitchell's Satyr Butterfly *Neonympha mitchellii mitchellii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8062	Endangered
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

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1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are Bald Eagles and/or Golden Eagles in your project area.

Measures for Proactively Minimizing Eagle Impacts
For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the National Bald Eagle Management Guidelines. You may employ the timing and activity-specific distance recommendations in this document when designing your project/ activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to Bald Eagle Nesting and Sensitivity to Human Activity.

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

If disturbance or take of eagles cannot be avoided, an incidental take permit may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the Do I Need A Permit Tool. For assistance making this determination for golden eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

Ensure Your Eagle List is Accurate and Complete
If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information

on Migratory Birds and Eagles, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

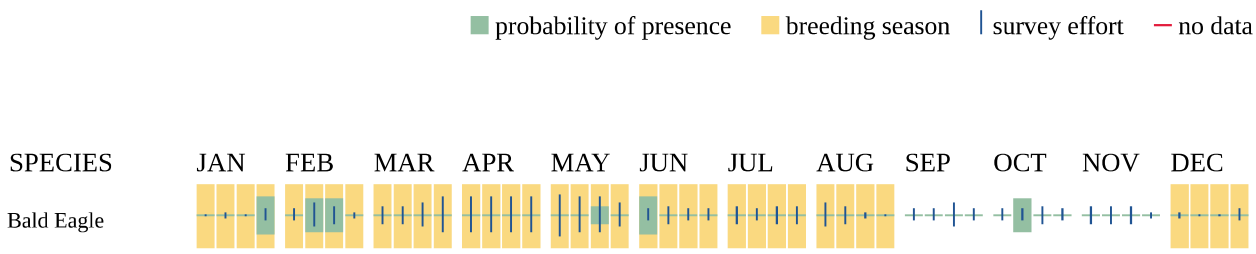
Probability of Presence (▪)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (▪)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Non-BCC
Vulnerable

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service). The incidental take of migratory birds is the injury or death of birds that results from, but is not the purpose, of an activity. The Service interprets the MBTA to prohibit incidental take.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10

NAME	BREEDING SEASON
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9454	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9643	Breeds May 20 to Aug 10
Cerulean Warbler *Setophaga cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 22 to Jul 20
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10678	Breeds May 1 to Aug 20
Golden-winged Warbler *Vermivora chrysoptera* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Grasshopper Sparrow *Ammodramus savannarum perpallidus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8329	Breeds Jun 1 to Aug 20
Henslow's Sparrow *Centronyx henslowii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3941	Breeds May 1 to Aug 31
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Long-eared Owl *asio otus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3631	Breeds Mar 1 to Jul 15

NAME	BREEDING SEASON
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9478	Breeds elsewhere
Semipalmated Sandpiper *Calidris pusilla* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9603	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

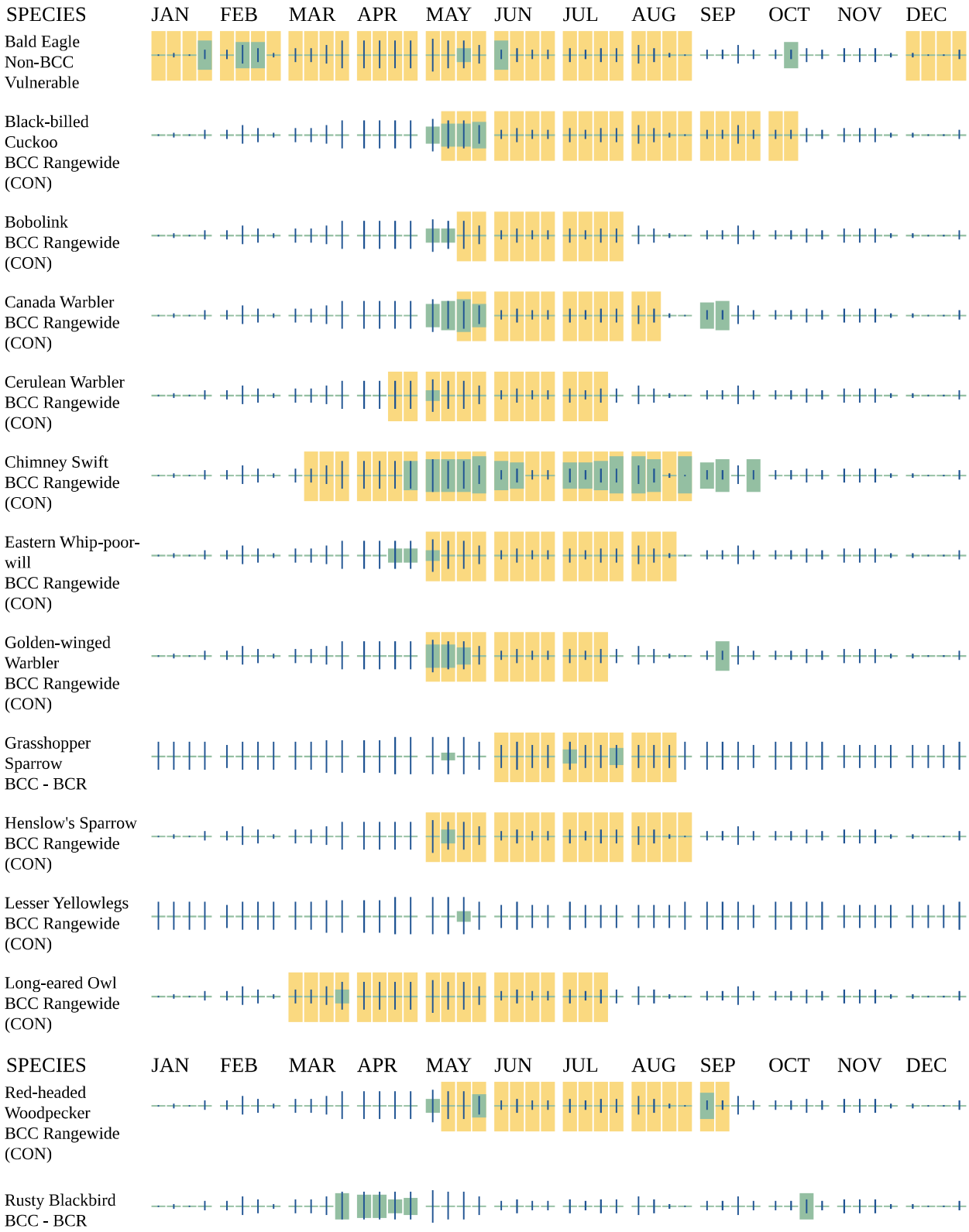
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

■ probability of presence ■ breeding season | survey effort – no data


SPECIES
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Bald Eagle
Non-BCC
Vulnerable
Black-billed
Cuckoo
BCC Rangewide
(CON)
Bobolink
BCC Rangewide
(CON)
Canada Warbler
BCC Rangewide
(CON)
Cerulean Warbler
BCC Rangewide
(CON)
Chimney Swift
BCC Rangewide
(CON)
Eastern Whip-poor-
will
BCC Rangewide
(CON)
Golden-winged
Warbler
BCC Rangewide
(CON)
Grasshopper
Sparrow
BCC - BCR
Henslow's Sparrow
BCC Rangewide
(CON)
Lesser Yellowlegs
BCC Rangewide
(CON)
Long-eared Owl
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SPECIES
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Red-headed
Woodpecker
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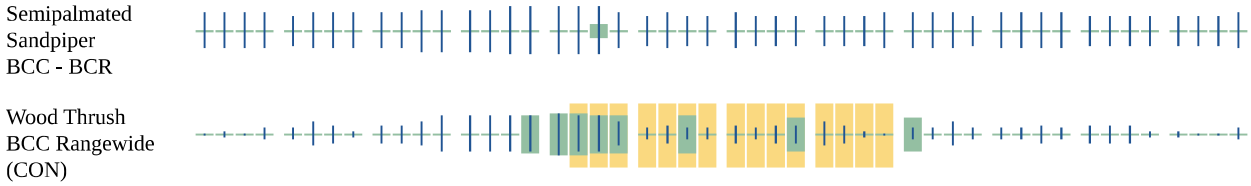
(CON)
Rusty Blackbird
BCC - BCR



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER POND

- PUBGx

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1C

RIVERINE

- R2UBH

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Nicole Stewart
Address: 9436 Maltby Rd
City: Brighton
State: MI
Zip: 48116
Email nstewart@niswander-env.com
Phone: 8108190021

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
Phone: (517) 351-2555 Fax: (517) 351-1443

In Reply Refer To: 01/28/2025 18:00:49 UTC
Project code: 2025-0043601
Project Name: Verburg Park Improvements

Subject: Verification letter for the project named 'Verburg Park Improvements' for specified threatened and endangered species that may occur in your proposed project location consistent with the Michigan Endangered Species Determination Key (Michigan DKey)

Dear Nicole Stewart:

The U.S. Fish and Wildlife Service (Service) received on **January 28, 2025** your effect determination(s) for the 'Verburg Park Improvements' (the Action) using the Michigan DKey within the Information for Planning and Consultation (IPaC) system. The Service developed this system in accordance with the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based on your answers and the assistance of the Service's Michigan DKey, you made the following effect determination(s) for the proposed Action:

Species	**Listing Status**	**Determination**
Eastern Massasauga (=rattlesnake) (*Sistrurus catenatus*)	Threatened	NLAA
Indiana Bat (*Myotis sodalis*)	Endangered	No effect
Mitchell's Satyr Butterfly (*Neonympha mitchellii mitchellii*)	Endangered	No effect
Monarch Butterfly (*Danaus plexippus*)	Proposed Threatened	No effect
Whooping Crane (*Grus americana*)	Experimental Population, Non-Essential	No effect

The Service will notify you within 30 calendar days if we determine that this proposed Action does not meet the criteria for a "may affect, not likely to adversely affect" (NLAA) determination for Federally listed species in Michigan. If we do not notify you within that timeframe, you may proceed with the Action under the terms of the NLAA concurrence provided here. This

verification period allows the Michigan Ecological Services Field Office to apply local knowledge to evaluation of the Action, as we may identify a small subset of actions having impacts that were unanticipated. In such instances, the Michigan Ecological Services Field Office may request additional information to verify the effects determination reached through the Michigan DKey.

Your agency has met consultation requirements by informing the Service of your "No Effect" determination(s). No consultation is required for species that you determined will not be affected by the Action.

Please provide sufficient project details on your project homepage in IPaC (Define Project, Project Description) to support your conclusions and the Service's 30-day review period. Failure to disclose important aspects of your project that would influence the outcome of your effects determinations may negate your determinations and invalidate this letter. If you have site-specific information that leads you to believe a different determination is more appropriate for your project than what the Dkey concludes, you can and should proceed based on the best available information.

The Service recommends that you contact the Service or re-evaluate the project in IPaC if: 1) the scope or location of the proposed Action is changed; 2) new information reveals that the action may affect listed species or designated critical habitat in a manner or to an extent not previously considered; 3) the Action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. If any of the above conditions occurs, additional consultation with the Service should take place before project changes are final or resources committed.

For non-Federal representatives: Please note that when a project requires consultation under section 7 of the Act, the Service must consult directly with the Federal action agency unless that agency formally designates a non-Federal representative (50 CFR 402.08). Non-Federal representatives may prepare analyses or conduct informal consultations; however, the ultimate responsibility for section 7 compliance under the Act remains with the Federal agency. If the Federal agency concurs with your determination, the project as proposed has completed section 7 consultation. All documents and supporting correspondence should be provided to the Federal agency for their records.

Bald and Golden Eagles:
Bald eagles, golden eagles, and their nests are protected under the Bald and Golden Eagle Protection Act (54 Stat. 250, as amended, 16 U.S.C. 668a-d) (Eagle Act). The Eagle Act prohibits, except when authorized by an Eagle Act permit, the "taking" of bald and golden eagles and defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." The Eagle Act's implementing regulations define disturb as "…to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

If the Action may impact bald or golden eagles, additional coordination with the Service under the Eagle Act may be required. For more information on eagles and conducting activities in the vicinity of an eagle nest, please visit https://www.fws.gov/library/collections/all-about-eagles. In addition, the Service developed the National Bald Eagle Management Guidelines (May 2007) in order to assist landowners in avoiding the disturbance of bald eagles. The full Guidelines are available at https://www.fws.gov/media/national-bald-eagle-management-guidelines-0.

If you have further questions regarding potential impacts to eagles, please contact Chris Mensing, Chris_Mensing@fws.gov or 517-351-2555.

Monarch butterfly and other pollinators
In December 2020, after an extensive status assessment of the monarch butterfly, we determined that listing the monarch under the Endangered Species Act is warranted but precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. Therefore, the Service added the monarch butterfly to the candidate list. The Service will review its status each year until we are able to begin developing a proposal to list the monarch.

The Endangered Species Act does not establish protections or consultation requirements for candidate species. Some Federal and State agencies may have policy requirements to consider candidate species in planning. We encourage implementing measures that will remove or reduce threats to these species and possibly make listing unnecessary.

For all projects, we recommend the following best management practices (BMPs) to benefit monarch and other pollinators.

Monarch and Pollinator BMP Recommendations

Consider monarch and other pollinators in your project planning when possible. Many pollinators are declining, including species that pollinate key agricultural crops and help maintain natural plant communities. Planting a diverse group of native plant species will help support the nutritional needs of Michigan’s pollinators. We recommend a mix of flowering trees, shrubs, and herbaceous plants so that something is always blooming and pollen is available during the active periods of the pollinators, roughly early spring through fall (mid-March to mid-October). To benefit a wide variety of pollinators, choose a wide range of flowers with diverse colors, heights, structure, and flower shape. It is important to provide host plants for any known butterfly species at your site, including native milkweed for Monarch butterfly. Incorporating a water source (e.g., ephemeral pool or low area) and basking areas (rocks or bare ground) will provide additional resources for pollinators.

Many pollinators need a safe place to build their nests and overwinter. During spring and summer, leave some areas unmowed or minimize the impacts from mowing (e.g., decrease frequency, increase vegetation height). In fall, leave areas unraked and leave plant stems standing. Leave patches of bare soil for ground nesting pollinators.

Avoid or limit pesticide use. Pesticides can kill more than the target pest. Some pesticide residues can kill pollinators for several days after the pesticide is applied. Pesticides can also kill natural predators, which can lead to even worse pest problems.

Planting native wildflowers can also reduce the need to mow and water, improve bank stabilization by reducing erosion, and improve groundwater recharge and water quality.

Resources:

https://www.fws.gov/initiative/monarchs
https://www.fws.gov/library/collections/pollinators

Wetland impacts:
Section 404 of the Clean Water Act of 1977 (CWA) regulates the discharge of dredged or fill material into waters (including wetlands) of the United States. Regulations require that activities permitted under the CWA (including wetland permits issued by the Michigan Department of Environment, Great Lakes, and Energy (EGLE)) not jeopardize the continued existence of species listed as endangered or threatened. Permits issued by the U.S. Army Corps of Engineers must also consider effects to listed species pursuant to section 7 of the Endangered Species Act. The Service provides comments to the agencies that may include permit conditions to help avoid or minimize impacts to wildlife resources including listed species. For this project, we consider the conservation measures you agreed to in the determination key and/or as part of your proposed action to be non-discretionary. If you apply for a wetland permit, these conservation measures should be explicitly incorporated as permit conditions. Include a copy of this letter in your wetland permit application to streamline the threatened and endangered species review process.

Summary of conservation measures for your project You agreed to the following conservation measures to avoid adverse effects to listed species and our concurrence is only valid if the measures are fully implemented. These must be included as permit conditions if a permit is required and/or included in any contract language.

Freshwater Mussels:
EGLE Minor Permit/General Permit Category
You indicated that your project falls within one of the following the Michigan Department of Energy, Great Lakes, and the Environment (EGLE)/Army Corps of Engineers joint permit Minor Permit (MP) or General Permit (GP) Categories:

- MP 3 - Boat Hoist;
- MP 5 - Boat Wells;
- MP 7 - Completed Enforcement Actions;
- MP 12 - Dock;
- MP 21 - Fish and Wildlife Habitat Structures;
- MP 22 - Ford Stream Crossings for Commercial Forestry Operations;
- MP 28 - Maintenance and Repair of Serviceable Structures;
- MP 45 - Temporary Recreational Structures;
- MP 48 - Wetland Habitat Restoration and Enhancement;
- GP A - Aids to Navigation;
- GP C - Clear Span Bridge;
- GP J - Dry Fire Hydrant;
- GP O - Minor Permit Revisions and Transfers;
- GP Q - Mooring Buoy;
- GP W - Scientific Measuring Devices;
- GP X - Snow Road Stream Crossings for Forestry Operations;
- GP Y - Spring Piles and Piling Clusters

If EGLE or the Army Corps of Engineers determines that your project does not fit within one of these MP/GP categories, you will need to reinitiate this consultation by contacting MIFO_Dkey@fws.gov or revising your answer in IPAC and generating a new letter.

Eastern massasauga: Materials used for erosion control and site restoration must be wildlife-friendly. Do not use erosion control products containing plastic mesh netting or other similar material that could entangle eastern massasauga rattlesnake (EMR). Several products for soil erosion and control exist that do not contain plastic netting including net-less erosion control blankets (for example, made of excelsior), loose mulch, hydraulic mulch, soil binders, unreinforced silt fences, and straw bales. Others are made from natural fibers (such as jute) and loosely woven together in a manner that allows wildlife to wiggle free.

Eastern massasauga: To increase human safety and awareness of EMR, those implementing the project must first review the EMR factsheet (available at https://www.fws.gov/media/eastern-massasauga-rattlesnake-fact-sheet), and watch MDNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake" video (available at https://www.youtube.com/watch?v=-PFnXe_e02w).

Eastern massasauga: During project implementation, report sightings of any federally listed species, including EMR, to the Service within 24 hours.

Eastern massasauga: The project will not result in permanent loss of more than one acre of wetland or conversion of more than 10 acres of EMR upland habitat (uplands associated with high quality wetland habitat) to other land uses.

Listed bats: The action will not include temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s).

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Verburg Park Improvements

2. Description

The following description was provided for the project 'Verburg Park Improvements':

> Park improvements under consideration include:
>
> • Installation of an accessible kayak launch (EZ Launch) in a small inlet/pond that is connected to the Kalamazoo
> River. This inlet/pond and segment of the Kalamazoo River has been recently dredged to remove PCB-contaminated sediment.
> • A new kayak storage pod.
> • A new pavilion/shelter.
> • A new pump track and tot track, or athletic fields (e.g. soccer field)

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.30078555,-85.57320328167685,14z



QUALIFICATION INTERVIEW

1. Are there any possible effects to any listed species or to designated critical habitat from your project or effects from any other actions or projects subsequently made possible by your project?

   Select "Yes" even if the expected effects to the species or critical habitat are expected to be 1) extremely unlikely (discountable), 2) can't meaningfully be measured, detected, or evaluated (insignificant), or 3) wholly beneficial.

   Select "No" to confirm that the project details and supporting information allow you to conclude that listed species and their habitats will not be exposed to any effects (including discountable, insignificant, or beneficial effects) and therefore, you have made a "no effect" determination for all species. If you are unsure, select YES to answer additional questions about your project.

   Yes

2. This determination key is intended to assist the user in the evaluating the effects of their actions on Federally listed species in Michigan. It does not cover other prohibited activities under the Endangered Species Act (e.g., for wildlife: import/export, Interstate or foreign commerce, possession of illegally taken wildlife, purposeful take for scientific purposes or to enhance the survival of a species, etc.; for plants: import/export, reduce to possession, malicious destruction on Federal lands, commercial sale, etc.) or other statutes. Click yes to acknowledge that you must consider other prohibitions of the ESA or other statutes outside of this determination key.

   Yes

3. Is the action the approval of a long-term (i.e., in effect greater than 10 years) permit, plan, or other action? (e.g., a new or re-issued hydropower license, a large-scale land management plan, or other kinds of documents that provide direction for projects or actions that may be conducted over a long term (>10 years) without the need for additional section 7 consultation).

   No

4. Is the action being funded, authorized, or carried out by a Federal agency?

   Yes

5. Does the action involve the installation or operation of wind turbines?

   No

6. Are there at least 30 days prior to your action occurring? Endangered species consultation must be completed before taking any action that may have effects to listed species. The Service also needs 30 days to review projects before we can verify conclusions in some dkey output letters. For example, if you have already started some components of the project on the ground (e.g., removed vegetation) before completing this key, answer “no” to this question. The only exception is if you have a Michigan Field Office pre-approved emergence survey (i.e., if you have conducted pre-approved emergence surveys for listed bats before tree removal, you can still answer yes to this question).

   Yes

7. Does the action involve constructing a new communications tower or modifying an existing communications tower?

   No

8. Does the activity involve aerial or other large-scale application of any chemical (including insecticide, herbicide, etc.)?

   No

9. Does your project include water withdrawal (ground or surface water) greater than 10,000 gallons/day?

   No

10. Will your action permanently affect hydrology?

    No

11. Will your action temporarily affect hydrology?

    No

12. Will your project have any direct impacts to a stream or river (e.g., Horizontal Directional Drilling (HDD), hydrostatic testing, stream/road crossings, new storm-water outfall discharge, dams, other in-stream work, changes to water quality or hydrology, etc.)?

    Yes

13. Does your project have the potential to indirectly impact the stream/river or the riparian zone (e.g., cut and fill, horizontal directional drilling, hydrostatic testing, construction, vegetation removal, discharge, changes to water quality or hydrology, etc.)?

    Yes

14. Are you applying for one of the following Michigan EGLE/Army Corps of Engineers joint permit application Minor Permit (MP) Categories:
MP 3 - Boat Hoist; MP 5 - Boal Wells; MP 7 - Completed Enforcement Actions; MP 13 - Dock;
MP 22 - Fish and Wildlife Habitat Structures;
MP 25 - Ford Stream Crossings for Commercial Forestry Operations;
MP 31 - Maintenance and Repair of Serviceable Structures;
MP 52 - Temporary Recreational Structures;
MP 54 - Wetland Habitat Restoration and Enhancement?

    Verify the MP category number and associated description matches your project/ application (https://www.michigan.gov/documents/egle/WRD-Minor-Project-Categories_733320_7.pdf). If you don't know what category applies for your project, answer no to this question.

    Yes

15. Are you applying for one of the following Michigan EGLE/Army Corps of Engineers joint permit application General Permit (GP) Categories:
GP A - Aids to Navigation;
GP C - Clear Span Bridge;
GP J - Dry Fire Hydrant;
GP O - Minor Permit Revisions and Transfers;
GP Q - Mooring Buoy;
GP W - Scientific Measuring Devices;
GP X - Snow Road Stream Crossings for Forestry Operations;
GP Z - Spring Piles and Piling Clusters?

    Verify the GP category number and associated description matches your project/ application (https://www.michigan.gov/documents/deq/wrd-general-permit-categories_555828_7.pdf). If you don't know what category applies for your project, answer no to this question.

    No

16. Will your action disturb the ground or existing vegetation? This includes any off road vehicle access, soil compaction, digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application, vegetation management (including removal or maintenance using equipment or chemicals), cultivation, development, etc.

    Yes

17. Is the action a utility-scale solar development project?

    Note: Solar projects are considered utility scale if they will be 1 megawatt or larger.

    No

18. [Hidden semantic] Does the action intersect the MOBU AOI?

    Automatically answered
    Yes

19. Under the ESA, monarchs remain warranted but precluded by listing actions of higher priority. The monarch is a candidate for listing at this time. The Endangered Species Act does not establish protections or consultation requirements for candidate species. Some Federal and State agencies may have policy requirements to consider candidate species in planning. We encourage implementing measures that will remove or reduce threats to these species and possibly make listing unnecessary. If your project will have no effect on monarch butterflies (for example, if your project won't affect their habitat or individuals), then you can make a "no effect" determination for this project. Are you making a "no effect" determination for monarch?

    Yes

20. [Hidden Semantic] Does the action intersect the Eastern massasauga rattlesnake area of influence?

    Automatically answered
    Yes

21. Does your action involve prescribed fire?

    No

22. Will this action occur entirely in the Eastern massasauga rattlesnake inactive season (October 16 through April 14)?

    No

23. Will this action occur entirely in the Eastern massasauga rattlesnake active season (April 15 through October 15)?

    No

24. Will the action result in permanent loss of more than one acre of wetland or conversion of more than 10 acres of uplands of potential Eastern massasauga rattlesnake habitat (uplands associated with high quality wetland habitat) to other land uses?

    No

25. Will you use wildlife safe materials for erosion control and site restoration and eliminate the use of erosion control products containing plastic mesh netting or other similar material that could ensnare Eastern massasauga rattlesnake?

    Yes

26. Will you watch MDNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake (EMR)" video, review the EMR factsheet or call 517-351-2555 to increase human safety and awareness of EMR?

    Yes

27. Will all action personnel report any Eastern massasauga rattlesnake observations, or observation of any other listed threatened or endangered species, during action implementation to the Service within 24 hours?

    Yes

28. [Hidden Semantic] Does the action area intersect the Mitchell's satyr area of influence?

    Automatically answered
    Yes

29. Does your project include alteration or fill of 3 or more acres of wetland?

    No

30. [Hidden Semantic] Does the action area intersect the whooping crane (ex. Pop) area of influence?

    Automatically answered
    Yes

31. Have you determined that the action will have no effect on individuals within the whooping crane nonessential experimental population (NEP)?

    Yes

32. The project has the potential to affect federally listed bats. Does the action area contain any known or potential bat hibernacula (natural caves, abandoned mines, or underground quarries)?

    No

33. Has a presence/absence bat survey or field-based habitat assessment following the Service's Range-wide Indiana Bat and Northern Long-eared Bat Summer Survey Guidelines been conducted within the action area?

    No

34. Does the action involve removal/modification of a human structure (barn, house or other building) known to contain roosting bats?

    No

35. Does the action include removal/modification of an existing bridge or culvert?

    No

36. Does the action include temporary or permanent lighting of roadway(s), facility(ies), and/or parking lot(s)?

    No

37. Does the action include one or more of the following: (1) tree cutting/trimming, (2) prescribed fire, (3) pesticide (including insecticide and/or rodenticide), and/or (4) herbicide/fungicide application?

    No

38. [Hidden Semantic] Does the action area intersect the Indiana bat AOI?

    Automatically answered
    Yes

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Nicole Stewart
Address: 9436 Maltby Rd
City: Brighton
State: MI
Zip: 48116
Email nstewart@niswander-env.com
Phone: 8108190021

Nicole Stewart

From: Nicole Stewart
Sent: Wednesday, January 29, 2025 11:54 AM
To: MIFO DKey, FW3
Cc: Dunivant, Autumn M
Subject: RE: IPaC delivered Determination Key letter for project: Verburg Park Improvements

Good Morning, Autumn,

Thank you for your email—I appreciate your vigilance.

Question Number 36 in the DKey was answered correctly. The proposed action does **not** include temporary or permanent lighting of roadway(s), facility(ies), and/ or parking lot(s). Therefore, the determination is valid and no further action is needed.

Very best,
Nicole

Nicole Stewart
Ecologist
Niswander Environmental, LLC
Office: 810-225-0539 | Cell: 810-819-0021
9436 Maltby Road, Brighton, MI 48116
www.niswander-env.com

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From: MIFO DKey, FW3 <MIFO_DKey@fws.gov>
Sent: Wednesday, January 29, 2025 11:26 AM
To: Nicole Stewart <nstewart@niswander-env.com>
Cc: Dunivant, Autumn M <autumn_dunivant@fws.gov>
Subject: Fw: IPaC delivered Determination Key letter for project: Verburg Park Improvements

Dear Nicole,

Thank you for using the All Species Michigan Determination Key to evaluate the project "Verburg Park Improvements" in Kalamazoo, Michigan.

It looks like you answered "No" to question #36: "Does the action include temporary or permanent lighting of roadway(s), facility(ies), and/ or parking lot(s)?"

If this question is answered correctly then your determination is valid and no further action is needed. If lighting will be installed in the construction of the new pavilion/shelter or to light up the potential athletic field then we would recommend revising your answer to this question to ensure you receive the appropriate effect determinations.

How to change your answer in IPaC:

- Login to IPAC and go to your project home page.
- Select Resume Review
- Select "Evaluate Determination Keys"
- Click the "View/Modify" button under the completed Determination Key
- Scroll to the end of the questions and select "Change Answers" to modify your previous responses
- Find the question you need to revise your answer on. You will need to answer subsequent questions again, and it will generate a new letter based on your current responses (your previous letter is no longer valid).

Thank you for your cooperation in conserving Michigan's threatened and endangered species. Please let me know if you have any questions, and I would be happy to help you. Please respond to all in your reply.

Best Regards,

Autumn

From: Administrator Email <ecosphere_support@ecosphere.fws.gov>
Sent: Tuesday, January 28, 2025 1:02 PM
To: MIFO DKey, FW3 <MIFO_DKey@fws.gov>
Subject: IPaC delivered Determination Key letter for project: Verburg Park Improvements

To: IPaC point(s) of contact for Michigan Ecological Services Field Office
Project Location: Kalamazoo County, Michigan

IPaC has delivered a determination key letter on behalf of your office for the All Species Michigan Determination Key. For your convenience, IPaC has created a ETK project (2025-0043601) with a new associated Concurrence Letter Rendered event. A PDF file of the determination key letter is attached to the event and contact information for the project can be found on the last page of the PDF.

Species and Critical Habitat in the project area analyzed in the determination key are:
Indiana bat (Myotis sodalis),

Whooping crane (Grus americana),
Mitchell's satyr Butterfly (Neonympha mitchellii mitchellii),
Monarch butterfly (Danaus plexippus),
Eastern Massasauga (=rattlesnake) (Sistrurus catenatus)

IPaC has automatically set the consultation status to "Closed". If you need to do any additional work in this project (*e.g.*, add staff, add events, change lead office, etc.), you must first change the status to "active" so that you can edit the project. You can access the project via the link, above.

If you do not agree with the determination key letter generated through IPaC, please contact the person who requested the letter and notify them immediately. Contact information can be found on the last page of the PDF.

Lead FWS Office:
The Michigan Ecological Services Field Office is currently designated as the lead office for Section 7 on this project. The following additional offices have jurisdiction and have been notified: None. If another office is the lead office on this project, please access the project (via the link above) and update it. IPaC will not reset the Lead Office once it has been updated by a biologist.

*Projects created in ETK by IPaC have not been assigned to an FWS staff member. To identify the staff assigned to this project, please access the project (via the link above) and add their name(s).

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Appendix D

SITE PHOTOS

Verburg Park
Site Photographs
Photos taken November 25, 2024



Photo 1
View facing southeast showing scrub-shrub and forested wetland on the banks of the Kalamazoo River. The river flows north past Verburg Park.



Photo 2
View facing north, showing narrow forested wetland on the west bank of the Kalamazoo River.

Site Photographs



Photo 3
Representative photo of scrub-shrub and forested wetland within the northern portion of the Review Area.



Photo 4
Representative photo of forested wetland within the Review Area.

Site Photographs



Photo 5
Representative photo of scrub-shrub and forested wetland surrounding a small pond connected to the Kalamazoo River.



Photo 6
View facing south from the northwest corner of the small pond, showing scrub-shrub wetland fringe and the existing boat launch.

Site Photographs



Photo 7
Existing boat launch located at the northwest edge of the small pond that is connected to the Kalamazoo River.



Photo 8
Looking east along the connection between the small pond and the Kalamazoo River.

Site Photographs



Photo 9
Representative photo of mowed grass within the Review Area.



Photo 10
Representative photo of isolated trees scattered across mowed grass. Representative photo of the bike trail.

Site Photographs



Photo 11
Representative photo of the paved parking area and forest/scrubland (upland) located east and south of the parking lot.



Photo 12
Representative photo of gravel parking areas and industrial properties surrounding Verburg Park.

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Appendix E

MDNR EMAIL CORRESPONDENCE

Nicole Stewart

From: Diana, Matthew (DNR) <DianaM@michigan.gov>
Sent: Wednesday, January 29, 2025 8:42 AM
To: Nicole Stewart
Subject: RE: Mussels and Clam at Verburg Park, City of Kalamazoo, Michigan
Attachments: 15210_Kalamazoo_Mussel_Survey_Report_Final_WSP.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Nicole,

I am responding to confirm documentation of the discussion we had regarding Verburg Park Pond. The pond is a backwater connected to the Kalamazoo River through a small channel. There was extensive Superfund cleanup work conducted in the park, pond and river in 2023 and 2024. This involved detailed mussel surveys and relocations prior to extensive dredging of the area. The pond was surveyed for mussels in 2021 and results are summarized in the attached report (see Table 1 and Figure 2c). Verburg Pond contained poor mussel habitat and only 8 individuals were collected rom 4 species. The substrates in the entire pond were subsequently dredged and capped with clean material. As a result of the described work, there would be no need for mussel surveys or relocations for any work conducted in the area for at least 5 years following completion of dredging. Because of the habitat and impact to the area, it is likely that this time period could be extended. Projects with small footprints or limited bottom disturbance would also not require mussel survey work. I would need to review specifics of any work proposed to give a definitive recommendation, but any small project proposed in Verburg Pond through at least 2028 would not require mussel work and projects with limited bottom impact would also likely not require mussel work. There will likely be some spawning work closures (e.g. March 1 through June 30) as we know fish use Verburg Pond to spawn. This would only impact timing of work in the water and BMPs can often be employed to allow for some work during these closures. I fully support any project proposed that will enhance public access and the ability of the public to get on the water. Please let me know how I can be of help and if you need anything else.

Matt Diana
Fisheries Biologist
Michigan Department of Natural Resources
621 N 10th Street
Plainwell, MI 49080
269-910-0157 (Cell)
dianam@michigan.gov

From: Nicole Stewart <nstewart@niswander-env.com>
Sent: Monday, January 27, 2025 2:49 PM
To: Diana, Matthew (DNR) <DianaM@michigan.gov>
Subject: Mussels and Clam at Verburg Park, City of Kalamazoo, Michigan

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Good Afternoon, Matt!

Thank you for taking the time to speak with me over the phone regarding freshwater mussels/clam and proposed improvements at Verburg Park, located in the City of Kalamazoo, Michigan.
Using Michigan Natural Features Inventory's Information Request (IR) for Verburg Park, dated 10/25/2024, the following nine mussels and one clam have known occurrences in Sections (PLSS) located within two miles of the Review Area:

- Elktoe (*Alasmidonta marginata*), SC
- Slippershell (*Alasmidonta viridis*), ST
- Rainbow (*Cambarunio iris*), SC
- Purple wartyback (*Cyclonaias tuberculata*), ST
- Creek heelsplitter (*Lasmigona compressa*), SC
- Flutedshell (*Lasmigona costata*), SC
- Paper pondshell (*Utterbackia imbecillis*), SC
- Ellipse (*Venustaconcha ellipsiformis*), SC
- Round pigtoe (*Pleurobema sintoxia*), SC
- River fingernail clam (*Sphaerium fabale*), SC

During our phone call we discussed recent cleanup activities at Verburg Park. In 2022, 2023, and 2024, Georgia-Pacific LLC and International Paper Company conducted sediment cleanup (dredging) under the oversight of the Environmental Protection Agency to remove polychlorinated biphenyls from the Kalamazoo River adjacent to Verburg Park and its inlet/pond. Thank you for confirming that a mussel survey and relocation were conducted prior to dredging. In accordance with *Michigan Freshwater Mussel Survey Protocols and Relocation Procedures for Rivers and Streams, Version 3*, dated May 2021, "survey data collected on a specific site will generally be considered valid for five years from the date the survey was conducted". Further, "facilities/areas that have been dredged within the past 5 years do not need to be resurveyed unless the dredged area is to be expanded or moved".

Due to the recent mussel relocation and dredging, it is Niswander Environmental's professional opinion that work proposed at/below the ordinary high water mark at Verburg Park will have "No Take" of these ten aquatic species.
We appreciate your time and the mussel survey/relocation report if you are willing to share.

Sincerely (and thank you!),
Nicole Stewart

Nicole Stewart
Ecologist
Niswander Environmental, LLC

Office: 810-225-0539 | Cell: 810-819-0021
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Appendix F

MUSSEL SURVEY AND RELOCATION REPORT

FINAL REPORT: FRESHWATER MUSSEL SURVEY AND RELOCATION ON THE KALAMAZOO RIVER FOR THE PROPOSED SEDIMENT REMEDIATION PROJECT IN KALAMAZOO AND ALLEGAN COUNTIES

Summer 2021

Prepared for:

wsp

Project No.: 13121
Date: February 13, 2024

Prepared by:

EnviroScience
Excellence In Any Environment
5070 Stow Rd.
Stow, OH 44224
800-940-4025
www.EnviroScienceInc.com

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Figure 3b. Mussel Relocation Design and Results for the KRT-4 Upstream Hotspot on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

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Appendix B-2. Mussels Collected per Cell from the Mussel Relocations of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2 and 3.

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Appendix C. Digital Image Log

1.0 INTRODUCTION

EnviroScience, Inc. completed a mussel survey on behalf of behalf of WSP USA Environment & Infrastructure, Inc. (WSP, formerly Wood Environment & Infrastructure Solutions, Inc) and their clients to support the remedial action planned for 2022 in Area 1 of Operable Unit 5 (OU5) of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site (site). Area 1 is the 22-mile reach between Morrow Lake Dam (upstream extent; 42.282856, -85.491551; Township 2S, Range 10W Section 21) and the former Plainwell Dam (downstream extent; 42.455884, -85.668078; Township 1N, Range 12W, Section 24), as well as the 3-mile stretch of Portage Creek from Alcott Street to its confluence with the Kalamazoo River in Kalamazoo and Allegan Counties, Michigan. WSP is planning a construction event beginning in 2022 to remediate sediment at five hot spots in Area 1: Verburg Park Pond, SED-118, KRT-4, KRT-5/FF-19, and S-IM1. These five hot spots are located in an approximately 3-mile river segment extending from river mile (RM) 69.3 to RM 72.5 known as the Remedial Reach. The planned remedial action is likely to cause instream disturbances and instability over approximately 51,220 m^2 (551,327 ft^2) (Figure 1).

Between October 2019 and December 2020, Morrow Dam, located at the upstream end of Area 1 and approximately 3 RMs upstream of the Remedial Reach, was drawn down to facilitate dam repairs. The drawdown resulted in the release of an unknown volume of sediment from the Morrow Lake impoundment into the river system. The effects of the added sediment load have been observed as far downstream as Lake Allegan. This drawdown was unrelated to the planned sediment remediation but will have a significant effect on the mussel survey/salvage activities due to the deposition of varying thicknesses of sediment within the hot spot areas.

WSP compared bathymetric survey data of the Remedial Reach collected in 2018 (pre-Morrow Dam release) with survey data collected in 2021 (post-release) to identify areas with relatively little sediment deposition (approximately 0.33 meters [m; 1 foot [ft]] or less) that may still provide suitable mussel habitat. WSP presented this data to the Michigan Department of Natural Resources (MDNR; (Matt Diana) and proposed that mussel survey/salvage efforts only be completed only within these areas. MDNR approved of this approach. The MDNR-approved mussel survey and potential salvage/relocation areas were identified as:

- KPT-19: Upstream
- KPT-19: Downstream
- Verburg Park Pond
- KRT-4: Upstream
- KRT-4: Downstream
- KRT-5/FF-19: Upstream
- KRT-5/FF-19: Downstream
- S-im1
- SED-118

Construction/remediation activities from this project could affect mussels in several ways. Those living in the direct impact area could be crushed, smothered, or dislodged by construction equipment, debris, etc. Dredging of the stream bed and riverbanks could alter flow patterns that result in scouring or sediment deposition, which are putative sources of unionid impairment and decline (Aldridge et al., 1987; Bogan, 1993; Williams et al., 1993). Additionally, host fish activity

may be altered by changes in habitat or flow patterns, disrupting unionids' life cycles. Because of these potential impacts,) the MDNR required that a mussel survey and possible relocation be completed prior to construction in accordance with the Michigan Freshwater Mussel Survey Protocols and Relocation Procedures for Rivers and Streams (Protocol; Hanshue et al., 2019). The Protocol provided guidance for a project specific Scope of Work (Appendix A) that utilized modified Protocol methods to accelerate the project timeline while maintaining the conservation needs of the local mussel resources.

The Kalamazoo River has been designated by the Protocol as Group 1 streams, meaning it is likely to support populations of mussels considered to be of special concern by the state. The receiving water of the Kalamazoo River is Lake Michigan, and the drainage area at the downstream extent of the project area is 1,267mi^2 (3,280km^2).

2.0 METHODS

2.1 TASK 1: SCOPING SURVEYS

EnviroScience performed a scoping survey to confirm the presence or absence of unionid mussels at each area where sediment deposition was minimal (<0.33m) from the Morrow release (Figure 1). The six proposed survey areas together totaled approximately 51,220 m^2. Each survey area was split into cells no larger than 400 m^2 (4,306 ft^2). Each cell was searched for 80 minutes (0.2 min/m^2) to determine the presence or absence of mussels.

Once the presence of live mussels or fresh dead shells was confirmed, the cell was triggered to a mussel relocation. If no live mussels were located during a scoping search or if only weathered dead shells or fragments were observed during the entire survey time, the cell would be deemed void of mussel resources and considered complete.

2.1.1 Data Processing

Mussels or valves observed were placed in a mesh bag and brought to the surface for further processing and positive identification. Mesh bags were used to temporarily hold mussels prior to identification, measuring, photographing, and marking. Bags were placed in flowing water to maximize dissolved oxygen concentrations and minimize temperature around the mussels. Collected mussels were kept in water to minimize handling stress, except for the brief period needed for processing. Live mussels were identified to species and sexed where possible. Mussel shell lengths were measured to the nearest millimeter using vernier calipers to document the size distribution of the populations and potential recruitment. Photographic vouchers (live and shell) of native species were collected. To help confirm identifications, photographs of individuals include a close-up view of the umbo and one of the valves. For each 400 m^2 search cell, the general habitat information of water depth and visual estimates of percent areal coverage of macrophytes, percent areal coverage of woody material, and substrate particle composition using the Wentworth Scale (percent presence of mud, silt, sand, gravel, cobble, boulder, etc.) were recorded. Habitat data were recorded during the scoping survey because not all areas were required to have a relocation.

2.2 TASK 2: MUSSEL SALVAGE AND RELOCATION

According to the Protocol, a mussel relocation effort is required when state threatened or endangered (T&E) mussel species are found within a survey site during the scoping survey. No T&E mussel species were identified during the scoping survey or subsequent relocations.

A relocation is also recommended, but not required, for non-listed mussel species because if mussels have been removed from their respective areas and are already being handled, it is in their best interest not to return them to their point of collection, but rather to an approved relocation area. Therefore, the mussels collected during the scoping survey were also returned to the approved relocation area.

Areas where live or fresh-dead mussels were detected during the scoping survey were triggered into mussel salvage and relocation. The triggered area was split into cells no larger than 100m^2 (1,076 ft^2), and each salvage cell was searched at a rate of 0.5min/m^2 in suitable, heterogeneous substrates. After the initial pass, if no state T&E mussels were detected, the cell was considered complete, and no further action was required. No state T&E mussels were detected during salvage cell searches. Due to field conditions including weather and river flow rates, relocation was not completed in all areas where it was indicated. Scoping surveys, salvages, and relocations were completed for Verburg Park Pond, KRT-4 hotspot, and SED-118 hotspot. A scoping survey only was completed on the KPT-19 hotspot and salvage and relocation is scheduled to occur in 2022. Hotspots KRT-5/FF-19 and S-im1 did not have any survey work or salvage and relocation efforts in 2021, but will have the survey and salvage effort completed in 2022.

Mussels found (living or dead) in each salvage cell were placed together in a uniquely numbered nylon mesh bag that was tied off to produce a discrete sample for each search cell. Estimates of the percent of unsuitable mussel habitat (e.g., areas of scour, bedrock, etc.) in the project were recorded. Bags of mussels were held in flowing stream water prior to processing.

2.2.1 Relocation Site Selection

The proper selection of a mussel relocation (destination) site is critically important to the success of the salvage and relocation effort. EnviroScience worked with the MDNR to obtain in-the-field site approval. One hour of qualitative searches (six 10 min searches) were used to sample potential relocation sites. Criteria for site selection guidance are provided in the Protocol and include the following: similar species composition, signs of recruitment, similar or better habitat, equal or larger in size than the collection area, and follow other site selection guidance provided in the Protocol. Information on the specific relocation area used for this project is provided in section 3.7 below.

3.0 RESULTS

EnviroScience's MDNR permitted malacologist, Mr. Philip Mathias, received survey plan authorization and his amended Scientific Collector's Permit from the MDNR on September 1, 2021 (Appendix A). Mr. Mathias and the EnviroScience scientific dive team initiated the survey and relocation on October 2, 2021 and concluded on October 14, 2021. Water temperature ranged from 18.6°C (65.2°F) to 20.7°C (69.5°F) and flows ranged from 800-1,450ft^3/s to (USGS Gage 04106000 Kalamazoo River at Comstock, MI). Visibility at depth averaged 150 cm (59 in). Individual lengths of each mussel were measured and recorded and can be found in Appendix B-4 and B-5. Photo vouchers and site images are included in Appendix C.

3.1 KPT-19 UPSTREAM

Survey Site KPT 19 Upstream was approximately 5,767 m^2 (62,077 ft^2), and substrates were dominated by sand and gravel throughout the survey site (Appendix B-3). Water depths averaged 152 cm (5 ft). A total of 161 live mussels, representing eight species, were collected during the

scoping survey (Table 1; Figure 2a; Appendix B-1). The dominant species was *Actinonaias ligamentina* (Mucket), representing 45.34% of the live individuals collected. No state or federal T&E mussels were collected; however, two state species of concern were detected: *Lasmigona costata* (Flutedshell) and *Alasmidonta marginate* (Elktoe). Mussels collected during the scoping survey were returned to the approved relocation area.

3.1.1 Relocation

Based on the results of a scoping survey, a mussel salvage will be required at this location. Field conditions prevented salvage and relocation during this mobilization.

3.2 KPT-19 DOWNSTREAM

Survey Site KPT 19 Downstream was approximately 2,539 m^2 (27,326 ft^2), and substrates were dominated by sand and gravel throughout the survey site (Appendix B-3). Depths averaged 152 cm (5 ft). A total of 96 live mussels, representing eight species, were collected during the scoping survey (Table 1; Figure 2b; Appendix B-1). The dominant species was Mucket, representing 42.71% of the live individuals collected. No state or federal T&E mussels were collected; however, two state species of concern were detected: Flutedshell and Elktoe. Collected mussels were returned to the approved relocation area.

3.2.1 Relocation

Based on the results of a scoping survey, a mussel salvage will be required at this location. Field conditions prevented salvage and relocation during this mobilization.

3.3 VERBURG PARK POND

Survey Site Verburg Park Pond was approximately 15,531 m^2 (167,172 ft^2), and substrates were dominated by mud, silt, sand, and woody debris throughout the survey site (Appendix B-3). Water depths averaged 183 cm (6 ft). A total of eight live mussels, representing four species, were collected during the scoping survey (Table 1; Figure 2c; Appendix B-1). The dominant species, a state species of concern, was *Utterbackia imbecillis* (Paper Pondshell), representing 50.00% of the live individuals collected. No state or federal T&E mussels were collected.

3.3.1 Salvage and Relocation

A mussel salvage resulted in the collection of an additional seven live mussels, representing three species (Table 2; Figure 3a; Appendix B-2). No state threatened, or endangered mussel species were found during the initial pass; therefore, the salvage was considered complete. Mussels collected during the salvage were returned to the approved relocation area.

3.4 KRT-4 UPSTREAM

Survey Site KRT-4 Upstream was approximately 6,663 m^2 (71,715 ft^2), and substrates were dominated by sand, gravel, and cobble throughout the survey site; however, the left descending bank was dominated by silt and mud (Appendix B-3). Water depths averaged 183 cm (6 ft). A total of 431 live mussels, representing 12 species, were collected during the scoping survey (Table 1; Figure 2d; Appendix B-1). The dominant species was Mucket, representing 82.13% of the live individuals collected. No state or federal T&E mussels were collected; however, four state species of concern were detected: *Lasmigona compressa* (Creek Heelsplitter), *Pleurobema sintoxia* (Round Pigtoe), Paper Pondshell, and Elktoe. Mussels collected during the scoping survey were returned to the approved relocation area.

3.4.1 Salvage and Relocation

A mussel salvage resulted in the collection of an additional 725 live mussels, representing 10 species (Table 2; Figure 3b; Appendix B). No state T&E mussel species were found during the initial pass; therefore, the salvage was considered complete. Mussels collected during the salvage were returned to the approved relocation area.

3.5 KRT-4 DOWNSTREAM

Survey Site KRT-4 Downstream was approximately 1,312 m^2 (14,121 ft^2), and substrates were dominated by sand and gravel throughout the survey site (Appendix B-3). Water depths averaged 274 cm (9 ft). A total of 117 live mussels, representing eight species, were collected during the scoping survey (Table 1; Figure 2e; Appendix B-1). The dominant species was Mucket, representing 80.34% of the live individuals collected. No state or federal T&E mussels were collected; however, two state species of concern were detected: Flutedshell and Elktoe. Mussels collected during the scoping survey were returned to the approved relocation area.

3.5.1 Salvage and Relocation

A mussel salvage resulted in the collection of an additional 106 live mussels, representing six species (Table 2; Figure 3c; Appendix B-2). No state T&E mussel species were found during the initial pass; therefore, the salvage was considered complete. Mussels collected during salvage were returned to the approved relocation area.

3.6 SED-118

Survey Site SED-118 was approximately 566 m^2 (6,091 ft^2), and substrates were dominated by mud, silt, sand, and woody debris throughout the survey site (Appendix B-3). Water depths averaged 152 cm (5 ft). A total of 58 live mussels, representing five species, were collected during the scoping survey (Table 1; Figure 2f; Appendix B-1). The dominant species was Mucket, representing 81.03% of the live individuals collected. No state or federal T&E mussels were collected; however, one state species of concern was detected: Round Pigtoe. Mussels collected during the scoping survey were returned to the approved relocation area.

3.6.1 Salvage and Relocation

A mussel salvage resulted in the collection of an additional 72 live mussels, representing seven species (Table 2; Figure 3d; Appendix B-2). No state T&E mussel species were found during the initial pass; therefore, the salvage was considered complete. Mussels collected during salvage were returned to the approved relocation area.

3.7 RELOCATION AREA

A suitable relocation area was located between coordinates 42.284600, -85.539145, and 42.286029, -85.531846. It appeared to have intact riparian zones and was relatively undeveloped. This site was approved by MDNR via email on October 12, 2021. Substrates were dominated by sand and gravel, similar to the habitat in the survey/salvage areas. Water depths averaged 76 cm (2.5 ft). A total of 102 live mussels, representing eight species, were collected during the scoping survey (Table 3; Figure 4). The dominant species was Mucket, representing 55.9% of the live individuals collected. No state or federal T&E mussels were collected; however, two state species of concern were detected: Flutedshell and Elktoe.

4.0 CONCLUSIONS

No state-listed T&E mussel species were found during the survey and salvage efforts. Mussels were present within each of the scoping survey regions. Due to failing field conditions (increased flows), mussel salvages were completed at four of the six scoping survey sites. A detailed mussel salvage was completed at Verburg Park Pond, KRT-4 Upstream, KRT-4 Downstream, and SED-118. These sites should be considered complete and require no further mussel survey/salvage. Construction for those four sites is anticipated to start in the spring of 2022. Mussel salvage efforts should be performed in KPT-19 Upstream and KPT-19 Downstream prior to remedial action in those locations. KRT-5/FF-19-Upstream and KRT-5/FF-19 Downstream were rapidly assessed in 2021, and the presence of resident mussel populations was detected (Figure 1). Flows at S-IM1 were unsafe for an assessment; however, based on the distribution of mussels throughout the remainder of the survey areas, it should be assumed that mussels are present. Scoping surveys, and, if indicated, salvages should be performed in S-IM1, KRT-5/FF-19 Upstream and KRT-5/FF-19 Downstream prior to remedial action. For future and ongoing remedial action, WSP should continue to consult with MDNR to ensure the adequate protection of mussel resources in the Kalamazoo River.

5.0 LITERATURE CITED

Hanshue, S., Rathbun, J., Badra, P., Bettaso, J., Hosler, B., Pruden, J., & Grabarkiewicz, J. (2019). Michigan Freshwater Mussel Survey Protocols and Relocation Procedures.

Wentworth, C. K. (1922). A scale of grade and class terms for clastic sediments. *Journal of Geology, 30*, 377-392.

Williams, J. D., Bogan, A. E., Butler, R. S., Cummings, K. S., Garner, J. T., Harris, J. L., & Watters, G. T. (2017). A revised list of the freshwater mussels (Mollusca: Bivalvia: Unionida) of the United States and Canada. Freshwater Mollusk Biology and Conservation, 20(2), 33-58.

Williams, J.D., Warren Jr., M. L., Cummings, K. S., Harris, J. L., & Neves, R. J. (1993). Conservation status of freshwater mussels of the United States and Canada. *Fisheries, 18*, 6-22.

Tables

Table 1.

Status, Numbers, and Relative Abundance of Freshwater Mussels, from the Mussel Scoping Surveys of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

KPT-19 Upstream

Species	Common Name	CODE	MI Status[1]	Live	Relative frequency (% total)
Actinonaias ligamentina	Mucket	ACLI		73	45.34%
Alasmidonta marginata	Elktoe	ALMA	SC	6	3.73%
Fusconaia flava	Wabash Pigtoe	FUFL		56	34.78%
Lampsilis cardium	Plain Pocketbook	LACA		13	8.07%
Lasmigona complanata	White Heelsplitter	LSCO		4	2.48%
Lasmigona costata	Flutedshell	LSCS	SC	3	1.86%
Pyganodon grandis	Giant Floater	PYGR		5	3.11%
Strophitus undulatus	Creeper	STUN		1	0.62%
Total:				161	100.00%
No. of Species (Total Live + Dead):				8	

KPT-19 Downstream

Species	Common Name	CODE	MI Status[1]	Live	Relative frequency (% total)
Actinonaias ligamentina	Mucket	ACLI		41	42.71%
Alasmidonta marginata	Elktoe	ALMA	SC	3	3.13%
Eurynia dilatata	Spike	EUDI		2	2.08%
Fusconaia flava	Wabash Pigtoe	FUFL		30	31.25%
Lampsilis cardium	Plain Pocketbook	LACA		9	9.38%
Lasmigona complanata	White Heelsplitter	LSCO		7	7.29%
Lasmigona costata	Flutedshell	LSCS	SC	3	3.13%
Strophitus undulatus	Creeper	STUN		1	1.04%
Total:				96	100.00%
No. of Species (Total Live + Dead):				8	

Verburg Park Pond

Species	Common Name	CODE	MI Status[1]	Live	Relative frequency (% total)
Fusconaia flava	Wabash Pigtoe	FUFL		1	12.50%
Lampsilis cardium	Plain Pocketbook	LACA		1	12.50%
Lasmigona complanata	White Heelsplitter	LSCO		2	25.00%
Utterbackia imbecillis	Paper Pondshell	UTIM	SC	4	50.00%
Total:				8	100.00%
No. of Species (Total Live + Dead):				4	

Table 1.

Status, Numbers, and Relative Abundance of Freshwater Mussels, from the Mussel Scoping Surveys of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

KRT-4 Upstream

Species	Common Name	CODE	MI Status[1]	Live	Relative frequency (% total)
Actinonaias ligamentina	Mucket	ACLI		354	82.13%
Alasmidonta marginata	Elktoe	ALMA	SC	2	0.46%
Eurynia dilatata	Spike	EUDI		1	0.23%
Fusconaia flava	Wabash Pigtoe	FUFL		37	8.58%
Lampsilis cardium	Plain Pocketbook	LACA		4	0.93%
Lasmigona complanata	White Heelsplitter	LSCO		19	4.41%
Lasmigona compressa	Creek Heelsplitter	LSCM	SC	2	0.46%
Lasmigona costata	Flutedshell	LSCS	SC	4	0.93%
Pleurobema sintoxia	Round Pigtoe	PLSI	SC	3	0.70%
Pyganodon grandis	Giant Floater	PYGR		1	0.23%
Strophitus undulatus	Creeper	STUN		3	0.70%
Utterbackia imbecillis	Paper Pondshell	UTIM	SC	1	0.23%
Total:				431	100.00%
No. of Species (Total Live + Dead):				12	

KRT-4 Downstream

Species	Common Name	CODE	MI Status[1]	Live	Relative frequency (% total)
Actinonaias ligamentina	Mucket	ACLI		94	80.34%
Alasmidonta marginata	Elktoe	ALMA	SC	1	0.85%
Eurynia dilatata	Spike	EUDI		1	0.85%
Fusconaia flava	Wabash Pigtoe	FUFL		12	10.26%
Lampsilis cardium	Plain Pocketbook	LACA		2	1.71%
Lasmigona complanata	White Heelsplitter	LSCO		3	2.56%
Lasmigona costata	Flutedshell	LSCS	SC	2	1.71%
Strophitus undulatus	Creeper	STUN		2	1.71%
Total:				117	100.00%
No. of Species (Total Live + Dead):				8	

SED-118

Species	Common Name	CODE	MI Status[1]	Live	Relative frequency (% total)
Actinonaias ligamentina	Mucket	ACLI		47	81.03%
Fusconaia flava	Wabash Pigtoe	FUFL		3	5.17%
Lampsilis cardium	Plain Pocketbook	LACA		1	1.72%
Lasmigona complanata	White Heelsplitter	LSCO		6	10.34%
Pleurobema sintoxia	Round Pigtoe	PLSI	SC	1	1.72%
Total:				58	100.00%
No. of Species (Total Live + Dead):				5	

[1] SC = Special Concern

Table 2.

Status, Numbers, and Relative Abundance of Freshwater Mussels, from the Mussel Relocation of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Verburg Park Pond					
Species	Common Name	CODE	MI Status[1]	Live	Relative frequency (% total)
Lasmigona complanata	White Heelsplitter	LSCO		2	28.6%
Pyganodon grandis	Giant Floater	PYGR		1	14.3%
Utterbackia imbecillis	Paper Pondshell	UTIM	SC	4	57.1%
Total:				7	100.0%
No. of Species (Total Live + Dead):				3	

KRT-4 Upstream					
Species	Common Name	CODE	MI Status[1]	Live	Relative frequency (% total)
Actinonaias ligamentina	Mucket	ACLI		559	77.1%
Alasmidonta marginata	Elktoe	ALMA	SC	1	0.1%
Eurynia dilatata	Spike	EUDI		1	0.1%
Fusconaia flava	Wabash Pigtoe	FUFL		67	9.2%
Lampsilis cardium	Plain Pocketbook	LACA		22	3.0%
Lasmigona complanata	White Heelsplitter	LSCO		45	6.2%
Lasmigona costata	Flutedshell	LSCS	SC	14	1.9%
Pleurobema sintoxia	Round Pigtoe	PLSI	SC	9	1.2%
Pyganodon grandis	Giant Floater	PYGR		3	0.4%
Strophitus undulatus	Creeper	STUN		4	0.6%
Total:				725	100.0%
No. of Species (Total Live + Dead):				10	

KRT-4 Downstream					
Species	Common Name	CODE	MI Status[1]	Live	Relative frequency (% total)
Actinonaias ligamentina	Mucket	ACLI		91	85.8%
Fusconaia flava	Wabash Pigtoe	FUFL		4	3.8%
Lampsilis cardium	Plain Pocketbook	LACA		2	1.9%
Lasmigona complanata	White Heelsplitter	LSCO		6	5.7%
Lasmigona costata	Flutedshell	LSCS	SC	2	1.9%
Pyganodon grandis	Giant Floater	PYGR		1	0.9%
Total:				106	100.0%
No. of Species (Total Live + Dead):				6	

SED-118					
Species	Common Name	CODE	MI Status[1]	Live	Relative frequency (% total)
Actinonaias ligamentina	Mucket	ACLI		59	81.9%
Fusconaia flava	Wabash Pigtoe	FUFL		4	5.6%
Lampsilis cardium	Plain Pocketbook	LACA		3	4.2%
Lasmigona complanata	White Heelsplitter	LSCO		3	4.2%
Pleurobema sintoxia	Round Pigtoe	PLSI	SC	1	1.4%
Pyganodon grandis	Giant Floater	PYGR		1	1.4%
Strophitus undulatus	Creeper	STUN		1	1.4%
Total:				72	100.0%
No. of Species (Total Live + Dead):				7	

[1] SC = Special Concern

Table 3.

Status, Numbers, and Relative Abundance of Freshwater Mussels, from the Approved Relocation Area on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Species	Common Name	CODE	MI Status[1]	Live	Relative frequency (% total)
Actinonaias ligamentina	Mucket	ACLI		57	55.9%
Alasmidonta marginata	Elktoe	ALMA	SC	2	2.0%
Fusconaia flava	Wabash Pigtoe	FUFL		29	28.4%
Lampsilis cardium	Plain Pocketbook	LACA		1	1.0%
Lasmigona complanata	White Heelsplitter	LSCO		6	5.9%
Lasmigona costata	Flutedshell	LSCS	SC	5	4.9%
Pyganodon grandis	Giant Floater	PYGR		1	1.0%
Strophitus undulatus	Creeper	STUN		1	1.0%
Total:				102	100.0%
No. of Species (Total Live + Dead):				8	

[1] SC = Special Concern

Figures

S-im1
42.323829, -85.573822

KRT-5/FF-19: Downstream
42.309016, -85.572163

KRT-5/FF-19: Upstream
42.307019, -85.57167

KRT-4: Downstream
42.304293, -85.57094

KRT-4: Upstream
42.302726, -85.571066

Verburg Park Pond
42.302002, -85.572489

SED-118
42.300061, -85.572793

KPT-19: Downstream
42.291872, -85.562226

KPT-19: Upstream
42.291197, -85.559721

Relocation Area
42.285577, -85.535635

Figure 1. USGS 7.5-minute Topographic Map of Kalamazoo Quadrangle. Hotspot Locations and Progress on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Post-2021 Survey/Salvage
Scoping Only
Scoping and Relocation
Relocation Area

0 750 1,500 3,000 Feet
0 250 500 1,000 Meters

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Basemap courtesy of National Geographic Society (2013).

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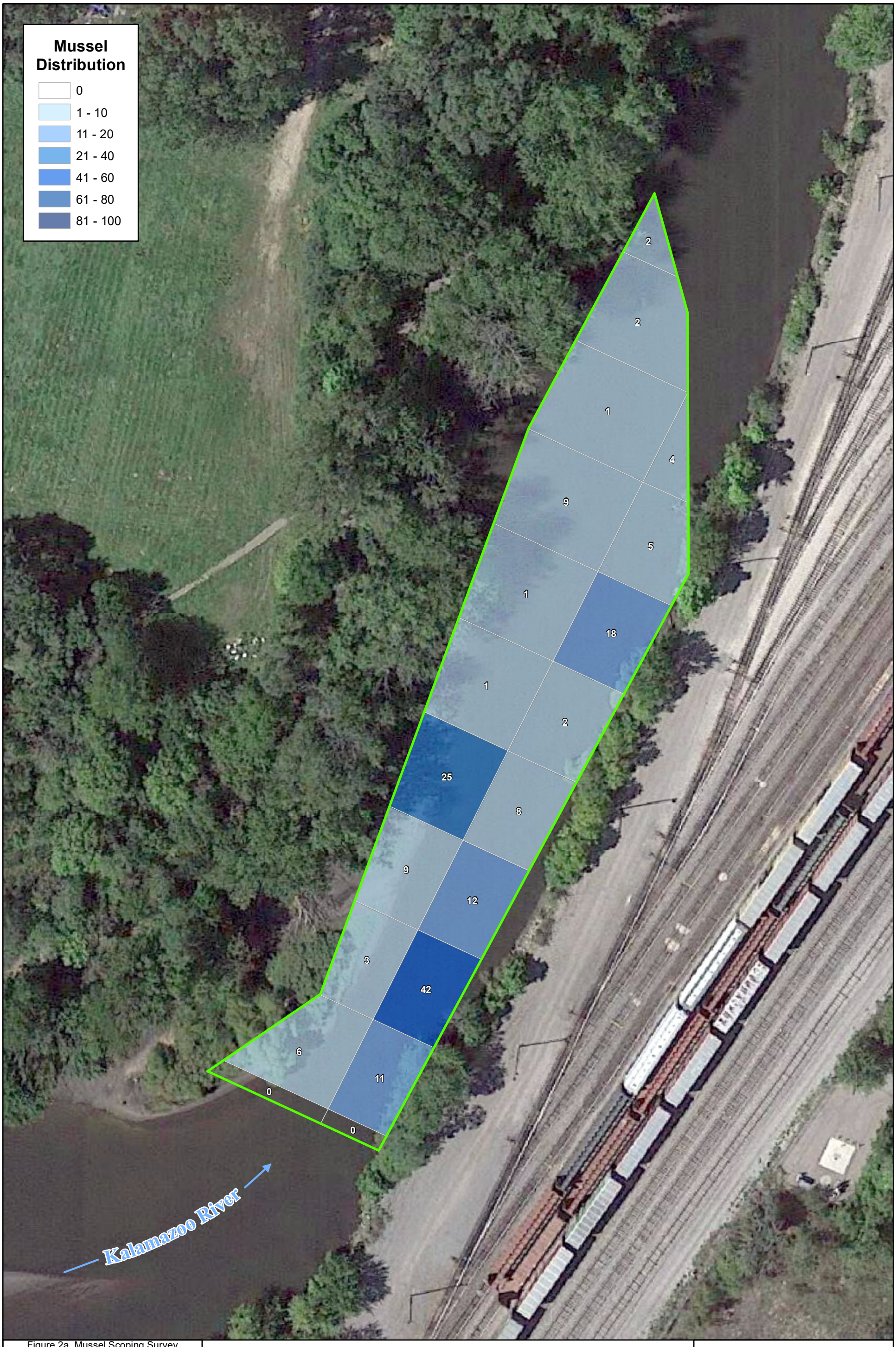

Figure 2a. Mussel Scoping Survey Design and Results for the KPT-19 Upstream Hotspot on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Survey Area
Survey Cell (20m x 20m)

0 15 30 60 Feet
0 5 10 20 Meters

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Date: 12/15/2021 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\W\Wood\480M\15210_Kalamazoo_Mussel_Survey\GIS\Map2a_Recon_KPT-19US.mxd

Basemap courtesy of Esri.

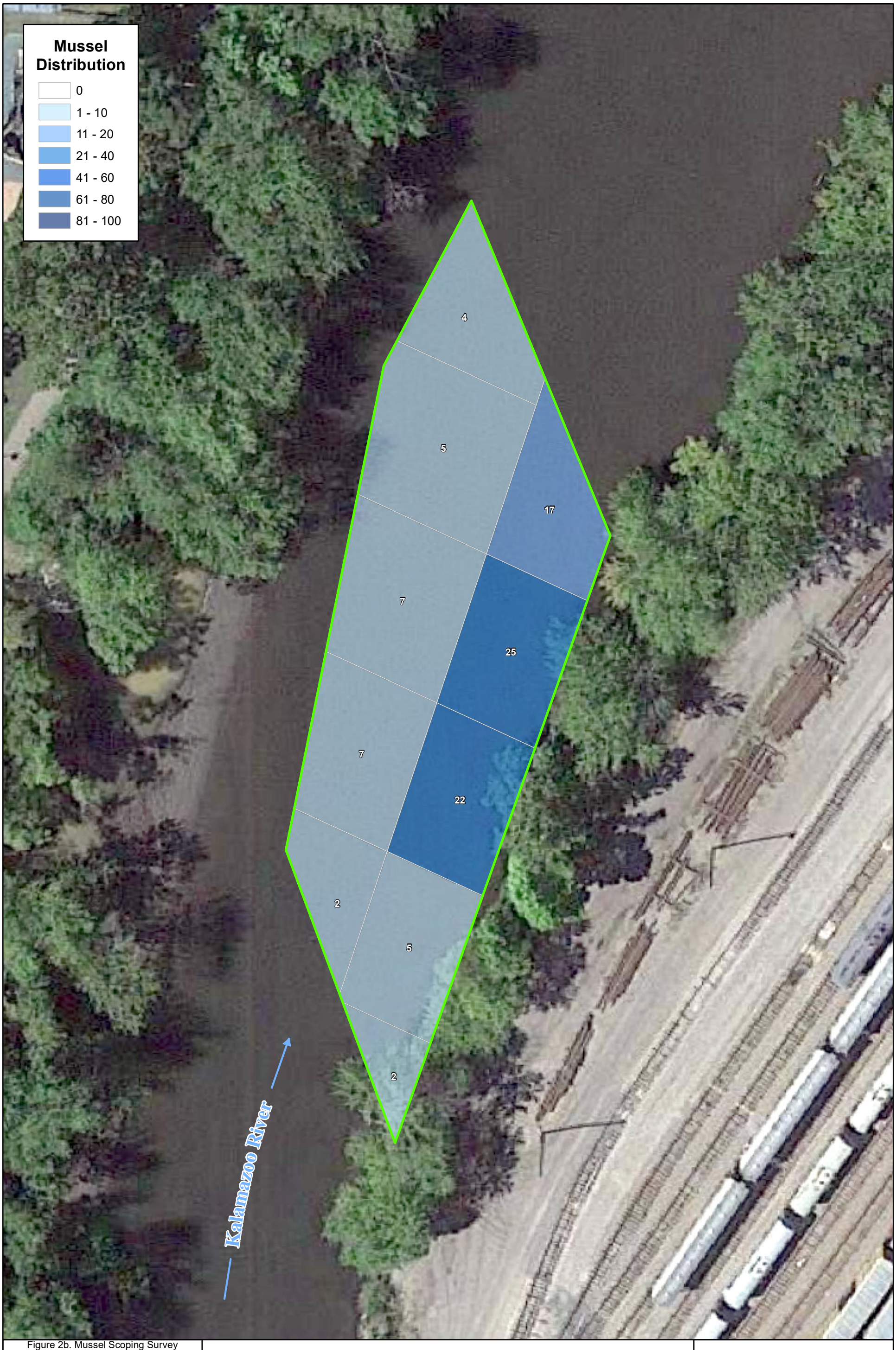

Figure 2b. Mussel Scoping Survey Design and Results for the KPT-19 Downstream Hotspot on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Survey Area
Survey Cell (20m x 20m)

0 10 20 40 Feet
0 3 6 12 Meters

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Basemap courtesy of Google.

Date: 12/15/2021 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\W\Wood\480M\115210_Kalamazoo_Mussel_Survey\GIS\Map2b_Recon_KPT-19DS.mxd

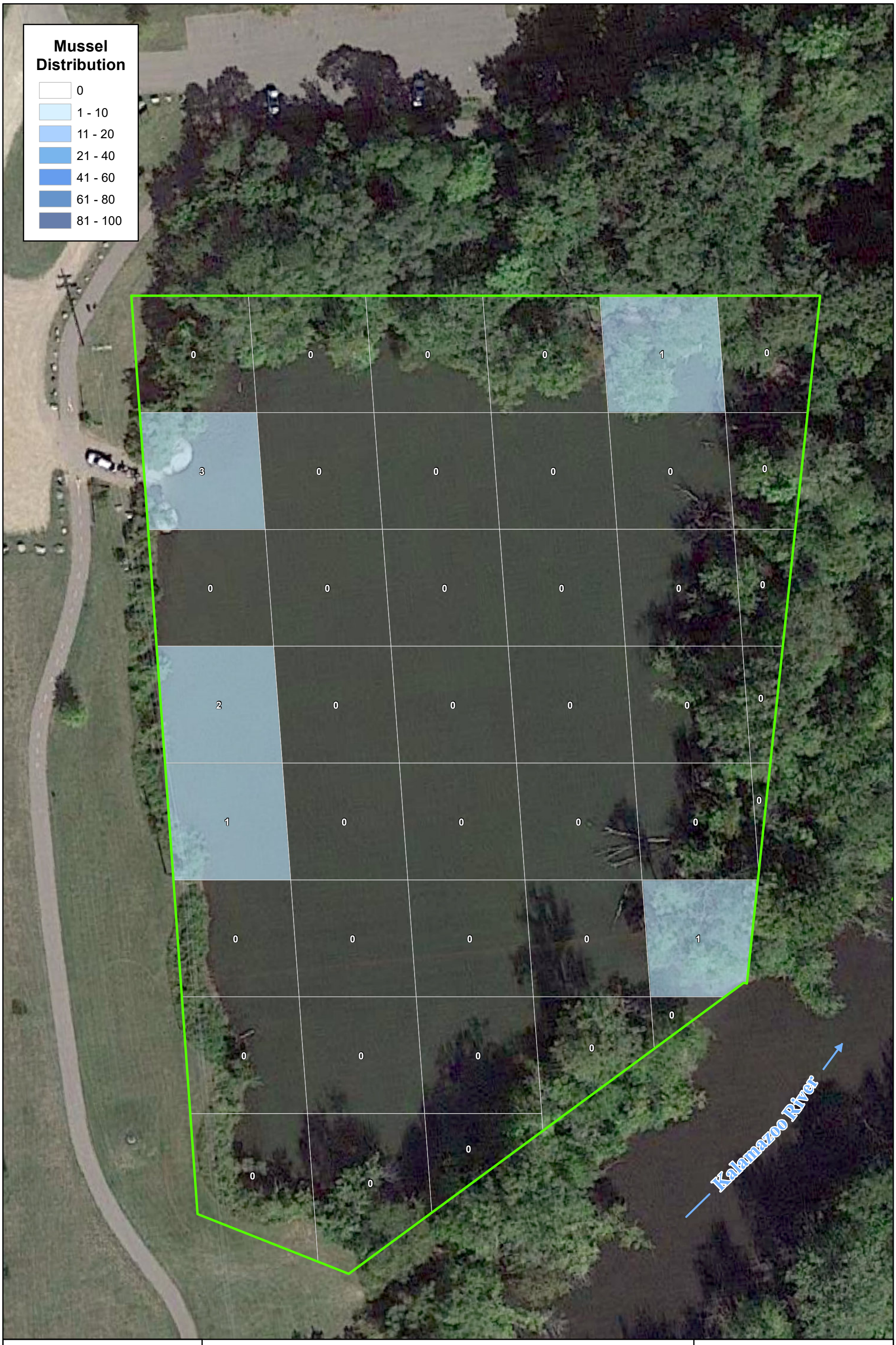

Figure 2c. Mussel Scoping Survey Design and Results for the Verburg Park Pond Hotspot on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Survey Area
Survey Cell (20m x 20m)

0 15 30 60 Feet
0 5 10 20 Meters

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Date: 12/15/2021 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\WWood\480M\15210_Kalamazoo_Mussel_Survey\GIS\Map2c_Recon_VPP.mxd

Basemap courtesy of Google.

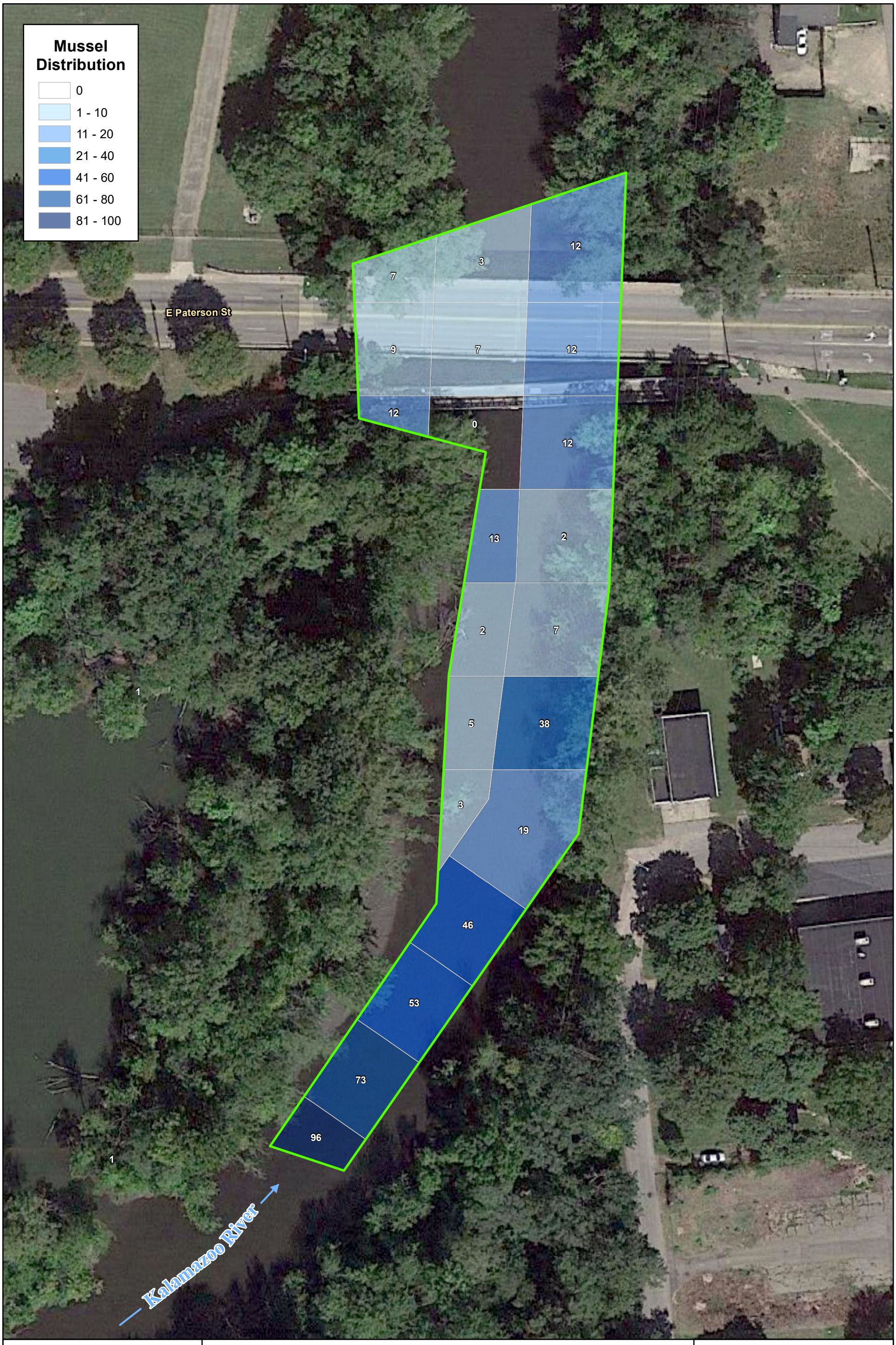

Figure 2d. Mussel Scoping SurveyDesign and Results for the Verburg Park Pond Hotspot on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Survey Area
Survey Cell (20m x 20m)

0 15 30 60 Feet
0 5 10 20 Meters

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Date: 12/15/2021 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\W\Wood\480M\15210_Kalamazoo_Mussel_Survey\GIS\Map2d_Recon_KRT-4US.mxd

Basemap courtesy of Google.



Figure 2e. Mussel Scoping Survey Design and Results for the KRT-4 Downstream Hotspot on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Survey Area
Survey Cell (20m x 20m)

0 10 20 40 Feet
0 3 6 12 Meters

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Date: 12/15/2021 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\W\Wood\480M\15210_Kalamazoo_Mussel_Survey\GIS\Map2e_Recon_KRT-4DS.mxd

Basemap courtesy of Google.



Figure 2f. Mussel Scoping Survey Design and Results for the SED-118 Hotspot on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Survey Area
Survey Cell (20m x 20m)

0 10 20 40 Feet
0 3 6 12 Meters

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Date: 12/15/2021 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\W\Wood\480M\15210_Kalamazoo_Mussel_Survey\GIS\Map2f_Recon_SED-118.mxd

Basemap courtesy of Google.



Figure 3a. Mussel Relocation Design and Results for the Verburg Park Pond Hotspot on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Survey Area
Survey Cell (10m x 10m)

0 15 30 60 Feet
0 5 10 20 Meters

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Date: 12/15/2021 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\W\Wood\480M\15210_Kalamazoo_Mussel_Survey\GIS\Map3a_Relocation_VPP.mxd

Basemap courtesy of Esri.

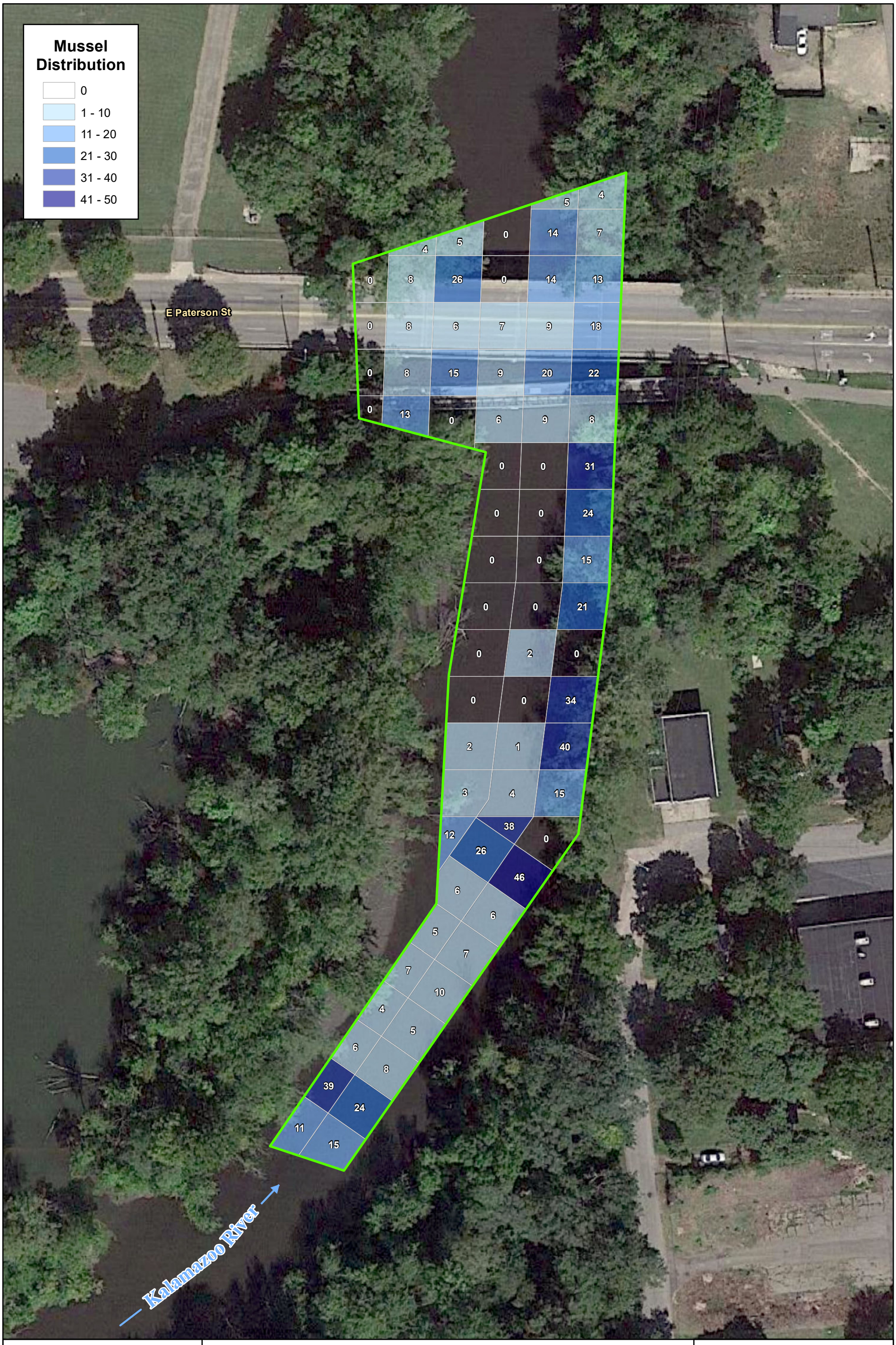

Figure 3b. Mussel Relocation Design and Results for the KRT-4 Upstream Hotspot on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Survey Area
Survey Cell (10m x 10m)

0 15 30 60 Feet
0 5 10 20 Meters

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Date: 12/14/2021 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\W\Wood\480M\15210_Kalamazoo_Mussel_Survey\GIS\Map3b_Relocation_KRT-4US.mxd

Basemap courtesy of Esri.



Figure 3c. Mussel Relocation Design and Results for the KRT-4 Downstream Hotspot on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Survey Area
Survey Cell (10m x 10m)

0 10 20 40 Feet
0 3 6 12 Meters

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Date: 12/14/2021 Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\W\Wood\480M\15210_Kalamazoo_Mussel_Survey\GIS\Map3c_Relocation_KRT-4DS.mxd

Basemap courtesy of Esri.



Figure 3d. Mussel Relocation Design and Results for the SED-118 Hotspot on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Survey Area
Survey Cell (10m x 10m)

0 10 20 40 Feet
0 3 6 12 Meters

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Basemap courtesy of Google.

Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\W\Wood\480M\15210_Kalamazoo_Mussel_Survey\GIS\Map3d_Relocation_SED-118.mxd

Date: 12/15/2021



Figure 4. Mussel Relocation Area on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021.

Relocation Area

0 75 150 300 Feet

0 25 50 100 Meters

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Basemap courtesy of Esri.

Path: C:\Users\Anna Giordano\Desktop\GIS_Projects\W\Wood\480M\15210_Kalamazoo_Mussel_Survey\GIS\Map4_RelocationArea.mxd

Date: 12/15/2021

Appendix A

Scientific Collector's Permit and Site-Specific Approval

Michigan Department of Natural Resources – Fisheries Division

SCIENTIFIC COLLECTOR'S PERMIT

Issued under the authority of Public Act 451 of 1994, Part 487, as amended, section 324.48735.

Under the provisions of Part 487, Act 451, P.A. 1994, as amended, being section 324.48735, permission is hereby granted to:

Title Mr.	First Name Philip	Last Name Mathias
Co-Permittee Ryan Schwegman	Co-Permittee Becca Winterringer	Co-Permittee Brian Carlson
Institution/Affiliation EnviroScience, Inc.		
Mailing Address 5070 Stow Rd, Stow, Ohio, 44224		

To survey, handle, take, catch, kill and/or possess species from the waters and land within the jurisdiction of this state, as specified below in the special provisions section. This permit limits the take of the species authorized to the **minimum** number needed.

Prior to field activities occurring on any stream, public lake or public lands under this permit, the permittee **must notify** the local fish biologist or Fisheries Division supervisor of the Management Unit where collections will occur. This contact must be made at least 48 hours prior to commencing field work and during normal business hours Monday-Friday between 8 a.m. and 5 p.m. If a set work schedule has been established for the field season, providing a copy to the unit may alleviate the need for additional contacts with a single unit. It is also strongly recommended that the permittee notify the District Law Supervisor for the county where the permit is being used. Failure to notify the law supervisor may result in the disruption of field work. Both contacts can be initiated by calling the appropriate operational service center (map and phone numbers provided separately).

SPECIAL PROVISIONS:
The permittees listed on this permit including Sarah Veselka are authorized for general survey purposes and potential relocation efforts to collect, identify, enumerate and release freshwater mussels from the waters listed below. The permittee is to follow the Michigan Mussel Survey Protocols and Relocation Procedures by Hanshue et. al 2019. Additionally, the permittees are working with DNR Fisheries Division biologist Matthew Diana on developing the exact sampling protocol for these efforts.

Added 9-1-21: Freshwater Mussel Surveys and (if required) Relocations and Monitoring in the Kalamazoo River within the vicinity of Morrow Dam downstream to the former Plainwell Dam site. Mussel surveys and relocations are authorized following the approved plan between the permittees and Southern Lake Michigan Management Unit Fisheries Biologist Matt Diana. When ever possible the permittees must follow the Michigan Mussel Survey Protocols and Relocation Procedures document referenced above. Deviation from those procedures specifically in regards to dates and temperature limits requires prior approval from Matt Diana.

All equipment coming in contact with water including: boat hulls, boat trailers, buckets, waders, nets, etc. must be visually inspected and cleaned by hand picking any attached plants, sediments, or other debris. This should be done immediately upon leaving the water body being worked on.

The collection or handling of any freshwater mussel, regardless of species, from a waterbody known to be inhabited by a state or federally listed mussel species requires, in addition to this permit, either a State of Michigan T&E Permit, a Federal T&E permit or both. Please review Michigan's Mussel Map Viewer for waterbodies in Michigan with known T&E populations and prepare for your permitting needs accordingly at https://mnfi.anr.msu.edu/resources/michigan-mussels.

For State T&E permitting contact Casey Reitz at reitzc@michigan.gov. In addition to mussel work, Casey should be contacted if any other threatened or endangered species is encountered in an area slated for development.

For Federal T&E permitting please contact the regional US Fish and Wildlife Service Office in East Lansing, Michigan.

Permitted collection area: The Kalamazoo River in Kalamazoo County at the Norfolk Southern Botsford Yard; Lake Michigan Basin.

Added 9-1-21: The Kalamazoo River from Morrow Lake Dam (42.282856, -85.491551; T2S, R10W, S21) downstream to the former Plainwell Dam sites (42.455884, -85.668078; T1N, R12W, S24); Lake Michigan Basin.

Permitted collection gear: by hand; scuba;

Completion of an annual report is required with this permit. It shall be provided to DNR, Fisheries Division using online Collector's Report Form at www.michigan.gov/scientificcollectorspermit.

GENERAL PROVISIONS: This permit must be in permittee's possession during collection in the field or the location where specimens are being held and must be made available upon request of any Department representative. Activities under this permit are limited to species not listed as threatened or endangered unless the permittee(s) is also in possession of the required Threatened and Endangered Species Permit from DNR Wildlife Division for state listed species as well as the proper permit(s) from the US Fish and Wildlife Service for federally listed species. This permit is not transferable. This permit does not provide any authorization to circumvent any federal, state, or local laws and ordinances, including, but not limited to restricted entrance to refuges or other areas closed to the public without written permission of the land administrator.

In addition to this permit, separate DNR Public Land Use permits are required from:

1) Parks and Recreation Division for activities in State Parks and Recreation Areas and at the state boat launches;
2) Wildlife Division for activities in State Game Areas; and
3) Forest Resources Division for activities in State Forests

Public Land Use Permit applications can be obtained online at:
https://www.michigan.gov/dnr/0,4570,7-350-79136_79262_80436_85611---,00.html

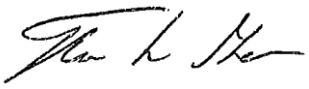
Permittees are also advised to contact the US Forest Service and/or National Park Service about any permit requirements for activities occurring in Michigan's National Forests and National Parks, respectively.

All sampling gear that is deployed and left un attended in the field by persons permitted under this program must be clearly labeled with the name of the permittee's affiliation (university, zoo, consulting firm, agency, etc.) on the sampling gear itself or on at least one of the buoys or floats used to mark deployed gear that is submerged. Additionally, boats used to conduct permit activities must also be clearly marked on the sides of the vessel with the permittee's affiliation.

Any violation of the conditions of this permit may result in revocation of this permit and misdemeanor penalties of imprisonment for not more than 90 days or a fine of not more than $500 or all of the above.

FOR DNR USE ONLY		
Permit Number FSCP02222021152227	Issue Date 02/25/2021	Expiration Date 12/31/2021
cc: SLMMU, Threatened & Endangered		

For, James L. Dexter, Chief, MDNR Fisheries Division



Philip Mathias

From: Diana, Matthew (DNR) <DianaM@michigan.gov>
Sent: Wednesday, September 1, 2021 1:21 PM
To: DeVisser, Anita
Cc: Strzalka, Bonnie; Ryan Schwegman; Philip Mathias; Goniea, Thomas (DNR); Bleisch, Amy (DNR)
Subject: RE: Kzoo River Area 1 mussels work plan - DRAFT

I have reviewed the proposed mussel relocation document and we conducted a follow up call. I approve of the proposed approach. I do not anticipate any state T&E species located in the project area based on the habitat model, recent CMU surveys, and several local area mussel relocations conducted. I do not believe a T&E permit is required. If T&E species are encountered, contact me and Amy. Please continue to communicate with me once the initial recon survey is complete and the scope of the relocation and potential relocation locations are determined. Tom, expect to see a collectors permit application in the near future. Thanks for coordinating with me.

Matt Diana
Fisheries Biologist
Michigan Department of Natural Resources
621 N 10th Street
Plainwell, MI 49080
269-910-0157 (Cell)
dianam@michigan.gov

From: DeVisser, Anita <anita.devisser@woodplc.com>
Sent: Wednesday, September 1, 2021 7:29 AM
To: Diana, Matthew (DNR) <DianaM@michigan.gov>
Cc: Strzalka, Bonnie <Bonnie.Strzalka@woodplc.com>; Ryan Schwegman <rschwegman@enviroscienceinc.com>
Subject: Kzoo River Area 1 mussels work plan - DRAFT

CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov

Hi Matt

Thought I would send this to you in advance of our call at 1 pm so that you had a chance to review. If not, don't worry – we will go over it in the call.

Thanks

Anita Emery-DeVisser

Project Manager/Associate
Direct: +1(248) 313-3667
Mobile: +1(947) 777-4225
www.woodplc.com

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Appendix B-1

Mussels Collected per Cell from the Mussel Scoping Surveys of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

Appendix B-1

Mussels Collected per Cell from the Mussel Scoping Surveys of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

KPT-19 Upstream																				
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	B1	B2	B3	B4	B5	B6	B7	B8	B9
ACLI	1	1		3	1		9	1	2	4		1	2	9		5	6	20	8	
ALMA							1						1				1	3		
FUFL	1		1	3		1	10	6	1			2	1	8	1	2	4	15		
LACA		1		2			2	1		1		1	1		1			2	1	
LSCO							1	1											2	
LSCS																1		2		
PYGR				1			2			1							1			
STUN														1						
Total	2	2	1	9	1	1	25	9	3	6	0	4	5	18	2	8	12	42	11	0

KPT-19 Downstream		
	A	B
ACLI	5	36
ALMA	1	2
EUDI		2
FUFL	13	17
LACA	6	3
LSCO		7
LSCS		3
STUN		1
Total	25	71

Verburg Park Pond					
	VPP1_20-40	VPP1_60-80	VPP1_80-100	VPP5_0-20	VPP5_100-120
FUFL	1				
LACA		1			
LSCO	1				1
UTIM	1	1	1	1	
Total					

Appendix B-1

Mussels Collected per Cell from the Mussel Scoping Surveys of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

KRT-4 Downstream				
	1	2	3	4
ACLI	44	31	19	
ALMA		1		
EUDI		1		
FUFL		8	4	
LACA		1	1	
LSCO	1	1	1	
LSCS	1		1	
STUN			2	
Total	46	43	28	0

KRT-4 Upstream																																		
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	B1	B2	B3	B4	B5	B6	B7	B8	B9	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
ACLI	5	8	9									3	6		13	1	1	2			11	6	9	1	4	33	18	43	38	63	80
ALMA																											1		1		
EUDI																														1	
FUFL			1										1				3				1	4	1	1		1		2	9	6	7
LACA																	1								1				1		1
LSCM			1																			1									
LSCO	2	1	1															1					2		1	1			2	1	7
LSCS																										1		1	1	1	
PLSI																									1	2					
PYGR																														1	
STUN																						1							1		1
UTIM																1															
Total	7	9	12	0	0	0	0	0	0	0	0	3	7	0	13	2	5	3	0	0	12	12	12	2	7	38	19	46	53	73	96

SED-118		
	1	2
ACLI	28	19
FUFL	1	2
LACA	1	
LSCO	3	3
PLSI	1	
Total	34	24

Appendix B-2.

Mussels Collected per Cell from the Mussel Relocations of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

Appendix B-2

Mussels Collected per Cell from the Mussel Relocations of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

	Verburg Park Pond					
	1L60	1L70	1L80	1R70	4L00	4R00
LSCO		1				1
PYGR				1		
UTIM	1	1	1		1	
Total	1	2	1	1	1	1

	KRT-4 Upstream																																		
	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C2	C3	C4	C5	D10	D11	D12	D13	D14	D15	D2	D3	D4	D5	D6	D9	E1	E10	E11	E12	E13	E14	E16
ACLI							4	6	6	3	12	5	19	5	10				2	2	12			6	7	6		3				1	4	34	18
ALMA																																			
EUDI																																			
FUFL									1	2	1		1	1	4					1					1			2					2	6
LACA									1				2												1					2					
LSCO								1		2			3		1									1											
LSCS								1		1			1																					2	2
PLSI																																			
PYGR																																			
STUN																																			
Total	0	0	0	0	0	0	4	8	8	8	13	5	26	6	15	0	0	0	2	3	12	0	0	7	9	6	0	5	0	2	0	1	4	38	26

	E17	E18	E19	E2	E20	E21	E22	E23	E24	E3	E4	E5	E6	E9	F1	F3	F4	F5	F6	F7	F8	F9	F10	F12	F13	F14	F17	F18	F19	F2	F20	F21	F22	F23	F24
ACLI	5	5	11	6	4	5	27	8	13	7	13	7		2	18	16	20	6	26	17	13		30	28	10	26	5	4	5	8	4	7	17	12	9
ALMA											1																									
EUDI															1																					
FUFL			2	1		1	8		1	1	1	1			1	2		1	1		1		1	3	1	10					1	1	4		2
LACA							1			1	2	1					1	1		1				1	2					1			2	1	1
LSCO	1						1	2			1				1				3	5			1	7	2	6		3	1	1				2	
LSCS								1						1						1	1		1	1										1		
PLSI			1				2				2												1			2									1
PYGR														1					1								1								
STUN																	1									2			1						
Total	6	5	14	7	4	6	39	11	14	9	20	9	0	4	21	18	22	8	31	24	15	0	34	40	15	46	6	7	7	10	5	8	24	15	13

Appendix B-2

Mussels Collected per Cell from the Mussel Relocations of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

	KRT-4 Downstream											
	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6
ACLI	3	5	12	8	4	6	26		10	3	9	5
FUFL	1			1						2		
LACA					1						1	
LSCO						1			1		1	3
LSCS						1						1
PYGR									1			
Total	4	5	12	9	5	8	26	0	12	5	11	9

	SED-118						
	A1	A2	A3	A4	A5	A6	B1
ACLI	17	11	1	11	3		16
FUFL	1			1			2
LACA	2				1		
LSCO		1			1		1
PLSI		1					
PYGR	1						
STUN				1			
Total:	21	13	1	13	5	0	19

Appendix B-3.

Habitat Data per Cell from the Mussel Scoping Surveys of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

Appendix B-3

Habitat Data per Cell from the Mussel Scoping Surveys of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

Verburg Park Pond								
Cell	Silt	Mud	Sand	Gravel	Cobble	Boulder	Wood	Depth_ft	Depth_m
VPP1_0-20	15	20	50	15				3.5	1.07
VPP1_20-40	15	20	50	15				3.5	1.07
VPP1_40-60	15	20	50	15				3.5	1.07
VPP1_60-80	15	20	50	15				3.5	1.07
VPP1_80-100	15	20	50	15				3.5	1.07
VPP1_100-120	15	20	50	15				3.5	1.07
VPP1_120-140	15	20	50	15				3.5	1.07
VPP1_140-160	15	20	30	15			20	3.5	1.07
VPP2_0-20	15	20	30	5			30	3	0.91
VPP2_20-40	15	20	50	15				5	1.52
VPP2_40-60	15	20	50	15				5	1.52
VPP2_60-80	15	20	50	15				5	1.52
VPP2_80-100	15	20	50	15				5	1.52
VPP2_100-120	15	20	50	15				5	1.52
VPP2_120-140	15	20	50	15				5	1.52
VPP2_140-160	15	20	30	15			20	3	0.91
VPP3_0-20	15	20	30	5			30	3	0.91
VPP3_20-40	15	20	50	15				6.5	1.98
VPP3_40-60	15	20	50	15				6.5	1.98
VPP3_60-80	15	20	50	15				6.5	1.98
VPP3_80-100	15	20	50	15				6.5	1.98
VPP3_100-120	15	20	50	15				6.5	1.98
VPP3_120-140	15	20	50	15				6.5	1.98
VPP3_140-160	15	20	30	15			20	3	0.91
VPP4_0-20	15	20	30	5			30	3	0.91
VPP4_20-40	15	20	50	15				7	2.13
VPP4_40-60	15	20	50	15				7	2.13
VPP4_60-80	15	20	50	15				7	2.13
VPP4_80-100	15	20	50	15				7	2.13
VPP4_100-120	15	20	50	15				7	2.13
VPP4_120-140	15	20	40	5			20	3	0.91
VPP5_0-20	15	20	30	5			30	3	0.91
VPP5_20-40	15	20	50	15				4	1.22
VPP5_40-60	15	20	50	15				4	1.22
VPP5_60-80	15	20	50	15				4	1.22
VPP5_80-100	15	20	50	15				4	1.22
VPP5_100-120	15	20	50	15				4	1.22
VPP5_120-140	15	20	30	15			20	3	0.91
VPP6_0-20	15	20	25	10			30	3	0.91
VPP6_20-40	15	20	25	10			30	3	0.91
VPP6_40-60	15	20	25	10			30	3	0.91
VPP6_60-80	15	20	25	10			30	3	0.91
VPP6_80-100	15	20	25	10			30	3	0.91

Appendix B-3

Habitat Data per Cell from the Mussel Scoping Surveys of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

KPT-19 Upstream									
Cell	Silt	Mud	Sand	Gravel	Cobble	Boulder	Wood	Depth_ft	Depth_m
KPT-19-US-A1	20	10	40	20	10			5	1.52
KPT-19-US-A2	20	10	40	20	10			5	1.52
KPT-19-US-A3	20	10	40	20	10			5	1.52
KPT-19-US-A4	20	10	40	20	10			4	1.22
KPT-19-US-A5	20	10	40	20	10			4	1.22
KPT-19-US-A6	20	10	40	20	10			4	1.22
KPT-19-US-A7	20		40	30	10			3	0.91
KPT-19-US-A8	20		40	30	10			3	0.91
KPT-19-US-A9	20		40	30	10			3	0.91
KPT-19-US-A10	20		40	30	10			3	0.91
KPT-19-US-A11	20		40	30	10			3	0.91
KPT-19-US-B1	10		35	35	10	10		5	1.52
KPT-19-US-B2	10		35	35	10	10		4	1.22
KPT-19-US-B3	10		35	35	10	10		5	1.52
KPT-19-US-B4	10		35	35	10	10		5	1.52
KPT-19-US-B5	10		35	35	10	10		5	1.52
KPT-19-US-B6	10		35	35	10	10		4	1.22
KPT-19-US-B7	10		35	35	10	10		4	1.22
KPT-19-US-B8	10		35	35	10	10		3	0.91
KPT-19-US-B9	10		35	35	10	10		3	0.91

KPT-19 Downstream									
Cell	Silt	Mud	Sand	Gravel	Cobble	Boulder	Wood	Depth_ft	Depth_m
KPT-19-DS-A0-20	10		45	25	15	5		5	1.52
KPT-19-DS-A20-40	10		65	15	5	5		5	1.52
KPT-19-DS-A40-60	10		65	15	5	5		5	1.52
KPT-19-DS-A60-80	10		65	15	5	5		5	1.52
KPT-19-DS-A80-87	10		65	15	5	5		5	1.52
KPT-19-DS-B0-20	10		45	25	15	5		4	1.22
KPT-19-DS-B20-40	10		45	25	15	5		4	1.22
KPT-19-DS-B40-60	10		45	25	15	5		4	1.22
KPT-19-DS-B60-80	10		45	25	15	5		4	1.22
KPT-19-DS-B80-87	10		45	25	15	5		4	1.22

Appendix B-3

Habitat Data per Cell from the Mussel Scoping Surveys of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

KRT-4 Upstream									
Cell	Silt	Mud	Sand	Gravel	Cobble	Boulder	Wood	Depth_ft	Depth_m
KRT-4-US-A1	20	15	25	10	10	5	15	3	0.91
KRT-4-US-A2	20	15	25	10	10	5	15	3	0.91
KRT-4-US-A3	20	15	25	10	10	5	15	3	0.91
KRT-4-US-B1	10		45	30	10	5		3	0.91
KRT-4-US-B2	10		45	30	10	5		3	0.91
KRT-4-US-B3	10		45	30	10	5		3	0.91
KRT-4-US-B4	20	30	40	10				4	1.22
KRT-4-US-B5	20	30	40	10				4	1.22
KRT-4-US-B6	20	30	40	10				5	1.52
KRT-4-US-B7	20	30	40	10				5	1.52
KRT-4-US-C1	10		30	30	30			5	1.52
KRT-4-US-C2	10		30	30	30			5	1.52
KRT-4-US-C3	10		30	30	30			6	1.83
KRT-4-US-C4	10		20	20	40	10		7	2.13
KRT-4-US-C5	10		20	20	40	10		7	2.13
KRT-4-US-C6	10		20	20	40	10		7	2.13
KRT-4-US-C7	10		20	20	40	10		7	2.13
KRT-4-US-C8	20	10	35	25			10	5	1.52
KRT-4-US-C9	20	10	35	25			10	5	1.52
KRT-4-US-C10	20	10	35	25			10	5	1.52
KRT-4-US-C11	20	10	35	25			10	5	1.52

KRT-4 Downstream									
Cell	Silt	Mud	Sand	Gravel	Cobble	Boulder	Wood	Depth_ft	Depth_m
KRT-4-DS-1	10		45	30	15			10	3.05
KRT-4-DS-2	10		45	30	15			10	3.05
KRT-4-DS-3	10		45	30	15			10	3.05
KRT-4-DS-4	10		45	30	15			10	3.05

SED-118									
Cell	Silt	Mud	Sand	Gravel	Cobble	Boulder	Wood	Depth_ft	Depth_m
SED-118-1	20	20	40	10			10	5	1.52
SED-118-2	20	20	40	10			10	3	0.91

Appendix B-4.

Individual Shells Lengths (Millimeters) of Live Mussels from the Mussel Scoping Surveys and Mussel Relocations of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

Appendix B-4

Individual Shells Lengths (Millimeters) of Live Mussels from the Mussel Scoping Surveys and Mussel Relocations of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

Length (mm)	26	28	30	31	32	34	35	36	37	38	39	41	42	43	44	45	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
ACLI																					1		1		2												
ALMA																						1														1
EUDI																															1					
FUFL	1	3	1		1	2	2	1	2	1	1	1	1	1	3	2	5	4	5	4	4	8	3	8	7	5	3	6	1	5	3	3	2	2	4	9
LACA																																	1			
LSCM																																				
LSCO																																				
LSCS																																				
PLSI																																				
PYGR																																				
STUN																									1				1							
UTIM																				1			1		1	1	1	1				1				

Length (mm)	67	68	69	70	71	72	73	74	75	76	77	78	80	81	82	83	84	85	86	87	88	89	90	91	92	93	95	96	97	98	99	100	101	102	103	104
ACLI																	1			1	1		2	3	1	2	3		2	3	5	1	1	6	3	3
ALMA		1	1		2													2	3		1										1					
EUDI					1																			1												1
FUFL	4	5	1	3	4	8	3	2	8	3	11	7	2	2	4	2	3	5	1		2	3	1	2	1	4	3		1	1	1				1	1
LACA						1					1		2			2				1			1		3			3	2	1	2		1	1	4	3
LSCM															1										1											
LSCO																																				
LSCS																																				
PLSI																								2		2	5						1	1		
PYGR																																				
STUN	2						1		3		1				1	1											1									
UTIM																1												1								

Appendix B-4

Individual Shells Lengths (Millimeters) of Live Mussels from the Mussel Scoping Surveys and Mussel Relocations of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

Length (mm)	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
ACLI	4	3	1	4	5	8	4	7	9	4	16	15	5	15	14	15	9	20	15	11	26	15	36	34	24	39	40	38	41	31	67	35	61	56	32	66
ALMA																																				
EUDI								1																												
FUFL														1																						
LACA		1	3	1		1							3		2	2	2		3	1		1		1	2			2								
LSCM																																				
LSCO									1			1									2			1		1	1	1	1	1	1	1	1	4		1	2
LSCS												1							2	2	2	1	2		1	1	1		2	1	1	1	1	1	2	1	
PLSI	1		1	1																																
PYGR						1			1		2				2	1				1		1				1	1			1						
STUN																																				
UTIM																																				

Length (mm)	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	169	170	172	173	174	191	210
ACLI	31	47	38	23	59	26	45	24	14	34	13	11	13	11	19	9	15	5		3	3	2	3	1	3	1	1		1	1	1			
ALMA																																		
EUDI																																		
FUFL																																		
LACA	2		1				1																											
LSCM																																		
LSCO	3	2	3	2	3	2	5	2	1	5	6	5	5	1	7	1		3	1	2	1	1	2	3	4			2	2		1	1	1	1
LSCS	1	2		1	1	1												1																
PLSI																																		
PYGR																																		
STUN																																		
UTIM																																		

Appendix B-5.

Mussel Shells Length (Millimeters) Summary of Live Mussels from the Mussel Scoping Surveys and Mussel Relocations of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

Appendix B-5

Mussel Shells Length (Millimeters) Summary of Live Mussels from the Mussel Scoping Surveys and Mussel Relocations of the Hotspot Areas on Kalamazoo River for the Proposed Area 1 Remedial Action, Allegan & Kalamazoo Counties, Michigan, 2021. Species Codes Are Defined in Tables 1, 2, and 3.

	Minimum	Maximum	Mean
ACLI	51	173	135.0
ALMA	52	99	77.8
EUDI	61	112	87.8
FUFL	26	118	65.3
LACA	63	147	107.8
LSCM	82	92	87.0
LSCO	113	210	150.4
LSCS	116	158	133.5
PLSI	91	108	97.6
PYGR	110	134	121.3
STUN	55	95	73.6
UTIM	50	96	63.3

Appendix C

Digital Image Log



Digital Image 1. Hotspot KPT-19 Upstream looking downstream



Digital Image 2. Hotspot KPT-19 Upstream looking upstream



Digital Image 3. Hotspot KPT-19 Downstream looking downstream



Digital Image 4. Hotspot KPT-19 Downstream looking upstream



Digital Image 5. Hotspot Verburg Park Pond looking east



Digital Image 6. Hotspot Verburg Park Pond looking south



Digital Image 7. Hotspot KRT-4 looking downstream



Digital Image 8. Hotspot KRT-4 looking upstream



Digital Image 9. Relocation area looking downstream



Digital Image 10. Relocation area looking upstream



Digital Image 11. Mucket (*Actinonaias ligamentina*)



Digital Image 12. Elktoe (*Alasmidonta marginata*)



Digital Image 13. Spike (*Eurynia dilatata*)



Digital Image 14. Wabash Pigtoe (*Fusconaia flava*)



Digital Image 15. Plain Pocketbook (*Lampsilis cardium*); Side View: Male Left, Female Right; Umbo view: Male Top, Female Bottom



Digital Image 16. White Heelsplitter (*Lasmigona complanata*)



Digital Image 17. Creek Heelsplitter (*Lasmigona compressa*)



Digital Image 18. Flutedshell (*Lasmigona costata*)



Digital Image 19. Round Pigtoe (*Pleurobema sintoxia*)



Digital Image 20. Giant Floater (*Pyganodon grandis*)



Digital Image 21. Creeper (*Strophitus undulatus*)



Digital Image 22. Paper Pondshell (*Utterbackia imbecillis*)

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Appendix G

EASTERN MASSASAUGA RATTLESNAKE BMPS

Eastern Massasauga Rattlesnake (*Sistrurus catenatus*)

Protected as federally threatened





Photos courtesy of the Michigan Department of Natural Resources and Michigan State University

This species is suspected to occur at or near the work site. Please have staff read the following information.

What Does an Eastern Massasauga Rattlesnake Look Like?

The eastern massasauga rattlesnake is a thick-bodied and short venomous snake. Adults typically measure 18 to 30 inches long. This species is gray to grayish-brown with dark blotches bordered by white down the middle of its back. The head is thick and triangular and has an obvious neck. Like many venomous snakes, the massasauga has vertical slitted pupils like a cat and heat sensing pits below the eyes. A rattle is present on the tail that "buzzes" as a warning signal, although they may strike without rattling. This is the only rattlesnake in Michigan.

Where Does It Live?

These snakes prefer wet areas, such as marshes, wet prairies, wet woods, and along rivers and lakes. They also use adjacent upland during parts of the year, especially in the summer. They hibernate during the winter in crayfish burrows, under logs and tree roots, and in small mammal burrows.

What Should You Do If You See a Massasauga Rattlesnake?

Massasaugas are shy and try to avoid confrontation but that does not mean they won't bite to protect themselves. Never try to handle, chase, provoke, or threaten a snake. When in potential snake habitat, wear thick boots that cover your ankles, long pants, and do not reach into thickets or under logs. If you hear the buzzing of a rattle stay calm and back away from the sound slowly. The snake will leave if you give it space.

If an eastern massasauga rattlesnake is found at a Michigan Department of Transportation (MDOT) project, the construction engineer should be contacted immediately. [redacted]

How is the Massasauga Protected Under the Law?

The eastern massasauga rattlesnake is protected under federal law by the Endangered Species Act. This status prohibits harming or harassing the species along with policies to protect the species habitat.

For More Information:

60-Second Snakes: The Eastern Massasauga Rattlesnake
www.youtube.com/watch?v=-PFnXe_e02w

Photos
http://animaldiversity.org/site/accounts/pictures/Sistrurus_catenatus.html

General Information
http://mnfi.anr.msu.edu/emr

Environmental Screening for Eastern Massasauga Rattlesnake in Michigan

March 14, 2017

Background

The Eastern Massasauga Rattlesnake (EMR) is listed as a threatened species under the U.S. Endangered Species Act (Act). The Act protects the EMR and their habitat by prohibiting "take" and may require agencies to coordinate with the U.S. Fish and Wildlife Service (Service) before authorizing or funding an activity affecting the species. To streamline coordination, the Service's Michigan Ecological Services Field Office has developed a set of Best Management Practices (BMPs) for specific activities potentially impacting EMR in Michigan. These BMPs are voluntary and just one of the ways that compliance with the Act may be achieved.

Projects may…

- have no effect to EMR and no need for additional ESA compliance considerations.
- have potential for adverse effects, but use BMPs to avoid adverse effects (i.e., "not likely to adversely affect" EMR) or minimize the adverse effects.
- use surveys to confirm probable absence of EMR (contact the Service for survey guidance).
- use "Informal Consultation" with Service (for actions requiring a Federal permit or funding).
- use "Formal Consultation" with Service (for actions requiring a Federal permit or funding).
- develop a Habitat Conservation Plan and seek an ESA permit, if adverse effects cannot be avoided.

For activities not listed in the BMPs, please contact the Service for project-specific recommendations. In some cases implementation of BMPs may not be sufficient to avoid all adverse impacts to EMR and additional consultation with the Service may be required. The Service can assist planners in determining whether adverse effects are likely as a result of proposed projects, and whether implementation of BMPs is sufficient to remove the risk of adverse effects.

Additional information on compliance with the Act can be found:

For Federal actions/section 7 consultation:
https://www.fws.gov/midwest/Endangered/section7/s7process/index.html

For non-Federal actions:
https://www.fws.gov/midwest/endangered/permits/index.html

For questions or comments you may contact the Service below:
U.S. Fish and Wildlife Service
Michigan Ecological Services Field Office
2651 Coolidge Road, Suite 101
East Lansing, MI 48823
Phone: (517)351-2555
Email: eastlansing@fws.gov

Definitions

Active Season: The active season begins in the spring when snakes emerge from hibernation, generally when maximum air temperatures are above 50°F, and ends in the fall when EMR have returned to their hibernacula and temperatures are consistently below 45°F. In Michigan, the active season is generally April through October. The active season dates will vary by location and weather. **Contact the Service for project-specific dates based on location when work in EMR habitat is planned near the start or end of the active season**.

Affecting hydrology: We consider "affecting hydrology" to include projects that are likely to appreciably change the elevations of surface water upstream or downstream, or in the local ground water (as estimated pre-project vs. post-project). The concern is for changes to local hydrology (e.g., creating new ditches, creating a new impoundment) that might harm EMR hibernating at or near ground water, or actions that significantly alter available suitable habitat either through flooding or drying of EMR wetlands.

Hibernacula: Areas suitable for EMR to overwinter. For most EMR populations, the locations of hibernacula are not known, but these areas are critical to protect. Unfortunately, we lack information on how to reliably identify these areas. EMR usually hibernate below the frost line in crayfish or small mammal burrows, tree root networks or rock cervices in or along the edge of wetlands or in adjacent upland areas with presumably high water tables (areas where the soil is saturated but not inundated). Following egress from hibernacula in the spring, EMR typically remain aboveground in the vicinity for a week or two, and return to these areas in the fall for several weeks prior to entering hibernation. Surveys in the spring (shorting following egress) or fall (prior to ingress) when snakes are congregating in the vicinity may help identify these important areas. Maintaining stable hydrology of these areas is important during the inactive season.

IPaC: "Information for Planning and Conservation" is a project planning tool available on-line to the public that streamlines the Service's environmental review process.

EMR Habitat: "Eastern Massasaugas have been found in a variety of wetland habitats. Populations in southern Michigan are typically associated with open wetlands, particularly prairie fens, while those in northern Michigan are known from open wetlands and lowland coniferous forests, such as cedar swamps. Some populations of Eastern Massasaugas also utilize open uplands and/or forest openings for foraging, basking, gestation and parturition (i.e., giving birth to young). Massasauga habitats generally appear to be characterized by the following: (1) open, sunny areas intermixed with shaded areas, presumably for thermoregulation; (2) presence of the water table near the surface for hibernation; and (3) variable elevations between adjoining lowland and upland habitats." From Michigan Natural Features Inventory (Website: mnfi.anr.msu.edu)

Tier 1 Habitat: Areas known to be occupied by EMR or highly likely to be occupied by EMR.

Tier 2 Habitat: Areas with high potential habitat and may be occupied by EMR.

Within the known range: EMR can occur throughout the Lower Peninsula and on Bois Blanc Island in Mackinac County. Areas within the known range but outside of Tier 1 and Tier 2 are considered less likely to be occupied. EMR is highly secretive and cryptic in nature, and can persist in low densities, which makes them difficult to detect. Further, there are extensive areas of the state that have never been surveyed. It is likely that there are additional and yet-unknown occurrences throughout the Lower Peninsula of Michigan. Mapped habitats are subject to change based on new information identifying current Tier 1 and 2 areas as unsuitable, or based on discovery of new EMR occurrences.

EMR Environmental Screening Step-wise Process

Step 1. Determine if EMR may be present in the action area

- ✓ Determine whether the project is in potential EMR habitat using https://ecos.fws.gov/ipac
  - o You can search for your project location and define the action area by drawing a polygon or uploading a shapefile.
  - o IPaC will give you a list of species that may be present in the area you identified. If you click on the thumbnail for EMR, it will tell you if your project is within Tier 1 or Tier 2 habitat, or within the known range of EMR. If EMR is not listed, you do not need to consider this species. Effects to other listed species should also be considered; contact the Service if you need assistance.
  - o If EMR is listed, it does not necessarily mean that the entire action area is potential habitat, only that some potential habitat is within the action area entered. For large-scale (e.g., county-wide or multi-county projects) consider coordinating the Michigan Ecological Services Field Office for direct assistance.

If your project is within the known range of EMR, including Tier 1 or Tier 2 habitat, continue to step 2:

Step 2. Determine if the project has the potential to affect EMR

Projects have no effect on EMR when…

- ✓ There is no suitable EMR habitat in the project area and no potential impact off-site (e.g., water discharge into adjacent EMR habitat). If project site conditions are determined to be wholly unsuitable for EMR (e.g., project is in regularly mowed turf grass, row crop, graveled lot, existing building, or industrial site), it is not suitable EMR habitat.
- ✓ The project occurs within suitable habitat, but the action will have absolutely no effect on the habitat or EMR.
- ✓ In suitable EMR habitat, but the site is entirely unoccupied by the species. This is typically confirmed through surveys (contact the Service for more information). In some cases it may be easier to assume EMR are present and use BMPs than to conduct surveys for the species.

For projects where there is a potential for effects to EMR, continue to the section of the document as follows:

For Tier 1 Habitat .....Page 5

For Tier 2 Habitat .....Page 6

Within the range of EMR .....Page 7

For projects with a combination of Tier 1 and Tier 2 habitat, follow the instructions for Tier 1.

Tier 1 Habitat

Tier 1: Project will not affect EMR if all of the following apply:

1. Project will not result in any changes to suitable EMR habitat quality, quantity, availability or distribution, including changes to local hydrology
2. If EMR are present in the project area, they are not likely to have any response as a result of exposure to the action or any environmental changes as a result of the action
3. Project includes all General Best Management Practices:
   a. Use wildlife-safe materials for erosion control and site restoration (see Erosion Control Resources side panel). In Tier 1 habitat, immediately eliminate use of erosion control products containing plastic mesh netting or other similar material that could entangle EMR.
   b. To increase human safety and awareness of EMR, those implementing the project should first watch MDNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake" video (available at https://youtu.be/-PFnXe_e02w), or review the EMR factsheet (available at https://www.fws.gov/midwest/endangered/reptiles/eama/pdf/EMRfactsheetSept2016.pdf or by calling 517-351-2555.
   c. Require reporting of any EMR observations, or observation of any other listed threatened or endangered species, during project implementation to the Service within 24 hours.

Tier 1: Project Not Affecting EMR Coordination Recommendation: No pre-project coordination with Service needed. Document the steps above for your records.

Tier 1: All Other Projects: For any other projects in Tier 1 habitat that may affect EMR or its habitat, contact the Service for assistance in evaluating potential impacts. Best Management Practices (starting on page 8) are included for many actions to help with project planning, but may not be sufficient to avoid all adverse impacts. The Service can determine whether additional measures are necessary after a project-specific review.

Erosion Control Resources

There are a variety of products that can be used for soil erosion and control requirements. These products may incorporate plastic mesh netting to help maintain form and function. This plastic netting has been demonstrated to entangle a wide variety of wildlife from birds to small mammals. In Michigan, soil erosion control netting has resulted in the documented mortality of a number of imperiled amphibian and reptile species including the EMR and the Eastern Fox Snake (State Threatened).

Several products for soil erosion and control exist that do not contain plastic netting including net-less erosion control blankets (for example, made of excelsior), loose mulch, hydraulic mulch, soil binders, unreinforced silt fences, and straw bales. Others are made from natural fibers (such as jute) and loosely woven together in a manner that allows wildlife to wiggle free. For more information regarding wildlife-safe erosion control measures contact the USFWS Michigan Ecological Services Field Office.

Tier 2 Habitat

Tier 2: Project is not likely to adversely affect EMR if all of the following apply:

1. Project does not impact more than 1 acre of wetland habitat and includes all applicable activity-specific BMPs (starting on page 8), and
2. Project will not appreciably affect hydrology
3. Project includes all General Best Management Practices:
    a. Use wildlife-safe materials for erosion control and site restoration (See Erosion Control Resources side panel, page 4). In Tier 2 habitat, eliminate the use of erosion control products containing plastic mesh netting or other similar material that could ensnare EMR as soon as is feasible but no later than January 1, 2018.
    b. To increase human safety and awareness of EMR, those implementing the project should first watch MDNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake" video (available at https://youtu.be/-PFnXe_e02w), or review the EMR factsheet (available at https://www.fws.gov/midwest/endangered/reptiles/eama/pdf/EMRfactsheetSept2016.pdf or by calling 517-351-2555.
    c. Require reporting of any EMR observations, or observation of any other listed threatened or endangered species, during project implementation to the Service within 24 hours.

Tier 2: Project Not Likely to Adversely Affect EMR Coordination Recommendation: Informal consultation with Service for actions requiring a Federal permit or funding. For non-Federal projects, document the steps above for your records, but no pre-project coordination with the Service needed.

Tier 2: All Other Projects: Coordinate with the Service for a project-level review to determine potential impacts and whether additional conservation measures are needed to avoid adverse effects.

Within the known range of EMR

For projects within the known range of EMR, but outside of Tier 1 and Tier 2 habitat:

To help ensure your project is unlikely to affect EMR:

1. Project applies the General Best Management Practices:
    a. Use wildlife-safe materials for erosion control and site restoration (See Erosion Control Resources side panel, page 4). By January 1, 2019, eliminate the use of erosion control products containing plastic mesh netting or other similar material that could ensnare EMR (within the known range but outside of Tier1 or Tier 2 habitat).
    b. To increase human safety and awareness of EMR, those implementing the project should first watch MDNR's "60-Second Snakes: The Eastern Massasauga Rattlesnake" video (available at https://youtu.be/-PFnXe_e02w), or review the EMR factsheet (available at https://www.fws.gov/midwest/endangered/reptiles/eama/pdf/EMRfactsheetSept2016.pdf or by calling 517-351-2555.
    c. Require reporting of any EMR observations, or observation of any other listed threatened or endangered species, during project implementation to the Service within 24 hours.
2. Project will not have significant impacts to dispersal, connectivity, or hydrology of existing EMR potential habitat, i.e., filling less than 1 acre of wetland habitat or converting less than 20 acres of uplands of potential EMR habitat (uplands associated with high quality wetland habitat) to other land uses.

Within the Known Range, but Outside Tier 1 or 2 Coordination Recommendation:
Document the steps above for your records and no pre-project coordination with the Service needed. If you cannot implement the General Best Management Practices contact the Service for assistance in evaluating potential impacts.

Activity-Specific Best Management Practices

For Tier 1, BMPs are included; however, even with implementation of the BMPs, project-specific review may be needed to determine whether they are sufficient to avoid all adverse impacts

- In Tier 1 habitat, contact the Service regarding the potential applicability of surveys to determine EMR absence in suitable habitat. In Tier 2, surveys can be conducted to confirm the presence of suitable habitat and/or the presence/probable absence of EMR. If onsite habitat is determined to be wholly unsuitable via desktop analysis (e.g., entirely mowed lawn, row crop, graveled lot, and industrial site), then it can be classified as unoccupied and the BMPs will not be necessary.
- Minimize work in Tier 1 and Tier 2 EMR habitat. When feasible, do not route new construction projects, such as pipelines, facilities, or access roads, through potential EMR habitat. Implement the use of wildlife-friendly corridors (e.g., oversized culverts) into new road design to maintain or enhance habitat connectivity.
- Projects should be designed to minimize the potential for disturbance to EMR during project activities.

Maintenance Activities (includes nominal modifications to existing roads and infrastructure)

1. Ground Disturbing Activities
    a. All
        i. No known EMR hibernacula are destroyed or disturbed at any time of year. Because these areas are often not known:
            1. For Tier 1: contact the Service to determine whether adverse impacts are likely as a result of ground disturbing work in Tier 1 habitat.
            2. For Tier 2: when operating in potential hibernation areas (e.g., EMR wetlands and adjacent areas with crayfish burrows, rodent holes, small mammal burrows, etc.), work is conducted well within the active season (June – August) to avoid when snakes are likely to be present. During this time, they are most likely to be able to move out of the way of disturbance and have greater chances to find alternative hibernation sites. Destroying potential hibernacula may still impact snakes indirectly. Potential hibernation areas should be avoided to the extent possible.
    b. Grading
        i. When working during EMR active season, use exclusionary fencing to separate EMR habitat from the work site to prevent EMR from accessing the disturbance area. For example, in linear projects exclusionary fencing should run parallel to the disturbance, creating a barrier to snake movement. Each end of the exclusionary fencing should be angled away from the area of disturbance to direct snakes traveling along fencing away from the site. The

exclusionary fencing will typically be traditional silt fence that is set up outside of all areas of disturbance and other types of fencing (i.e., snow fence used to delineate the work zone). Do not use fencing materials that can entangle or injure snakes.

ii. Any areas using exclusionary fencing should first be "cleared" by a qualified individual[1] before beginning construction activities. Fencing should be installed a minimum of 1 day before construction activities occur and walked weekly to ensure the integrity of the fence. If snakes are seen within the work zone, activity should stop until the snake can be safely moved, and the fence examined for breeches.

iii. Revegetate all disturbed Tier 1 and Tier 2 habitat with appropriate plant species (i.e., native species or other suitable non-invasive species present on site prior to disturbance). Monitor all restoration plantings for proper establishment and implement supplemental plantings as necessary to ensure restorations are of equal to or better habitat quality than previous conditions.

iv. In Tier 1 and Tier 2, avoid spread of invasive species into EMR habitat by following best practices. This includes inspecting and cleaning equipment and vehicles between work sites as needed to avoid the spread of invasive plant materials.

c. Trenching

i. In Tier 1 and Tier 2, avoid trenching in EMR wetlands when possible. In Tier 1, if open trenching is required install exclusionary fencing (follow measures 1(b)(i)-(iv)) and ensure the area is clear prior to trenching.

d. Fill

i. In Tier 1 and Tier 2, ensure all imported fill material is free from contaminants or invasive species could affect the species or habitat through acquisition of materials at an appropriate quarry or other such measures.

ii. In Tier 1 and Tier 2, use exclusionary fencing around the area to be filled and have the site "cleared" prior to placing fill by a qualified individual (as in 1(b)(i)-(ii).

e. Ditching

i. For Tier 1 and Tier 2, conduct work well within the active season (June-August) when snakes are not likely to be near hibernation sites and can escape disturbance, or contact Service for project specific recommendations.

ii. For Tier 1, use exclusionary fencing around the area to be cleared/graded and have the site cleared by a qualified individual prior to construction activities.

iii. For Tier 1, contact the Service for work greater than 200' for project specific recommendations.

[1] A qualified individual is someone who has received training on the identification and life history of EMR.

2. Site Access with vehicles (both Tiers)
    a. Limit operating vehicles/equipment, clearing trees, etc., in EMR habitat to the inactive season when the ground is frozen. During this time, under these conditions, EMR are most likely underground and will not be impacted by these activities. When possible, use low-impact equipment such as light weight track mounted vehicles with low ground pressure. In Tier 1, if the ground isn't completely frozen (due to weather conditions during the inactive season or if working near seeps and springs that are less likely to freeze), or if working near potential hibernacula, manual access (on foot) may be required.
    b. Strictly control and minimize vehicle activity in known/presumed occupied EMR habitat to the extent possible. During EMR active season, speed limits at facilities and access roads (i.e., 2-track and gravel) in occupied habitat should be <15 MPH.
    c. In Tier 1 and Tier 2 habitat areas, drivers should be aware of the potential danger to the driver of swerving to intentionally drive over snakes as well as legal and conservation implications.

3. Heavy Equipment (both Tiers)
    a. Spill Prevention for oils/fluids
        i. Site staging areas for equipment, fuel, materials, and personnel at least 100 feet from the waterway, if available, to reduce the potential for sediment and hazardous spills entering the waterway. If sufficient space is not available, a shorter distance can be used with additional control measures (e.g., redundant spill containment structures, on-site staging of spill containment/clean-up equipment and materials). If a reportable spill has impacted occupied habitat:
            1. Follow spill response plan;
            2. Call MDEQ and the National Response Center (800-424-8802), and the Service's Michigan Ecological Services Field Office (517-351-2555) to report the release.
    b. Do not use large equipment or perform earth-moving activities, water withdrawal and discharge for hydrostatic testing, or other activities that substantially affect the ground or water levels in potential EMR hibernacula areas. Avoidance measures may include, but are not limited to, re-routing of pipeline and appurtenance facilities, boring or drilling, and timing/weather-related restrictions. Measures will be determined on a site-specific basis, based on local habitat conditions, contact Service for more information.

4. Hydrology impacts (both Tiers)
        i. Water levels in known/presumed occupied habitats should not be artificially manipulated during the inactive season.

ii. Where applicable, water levels should be allowed to flow naturally and not be artificially stabilized. This allows for the restoration of early successional habitats.

Habitat Management and Restoration

5. Vegetation Management
    a. Mowing
        i. In Tier 1, mow during the inactive season.
        ii. For Tier 2, mowing is unrestricted during the inactive season. During the active season, follow daytime mowing restrictions and mow during times of day when snakes are less likely to be active (Figure 1). Increase mower deck height to >8 inches to reduce likelihood of injury to snakes. Higher deck height will reduce the risk of death or injury to snakes in the area.
        iii. In areas with turf grass or areas where trying to discourage EMR (e.g., in areas around buildings), mow regularly and keep grass relatively short (less than 4-6 inches) to reduce its suitability for EMR. If starting with longer grass (greater than 6 inches), mow during the inactive season initially, and then maintenance mowing can occur during the active season (as long as it is regularly maintained and kept shorter than 4-6 inches, so that EMR is unlikely to use those areas). Unmaintained/longer grass may be used by snakes and make them vulnerable to mortality during the next mowing event.

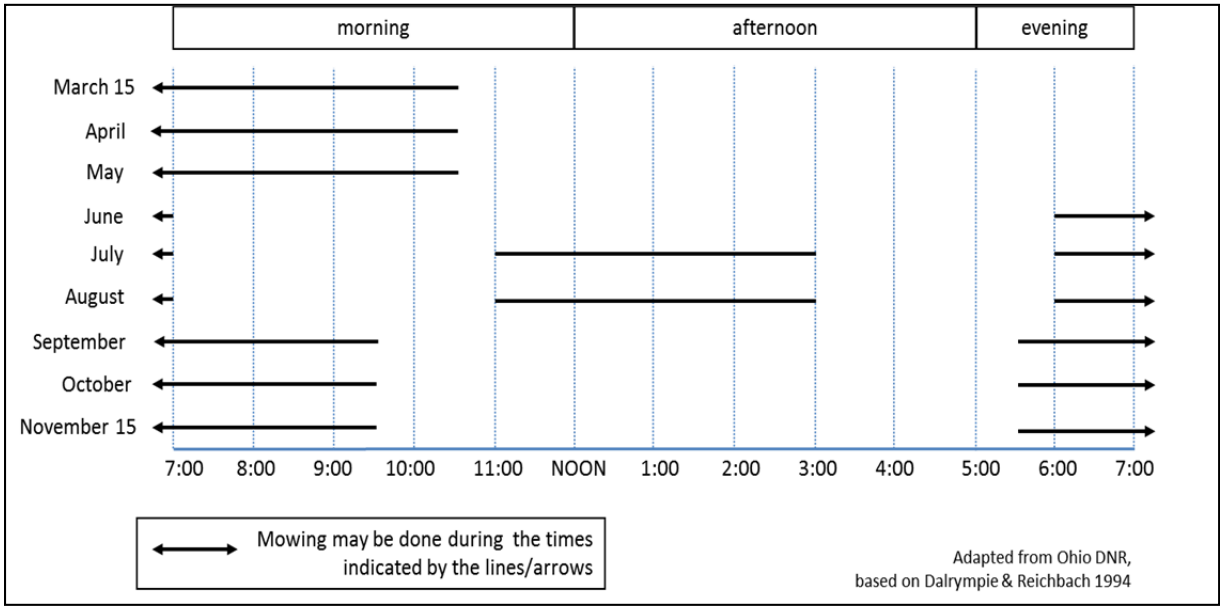


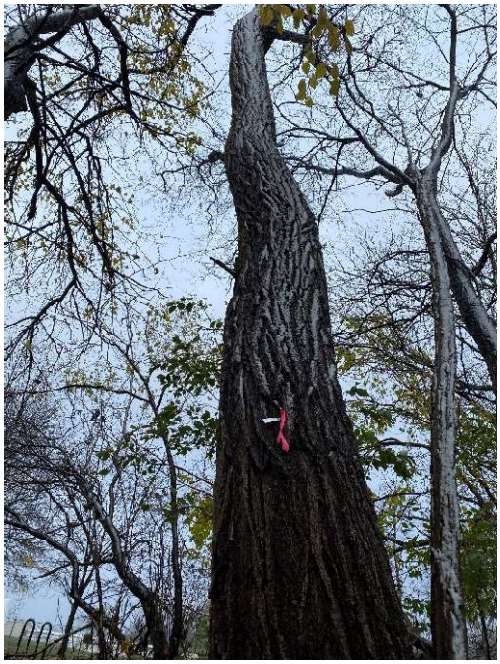
Figure 1. EMR Active season mowing schedule (NiSource Biological Opinion, page 273, USFWS 2015)

b. Cultivation (e.g., disking)
    i. In Tier 1 habitat, disking should be limited to the inactive season, and areas within 50 m of known or potential hibernacula should be avoided. In Tier 2, disking can occur in the active season if area is mowed during the inactive season and maintained shorter than 4-5 inches.
c. Brush/Tree Removal
    i. In Tier 1, conduct brush or tree removal in known/presumed EMR habitat during the inactive season, when the ground is frozen (such that soils can be left undisturbed).
    ii. Use low impact harvest methods in Tier 1 and Tier 2 wetlands to cut and remove individual trees. This includes using low-impact equipment such as light weight track mounted vehicles with low ground pressure. In Tier 1, if the ground isn't completely frozen (due to weather conditions during the inactive season or if working near seeps and springs that are less likely to freeze), or if working near potential hibernacula, use hand tools and access site on foot.
    iii. In Tier 1 and Tier 2, do not burn brush piles during the active season. Dispose of brush offsite or leave in place.
d. Herbicides
    i. Follow all appropriate label instructions regarding which herbicide formulation to use in potential EMR habitat. Avoid spray drift beyond the target species/area (observing label instructions regarding optimal wind speed and direction, boom height, droplet size calibration, precipitation forecast, etc.).
    ii. Avoid broadcast applications of herbicides in Tier 1. Spot spraying or wicking can be used to control invasive plants in occupied habitat. If using broadcast spray in Tier 2, limit the area of exposure to less than half of the available EMR habitat to allow for untreated areas to provide potential areas of refugia from exposure. Contact the Service if you need help in determining this.
e. Prescribed burning (Tier 1 and Tier 2)
    i. Conduct prescribed burns during the inactive season before snakes emerge from hibernation. Walk the burn unit following the burn and report any dead or injured EMR to the Service within 24 hours. Burn only a portion (e.g., one-third) of available EMR habitat in any year to leave suitable cover for EMR and its prey.
    ii. Establish fire breaks using existing fuel breaks (roads, rivers, trails, etc.) to the greatest extent possible. Cultivation (disking or roto-tilling) of burn breaks will be minimized to the extent that human health and safety are not jeopardized. Cultivation and mowing to establish fire breaks will occur during the inactive season.

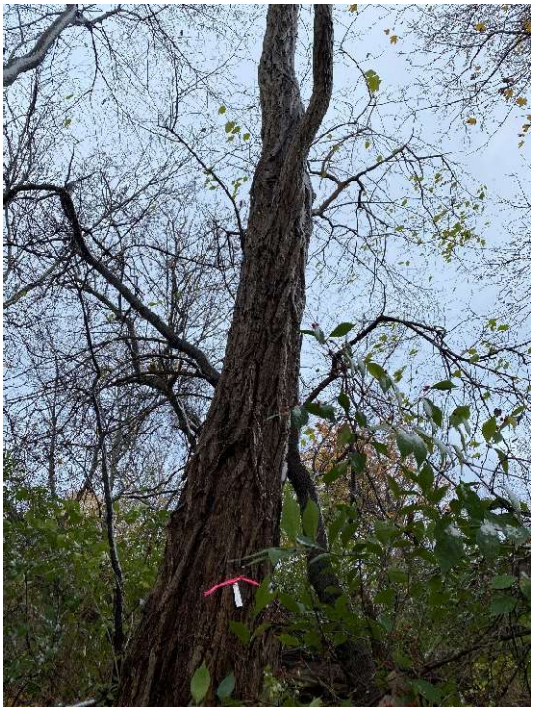
6. Erosion control
    a. Use wildlife-safe erosion control blankets (without plastic mesh netting in the layers of material) as required in the general BMPs. Remove all silt fence used for erosion control once soils are stable to reduce barriers to EMR movement.
7. Revegetation
    a. Revegetate all disturbed Tier 1 and Tier 2 habitat with appropriate plant species (i.e., native species or other suitable non-invasive species present on site prior to disturbance). Monitor all restoration plantings for proper establishment and implement supplemental plantings as necessary to ensure restorations are of equal to or better habitat quality than previous conditions.
8. Invasive species
    a. In Tier 1 and Tier 2, avoid spread of invasive species into EMR habitat by following best practices. This includes inspecting and cleaning equipment and vehicles between work sites as needed to avoid the spread of invasive plant materials.
9. Wetland restoration
    a. Restoring natural hydrology in areas that have been drained by tiling and ditching may greatly benefit EMR habitat. Conduct tile breaking or excavation well within the active season to avoid potential hibernacula. Have a qualified person walk in front of the equipment to clear the area. Work with the Service for Tier 1 habitat to ensure no indirect adverse effects are expected as a result of restoration efforts.
10. Water-level manipulation
    a. Water levels should not be artificially manipulated during the inactive season to avoid impacts to hibernating snakes. Contact the Service in Tier 1 habitat when water levels will be manipulated during the inactive season or will result in significant alterations to EMR habitat during the active season.

Verburg Park NFP Protected Tree Photo Log

Tree #1 (IMG_0871)



Tree #2 (IMG_0872)



Tree #3 (IMG_0873)



Tree #4 (IMG_0874)



Tree #5 (IMG_0876)



Tree #6 (IMG_0878)



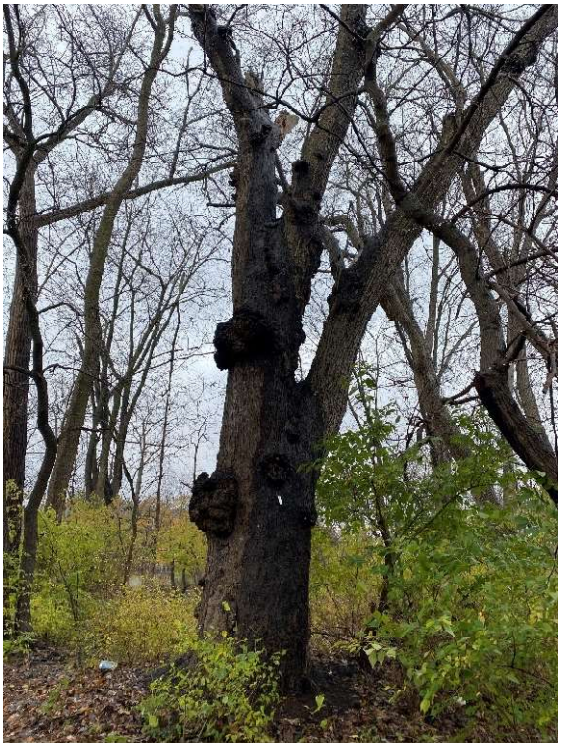
Tree #7 (IMG_0879)



Tree #8 (IMG_0877)



Tree #9 (IMG 0880)



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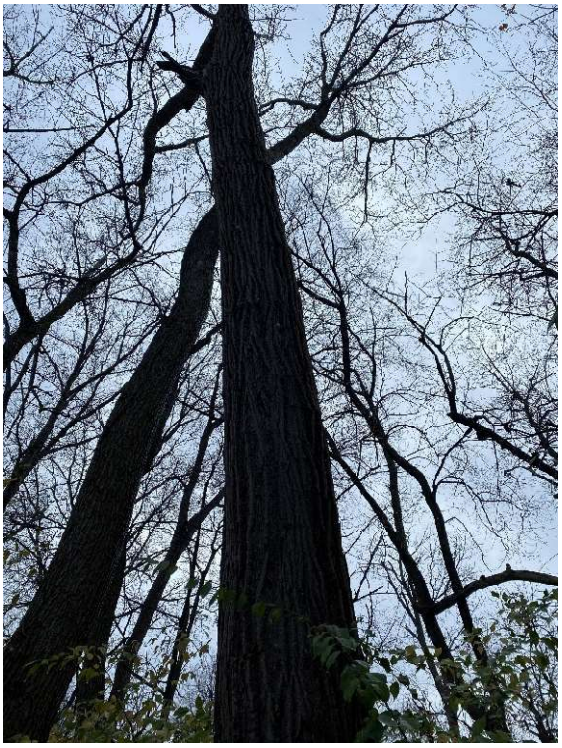


Tree #11 (IMG_0910)



Tree #12 (IMG_0911)



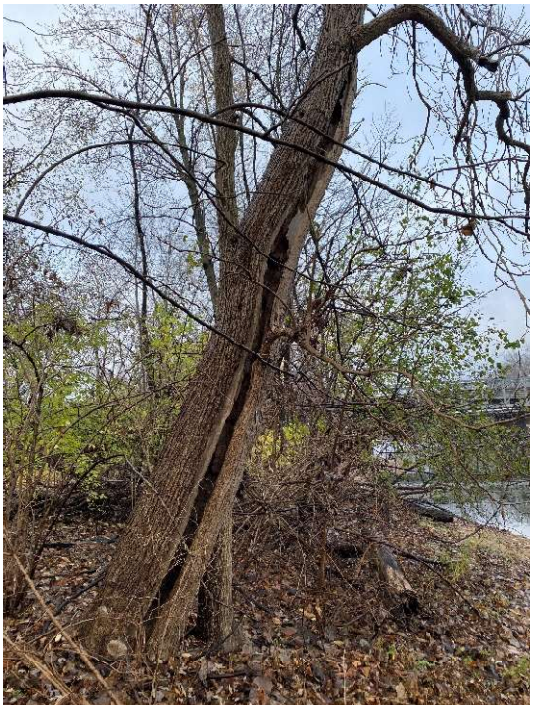
Tree #13 (IMG_0882)



Tree #14 (IMG_0884)



Tree #15 (IMG_0883)



Tree #16 (IMG_0885)



Tree #17 (IMG_0886)



Tree #18 (IMG_0887)



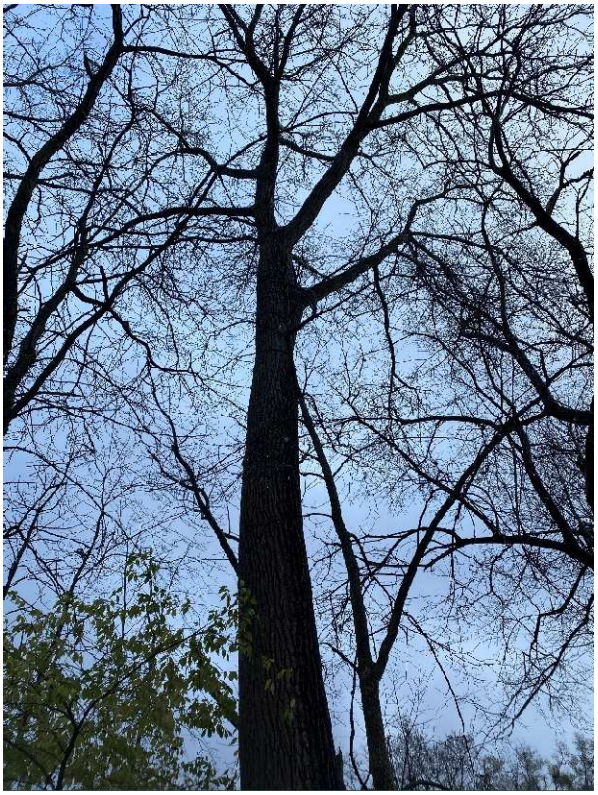
Tree #19 (IMG_0888)



Tree #20 (IMG_0889)



Tree #21 (IMG_0890)



Tree #22 (IMG_0894)



Tree #23 (IMG_0891)



Tree #24 (IMG_0892)



Tree #25 (IMG_0893)



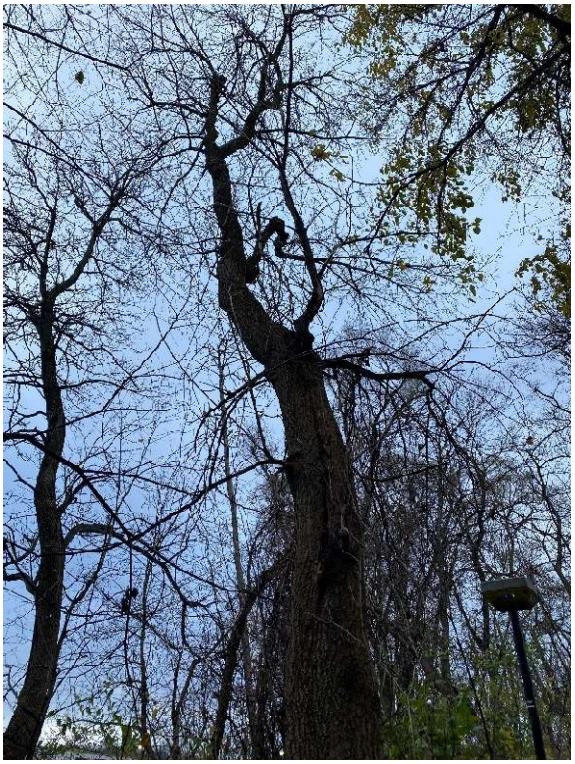
Tree #26 (IMG_0895)



Tree #27 (IMG_0875)



Tree #28 (IMG_0896)



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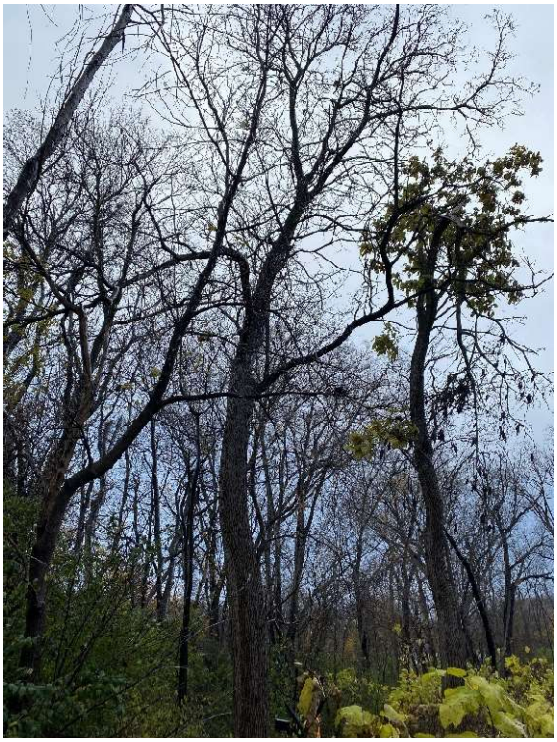


Tree #30 (IMG_0898)



Tree #31 (IMG_0899)



Tree #32 (IMG_0900)



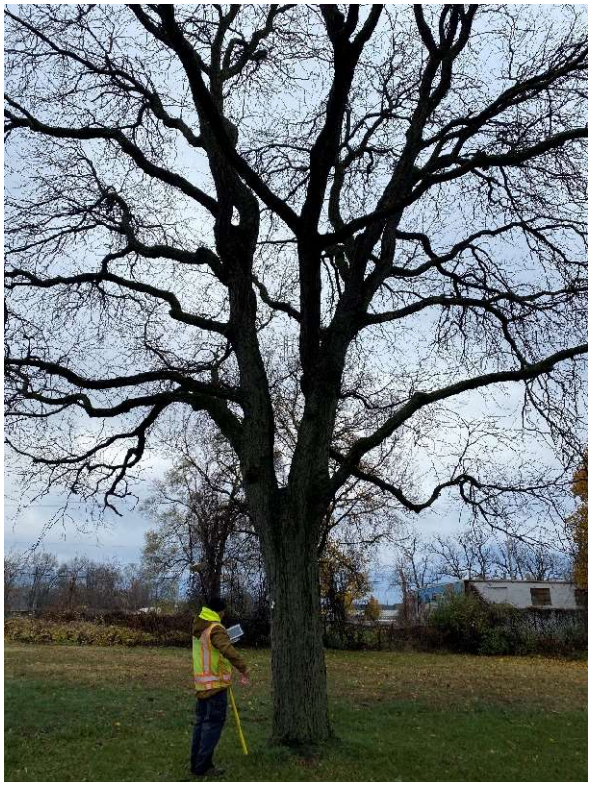
Tree #33 (IMG_0901)



Tree #34 (IMG_0902)



Tree #35 (IMG_0903)



Tree #36 (IMG_0904)



Tree #37 (IMG_0905)



Tree #38 (IMG_0906)



Tree #39 (IMG_0907)



Tree #40 (IMG_0908)



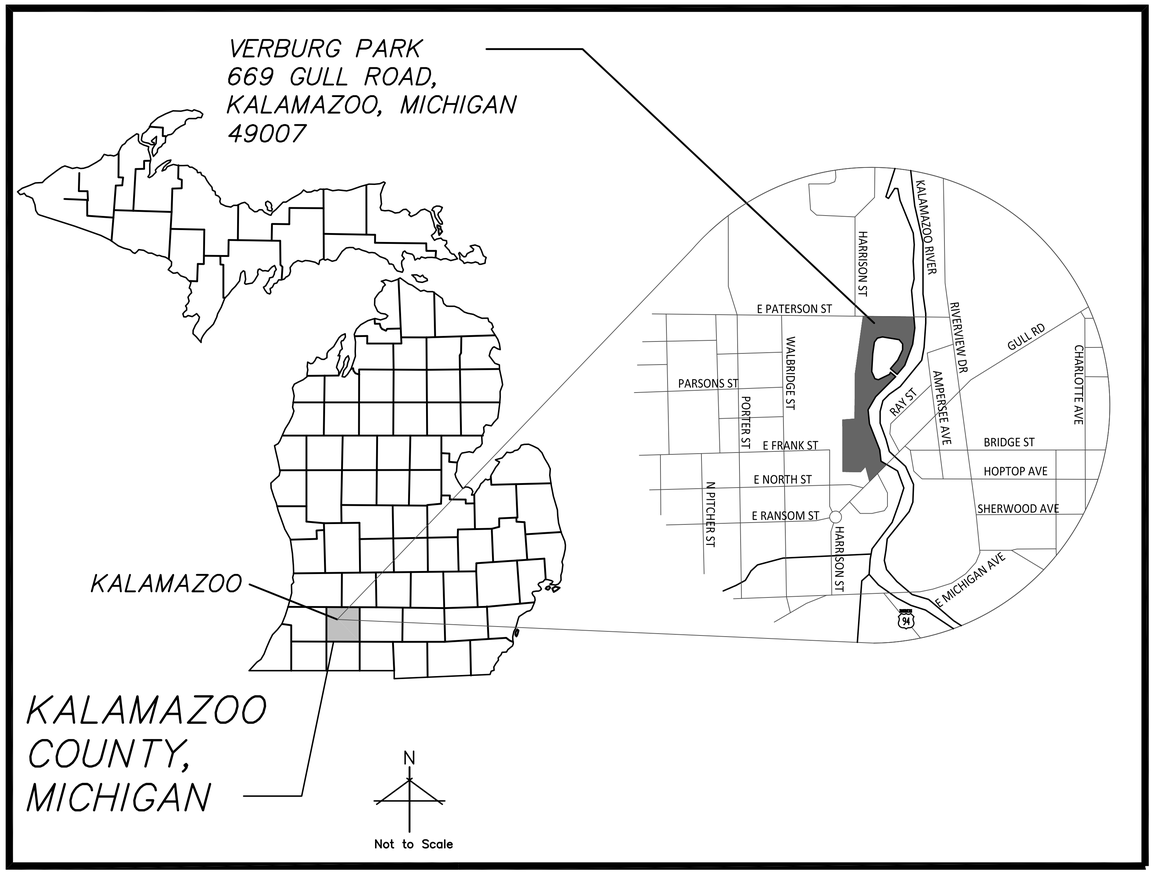
Tree #41 (IMG_0909)



CITY OF KALAMAZOO PARKS + RECREATION
VERBURG PARK IMPROVEMENTS

BID REFERENCE NO: XXXXXXXXXX
KALAMAZOO, MI

LOCATION MAP



SHEET INDEX

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C0.4	Center Demolition Enlargement Plan
C0.5	South Demolition Enlargement Plan
C2.0	North Layout Enlargement Plan
C2.1	Center Layout Enlargement Plan
C2.2	South Layout Enlargement Plan
C2.3	Layout Detail Enlargement Plan
C3.0	North Grading and SESC Enlargement Plan
C3.1	Center Grading and SESC Enlargement Plan
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C4.0	Details
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L1.3	Protected Tree Identification Plan – North
L1.4	Protected Tree Identification Plan – Center
L1.5	Protected Tree Identification Plan – South
L1.6	Woodland & Wetland Delineation Plan

OWNER:
CITY OF KALAMAZOO PARKS & RECREATION DEPT.
251 MILLS ROAD
KALAMAZOO, MICHIGAN 49048
269–337–8191 TELE
269–552–6457 FAX

LANDSCAPE ARCHITECT:
O'BOYLE COWELL BLALOCK & ASSOCIATES, INC.
141 E MICHIGAN AVE, SUITE 500
KALAMAZOO, MI, 49007
269–381–3357 TELE
269–381–2944 FAX

NOTES:
1. Except where other wise indicated on the plans or in the proposal and supplemental specifications or special provisions contained herein, all materials and workmanship shall be in accordance with Michigan Department of Transportation Standard Specifications for Construction, 1996 Edition.
2. Call Miss Dig, 1-800-482-7171 three working days, excluding Saturday, Sunday and holidays, before starting your project.

OCBA LANDSCAPE ARCHITECTS
141 E. Michigan Avenue, Suite 500
Kalamazoo Michigan 49007
Phone (269) 381-3357
Fax (269) 381-2944

Landscape Architecture
Urban Planning
Parks & Recreation
Campus & Institutional Planning
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Issued For:	Date
COK CHECKLIST MEETING	02–17–25
NFP SUBMISSION	03–27–25
SPR SUBMISSION	04–04–25

Project:

Verburg Park Improvements

Kalamazoo, MI

Sheet Title

Cover Sheet

Job No. 52411

Sheet No. C0.0

EXISTING CONDITIONS & GENERAL ZONING INFORMATION:

1. Project Address: Verburg Park, 669 Gull Road, Kalamazoo, Michigan 49007
2. Property Identification Number: 06-15-282-001
3. Owner: City of Kalamazoo Parks and Recreation Department, 251 Mills Street, Kalamazoo, Michigan 49007
4. Project Zoning: LW2 - Live-Work 2 District, Civic Lot Type.
5. Legal Description:

LAND SITUATED IN THE CITY OF KALAMAZOO, KALAMAZOO COUNTY, MICHIGAN:
COMMENCING AT THE NORTH 1/4 POST OF SECTION 15, TOWN 2 SOUTH, RANGE 11 WEST, RUNNING THENCE NORTH 90 DEGREES 00 MINUTES 00 SECONDS EAST ALONG THE NORTH LINE OF SAID SECTION 15, 1930.75 FEET; THENCE SOUTH 18 DEGREES 42 MINUTES 56 SECONDS WEST 52.91 FEET FOR THE PLACE OF BEGINNING OF THE LAND HEREAFTER DESCRIBED; THENCE NORTH 89 DEGREES 56 MINUTES 08 SECONDS WEST 79.30 FEET; THENCE SOUTH 05 DEGREES 12 MINUTES 52 SECONDS WEST 497.38 FEET; THENCE SOUTH 14 DEGREES 07 MINUTES 39 SECONDS EAST 377.46 FEET TO THE BANK OF THE KALAMAZOO RIVER; THENCE NORTH 64 DEGREES 37 MINUTES 30 SECONDS EAST ALONG THE WESTERLY BANK OF SAID RIVER, 101.96 FEET; THENCE NORTH 14 DEGREES 07 MINUTES 39 SECONDS WEST 568.07 FEET; THENCE ALONG A NON-TANGENT CURVE TO THE RIGHT, WHOSE LENGTH IS 221.71 FEET WITH A RADIUS OF 2814.90 FEET, AND A CHORD BEARING AND DISTANCE OF NORTH 15 DEGREES 54 MINUTES 44 SECONDS EAST 221.65 FEET; THENCE NORTH 18 DEGREES 42 MINUTES 56 SECONDS EAST 56.53 FEET TO THE POINT OF BEGINNING.

6. Applicable Zoning Overlays: Natural Features Protection (NFP)
7. Project location information: The project site is located along the Kalamazoo River, off the Kalamazoo River Valley Trail, with vehicular boundaries formed by Paterson Street to the north, Gull Road to the south, Walbridge Street to the west and Riverview Drive to the east.
8. The park is not located in a Historic district.
9. This park is not located within a Brownfield Redevelopment Authority.
10. This park is not located on a State/Federal list for Soil/Groundwater Contamination.
11. Refer to attached Threatened and Endangered Species Assessment Report submitted with application.
12. This park is not a RCRA/UP EPA Hazardous Waste Handler site.
13. This park is not a Solid Waste Facility.
14. No Baseline Environmental Assessments, Environmental Site Assessments or Due Care Plans have been created for this park.
15. This park is not located in a tax capture or deferment area.
16. This park is not located within any Wellhead Protection Area.
17. This park is identified as "Open Space/Parks" on the 2025 Future Land Use Plan

PROPOSED PROJECT INFORMATION

1. Gross Overall Site Area: (674,309 SF) 15.48 acres
2. Gross Area of Earth Change: 30,591 sf (0.70 acres)
3. Net Area of Open Space:
    *Existing: 637,474 sf (14.63 acres)
    *Proposed: 632,164 sf (14.51 acres)
4. Area of Regulated Wetlands: 1.17 acres, refer to Wetland Delineation Report submitted with application.
5. Impervious Area Quantities:
    *Existing:
        *Parking lot 13,863 sf (0.32 acres)
        * Trail 22,972 sf (0.53 acres);
    *Proposed:
        * Shelter & Playground Area: 1,475 sf (0.03 acres)
        * Kayak Launch Access: 251 sf (0.006 acres)
        * Pump Track: 3,584 sf (0.08 acres)

CITY OF KALAMAZOO LANDSCAPING ZONING REQUIREMENTS:

1. Site landscaping requirements: For sites greater than 1 acre, (1) tree per acre or fraction beyond shall be installed . If site falls within a natural features protection area, existing trees may not satisfy this requirement.
    *15.48 acres x (1) tree = 15.48, (16) new trees required to be planted.

2. Parking lot screening landscaping requirements: a minimum 5' wide buffer is required when parking adjoins or faces a public street. Buffer is required to contain fencing up to 42" ht. adjacent to the street and required plantings adjacent to the street. Required plantings include (1) tree per 35 lf of frontage at a consistent spacing and (1) shrub per 6 lf of frontage.
    **NOT APPLICABLE- NO ALTERATIONS OR IMPROVEMENTS BEING PROPOSED TO EXISTING PARKING AREA

3. Interior parking lot landscaping requirements: interior parking lot landscaping is required for lots containing greater than 30 spaces. A minimum of 5% of the entire parking lot area is to be provided as landscape area containing (1) tree per every 300 sf of required internal landscape area. Tree planting areas to be a minimum of 250 sf and 7' min. width covered with planting materials and mulch.
    **NOT APPLICABLE- NO ALTERATIONS OR IMPROVEMENTS BEING PROPOSED TO EXISTING PARKING AREA

NATURAL FEATURES PROTECTION OVERLAY REQUIREMENTS:

1. Wetland: When a wetland is present on a parent parcel of more than 1 acre, a 25' setback is required from the edge of the wetland. impervious surfaces are prohibited within the setback.
    * There is 228 SF of concrete walk within the 25' setback from the wetland to give barrier free access to the new accessible kayak launch.

2. Water resource: When a water resource is present on a parent parcel of more than 1 acre, a 25' setback measured from the ordinary high water mark is required. impervious surfaces are prohibited within the setback.
    * There is 60 SF of concrete walk within the 25' setback from the ordinary high water mark to give barrier free access to the new accessible kayak launch.

3. Protected trees: Existing trees not part of a woodland and appearing on the protected tree list identified in the City of Kalamazoo zoning ordinance, require protection of the critical root zone from construction activities. If it is necessary to remove a protected tree, replacement is to be per requirements in ordinance.
    **NOT APPLICABLE - NO EXISTING TREES ARE BEING REMOVED. EXISTING TREES IN VICINITY OF CONSTRUCTION ACTIVITIES WILL BE PROTECTED WITH FENCING

4. Woodland: If an area is determined to meet the requirements of woodland, it must be preserved as outlined in the ordinance. No disturbance is permitted in the area as defined by its critical root zone and must be protected during construction.
    **NOT APPLICABLE - WOODLAND AREA IS DELINEATED ON PLANS. NO CONSTRUCTION ACTIVITY IS PROPOSED IN VICINITY OF WOODLAND LIMITS

5. Slopes: Slopes are considered protected if they have a grade of 20% or greater and contain a woodland, contain a natural heritage area, are located within 500' of a wetland or water resource, or if any portion of the slope extends onto adjacent parcels.
    **NOT APPLICABLE- NO WORK PROPOSED IN AREAS OF SLOPES 20% OR GREATER

SITE PLAN REVIEW ZONING TABLE:

1) Building Location: Pavilion located on Sheet C2.3
    * Pavilion Structure Elevation is attached to application. Proposed buliding is one (1) story, no windows or doors, metal rib roofing, and no lighting.
    * Gross Floor Area of Existing Building: 0 SF
    * Gross Floor Area of Proposed Building: 400 SF (0.009 acres)
    * Building Classification: Utility
    * Number of Existing Residential Units by Type: 0
    * Number of Proposed Residential Units by Type: 0
2) Zoning District: LW-2
3) Impervious Coverage (Pre-Development): 36,835 sf (0.85 acres), 0.054% of overall site
4) Impervious Coverage (Post-Development): 42,145 sf (0.97 acres), 0.063% of overall site
5) Existing Parking Layout and Drive: Sheet C0.3
    * Thirty-nine (39) parking spaces
    * Two (2) barrier free parking spaces
    * Net Area of Existing Parking Lot Landscaping: 0
    * Net Area of Proposed Parking Lot Landscaping: 0
    * Net Area of Existing Off-Street Parking: 13,863 SF (0.32 acres)
    * Net Area of Proposed Off-Street Parking: 0
6) Existing lighting: There is no existing lighting in the park and there will be no proposed lighting in the park.
7) Refer to Sheet C0.3, C0.4, and C0.5 for existing signage information. (1) new standard park sign proposed for this project.
8) Site Access for All Modes: Refer to Sheet C2.0, C2.1, C2.2 and C2.3.
    * All existing vehicle, pedestrian, and bicycle access to remain.
    * Vehicular access to the site is provided by an existing singular drive on Paterson Avenue. Pedestrian and bicycle access is available on the Kalamazoo River Valley Trailway from Paterson Avenue to the north and Gull Road to the south.
    * Number of Bicycle Racks Required by Zoning: (1) bike space per 5,000 sf of open park space. Therefore, 674,308 sf/5,000 sf = (135) bike spaces required.
    * Number of Existing Bicycle Spaces: (2) racks for (5) bikes = (10) bicycle parking spaces
    * Number of Proposed Bicycle Spaces included in Project: Six (6) with three (3) singular bike loops.
9) Refuse: There are no refuse containers existing on site. There is one (1) new trash receptacle to be installed next to the pavilion. Refer to Sheet C2.3
10) Landscape Plan: Refer to Sheet L1.0, L1.1, and L1.2

ZONING FORM STANDARDS:

1) Lot Type: Civic Lot
2) Entry Type:
    * No formal entry for pavilion, all four (4) sides are open for access
    *Entrance not located on streetfront.
    * No facade treatments on pavilion structure
3) Number of Entrances: Not restricted, structure open on all sides.
4) Setbacks/BTZ:
    * Front: 0'-25'
    * Side: 0'
    * Rear: 0'-10'
5) Transparency: 100%
6) Number and location of Driveways:
    * (1) existing driveway located at Patterson Street to remain.
    * No new driveways proposed for this project.

OCBA
LANDSCAPE ARCHITECTS

141 E. Michigan Avenue, Suite 500
Kalamazoo Michigan 49007
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Issued For:	Date
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NFP SUBMISSION	03–27–25

Project:

Verburg Park Improvements

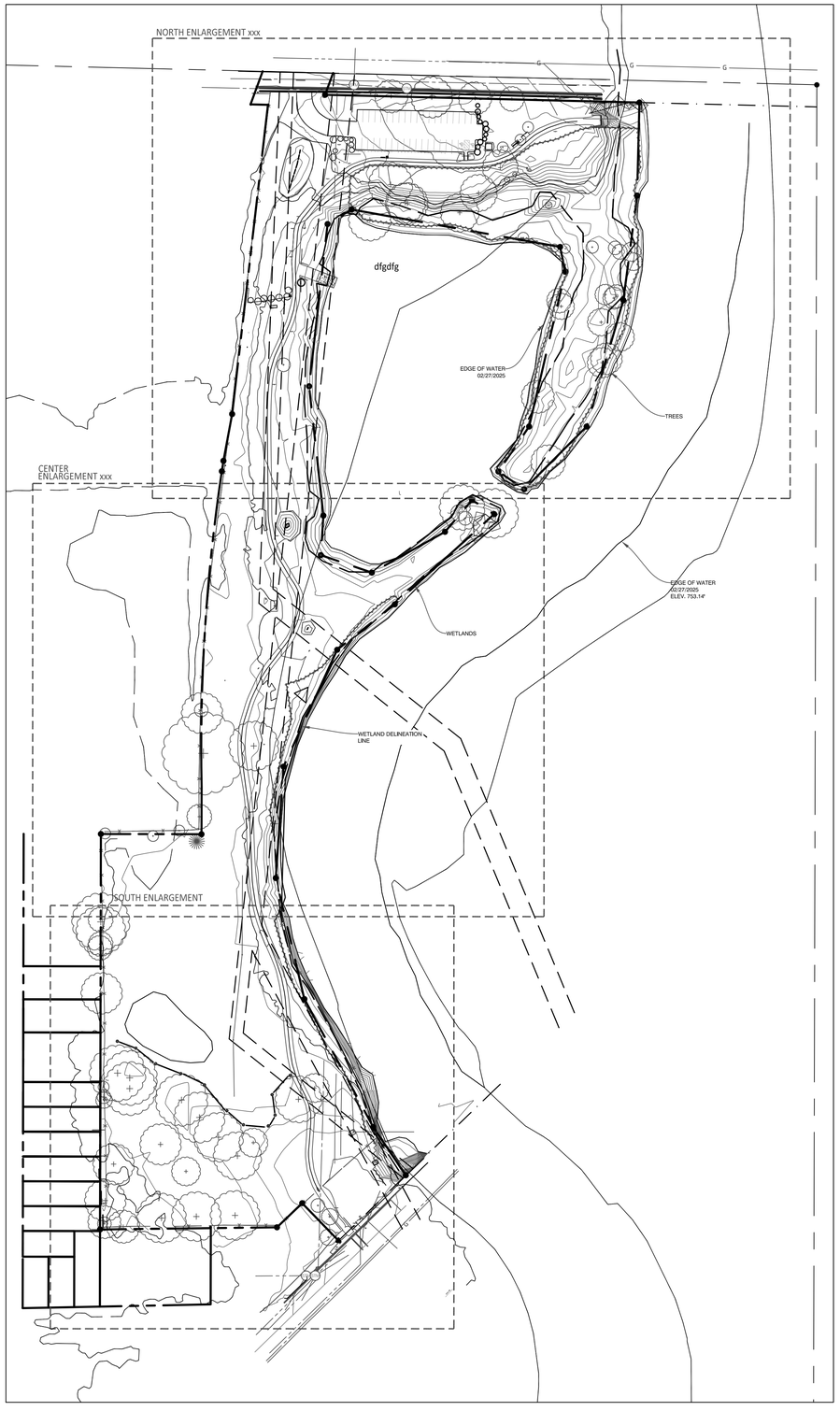
Kalamazoo, MI

Sheet Title

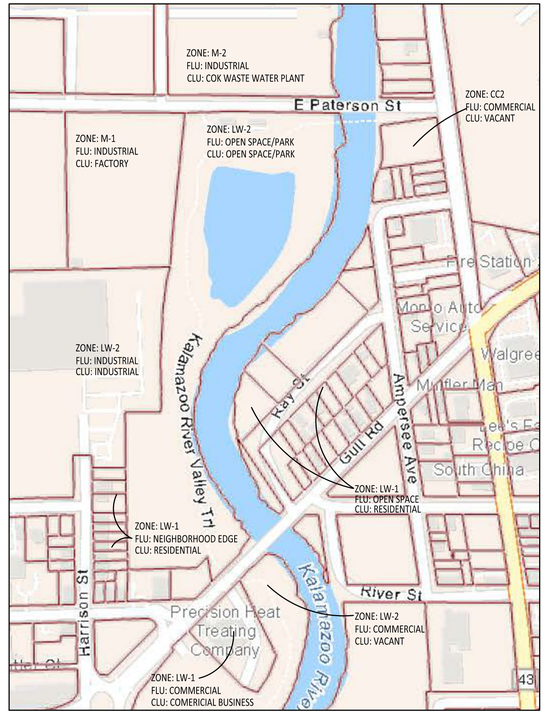
Code Sheet

Job No. 52411

Sheet No. C0.1



1 **Existing Conditions, Demolition, + Key Plan**
Scale: 1" = 100'-0"



1 **Site Vicinity Map**
Not to Scale

DEMOLITION NOTES:

1. SURVEY OF EXISTING CONDITIONS PROVIDED BY AR ENGINEERING, 5725 VENTURE PARK DRIVE, SUITE A, KALAMAZOO, MICHIGAN 49009, (269)250-5991.
2. VERIFY LOCATIONS OF ALL BELOW GRADE UTILITIES PRIOR TO BEGINNING WORK. 72 HOURS BEFORE YOU DIG CALL "MISS DIG" AT 1-800-482-7171.
3. PROTECT ALL TREES & EXISTING FEATURES TO REMAIN AS SPECIFIED.
4. REFER TO LAYOUT PLAN FOR LIMITS OF WORK.
5. DISCREPANCIES BETWEEN SITE AND PLANS SHOULD BE REPORTED TO THE PROJECT MANAGER IMMEDIATELY.
6. ALL AREAS OF TREE CLEARING SHALL BE STAKED FOR ARCHITECT'S APPROVAL PRIOR TO CLEARING.
7. ALL TOPSOIL AND EXCESS FILL MATERIAL SHALL BE STOCKPILED ON SITE SEPARATELY FOR LATER RE-USE. LOCATE STOCKPILES IN AREAS AS DIRECTED BY CONSTRUCTION MANAGER AND PROTECT FROM EFFECTS OF EROSION.

DEMOLITION LEGEND:

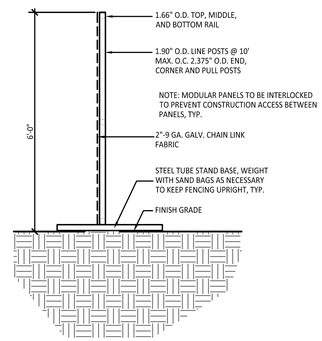
- REMOVE BITUMINOUS PAVEMENT AND BASE
- NO WORK, PARKING OR STORAGE IN THIS SHADED AREA
- REMOVE MISCELLANEOUS FEATURE AS NOTED
- TEMPORARY TREE PROTECTION FENCE, 2/C0.2
- LIMIT OF WORK
- FEMA FLOODWAY BOUNDARY LINE
- FEMA 100-YEAR FLOODPLAIN BOUNDARY LINE
- FEMA 500-YEAR FLOODPLAIN BOUNDARY LINE

TREE PROTECTION NOTES:

PROVIDE AND MAINTAIN TEMPORARY TREE PROTECTION FENCING IN ALL LOCATIONS MARKED ●——●——●——●——●. TREE FENCING SHALL BE PROVIDED AND IN PLACE PRIOR TO ANY WORK ON SITE (INCLUDING TOPSOIL STRIPPING OPERATIONS). REFER TO THE FOLLOWING NOTES AND THE SPECIFICATIONS FOR TREE PROTECTION REQUIREMENTS.

1. NO CONSTRUCTION OPERATIONS, EQUIPMENT, MATERIALS OR TOPSOIL SHALL BE ALLOWED WITHIN THE TREE PROTECTION AREAS.
2. EXISTING GROUND COVER AND TOPSOIL SHALL NOT BE REMOVED FROM TREE PROTECTION AREAS DURING EARTHWORK PHASE.
3. VEHICULAR TRAFFIC, PARKING, EQUIPMENT OR MATERIAL STORAGE MAY NOT OCCUR WITHIN THE TREE PROTECTION AREAS AT ANY TIME.
4. NO EXCAVATION SHALL BE MADE WITHIN THE TREE PROTECTION AREAS EXCEPT AS NOTED OTHERWISE.

IMPORTANT NOTE: ALL TREE PROTECTION FENCING SHALL BE INSTALLED PRIOR TO COMMENCEMENT OF DEMOLITION AND NEW CONSTRUCTION.



2 **Tree Protection Fencing Detail**
Not To Scale

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Issued For:	Date
COK CHECKLIST MEETING	02–17–25
NFP SUBMISSION	03–27–25

Project:

Verburg Park Improvements

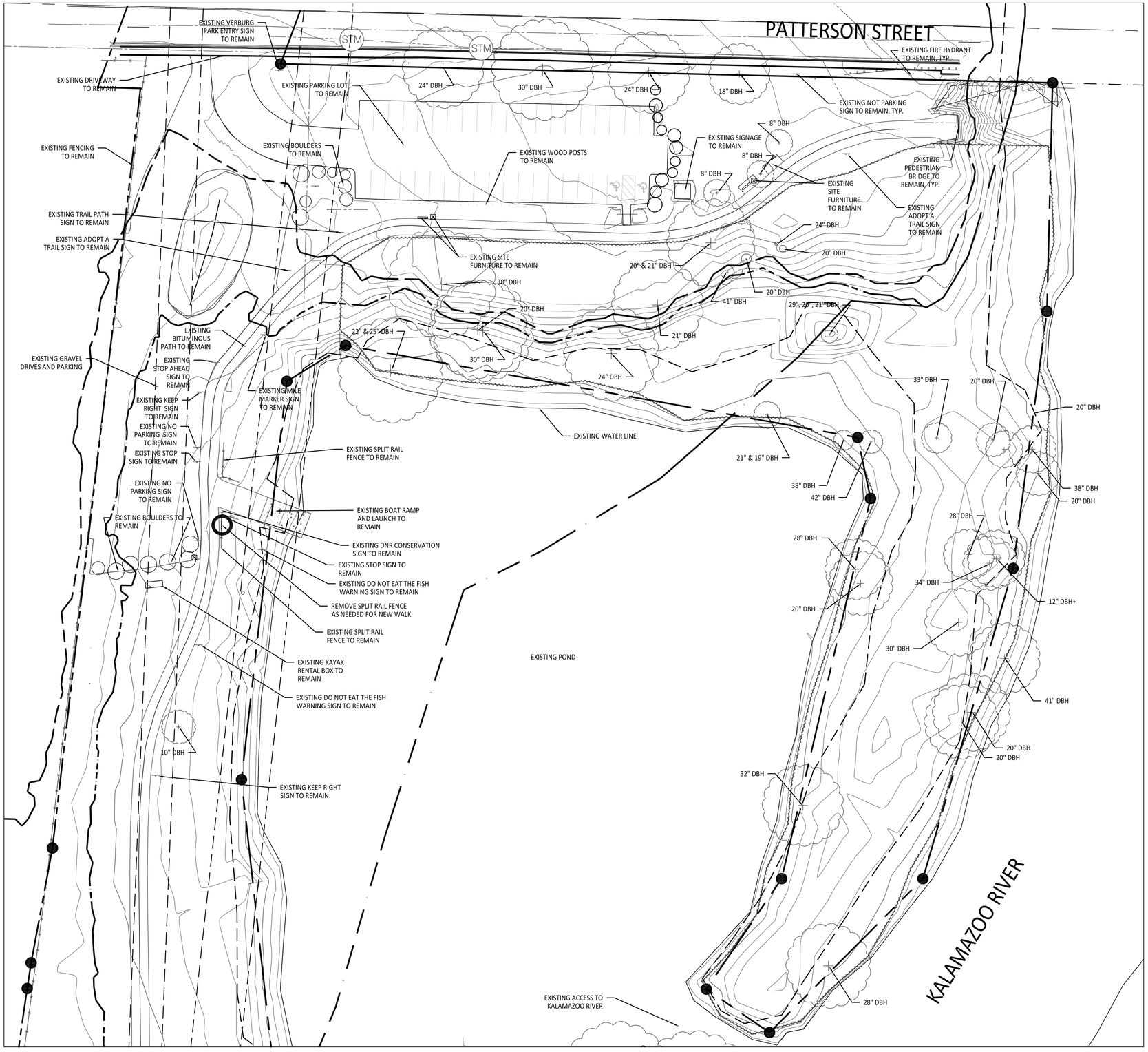
Kalamazoo, MI

Sheet Title
Ex. Conditions, Demolition + Key Plan

0 100 200 300
North
SCALE IN FEET

Job No. 52411

Sheet No. C0.2



1 **Existing Conditions + Demolition North Enlargement Plan**
Scale: 1" = 30'-0"

DEMOLITION NOTES:

1. SURVEY OF EXISTING CONDITIONS PROVIDED BY AR ENGINEERING, 5725 VENTURE PARK DRIVE, SUITE A, KALAMAZOO, MICHIGAN 49009, (269)250-5991.
2. VERIFY LOCATIONS OF ALL BELOW GRADE UTILITIES PRIOR TO BEGINNING WORK. 72 HOURS BEFORE YOU DIG CALL "MISS DIG" AT 1-800-482-7171.
3. PROTECT ALL TREES & EXISTING FEATURES TO REMAIN AS SPECIFIED.
4. REFER TO LAYOUT PLAN FOR LIMITS OF WORK.
5. DISCREPANCIES BETWEEN SITE AND PLANS SHOULD BE REPORTED TO THE PROJECT MANAGER IMMEDIATELY.
6. ALL AREAS OF TREE CLEARING SHALL BE STAKED FOR ARCHITECT'S APPROVAL PRIOR TO CLEARING.
7. ALL TOPSOIL AND EXCESS FILL MATERIAL SHALL BE STOCKPILED ON SITE SEPARATELY FOR LATER RE-USE. LOCATE STOCKPILES IN AREAS AS DIRECTED BY CONSTRUCTION MANAGER AND PROTECT FROM EFFECTS OF EROSION.

DEMOLITION LEGEND:

- REMOVE BITUMINOUS PAVEMENT AND BASE
- NO WORK, PARKING OR STORAGE IN THIS SHADED AREA
- REMOVE MISCELLANEOUS FEATURE AS NOTED
- TEMPORARY TREE PROTECTION FENCE, 2/C0.2
- LIMIT OF WORK
- FEMA FLOODWAY BOUNDARY LINE
- FEMA 100-YEAR FLOODPLAIN BOUNDARY LINE
- FEMA 500-YEAR FLOODPLAIN BOUNDARY LINE

TREE PROTECTION NOTES:

PROVIDE AND MAINTAIN TEMPORARY TREE PROTECTION FENCING IN ALL LOCATIONS MARKED ——•——•——•—— TREE FENCING SHALL BE PROVIDED AND IN PLACE PRIOR TO ANY WORK ON SITE (INCLUDING TOPSOIL STRIPPING OPERATIONS). REFER TO THE FOLLOWING NOTES AND THE SPECIFICATIONS FOR TREE PROTECTION REQUIREMENTS.

1. NO CONSTRUCTION OPERATIONS, EQUIPMENT, MATERIALS OR TOPSOIL SHALL BE ALLOWED WITHIN THE TREE PROTECTION AREAS.
2. EXISTING GROUND COVER AND TOPSOIL SHALL NOT BE REMOVED FROM TREE PROTECTION AREAS DURING EARTHWORK PHASE.
3. VEHICULAR TRAFFIC, PARKING, EQUIPMENT OR MATERIAL STORAGE MAY NOT OCCUR WITHIN THE TREE PROTECTION AREAS AT ANY TIME.
4. NO EXCAVATION SHALL BE MADE WITHIN THE TREE PROTECTION AREAS EXCEPT AS NOTED OTHERWISE.

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Issued For:	Date
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NFP SUBMISSION	03-27-25

Project:

Verburg Park Improvements

Kalamazoo, MI

Sheet Title

Ex. Conditions + Demolition North Enlargement Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

Sheet No. **C0.3**



1 **Existing Conditions + Demolition Center Enlargement Plan**
Scale: 1" = 30'-0"

DEMOLITION NOTES:

1. SURVEY OF EXISTING CONDITIONS PROVIDED BY AR ENGINEERING, 5725 VENTURE PARK DRIVE, SUITE A, KALAMAZOO, MICHIGAN 49009, (269)250-5991.
2. VERIFY LOCATIONS OF ALL BELOW GRADE UTILITIES PRIOR TO BEGINNING WORK. 72 HOURS BEFORE YOU DIG CALL "MISS DIG" AT 1-800-482-7171.
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4. REFER TO LAYOUT PLAN FOR LIMITS OF WORK.
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7. ALL TOPSOIL AND EXCESS FILL MATERIAL SHALL BE STOCKPILED ON SITE SEPARATELY FOR LATER RE-USE. LOCATE STOCKPILES IN AREAS AS DIRECTED BY CONSTRUCTION MANAGER AND PROTECT FROM EFFECTS OF EROSION.

DEMOLITION LEGEND:

- REMOVE BITUMINOUS PAVEMENT AND BASE
- NO WORK, PARKING OR STORAGE IN THIS SHADED AREA
- REMOVE MISCELLANEOUS FEATURE AS NOTED
- TEMPORARY TREE PROTECTION FENCE, 2/C0.2
- LIMIT OF WORK
- FEMA FLOODWAY BOUNDARY LINE
- FEMA 100-YEAR FLOODPLAIN BOUNDARY LINE
- FEMA 500-YEAR FLOODPLAIN BOUNDARY LINE

TREE PROTECTION NOTES:

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Issued For:	Date
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NFP SUBMISSION	03-27-25

Project:

Verburg Park Improvements

Kalamazoo, MI

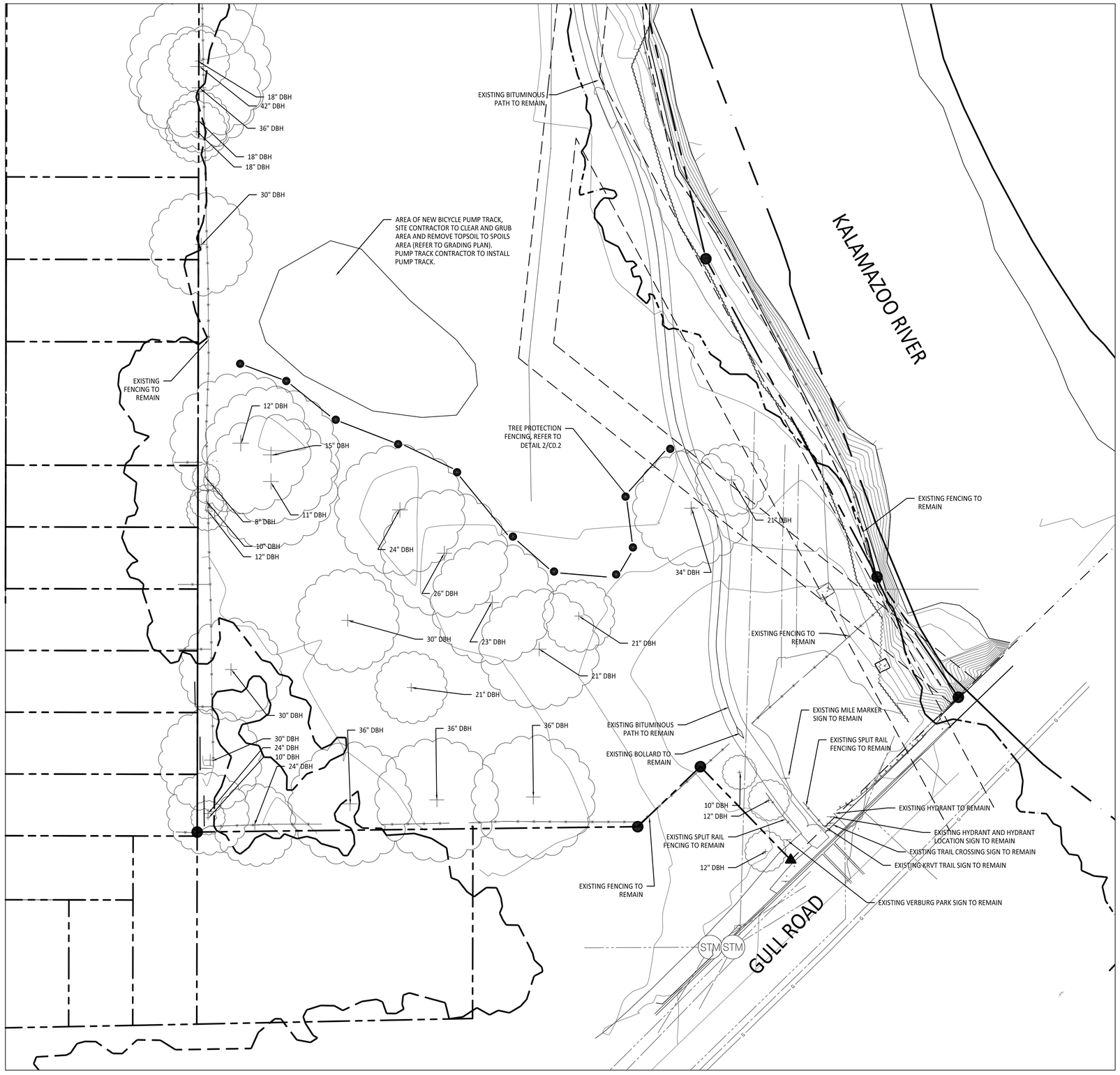
Sheet Title

Ex. Conditions + Demolition Center Enlargement Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

Sheet No. C0.4



1 **Existing Conditions + Demolition South Enlargement Plan**
Scale: 1" = 30'-0"

DEMOLITION NOTES:

1. SURVEY OF EXISTING CONDITIONS PROVIDED BY AR ENGINEERING, 5725 VENTURE PARK DRIVE, SUITE A, KALAMAZOO, MICHIGAN 49009, (269)250-5991.
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4. REFER TO LAYOUT PLAN FOR LIMITS OF WORK.
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DEMOLITION LEGEND:

- REMOVE BITUMINOUS PAVEMENT AND BASE
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- REMOVE MISCELLANEOUS FEATURE AS NOTED
- TEMPORARY TREE PROTECTION FENCE, 2/C0.2
- LIMIT OF WORK
- FEMA FLOODWAY BOUNDARY LINE
- FEMA 100-YEAR FLOODPLAIN BOUNDARY LINE
- FEMA 500-YEAR FLOODPLAIN BOUNDARY LINE

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3. VEHICULAR TRAFFIC, PARKING, EQUIPMENT OR MATERIAL STORAGE MAY NOT OCCUR WITHIN THE TREE PROTECTION AREAS AT ANY TIME.
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Issued For:	Date
COK CHECKLIST MEETING	02-17-25
NFP SUBMISSION	03-27-25

Project:

Verburg Park Improvements

Kalamazoo, MI

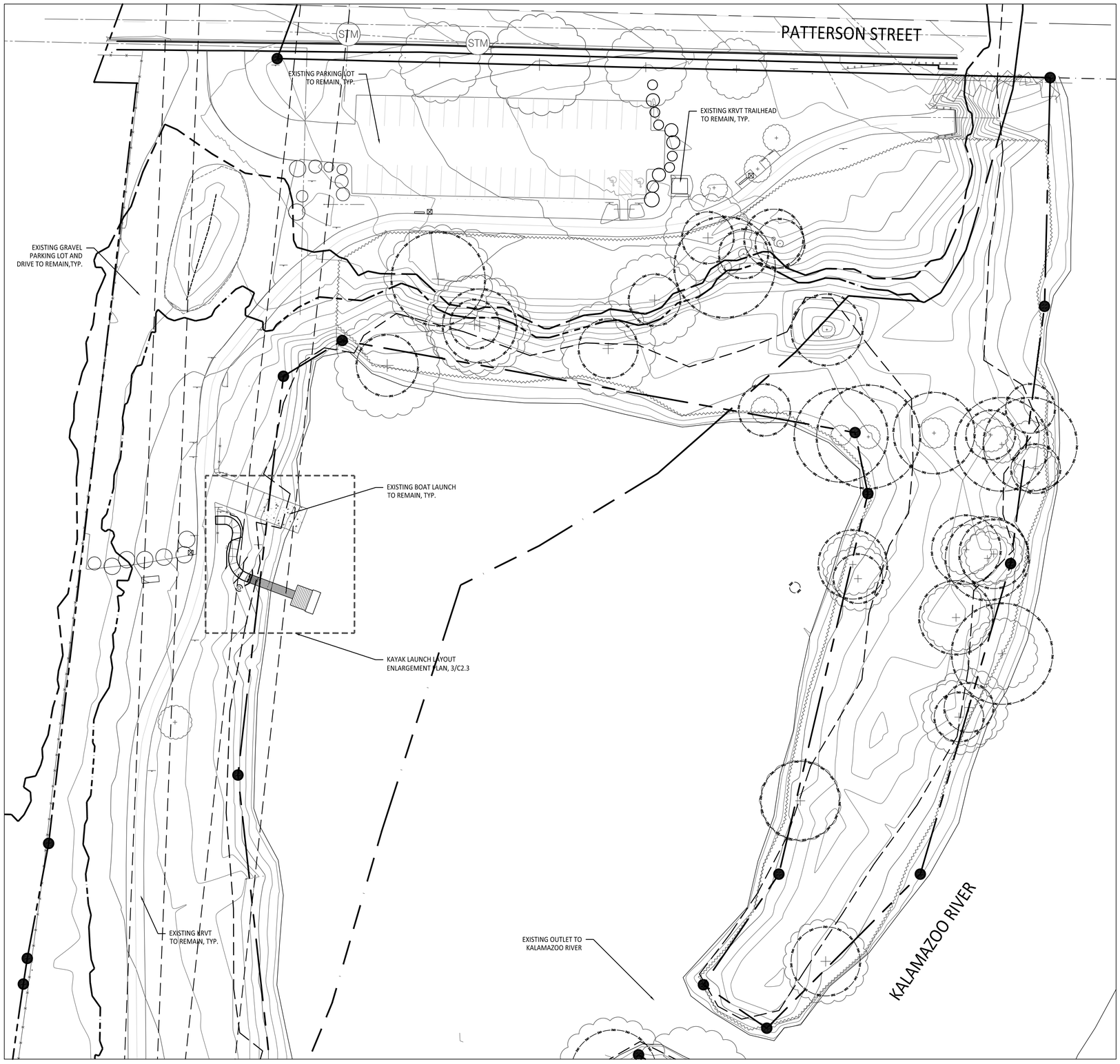
Sheet Title

Ex. Conditions + Demolition South Enlargement Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

Sheet No. C0.5



1 **NORTH LAYOUT ENLARGEMENT PLAN**
Scale: 1" = 30'-0"

LAYOUT NOTES:

1. SURVEY OF EXISTING CONDITIONS PROVIDED BY AR ENGINEERING, 5725 VENTURE PARK DR, SUITE A, KALAMAZOO, MICHIGAN 49009, (269)250-5991.
2. PAVEMENT DIMENSIONS AND RADII ARE TO EDGE OF PAVEMENT OR BACK OF CURB.
3. DISCREPANCIES BETWEEN SITE AND PLANS SHOULD BE REPORTED TO THE PROJECT MANAGER IMMEDIATELY.
4. VERIFY LOCATIONS OF ALL BELOW GRADE UTILITIES PRIOR TO BEGINNING WORK. 72 HOURS BEFORE YOU DIG CALL "MISS DIG" AT 1-800-482-7171.
5. PROVIDE BARRIER FREE PARKING SIGNS FOR ALL BARRIER FREE PARKING SPACES. ALL SIGNS TO COMPLY WITH THE MDOT MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.
6. SITE LAYOUT POINTS SHOULD BE ESTABLISHED AND PROTECTED FOR FUTURE SITE WORK.

PROPOSED FEATURES LEGEND:

SYMBOL	DESCRIPTION	
	LOOSE FILL RESILIENT SAFETY SURFACING (BY OTHERS)	
	LIMIT OF WORK	
	ENLARGEMENT LIMIT LINE	
KEY	DESCRIPTION	DETAIL
A	PLAY AREA ACCESS RAMP	7/C4.0
B	THICKENED EDGE CONCRETE WALK AND CURB	3/C4.0
C	CONCRETE WALK	2/C4.0
D	STRAIGHT FACED CURB	4/C4.0
E	PLASTIC PLAY EDGING (BY OTHERS)	
F	LOOSE FILL RESILIENT SAFETY SURFACING (BY OTHERS)	
G	20'X20' METAL ROOFED STRUCTURE	1/C4.1
H	ACCESSIBLE KAYAK LAUNCH (BY OTHERS)	
J	KAYAK LAUNCH GANGWAY CURB	1/C4.0
K	ASPHALT PAVED BICYCLE PUMP TRACK (BY OTHERS)	
L	PICNIC TABLES	5/C4.1
M	BIKE RACK	4/C4.1
N	TRASH RECEPTACLES	7/C4.1

BARRIER-FREE NOTES

BARRIER-FREE PARKING AND ACCESSIBLE ROUTE(S) MUST COMPLY WITH THE AMERICANS WITH DISABILITIES ACT AND MICHIGAN BARRIER-FREE CODE REQUIREMENTS, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

- 1:50 (2%) MAXIMUM CROSS-SLOPE ON ACCESSIBLE ROUTE.
- NO CHANGES IN LEVEL GREATER THAN 1/2" ALONG ACCESSIBLE ROUTE.
- 1:20 (5%) MAXIMUM LONGITUDINAL SLOPE ON ACCESSIBLE ROUTE (EXCEPT WHERE RAMPS ARE PROVIDED).
- 1:50 (2%) MAXIMUM SLOPE (IN ANY DIRECTION) IN B.F. PARKING AND ACCESS AISLES.

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Issued For:	Date
COK CHECKLIST MEETING	02–17–25
NFP SUBMISSION	03–27–25
SPR SUBMISSION	04–04–25

Project:

Verburg Park Improvements

Kalamazoo, MI

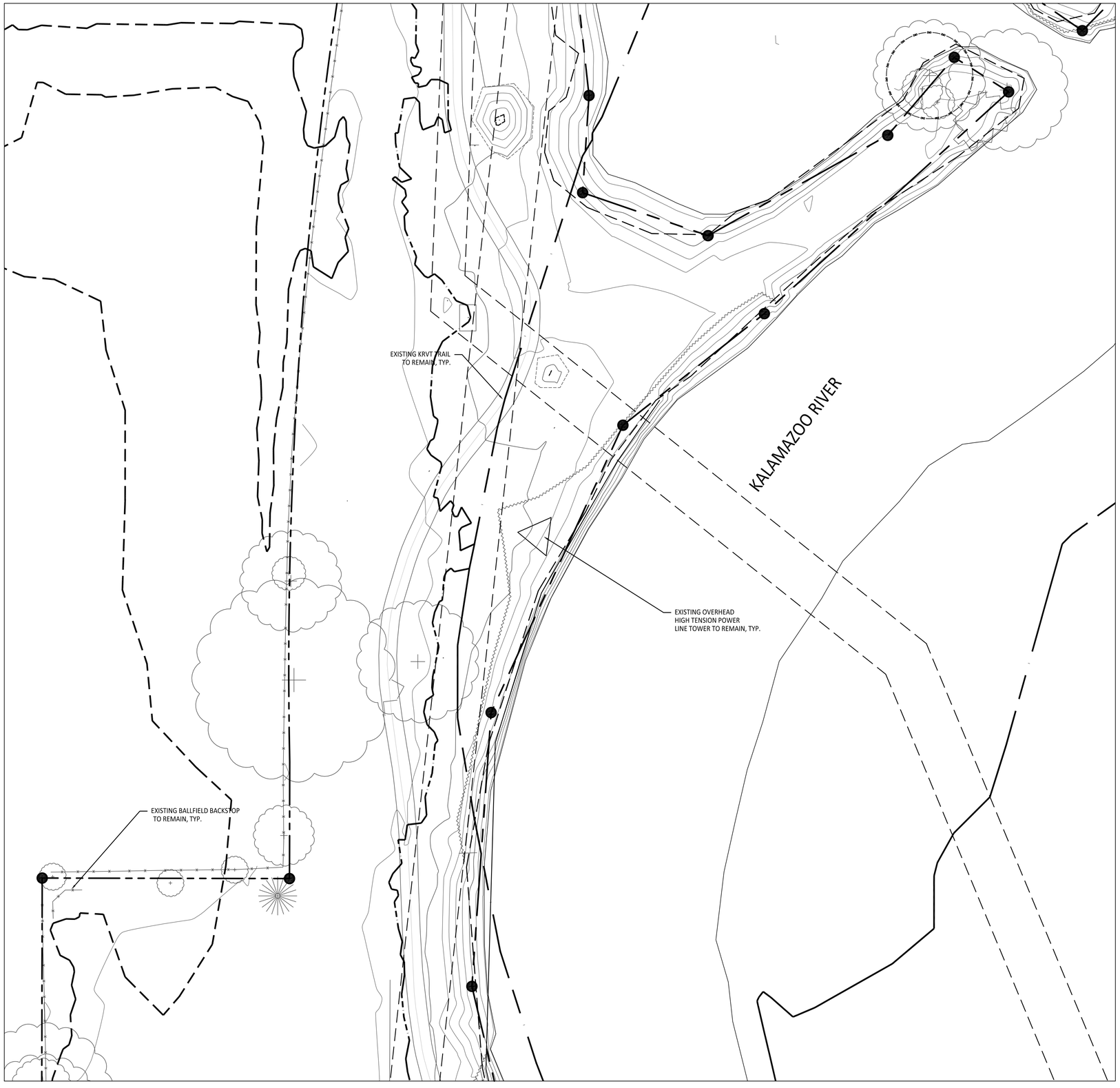
Sheet Title

North Layout Enlargement Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

Sheet No. C2.0



1 **CENTER LAYOUT ENLARGEMENT PLAN**
Scale: 1" = 30'-0"

LAYOUT NOTES:

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6. SITE LAYOUT POINTS SHOULD BE ESTABLISHED AND PROTECTED FOR FUTURE SITE WORK.

PROPOSED FEATURES LEGEND:

SYMBOL	DESCRIPTION
	LOOSE FILL RESILIENT SAFETY SURFACING (BY OTHERS)
	LIMIT OF WORK
	ENLARGEMENT LIMIT LINE

KEY	DESCRIPTION	DETAIL
A	PLAY AREA ACCESS RAMP	7/C4.0
B	THICKENED EDGE CONCRETE WALK AND CURB	3/C4.0
C	CONCRETE WALK	2/C4.0
D	STRAIGHT FACED CURB	4/C4.0
E	PLASTIC PLAY EDGING (BY OTHERS)	
F	LOOSE FILL RESILIENT SAFETY SURFACING (BY OTHERS)	
G	20'X20' METAL ROOFED STRUCTURE	1/C4.1
H	ACCESSIBLE KAYAK LAUNCH (BY OTHERS)	
J	KAYAK LAUNCH GANGWAY CURB	1/C4.0
K	ASPHALT PAVED BICYCLE PUMP TRACK (BY OTHERS)	
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SPR SUBMISSION	04–04–25

Project:

Verburg Park Improvements

Kalamazoo, MI

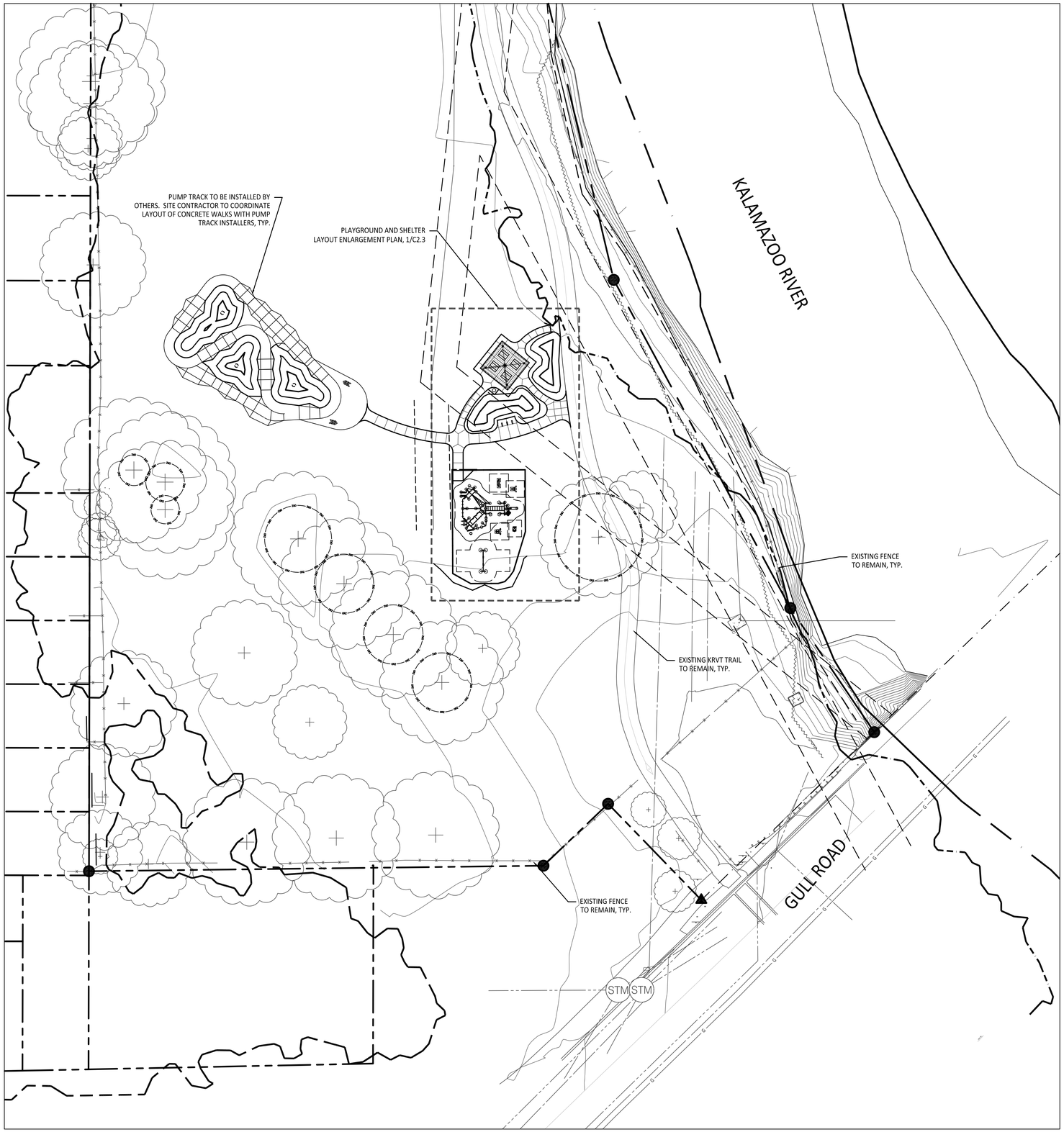
Sheet Title

Center Enlargement Layout Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

Sheet No. C2.1



1 **CENTER LAYOUT ENLARGEMENT PLAN**
Scale: 1" = 30'-0"

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PROPOSED FEATURES LEGEND:

SYMBOL	DESCRIPTION
	LOOSE FILL RESILIENT SAFETY SURFACING (BY OTHERS)
	LIMIT OF WORK
	ENLARGEMENT LIMIT LINE

KEY	DESCRIPTION	DETAIL
A	PLAY AREA ACCESS RAMP	7/C4.0
B	THICKENED EDGE CONCRETE WALK AND CURB	3/C4.0
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E	PLASTIC PLAY EDGING (BY OTHERS)	
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- 1:50 (2%) MAXIMUM SLOPE (IN ANY DIRECTION) IN B.F. PARKING AND ACCESS AISLES.

CONTRACTOR COORDINATION NOTES:

SITE CONTRACTOR AND PLAYGROUND CONTRACTOR ARE REQUIRED TO COORDINATE BOTH WITH EACH OTHER PRIOR TO AND DURING CONSTRUCTION. THE INSTALLATION PROCESS FOR THE PLAYGROUND SAFETY SURFACING SHOULD BE AS FOLLOWS:

* SITE CONTRACTOR TO EXCAVATE THE PLAYGROUND AREA AS SHOWN ON CONSTRUCTION DOCUMENTS AND INSTALL ALL CONCRETE CURBING AND ACCESS RAMP. THE SITE CONTRACTOR MUST COORDINATE DEPTHS OF EXCAVATION WITH PLAYGROUND CONTRACTOR PRIOR TO START OF WORK.

* THE PLAYGROUND CONTRACTOR WILL THEN INSTALL THE POSTS AND FOOTINGS FOR ALL EQUIPMENT IN THE PLAYGROUND AREA FIRST AND THE PLASTIC CURBING.

* THE SITE CONTRACTOR WILL THEN INSTALL THE DRAINAGE AGGREGATE IN THE PLAYGROUND AREA, TAKING CARE TO NOT DAMAGE THE POSTS OR POWDERCOATING OF THE PLAY EQUIPMENT.

* WHEN THE SITE CONTRACTOR HAS COMPLETELY INSTALLED THE DRAINAGE AGGREGATE IN THE PLAYGROUND AREA, THE PLAYGROUND CONTRACTOR WILL INSTALL THE LOOSE FILL SAFETY SURFACING IN THE PLAYGROUND AREA.

* THE PLAYGROUND CONTRACTOR WILL INSTALL ALL OF THE PLAYGROUND EQUIPMENT AND LOOSE FILL SAFETY SURFACING FOR THE PLAYGROUND AREA .

NOTE: VERIFY LOCATION OF NEW PLAYGROUND EQUIPMENT PRIOR TO INSTALLATION OF ANY CONCRETE CURB. CONCRETE CURB TO BE INSTALLED OUTSIDE OF FALL SAFETY ZONE OF EACH PIECE OF EQUIPMENT PER ASTM 1487-05 AND MANUFACTURER'S WRITTEN RECOMMENDATIONS.

NOTE: PLAYGROUND EQUIPMENT AND SURFACING PURCHASE AND INSTALLATION IS UNDER SEPARATE CONTRACT AND IS NOT INCLUDED IN THIS BID PACKAGE. CONTRACTOR IS REQUIRED TO COORDINATE INSTALLATION OF PLAYGROUND EQUIPMENT AND SURFACING WITH PLAYGROUND INSTALLER PRIOR TO ANY EXCAVATION AND CONCRETE CURBING OR PAVING INSTALLATION.

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NFP SUBMISSION	03-27-25
SPR SUBMISSION	04-04-25

Project:

Verburg Park Improvements

Kalamazoo, MI

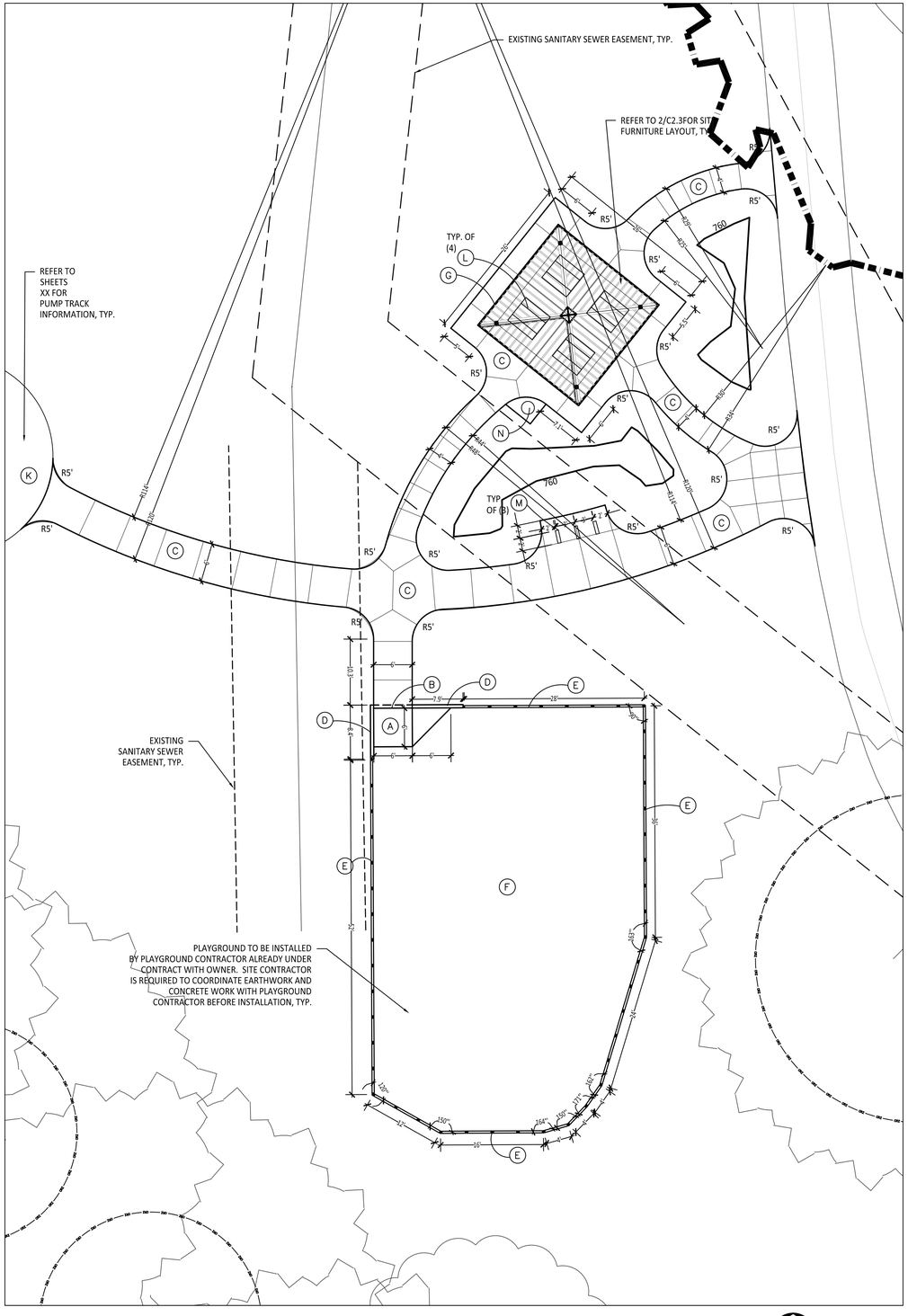
Sheet Title

South Enlargement Layout Plan

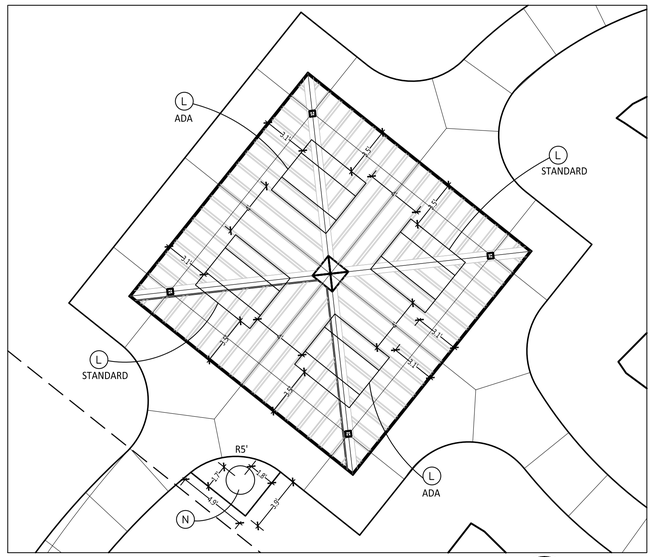
0 30 60 90
North
SCALE IN FEET

Job No. 52411

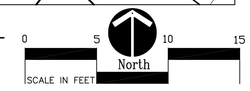
Sheet No. C2.2



1 **Playground and Shelter Layout Enlargement Plan**
Scale: 1" = 10'-0"



2 **Site Furniture Layout Enlargement Plan**
Scale: 1" = 5'-0"



BARRIER-FREE NOTES

BARRIER-FREE PARKING AND ACCESSIBLE ROUTE(S) MUST COMPLY WITH THE AMERICANS WITH DISABILITIES ACT AND MICHIGAN BARRIER-FREE CODE REQUIREMENTS, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

- 1:50 (2%) MAXIMUM CROSS-SLOPE ON ACCESSIBLE ROUTE.
- NO CHANGES IN LEVEL GREATER THAN 1/2" ALONG ACCESSIBLE ROUTE.
- 1:20 (5%) MAXIMUM LONGITUDINAL SLOPE ON ACCESSIBLE ROUTE (EXCEPT WHERE RAMPS ARE PROVIDED).
- 1:50 (2%) MAXIMUM SLOPE (IN ANY DIRECTION) IN B.F. PARKING AND ACCESS AISLES.

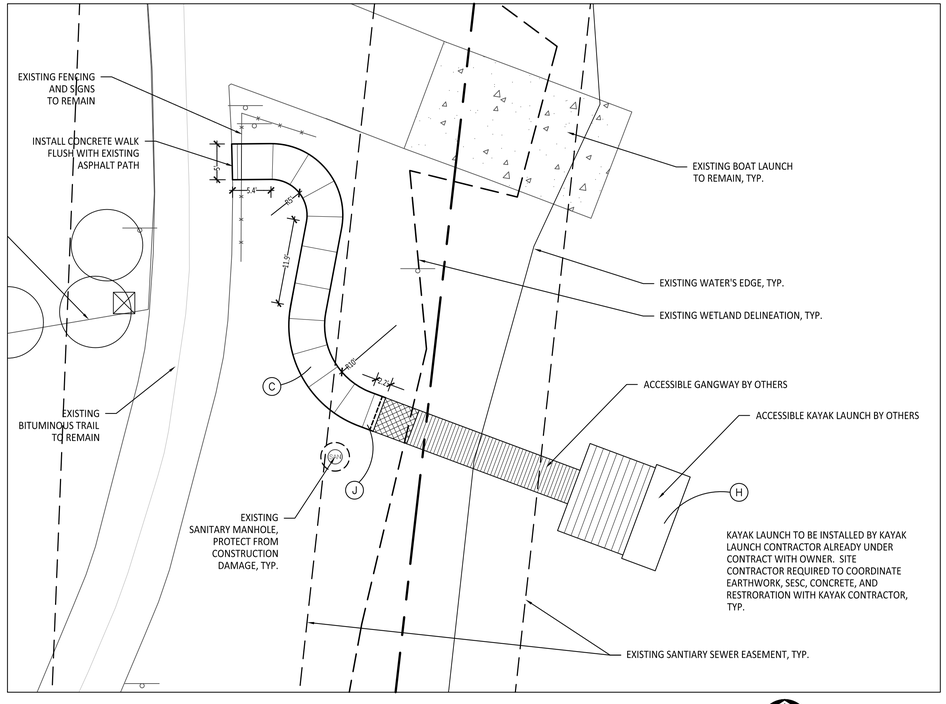
LAYOUT NOTES:

1. SURVEY OF EXISTING CONDITIONS PROVIDED BY AR ENGINEERING, 5725 VENTURE PARK DR, SUITE A, KALAMAZOO, MICHIGAN 49009, (269)250-5991.
2. PAVEMENT DIMENSIONS AND RADII ARE TO EDGE OF PAVEMENT OR BACK OF CURB.
3. DISCREPANCIES BETWEEN SITE AND PLANS SHOULD BE REPORTED TO THE PROJECT MANAGER IMMEDIATELY.
4. VERIFY LOCATIONS OF ALL BELOW GRADE UTILITIES PRIOR TO BEGINNING WORK. 72 HOURS BEFORE YOU DIG CALL "MISS DIG" AT 1-800-482-7171.
5. PROVIDE BARRIER FREE PARKING SIGNS FOR ALL BARRIER FREE PARKING SPACES. ALL SIGNS TO COMPLY WITH THE MDOT MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.
6. SITE LAYOUT POINTS SHOULD BE ESTABLISHED AND PROTECTED FOR FUTURE SITE WORK.

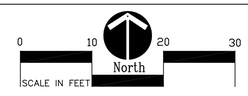
PROPOSED FEATURES LEGEND:

SYMBOL	DESCRIPTION
	LOOSE FILL RESILIENT SAFETY SURFACING (BY OTHERS)
	LIMIT OF WORK
	ENLARGEMENT LIMIT LINE

KEY	DESCRIPTION	DETAIL
A	PLAY AREA ACCESS RAMP	7/C4.0
B	THICKENED EDGE CONCRETE WALK AND CURB	3/C4.0
C	CONCRETE WALK	2/C4.0
D	STRAIGHT FACED CURB	4/C4.0
E	PLASTIC PLAY EDGING (BY OTHERS)	
F	LOOSE FILL RESILIENT SAFETY SURFACING (BY OTHERS)	
G	20'X20' METAL ROOFED STRUCTURE	1/C4.1
H	ACCESSIBLE KAYAK LAUNCH (BY OTHERS)	
J	KAYAK LAUNCH GANGWAY CURB	1/C4.0
K	ASPHALT PAVED BICYCLE PUMP TRACK (BY OTHERS)	
L	PICNIC TABLES	5/C4.1
M	BIKE RACK	4/C4.1
N	TRASH RECEPTACLES	7/C4.1



3 **Kayak Launch Layout Enlargement Plan**
Scale: 1" = 10'-0"



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Issued For:	Date
COK CHECKLIST MEETING	02-17-25
NFP SUBMISSION	03-27-25
SPR SUBMISSION	04-04-25

Project:

Verburg Park Improvements

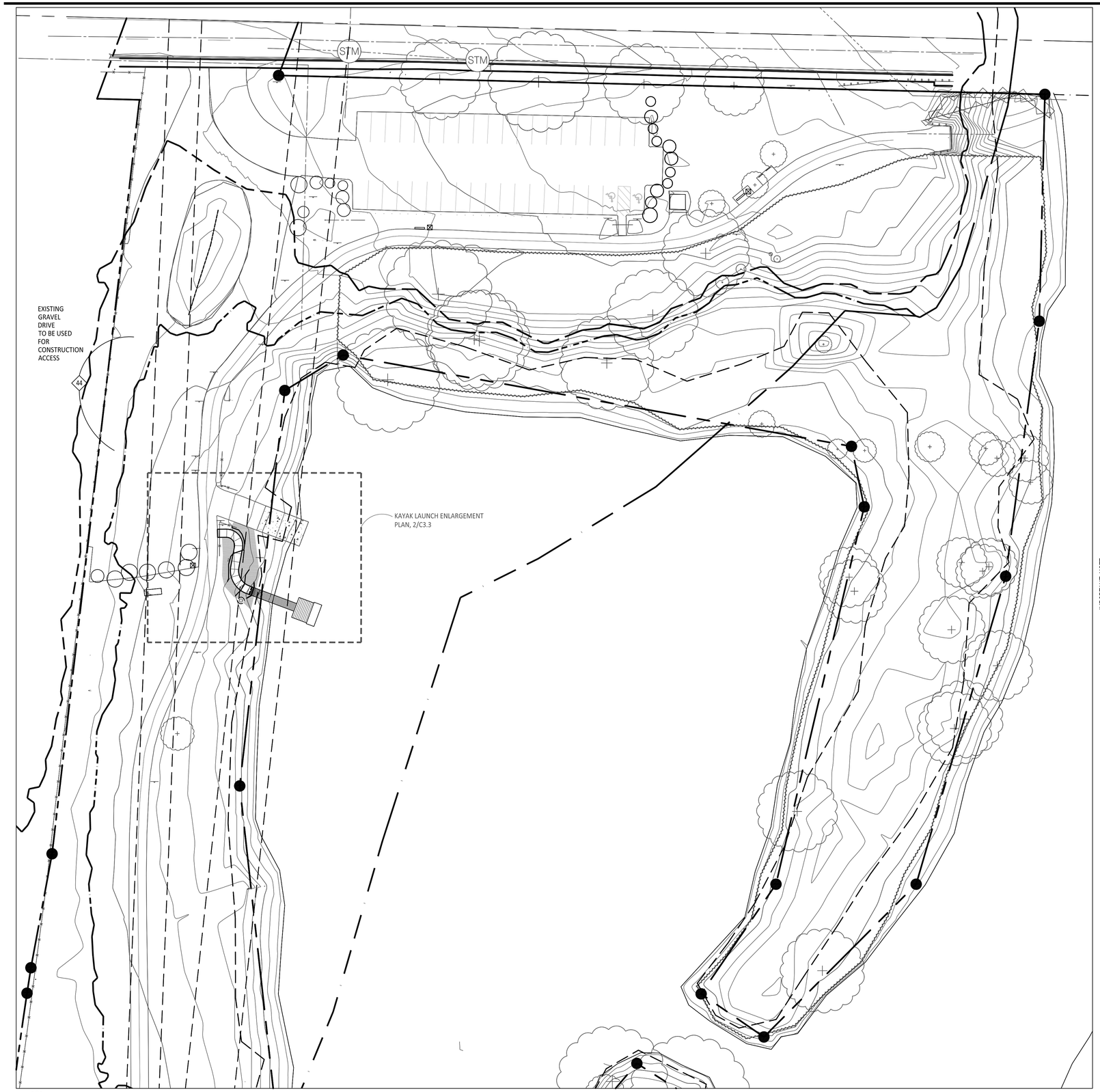
Kalamazoo, MI

Sheet Title

Detail Enlargement Layout Plans

Job No. 52411

Sheet No. C2.3



1 **Grading and SESC - North Enlargement Plan**
Scale: 1" = 30'-0"

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4. ALL NEW PAVEMENT ELEVATIONS AT EXTERIOR DOORS SHALL MATCH EXISTING FINISH FLOOR ELEVATIONS, TYPICAL.
5. FINISH GRADE SLOPE AT ALL BARRIER FREE PARKING SPACES AND ACCESS AISLES SHALL NOT EXCEED 2% IN ALL DIRECTIONS, TYPICAL.
6. ADJUST TOP OF EXISTING MANHOLES, CATCH BASINS, VAULT COVERS, ETC. TO NEW FINISH GRADE AS REQUIRED.
7. SEE SITE MECHANICAL AND SITE ELECTRICAL PLANS FOR ALL ADDITIONAL SITE UTILITY DEMOLITION AND CONSTRUCTION.

PROPOSED FEATURES LEGEND:

695	EXISTING CONTOURS
+711.55 2067 CONC.	EXISTING SPOT ELEVATIONS
710	PROPOSED CONTOURS
949.5 +	PROPOSED SPOT ELEVATIONS
2%	DIRECTION AND PERCENTAGE OF SLOPE
LB	LEACHING BASIN. SEE DETAIL
CB	CATCH BASIN. SEE DETAIL
FFE	FINISH FLOOR ELEVATION
INV	INVERT ELEVATION
TC	TOP OF CURB ELEVATION
IBC	INNER BOTTOM OF CURB ELEVATION (LOOSE FILL ELEVATION)
OBC	OUTER BOTTOM OF CURB ELEVATION (TURF ELEVATION)
HP	HIGH POINT
	SILT FENCE
	WORK LIMIT LINE
	FEMA FLOODWAY BOUNDARY
	FEMA 100-YEAR FLOODPLAIN BOUNDARY
	FEMA 500-YEAR FLOODPLAIN BOUNDARY
	EROSION CONTROL BLANKET, MUST BE "SNAKE FRIENDLY", SEE NOTES

IMPORTANT NOTE

GENERAL EARTHWORK NOTE:

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IMPORTANT NOTE

IMPORTANT NOTE

EROSION CONTROL TIMELINE

ITEM	DESCRIPTION	APPROXIMATE TIME FRAME
1.	INSTALL SILT FENCING / PERIMETER EROSION CONTROL	FALL '25
2.	STRIP & STOCKPILE TOPSOIL	FALL '25
3.	INSTALL STORM SEWER STRUCTURES AND PIPING	FALL '25
4.	INSTALL INLET SEDIMENT FILTERS AT CATCH BASINS	FALL '25
5.	INSTALL PAVEMENT SUB-BASE	SPRING '26
6.	INSTALL TEMPORARY STABILIZATION SEEDING	SPRING '26
7.	INSTALL CONCRETE PAVING	SPRING '26
8.	FINISH GRADE AND SEED / STABILIZE ALL AREAS	SPRING '26

1. CONTRACTOR SHALL MONITOR AND MAINTAIN ALL EROSION CONTROL DEVICES THROUGHOUT THE CONSTRUCTION PERIOD.

2. ADDITIONAL EROSION CONTROL MEASURES SHALL BE IMPLEMENTED AS REQUIRED TO MINIMIZE SILT LEAVING THE CONSTRUCTION SITE.

EROSION CONTROL REQUIREMENTS:

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44	GRAVEL ACCESS APPROACH	T
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Project:

Verburg Park Improvements

Kalamazoo, MI

Sheet Title

Grading + SESC - North Enlargement Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

Sheet No. C3.0



1 **Grading and SESC - Center Enlargement Plan**
Scale: 1" = 30'-0"

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Project:

Verburg Park Improvements

Kalamazoo, MI

Sheet Title
Grading + SESC - Center Enlargement Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

Sheet No. C3.1



1 **Grading and SESC - South Enlargement Plan**
Scale: 1" = 30'-0"

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Verburg Park Improvements

Kalamazoo, MI

Sheet Title
Grading + SESC - South Enlargement Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

Sheet No. C3.1

"SNAKE FRIENDLY" SESC STANDARDS

SNAKE FRIENDLY SOIL EROSION AND SEDIMENTATION CONTROL STANDARDS PER USDA

STANDARDS:

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ALL CONSTRUCTION SHALL COMPLY WITH THE SOIL EROSION AND SEDIMENTATION CONTROL ACT (P.A. 347 OF 1972, AS AMENDED) AS ADMINISTERED BY TOWNSHIP AND COUNTY. THE FOLLOWING EROSION CONTROL DEVICES ARE REFERENCED IN THE STANDARD EROSION CONTROL HANDBOOK PUBLISHED BY THE MICHIGAN DEPARTMENT OF TRANSPORTATION. (MDOT DRAWING R-96-C, 8-9-2001)

ALL TEMPORARY EROSION CONTROL DEVICES SHALL BE REMOVED AT THE END OF CONSTRUCTION. TEMPORARY EROSION CONTROL DEVICES SHOULD BE IN PLACE PRIOR TO EXCAVATION, TO THE EXTENT POSSIBLE.

KEY	DESCRIPTION	TEMPORARY / PERMANENT
3	PERMANENT/TEMPORARY SEEDING	P
26	GEOTEXTILE SILT FENCE	T
39A	INLET PROTECTION FABRIC DROP	T
44	GRAVEL ACCESS APPROACH	T
48	MULCH BLANKETS	T

PROPOSED FEATURES LEGEND:

- 695 — EXISTING CONTOURS
- +711.55 2067 CONC. — EXISTING SPOT ELEVATIONS
- 710 — PROPOSED CONTOURS
- 949.5 + — PROPOSED SPOT ELEVATIONS
- 2% — DIRECTION AND PERCENTAGE OF SLOPE
- LB — LEACHING BASIN. SEE DETAIL
- CB — CATCH BASIN. SEE DETAIL
- FFE — FINISH FLOOR ELEVATION
- INV — INVERT ELEVATION
- TC — TOP OF CURB ELEVATION
- IBC — INNER BOTTOM OF CURB ELEVATION (LOOSE FILL ELEVATION)
- OBC — OUTER BOTTOM OF CURB ELEVATION (TURF ELEVATION)
- HP — HIGH POINT
- SILT FENCE
- WORK LIMIT LINE
- FEMA FLOODWAY BOUNDARY
- FEMA 100-YEAR FLOODPLAIN BOUNDARY
- FEMA 500-YEAR FLOODPLAIN BOUNDARY
- EROSION CONTROL BLANKET, MUST BE "SNAKE FRIENDLY", SEE NOTES

IMPORTANT NOTE

GENERAL EARTHWORK NOTE:

CUTS AND FILLS AT THIS SITE MAY OR MAY NOT BALANCE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE REQUIRED EARTHWORK VOLUMES BASED ON THE GRADING PLAN SHOWN. IF FILL IS REQUIRED, THE CONTRACTOR SHALL INCLUDE THE REQUIRED VOLUME OF IMPORTED CLASS II SAND IN THE BASE BID PROPOSAL. IF EXCESS SOILS NEED TO BE SPOILED, THE CONTRACTOR SHALL INCLUDE HAULING AND SPOILING SOILS OFF SITE IN THE BASE BID PROPOSAL. NO CONTRACT COST ADJUSTMENTS WILL BE CONSIDERED FOR EARTHWORK REQUIRED TO BALANCE THE SITE.

IMPORTANT NOTE

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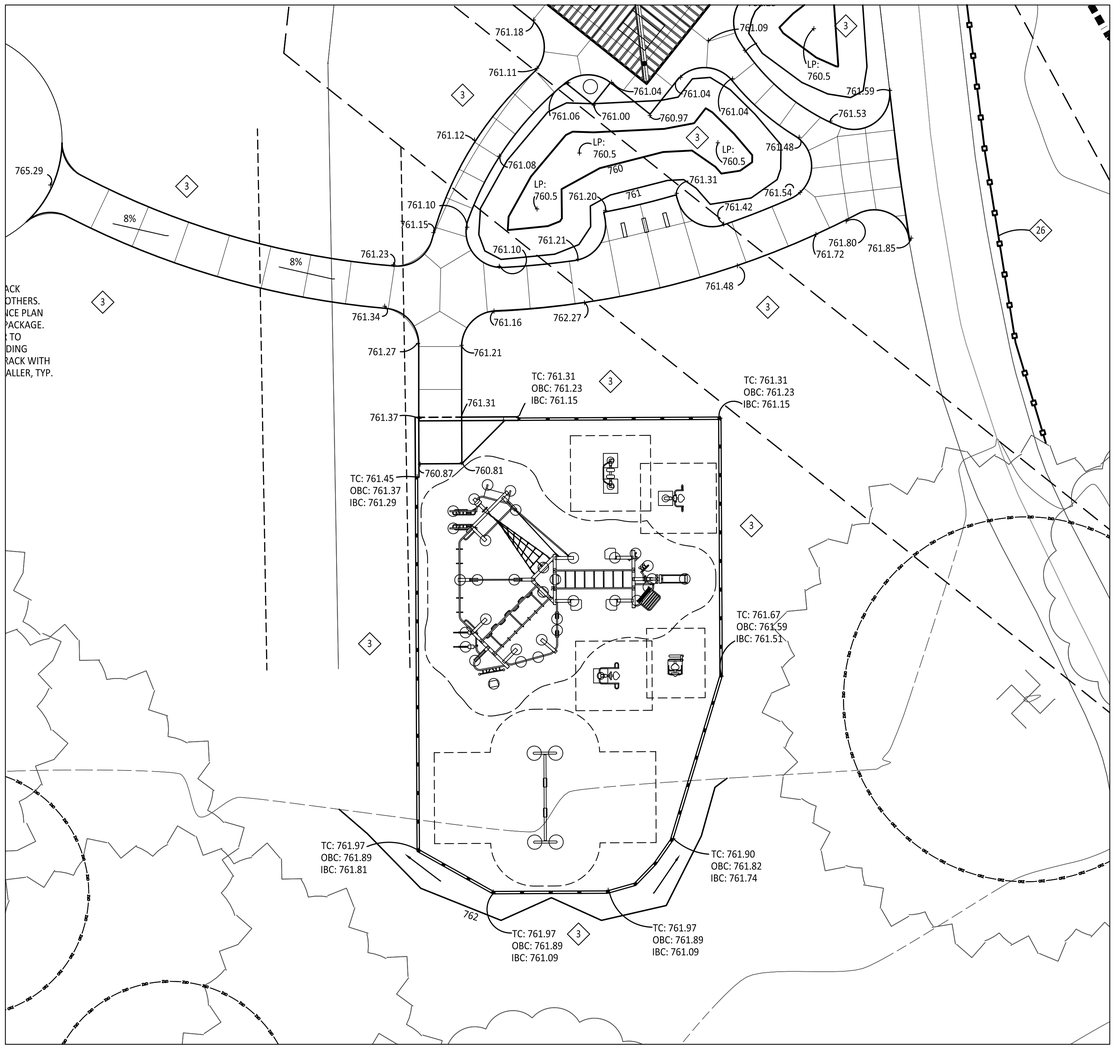
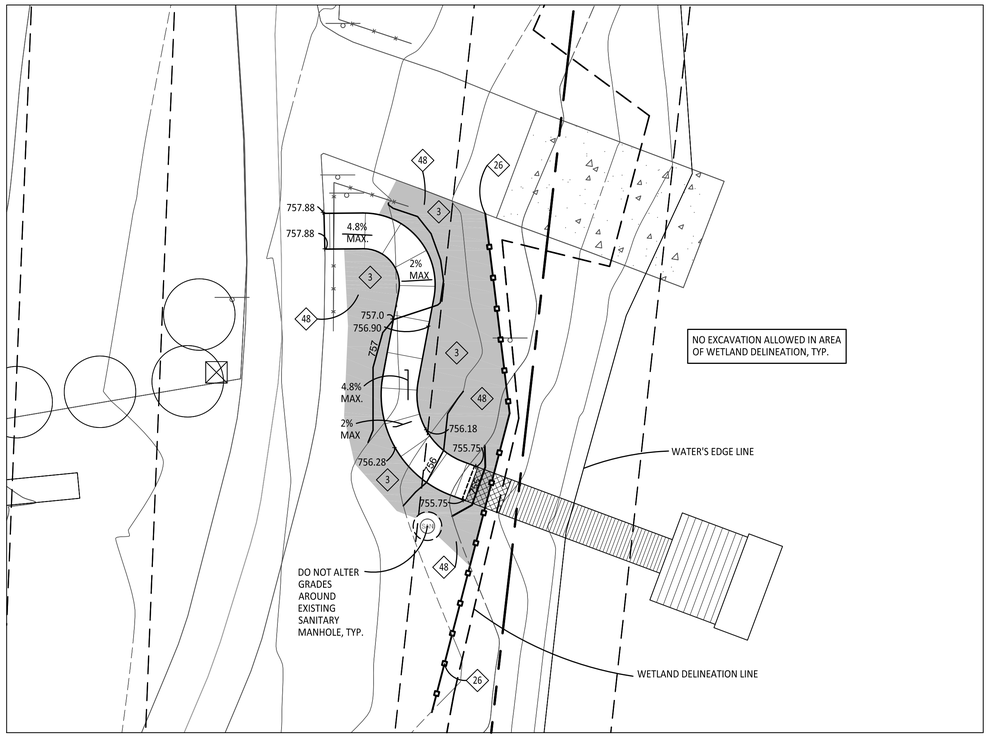


1 **Grading and SESC - Playground Enlargement Plan**
Scale: 1" = 10'-0"



2 **Grading and SESC - Kayak Launch Enlargement Plan**
Scale: 1" = 10'-0"

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Issued For:	Date
COK CHECKLIST MEETING	02-17-25
NFP SUBMISSION	03-27-25

Project:

Verburg Park Improvements

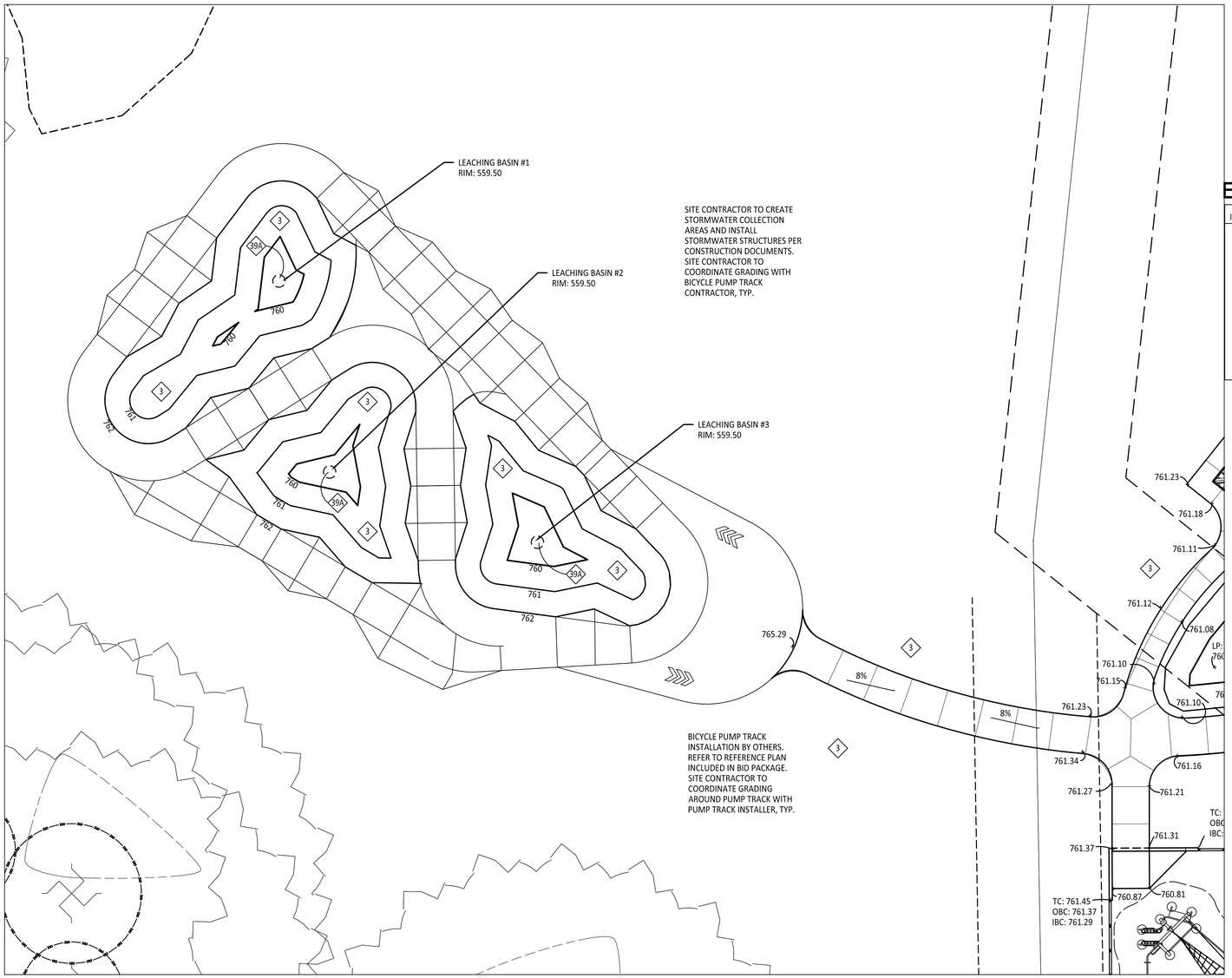
Kalamazoo, MI

Sheet Title
Grading + SESC - Detail Enlargement Plan

0 10 20 30
North
SCALE IN FEET

Job No. 52411

Sheet No. C3.3



1 Grading and SESC - Pump Track Enlargement Plan

Scale: 1" = 10'-0"

GRADING NOTES:

1. SURVEY OF EXISTING CONDITIONS PROVIDED BY AR ENGINEERING, 5725 VENTURE PARK DRIVE, SUITE A, KALAMAZOO, MICHIGAN, 49009, (269)250-5991.
2. VERIFY LOCATIONS OF ALL BELOW GRADE UTILITIES PRIOR TO BEGINNING WORK. 72 HOURS BEFORE YOU DIG CALL "MISS DIG" AT 1-800-482-7171.
3. ALL NEW PAVEMENTS AND TURF AREAS ARE INTENDED TO DRAIN FREELY WITH NO PONDING. IF THIS CANNOT BE ACHIEVED USING THE PROPOSED GRADES, NOTIFY THE OWNER'S REPRESENTATIVE IMMEDIATELY FOR RESOLUTION.
4. ALL NEW PAVEMENT ELEVATIONS AT EXTERIOR DOORS SHALL MATCH EXISTING FINISH FLOOR ELEVATIONS, TYPICAL.
5. FINISH GRADE SLOPE AT ALL BARRIER FREE PARKING SPACES AND ACCESS AISLES SHALL NOT EXCEED 2% IN ALL DIRECTIONS, TYPICAL.
6. ADJUST TOP OF EXISTING MANHOLES, CATCH BASINS, VAULT COVERS, ETC. TO NEW FINISH GRADE AS REQUIRED.
7. SEE SITE MECHANICAL AND SITE ELECTRICAL PLANS FOR ALL ADDITIONAL SITE UTILITY DEMOLITION AND CONSTRUCTION.

EROSION CONTROL TIMELINE

ITEM	DESCRIPTION	APPROXIMATE TIME FRAME
1.	INSTALL SILT FENCING / PERIMETER EROSION CONTROL	FALL '25
2.	STRIP & STOCKPILE TOPSOIL	FALL '25
3.	INSTALL STORM SEWER STRUCTURES AND PIPING	FALL '25
4.	INSTALL INLET SEDIMENT FILTERS AT CATCH BASINS	FALL '25
5.	INSTALL PAVEMENT SUB-BASE	SPRING '26
6.	INSTALL TEMPORARY STABILIZATION SEEDING	SPRING '26
7.	INSTALL CONCRETE PAVING	SPRING '26
8.	FINISH GRADE AND SEED / STABILIZE ALL AREAS	SPRING '26

1. CONTRACTOR SHALL MONITOR AND MAINTAIN ALL EROSION CONTROL DEVICES THROUGHOUT THE CONSTRUCTION PERIOD.

2. ADDITIONAL EROSION CONTROL MEASURES SHALL BE IMPLEMENTED AS REQUIRED TO MINIMIZE SILT LEAVING THE CONSTRUCTION SITE.

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PROPOSED FEATURES LEGEND:

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+711.55 2067 CONC.	EXISTING SPOT ELEVATIONS
710	PROPOSED CONTOURS
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	EROSION CONTROL BLANKET, MUST BE "SNAKE FRIENDLY", SEE NOTES

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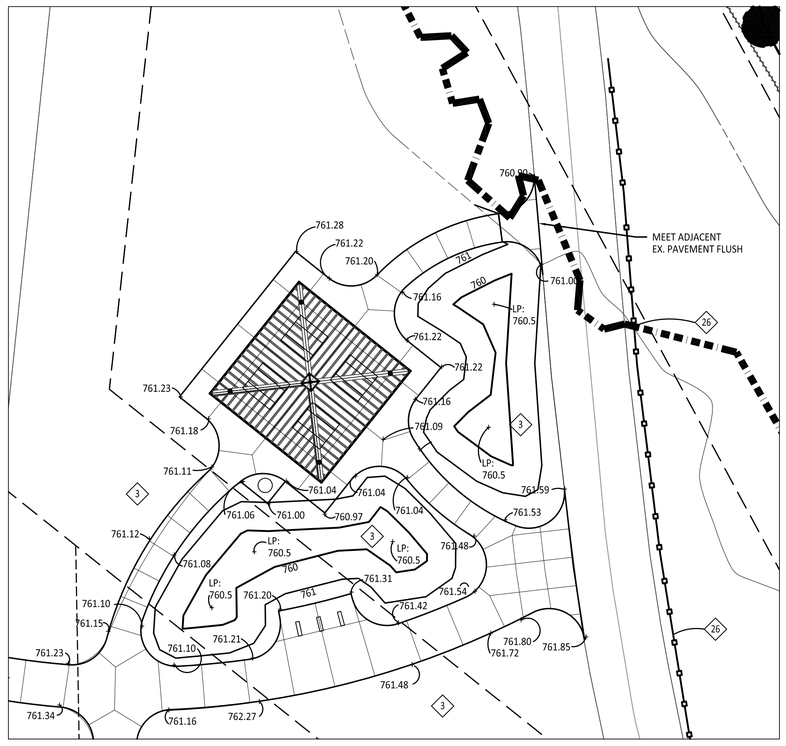

2 Grading and SESC - Shelter + Walk Enlargement Plan

Scale: 1" = 10'-0"

"SNAKE FRIENDLY" SESC STANDARDS

SNAKE FRIENDLY SOIL EROSION AND SEDIMENTATION CONTROL STANDARDS PER USDA

STANDARDS:

* NO PLASTIC MESH ALLOWED. ALL MESH MUST BE BIODEGRADABLE.
* BIODEGRADABLE MESH SHOULD BE WOVEN WITH A LENO WEAVE AND HAVE A MINIMUM OF 2"X2" OPENINGS.
* SESC MEASURES MUST BE STAKED ALONG ALL EDGES AT A MORE FREQUENT INTERVAL THAN MANUFACTURER'S WRITTEN INSTRUCTIONS TO DISCOURAGE SNAKES FROM TRAVELING UNDER SESC MATERIALS.

STORM STRUCTURE SCHEDULE :

STORM SEWER SYSTEM
STRUCTURE SUMMARY

PROPOSED STRUCTURE #	DIAMETER	RIM TYPE	RIM ELEVATION AT FLOW LINE	COMMENTS
LB #1	4'	EJIW 6508-O	559.50	
LB #2	4'	EJIW 6508-O	559.50	
LB #3	4'	EJIW 6508-O	559.50	

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Verburg Park Improvements

Kalamazoo, MI

Sheet Title

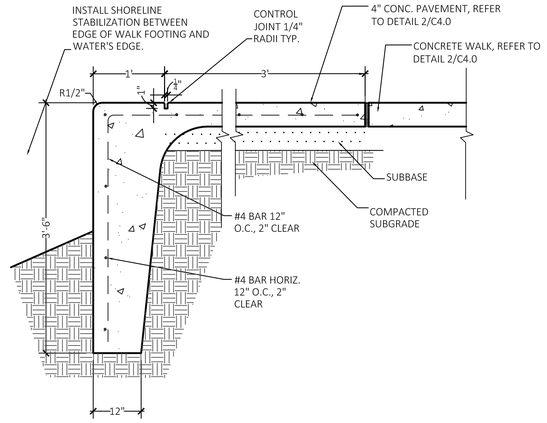
Grading + SESC - Detail Enlargement Plan

0 10 20 30
North
SCALE IN FEET

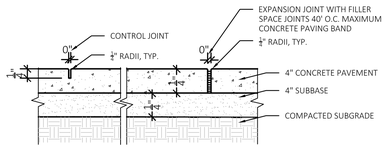
Job No. 52411

Sheet No. C3.4

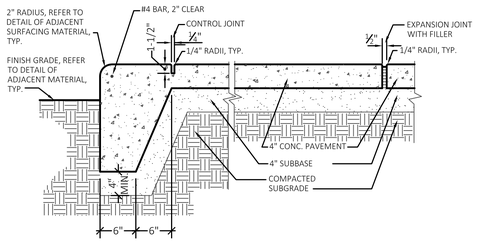
NOTE:
REFER TO MANUFACTURER'S WRITTEN INSTRUCTIONS FOR ANCHOR INSTALLATION.



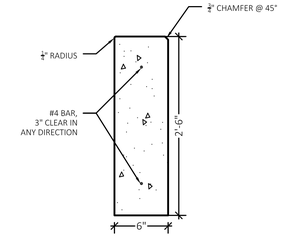
1 Walk Footing at Gangway Detail
Not to Scale



2 4" Concrete Paving
NOT TO SCALE



3 Thickened Edge Curb Detail
NOT TO SCALE



4 Straight Face Concrete Curb Detail
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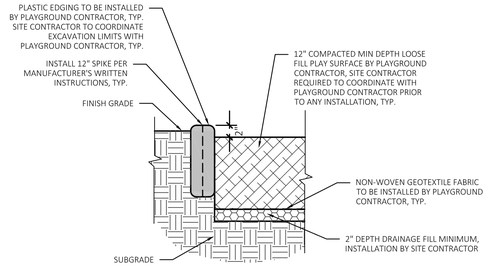
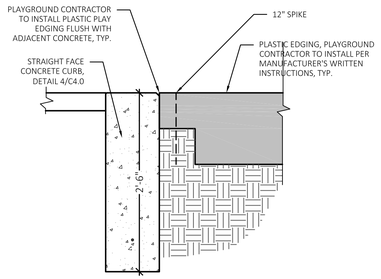
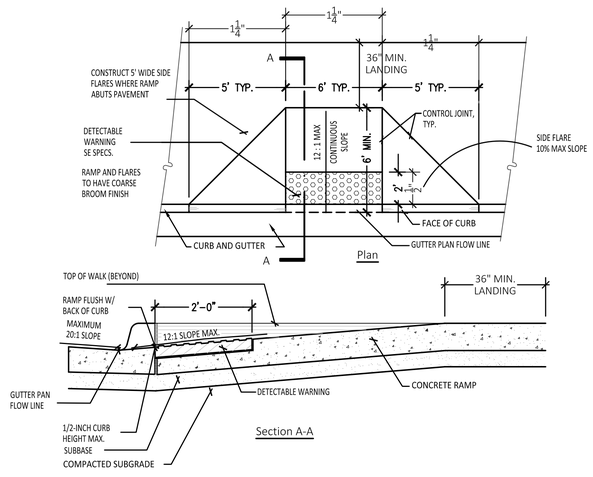


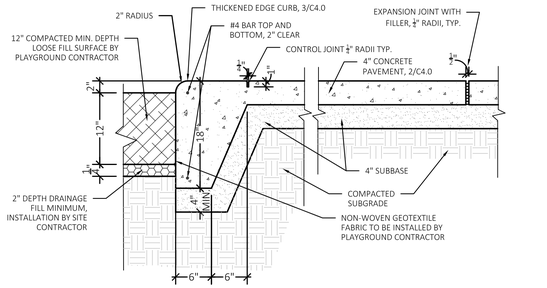
5 Plastic Edging Detail
NOT TO SCALE



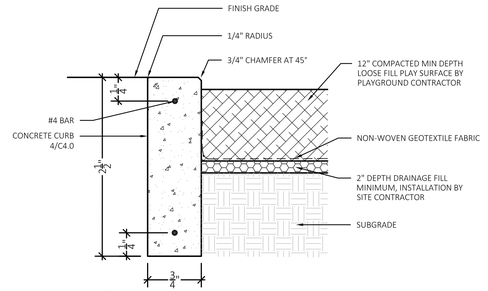
6 Concrete Curb to Plastic Edging Transition Detail
NOT TO SCALE



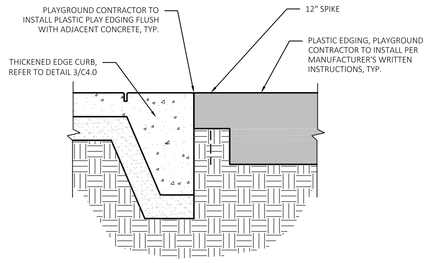
7 Barrier Free Curb Ramp
NOT TO SCALE



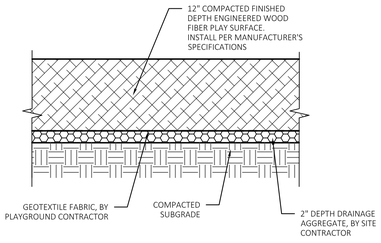
8 Loose Fill Surfacing to Thickened Edge Concrete Detail
NOT TO SCALE



9 Concrete Edge Restraint Curb Detail
NOT TO SCALE



10 Thickened Edge Curb to Plastic Edging Transition Detail
NOT TO SCALE



11 Loose Fill Safety Surfacing Detail
NOT TO SCALE

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Verburg Park Improvements

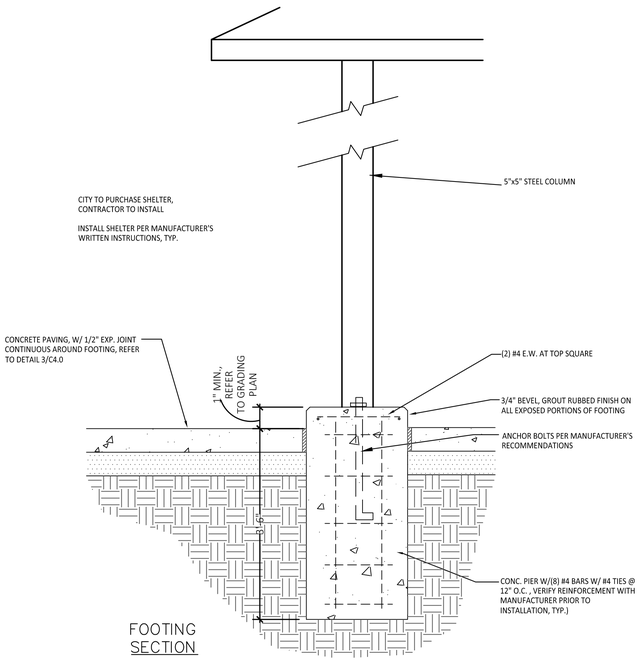
Kalamazoo, MI

Sheet Title

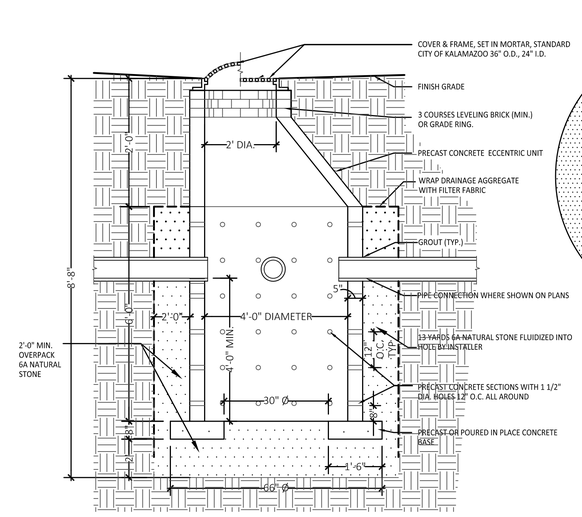
Details

Job No. 52411

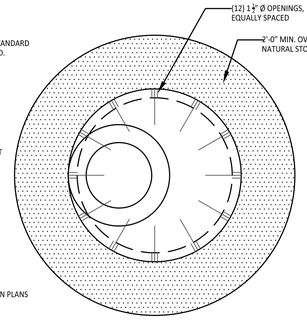
Sheet No. C4.0



1 Shelter Column Detail
Not to Scale

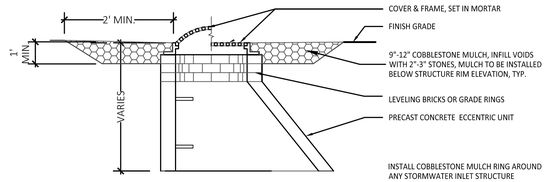


3 48" Dia. Precast Concrete Leaching Basin Detail
Not to Scale



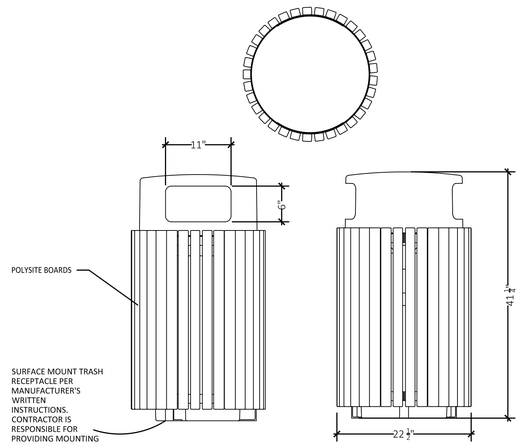
NOTE: SET LEACHING BASIN FIRST ON 2'-0" DEPTH STONE BED THEN HAVE STONE INSTALLER TRUCK LOAD FLUIDIZED 6A NATURAL STONE INTO HOLE

LEACHING BASIN INSTALLATION TO MEET CITY OF KALAMAZOO ENGINEERING STANDARDS.



INSTALL COBBLESTONE MULCH RING AROUND ANY STORMWATER INLET STRUCTURE LOCATED IN TURF AREAS OR NATIVE GRASS AREAS.

6 Cobblestone Mulch Ring Detail
Not To Scale



7 Trash Receptacle Detail
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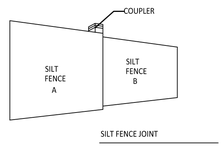
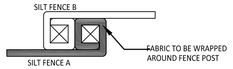
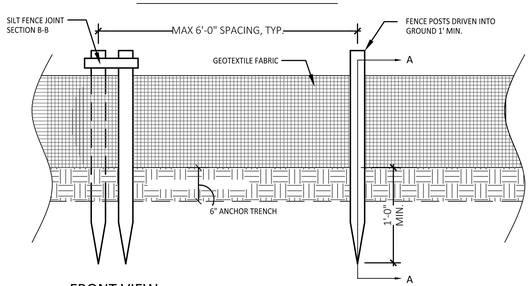
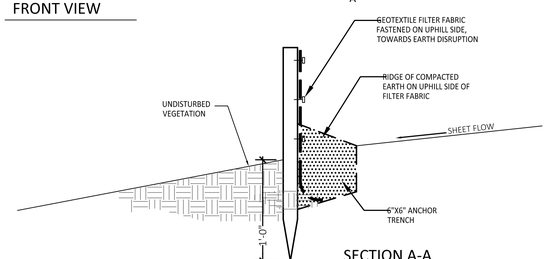




SECTION B-B

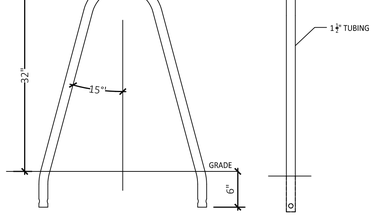


FRONT VIEW



SECTION A-A

2 Silt Fence Detail
Not To Scale



4 Bike Rack Detail
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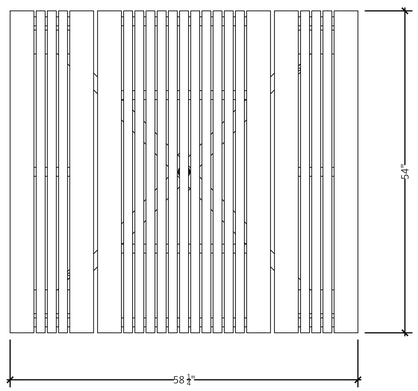

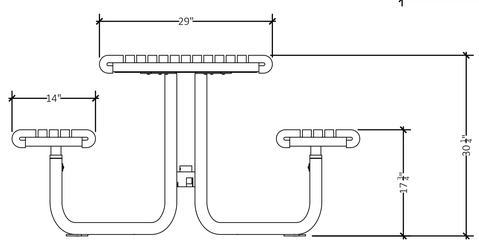

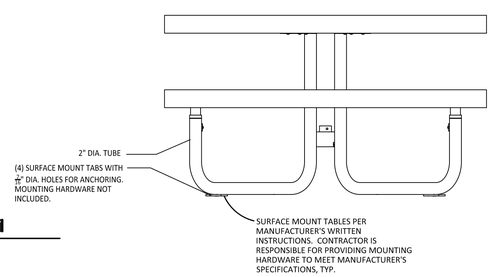

5 Picnic Table Detail
Not to Scale

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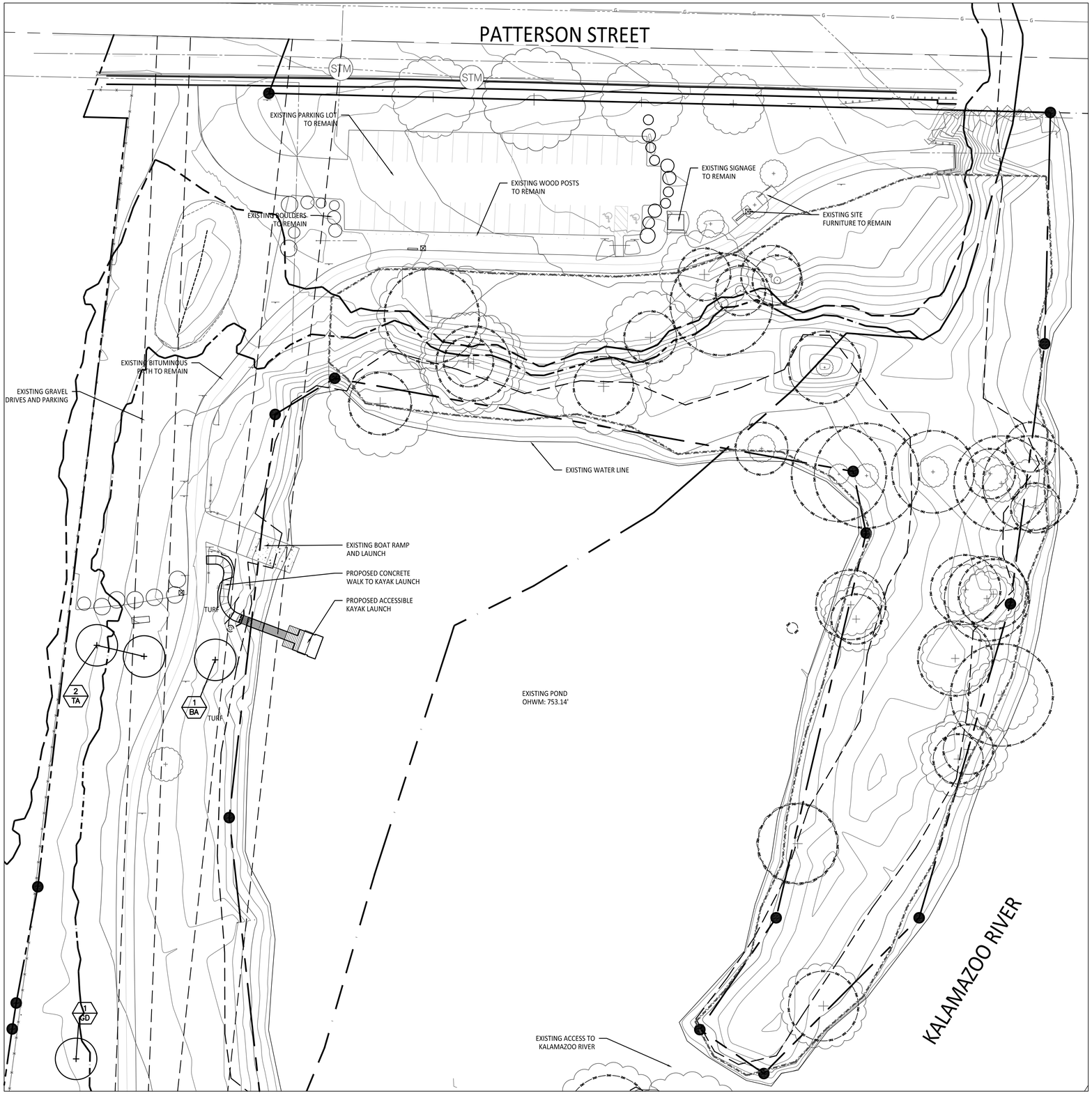
Kalamazoo, MI

Sheet Title

Details

Job No. 52411

Sheet No. C4.1



1 **Protected Tree Identification - North Enlargement Plan**
Scale: 1" = 30'-0"

LANDSCAPE ZONING ORDINANCE LEGEND:

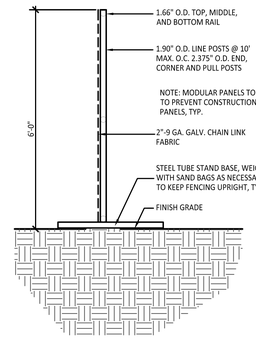
PROTECTED TREE (SEE TABLE FOR SPECIES AND SIZE)	LIMIT OF WORK
CRITICAL ROOT ZONE DELINEATION	PROPERTY LINE
EXISTING TREE TO REMAIN	TEMPORARY TREE PROTECTION FENCE; SEE DETAIL 2/L1.0
PROPOSED TREE, DETAIL 3/L1.0	6 Bn — PLANT TAG- REFERS TO TYPE AND NUMBER OF PLANTINGS TO BE PROVIDED AND MAINTAINED BY CONTRACTOR.

LANDSCAPE NOTES:

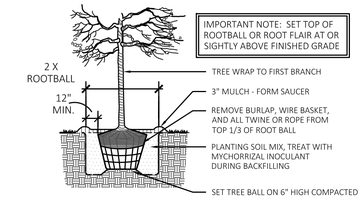
1. SURVEY OF EXISTING CONDITIONS PROVIDED BY AR ENGINEERING, INC., 5725 VENTURE PARK DRIVE, SUITE A, KALAMAZOO, MICHIGAN 49009, (269)250-5991.
2. CALL "MISS DIG" AND VERIFY ALL UNDERGROUND UTILITIES PRIOR TO BEGINNING WORK. 72 HOURS BEFORE YOU DIG CALL "MISS DIG" AT 1-800-482-7171. ANY UTILITIES DISTURBED BY CONSTRUCTION SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE.
3. ANY DISCREPANCIES BETWEEN THESE PLANS AND ACTUAL FIELD CONDITIONS SHOULD BE REPORTED TO THE CONSTRUCTION MANAGER IMMEDIATELY FOR RESOLUTION.
4. IN AREAS OF NEW TURF PLACE 4" MINIMUM TOPSOIL, FINE GRADE & ESTABLISH TURF WITHIN SEED LIMIT LINES.
5. PLACE SHREDDED HARDWOOD MULCH TO A 3" DEPTH IN ALL TREE BEDS.
6. UNLESS OTHERWISE NOTED, TOPSOIL, FINE GRADE AND SEED ALL DISTURBED AREAS WITHIN THE SEEDING LIMIT SHOWN AND AREAS DISTURBED BY CONSTRUCTION.
7. REPAIR AND RESTORE ANY DAMAGE OUTSIDE OF LIMIT OF WORK LINE TO ORIGINAL CONDITION.
8. SEE SHEET L1.2 FOR PLANT LISTS.
9. PROTECT ALL TREES AND EXISTING FEATURES TO REMAIN AS SPECIFIED.
10. ALL TOPSOIL AND EXCESS FILL MATERIAL SHALL BE STOCKPILED ON SITE SEPARATELY FOR LATER RE-USE. LOCATE STOCKPILES IN AREAS AS DIRECTED BY CONSTRUCTION MANAGER AND PROTECT FROM EFFECTS OF EROSION.
11. ALL NURSERY STOCK SHALL BE TRUE TO TYPE AND NAME. ALL STOCK SHALL BE FIRST CLASS QUALITY WITH WELL DEVELOPED BRANCH SYSTEMS AND VIGOROUS HEALTHY ROOT SYSTEMS. ALL STOCK SHALL BE WELL FORMED AND THE TRUNKS OF TREES SHALL BE UNIFORM AND STRAIGHT.
12. CONTRACTOR RESPONSIBLE TO LOCATE SITE LIGHTING SERVICES. CONTRACTOR RESPONSIBLE TO NOTIFY CONSTRUCTION MANAGER IF DAMAGE TO LIGHTING ELECTRICAL DISTRIBUTION OCCURS.
13. ALL AREAS OF TREE CLEARING SHALL BE STAKED FOR ARCHITECTS APPROVAL PRIOR TO CLEARING.

KALAMAZOO CITY ORDINANCE REQUIREMENTS:

1. FOR SITES GREATER THAN ONE ACRE, A MINIMUM OF (1) TREE PER ACRE OR FRACTION THERE OF IS REQUIRED. TOTAL SITE = 15.48 ACRES. (16) TREES REQUIRED AND (16) TREES PROVIDED.



2 **Tree Protection Fencing Detail**
Not To Scale



3 **Tree Planting Detail**
Not To Scale

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Issued For:	Date
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NFP SUBMISSION	03-27-25
SPR SUBMISSION	04-04-25

Project:

Verburg Park Improvements

Kalamazoo, MI

Sheet Title

Landscape-North Enlargement Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

Sheet No. L1.0



1 **Protected Tree Identification - Center Enlargement Plan**

Scale: 1" = 30'-0"

LANDSCAPE ZONING ORDINANCE LEGEND:

- PROTECTED TREE (SEE TABLE FOR SPECIES AND SIZE)
- CRITICAL ROOT ZONE
- EXISTING TREE TO REMAIN
- PROPOSED TREE, DETAIL 3/L1.0
- LIMIT OF WORK
- PROPERTY LINE
- TEMPORARY TREE PROTECTION FENCE SEE DETAIL 2/L1.0
- 6 Bn — PLANT TAG- REFERS TO TYPE AND NUMBER OF PLANTINGS TO BE PROVIDED AND MAINTAINED BY CONTRACTOR.

LANDSCAPE NOTES:

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5. PLACE SHREDDED HARDWOOD MULCH TO A 3" DEPTH IN ALL TREE BEDS.
6. UNLESS OTHERWISE NOTED, TOPSOIL, FINE GRADE AND SEED ALL DISTURBED AREAS WITHIN THE SEEDING LIMIT SHOWN AND AREAS DISTURBED BY CONSTRUCTION.
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12. CONTRACTOR RESPONSIBLE TO LOCATE SITE LIGHTING SERVICES. CONTRACTOR RESPONSIBLE TO NOTIFY CONSTRUCTION MANAGER IF DAMAGE TO LIGHTING ELECTRICAL DISTRIBUTION OCCURS.
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KALAMAZOO CITY ORDINANCE REQUIREMENTS:

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Verburg Park Improvements

Kalamazoo, MI

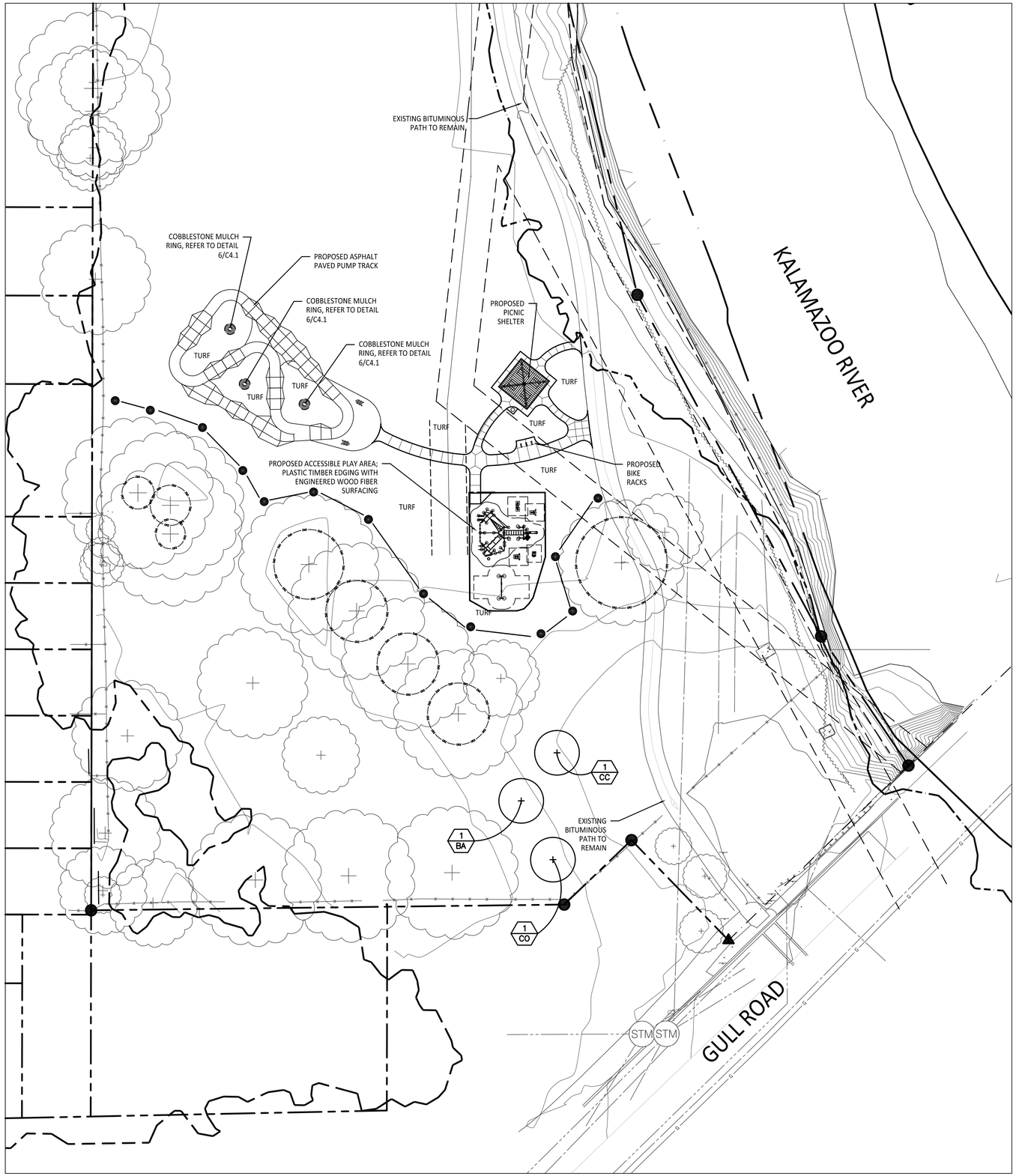
Sheet Title

Landscape - Center Enlargement Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

Sheet No. L1.1



1 **Landscape - South Enlargement Plan**

Scale: 1" = 30'-0"

LANDSCAPE ZONING ORDINANCE LEGEND:

- PROTECTED TREE (SEE TABLE FOR SPECIES AND SIZE)
- CRITICAL ROOT ZONE
- EXISTING TREE TO REMAIN
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PLANT LIST:

	SYM.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	SPACING	STATUS
TREES	AR	Acer rubrum	Red Maple	2" CAL.	B&B	PER PLANS	NATIVE
	BA	Betula alleghaniensis	Yellow Birch	2" CAL.	B&B	PER PLANS	NATIVE
	CC	Carpinus caroliniana	Hornbeam	2" CAL.	B&B	PER PLANS	NATIVE
	CE	Cercis canadensis	Redbud	2" CAL.	B&B	PER PLANS	NATIVE
	CO	Celtis occidentalis	Hackberry	2" CAL.	B&B	PER PLANS	NATIVE
	CV	Carya ovata	Shagbark Hickory	2" CAL.	B&B	PER PLANS	NATIVE
	GD	Gymnocladus dioicus	Kentucky Coffee-tree	2" CAL.	B&B	PER PLANS	NATIVE
	LT	Liriodendron tulipfera	Tulip Tree	2" CAL.	B&B	PER PLANS	NATIVE
	OV	Ostrya virginiana	Ironwood	2" CAL.	B&B	PER PLANS	NATIVE
	QP	Quercus palustris	Pin Oak	2" CAL.	B&B	PER PLANS	NATIVE
	QR	Quercus rubra	Red Oak	2" CAL.	B&B	PER PLANS	NATIVE
	TA	Tilia americana	Basswood	2" CAL.	B&B	PER PLANS	NATIVE

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Project:

Verburg Park Improvements

Kalamazoo, MI

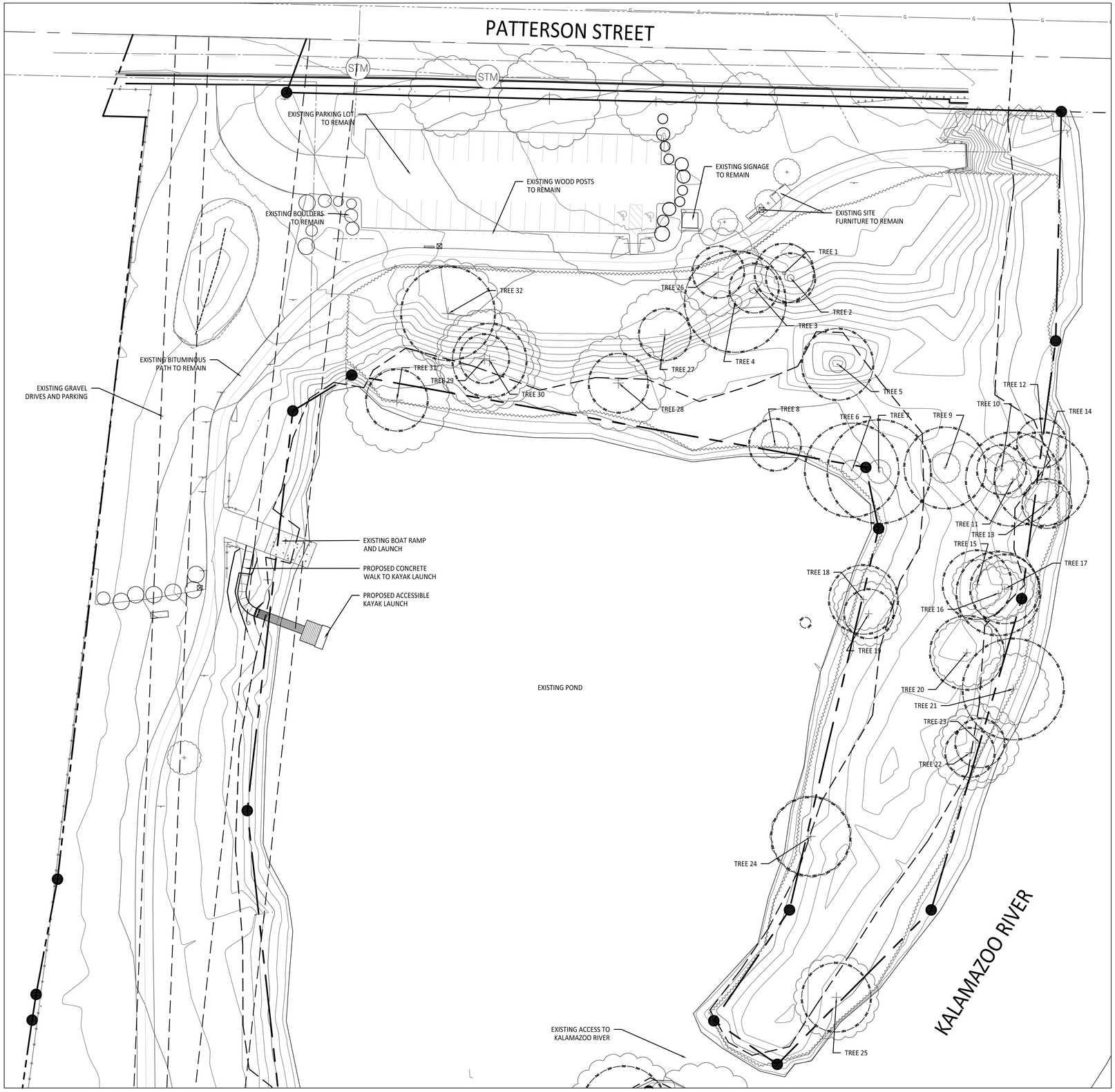
Sheet Title

Landscape - South Enlargement Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

Sheet No. L1.2



1 **Protected Tree Identification - North Enlargement Plan**
Scale: 1" = 30'-0"

NATURAL FEATURES PROTECTION OVERLAY PROTECTED TREES LEGEND:

- PROTECTED TREE (SEE TABLE FOR SPECIES AND SIZE)
- CRITICAL ROOT ZONE DELINEATION
- EXISTING TREE TO REMAIN
- PROPOSED TREE, DETAIL 3/L1.0
- LIMIT OF WORK
- PROPERTY LINE
- DELINEATED WOODLAND
- DELINEATED WETLAND
- TEMPORARY TREE PROTECTION FENCE; SEE DETAIL 2/L1.0

NATURAL FEATURES PROTECTION OVERLAY PROTECTED TREES NOTES:

1. SURVEY OF EXISTING CONDITIONS PROVIDED BY AR ENGINEERING, 5725 VENTURE PARK DR. A, KALAMAZOO, MI 49009. 269-250-5991.
2. PROTECTED TREE SURVEY PROVIDED BY ARBORWISE, P.O. BOX 6553, FORT WAYNE, IN, 46896, (260)402-6016.
3. 41 TREES IDENTIFIED AS PROTECTED TREES, 0 TREES BEING REMOVED.
4. 87,270 SF OF EXISTING WOODLAND AS IDENTIFIED BY AROBORIST BASED ON NFP GUIDELINES = 15% OF SITE; 0% REMOVED OR DISTURBED BY PROPOSED CONSTRUCTION ACTIVITY.

KALAMAZOO CITY ORDINANCE REQUIREMENTS:

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EXISTING PROTECTED TREE TABLE

TREE SURVEY		
TREE TAG	SIZE	TYPE
1	24	COTTONWOOD
2	20	BLACK LOCUST
3	20	RED ELM
4	41	COTTONWOOD
5	29 & 20 & 21	SILVER MAPLE
6	38	WILLOW
7	42	WILLOW
8	21 & 19	SILVER MAPLE
9	33	SILVER MAPLE
10	20	COTTONWOOD
11	38	COTTONWOOD
12	33	SILVER MAPLE
13	20	RED ELM
14	38	COTTONWOOD
15	28	COTTONWOOD
16	34	COTTONWOOD
17	NA	SILVER MAPLE
18	28	COTTONWOOD
19	20	CATALPA
20	30	SILVER MAPLE
21	41	SILVER MAPLE
22	20	SILVER MAPLE
23	20	SILVER MAPLE
24	32	COTTONWOOD
25	28	SYCAMORE
26	21 & 20	MULBERRY
27	21	RED ELM
28	24	COTTONWOOD
29	20	HACKBERRY
30	30	SIBERIAN ELM
31	22 & 25	SILVER MAPLE
32	38	BLACK WILLOW
33	35	COTTONWOOD
34	34	SYCAMORE
35	21	HONEY LOCUST
36	23	HONEY LOCUST
37	26	HONEY LOCUST
38	24	HONEY LOCUST
39	11	DOUGLAS FIR
40	15	DOUGLAS FIR
41	12	DOUGLAS FIR

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Project:

Verburg Park Improvements

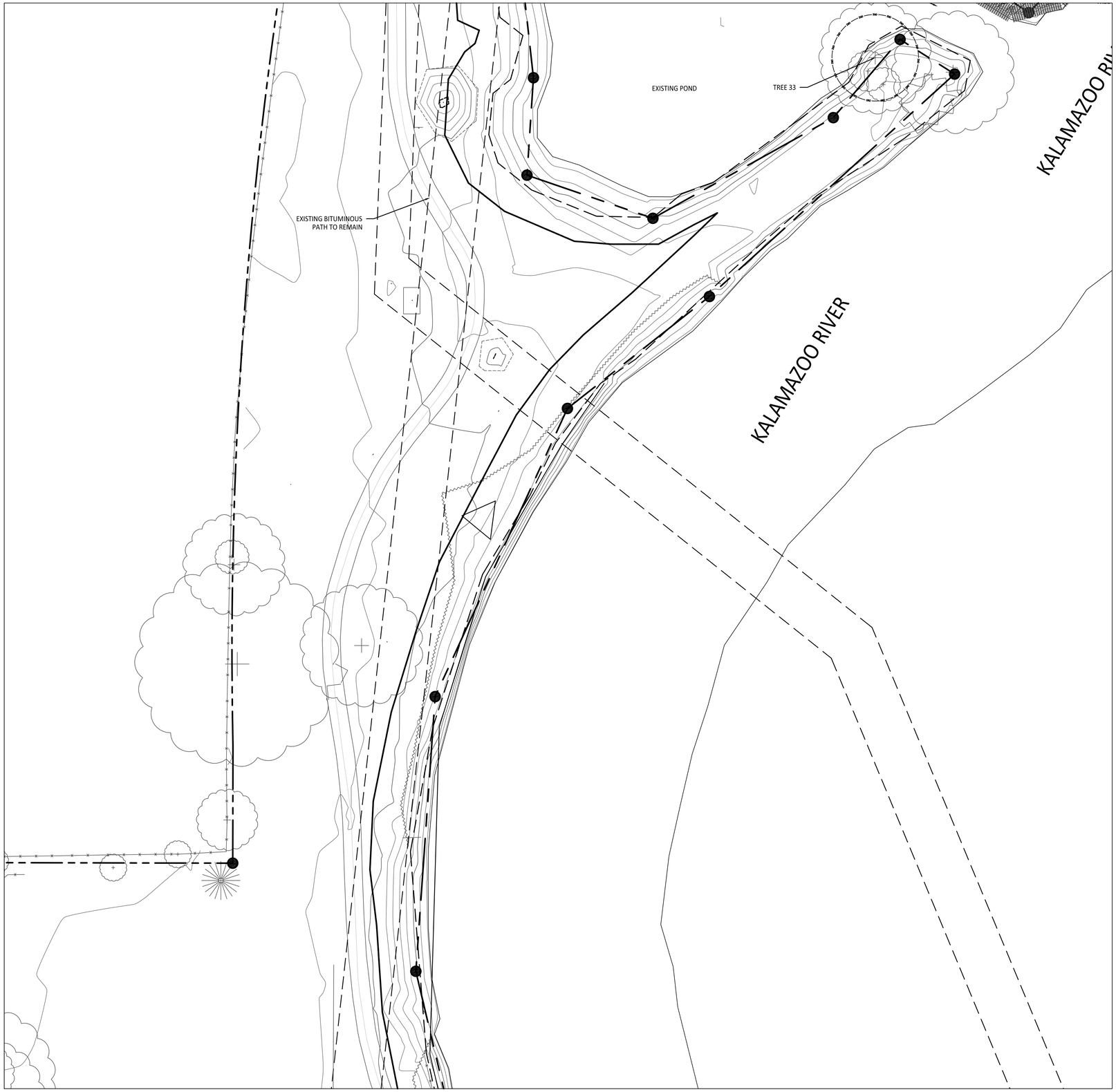
Kalamazoo, MI

Sheet Title
Protected Tree Identification-North Enlargement Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

Sheet No. L1.3



1 **Protected Tree Identification - Center Enlargement Plan**
Scale: 1" = 30'-0"

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- PROTECTED TREE (SEE TABLE FOR SPECIES AND SIZE)
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EXISTING PROTECTED TREE TABLE

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Protected Tree Identification - Center Enlargement Plan

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North
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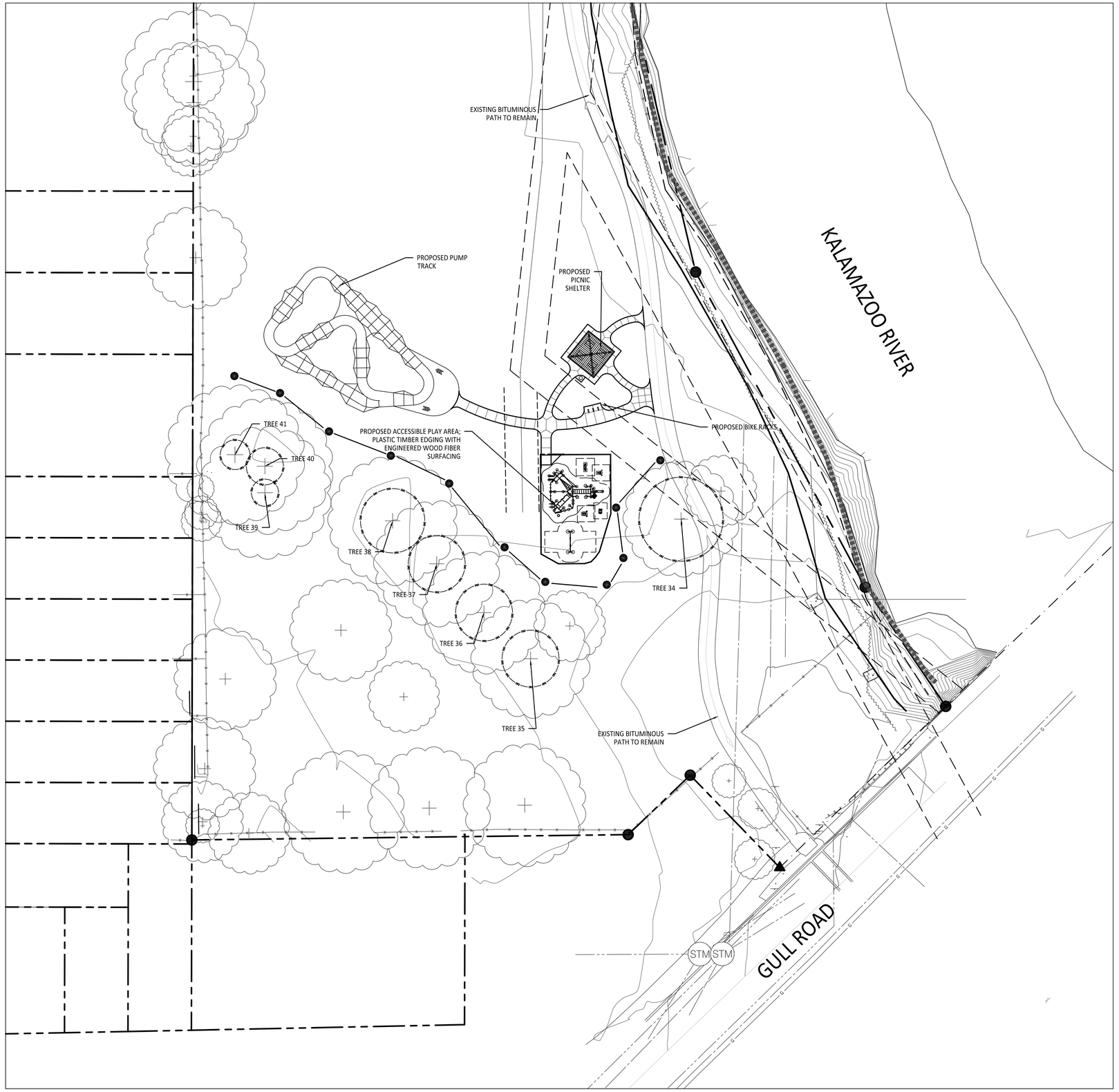
Sheet No. L1.4



1 **Protected Tree Identification - South Enlargement Plan**
Scale: 1" = 30'-0"

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- PROTECTED TREE (SEE TABLE FOR SPECIES AND SIZE)
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EXISTING PROTECTED TREE TABLE

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12	33	SILVER MAPLE
13	20	RED ELM
14	38	COTTONWOOD
15	28	COTTONWOOD
16	34	COTTONWOOD
17	NA	SILVER MAPLE
18	28	COTTONWOOD
19	20	CATALPA
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21	41	SILVER MAPLE
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Verburg Park Improvements

Kalamazoo, MI

Sheet Title
Protected Tree Identification - South Enlargement Plan

0 30 60 90
North
SCALE IN FEET

Job No. 52411

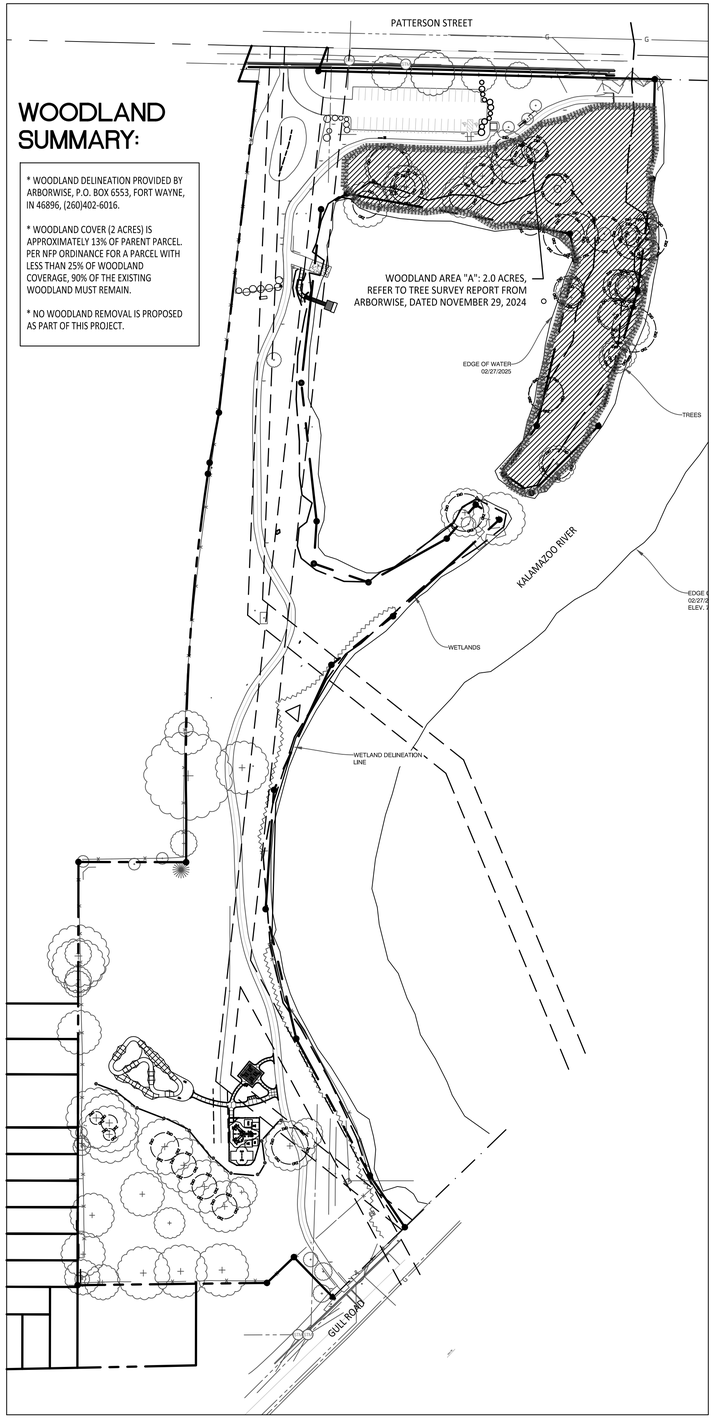
Sheet No. L1.5

WOODLAND SUMMARY:

* WOODLAND DELINEATION PROVIDED BY ARBORWISE, P.O. BOX 6553, FORT WAYNE, IN 46896, (260)402-6016.

* WOODLAND COVER (2 ACRES) IS APPROXIMATELY 13% OF PARENT PARCEL. PER NFP ORDINANCE FOR A PARCEL WITH LESS THAN 25% OF WOODLAND COVERAGE, 90% OF THE EXISTING WOODLAND MUST REMAIN.

* NO WOODLAND REMOVAL IS PROPOSED AS PART OF THIS PROJECT.



1 **Woodland Identification Plan**
Scale: 1" = 100'-0"

0 100 200 300
SCALE IN FEET
North

WETLAND SUMMARY:

* WETLAND DELINEATION PROVIDED BY NISWANDER ENVIRONMENTAL, 9436 MALTBY ROAD, BRIGHTON, MICHIGAN 48116, (810)225-0539.

* PARENT PARCEL IS MORE THAN (1) ACRE, SO WETLAND SETBACK IS 25'-0"

* 15 SF OF ACCESSIBLE KAYAK LAUNCH GANGWAY WILL SIT ABOVE THE 25' SETBACK LINE.

* 228 SF OF CONCRETE WALK WILL BE WITHIN THE 25' WETLAND SETBACK LINE.

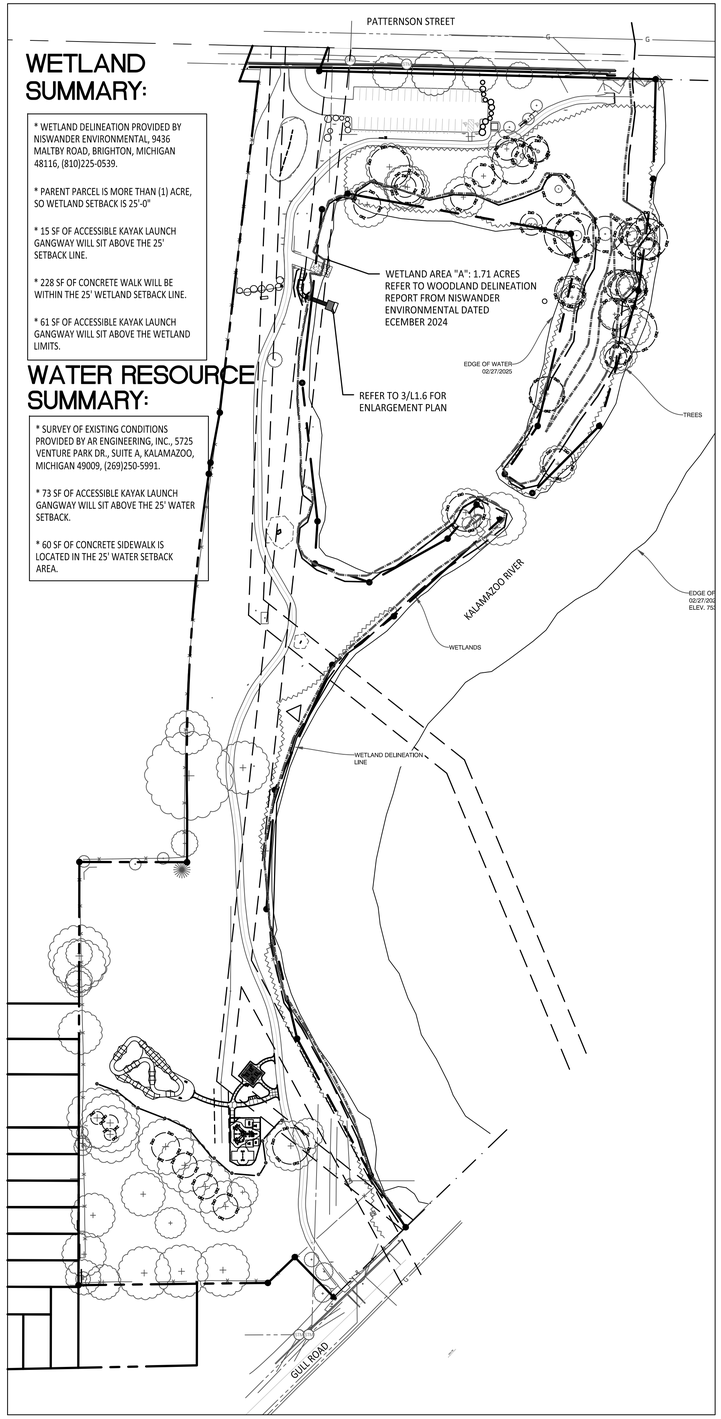
* 61 SF OF ACCESSIBLE KAYAK LAUNCH GANGWAY WILL SIT ABOVE THE WETLAND LIMITS.

WATER RESOURCE SUMMARY:

* SURVEY OF EXISTING CONDITIONS PROVIDED BY AR ENGINEERING, INC., 5725 VENTURE PARK DR., SUITE A, KALAMAZOO, MICHIGAN 49009, (269)250-5991.

* 73 SF OF ACCESSIBLE KAYAK LAUNCH GANGWAY WILL SIT ABOVE THE 25' WATER SETBACK.

* 60 SF OF CONCRETE SIDEWALK IS LOCATED IN THE 25' WATER SETBACK AREA.



1 **Wetland Identification Plan**
Scale: 1" = 100'-0"

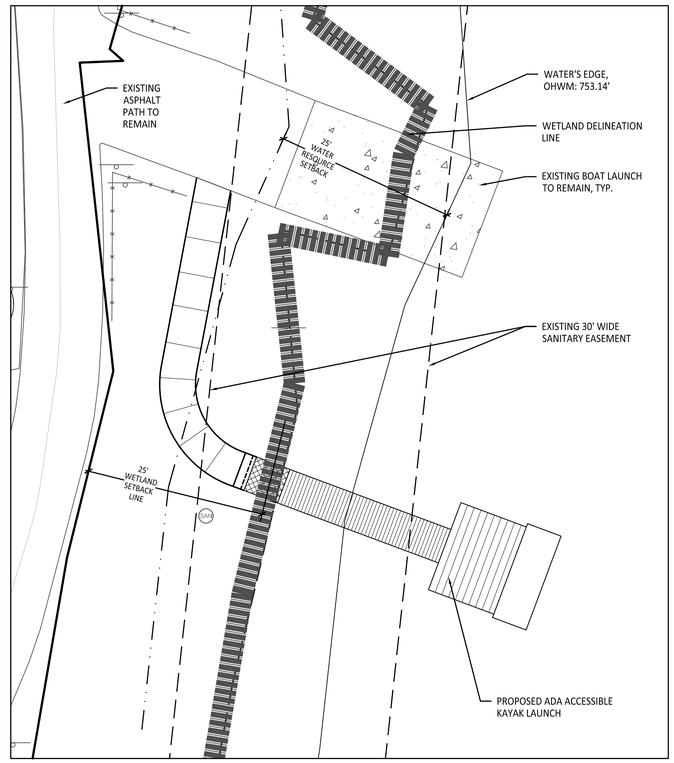
0 100 200 300
SCALE IN FEET
North

NATURAL FEATURES PROTECTION OVERLAY LEGEND:

- PROTECTED TREE (SEE TABLE FOR SPECIES AND SIZE)
- CRITICAL ROOT ZONE
- EXISTING TREE TO REMAIN
- PROPOSED TREE, DETAIL 3/L1.0
- LIMIT OF WORK
- PROPERTY LINE
- DELINEATED WOODLAND
- DELINEATED WETLAND
- TEMPORARY TREE PROTECTION FENCE SEE DETAIL 2/L1.0

NATURAL FEATURES PROTECTION OVERLAY NOTES:

1. SURVEY OF EXISTING CONDITIONS PROVIDED BY AR ENGINEERING, INC., 5725 VENTURE PARK DR., SUITE A, KALAMAZOO, MICHIGAN 49009, (269)250-5991.
2. WETLAND DELINEATION PROVIDED BY NISWANDER ENVIRONMENTAL, 9436 MALTBY ROAD, BRIGHTON, MICHIGAN 48116, (810)225-0539.
3. WOODLAND DELINEATION PROVIDED BY ARBORWISE, P.O. BOX 6553, FORT WAYNE, IN 46896, (260)402-6016.



1 **Wetland Enlargement Plan**
Scale: 1" = 10'-0"

0 10 20 30
SCALE IN FEET
North

OCBA LANDSCAPE ARCHITECTS

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Landscape Architecture
Urban Planning
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Campus & Institutional Planning
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Issued For:	Date
COK CHECKLIST MEETING	02–17–25
NFP SUBMISSION	03–27–25

Project:

Verburg Park Improvements

Kalamazoo, MI

Sheet Title

Woodland + Wetland Delineation Plans

Job No. 52411

Sheet No. L1.6