Appendix J

Environmental Studies

Biological Resources Review

Biological Resources Review

Lakeside Solar
White River Township
Muskegon County, Michigan



August 13, 2025

PRESENTED TO

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MANAGEMENT SUMMARY

This report presents the findings of a biological resources review conducted for the proposed Lakeside Solar project (the Project), located near the intersection of Lamos Road and Eilers Road, approximately 1.5 miles west-northwest of Montague in White River Township, Muskegon County, Michigan. At this location, Lakeside Solar, LLC proposes to develop a solar facility on 1,576.2 acres of privately held leased land (Project Area).

Tetra Tech's biological resources review includes an assessment of the likelihood of occurrence for endangered or threatened species known to be present in the Project Area or suspected to be present based on observed natural resource areas.

For known and suspected populations, Tetra Tech reviewed 1) publicly available information obtained from the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation System (IPaC) to identify federally-listed endangered or threatened species, and critical habitat in the Project Area, and 2) requested a Michigan Natural Features Inventory Information Request for the Project Area and 5 mile buffer from the Michigan Natural Features Inventory (MNFI).

Species designated as special concern were not reviewed as species within this category as they are not protected by the Part 365 Endangered Species Protection section of the Natural Resources and Environmental Protection Act of Michigan (M.C.L.A 324.36505), with the exception of amphibians and reptiles. Some amphibians and reptiles (including reptile eggs) are legally protected under Michigan Department of Natural Resources (MDNR) Director's Order No. FO-224.25.

To facilitate the likelihood of occurrence assessment, Tetra Tech biologists conducted an initial site visit in August 2022 and revisited the site in June 2025 to confirm the presence and extent of the natural resource areas (i.e., vegetated areas that are not cultivated cropland or otherwise human manipulated vegetation). Of the 1,576.2 acres reviewed, approximately 290.1 acres (18.4 percent of the Project Area) were documented as natural resource areas consisting predominantly of grassland herbaceous (194.0 acres), trees (63.0 acres), and wetland/streams (31.6 acres).

The review of federally listed and protected species determined that species with high or moderate likelihood of occurrence prefer grassland, forest, and wetland habitats and include the bald eagle, eastern massasauga rattlesnake, Indiana bat, and Karner blue butterfly. The review of state protected species determined that species with a moderate likelihood of occurrence prefer grassland, forest, and wetland habitats and include the Blanchard's cricket frog, Blanding's turtle, cerulean warbler, eastern box turtle, Karner blue butterfly, mudpuppy, and Persius dusky wing. Tetra Tech recommends siting facilities in cultivated cropland or grassland-hay areas to avoid and minimize the potential impacts to identified species. If impacts to suitable habitat are unavoidable, additional recommendations are provided in Section 4.0.

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1.0 – INTRODUCTION

Lakeside Solar, LLC proposes to develop the Lakeside Solar project (Project) on a 1,576.2-acre site (Project Area) located near the intersection of Lamos Road and Eilers Road, approximately 1.5 miles west-northwest of Montague in White River Township, Muskegon County, Michigan (Appendix A: Figure 1). Tetra Tech conducted a biological resource review for the Project to provide Lakeside Solar, LLC with a preliminary analysis of those potential existing biological resources within and in the vicinity of the Project Area that may preclude, constrain, or otherwise affect development of the Project.

2.0 – METHODS

Tetra Tech's biological resources review includes an assessment of the likelihood of occurrence for endangered or threatened species known to be present in the Project Area or suspected to be present based on observed natural resource areas. Tetra Tech characterizes the likelihood of occurrence as follows:

- **High** - species observed during site visit, highly suitable habitat is present in Project Area, or known populations exist in Project Area.
- **Moderate** - species range overlaps with Project Area and suitable habitat present in Project Area, or species known to occur in habitat similar to Project Area.
- **Low** - species range overlaps with Project Area and marginally suitable habitat in Project Area.

For known and suspected populations, Tetra Tech (1) reviewed publicly available information obtained from the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation System (IPaC) to identify federally-listed endangered or threatened species, and critical habitat in the Project Area, and 2) requested a Michigan Natural Features Inventory (MNFI) Information Request for the Project Area. The Information Request includes records within 5 miles of the Project Area and is valid for one year only.

Species designated as special concern were not reviewed as species within this category are not protected by the Part 365 Endangered Species Protection section of the Natural Resources and Environmental Protection Act of Michigan (M.C.L.A 324.36505), with the exception of amphibians and reptiles. Some amphibians and reptiles (including reptile eggs) are legally protected under Michigan Department of Natural Resources (MDNR) Director's Order No. FO-224.25 (MDNR 2024).

To facilitate the likelihood of occurrence assessment, Tetra Tech biologists conducted a desktop natural resource assessment by reviewing recent aerial photographs to identify areas that are not cultivated cropland within the Project Area. The natural resource areas were categorized by the dominant vegetation into subtypes of one of five broad categories – grassland herbaceous, shrub-scrub, trees, riparian, or wetlands/streams. Tetra Tech biologists conducted an initial site visit in August 2022 and revisited the site in June 2025 to confirm the presence and extent

of the natural resource areas (i.e., vegetated areas that are not cultivated cropland or otherwise human manipulated vegetation).

3.0 – RESULTS

3.1 – LAND USE AND VEGETATION

Of the 1,576.2 acres reviewed, 290.1 acres of natural resource areas were documented in the Project Area as part of the desktop natural resource assessment and site visits. The documented natural resource areas consist of predominantly grassland herbaceous (194.0 acres), trees (63.0 acres), and wetlands (31.6 acres) (Appendix A: Figure 2 and Figures 3A through 3F; Table 1). All three of the predominant natural resource area types are located throughout the Project Area. Representative photographs of natural resource area types are included as Appendix B.

Table 1. Surveyed Natural Resource Areas in the Project Area.

Natural Resource Area Type	Acres in Project Area	Percent of the Project Area
Grassland Herbaceous	**194.0**	**12.3**
Grassland-Hay	*159.4*	*10.1*
Grassland-Swale/Buffer Strip	*22.0*	*1.4*
Grassland- CRP or Unmanaged	*12.5*	*0.8*
Grassland – Pasture	*<0.1*	*<0.1*
Trees	**63.0**	**3.0**
Forest/Woodlot	*51.9*	*3.3*
Tree Row	*9.3*	*0.6*
Individual tree	*1.9*	*0.1*
Tree cluster	*1.8*	*0.1*
Wetlands	**31.6**	**2.0**
Emergent Wetland	*11.4*	*0.7*
Woody Wetland	*14.0*	*0.9*
Scrub Shrub Wetland	*0.2*	*<0.1*
Perennial Stream	*4.9*	*0.3*
Intermittent Stream	*1.1*	*0.1*
Riparian	**1.4**	**<0.1**
Riparian-Grasses or Forbs	*1.4*	*<0.1*
Shrub-Scrub	**0.2**	**<0.1**
Shrub scrub	*0.2*	*<0.1*
Natural Resource Area Total	**290.1**	**18.4**

Soil data for the Project Area was analyzed using the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA NRCS 2025a). The Project Area is comprised of 23 soil map units, 11 of which cover 83.7 percent of the Project Area (USDA NRCS 2025b). Soils of the same series are combined in Table 2 below (Table 2).

Table 2. USDA NRCS Web Soil Survey Results

Soil Map Unit	Percentage of Subject Property	Soil Series Description[1]
Nester soils, 12 to 25, 6 to 12, 25 to 45, 2 to 6, percent slopes, lake moderated	29.0	The Nester series consists of very deep, moderately well drained soils formed in till on ground moraines and end moraines. Slope ranges from 0 to 12 percent.
Tonkey and Deford soils	18.3	The Tonkey series consists of very deep, poorly drained and very poorly drained soils formed in stratified loamy and sandy glaciofluvial deposits on lake plains, outwash plains, or glacial drainageways. Slope ranges from 0 to 2 percent.
Kawkawlin loam, 0 to 2, 2 to 6, percent slopes	13.2	The Kawkawlin series consists of very deep, somewhat poorly drained soils formed in moderately fine and fine textured till on moraines. Slope ranges from 0 to 6 percent.
Belding and Allendale soils, 0 to 6 percent slopes	11.1	The Allendale series consists of very deep, somewhat poorly drained soils that formed in sandy sediments and in the underlying clayey lacustrine deposits or till on lake basins, lake terraces, lake plains, outwash plains, and ground moraines. Slope ranges from 0 to 12 percent.
Belding-Ubly sandy loams, 2 to 6 percent slopes	6.9	The Ubly series consists of very deep, well drained and moderately well drained soils formed in loamy glacial till materials on till plains and moraines. Permeability is moderately rapid in the upper part and moderately slow in the lower part. Slopes range from 0 to 35 percent.
Coloma-Brems-Metea complex, 6 to 12 percent slopes	5.2	The Coloma series consists of very deep, somewhat excessively drained or excessively drained soils formed in sandy drift. These soils are on moraines, outwash plains, deltas, and stream terraces. Slope ranges from 0 to 70 percent.

[1]Descriptions adapted from USDA Soil Series Descriptions (2025b)

3.2 – FEDERALLY-LISTED SPECIES AND CRITICAL HABITAT

The IPaC retrieved on June 24, 2025, indicates that the Project Area is within the range of the following species:

- three federally endangered species:
  - Indiana bat (*Myotis sodalis*),
  - piping plover (*Charadrius melodus*), and
  - Karner blue butterfly (*Lycaeides melissa samuelis*).
- three federally threatened species:
  - rufa red knot (*Calidris canutus rufa*),

  - eastern massasauga rattlesnake (*Sistrurus catenatus*), and
  - pitcher's thistle (*Cirsium pitcheri*).
- one species proposed to be listed as threatened:
  - monarch butterfly (*Danaus plexippus*) (Appendix C; Table 3).

Proposed threatened species are not protected by the take prohibitions of Section 9 of the Endangered Species Act until the rule to list is finalized. The monarch butterfly was proposed to be listed in the Federal Register (FR) on December 12, 2024, and comments were due to the USFWS by March 12, 2025 (89 FR 100662, USFWS 2024). The USFWS reopened the public comment period on March 19, 2025, and comments were due to the USFWS by May 19, 2025 (USFWS 2025a).

The IPaC did not identify critical habitat for the Project Area (Appendix C: IPaC Results).

Table 3. Federally Threatened and Endangered Species that May Occur in the Project Area.

Common Name	Scientific Name	Federal Status	Observed Species Habitat	Likelihood of Occurrence[1]
Mammal				
Indiana bat	*Myotis sodalis*	Endangered	Contiguous forest habitat on northern, western, and southern edges of the Project Area; 131.9 acres of the Project Area are included in the USFWS Indiana Bat Habitat Suitability Model (Appendix A: Figure 4)	High
Bird				
Piping plover	*Charadrius melodus*	Endangered	Lack of shoreline habitat	Low
Rufa red knot	*Calidris canutus rufa*	Threatened	Lack of shoreline habitat	Low
Reptile				
Eastern massasauga rattlesnake	*Sistrurus catenatus*	Threatened	Wetland habitat in the Project Area	Moderate
Insect				
Karner blue butterfly	*Lycaeides melissa samuelis*	Endangered	While no lupine was observed in the Project Area during the field survey, wooded areas with adjacent unmanaged and buffer strip grassland habitat is present. Additionally, occurrences have been reported in the Project Area vicinity.	Moderate

Common Name	Scientific Name	Federal Status	Observed Species Habitat	Likelihood of Occurrence[1]
Monarch butterfly	*Danaus plexippus*	Proposed Threatened	Open grasslands and roadside habitat are present. Observed incidentally during field survey.	High
Vascular Plant				
Pitcher's thistle	*Cirsium pitcheri*	Threatened	Lack of sand dune habitat	Low

[1]Likelihood of Occurrence: Low- species range overlaps with Project Area and marginally suitable habitat in Project Area; Moderate- species range overlaps with Project Area and suitable habitat present in Project Area, or species known to occur in habitat similar to Project Area; High- species observed during site visit, highly suitable habitat present in Project Area, or known populations exist in Project Area.

In summer, the Indiana bat occupies roost sites in forested areas under the exfoliating bark of dead or dying trees that retain large, thick slabs of peeling bark (USFWS 2025b). During the winter months, these species are obligatory cave hibernators (USFWS 2025b). The only known Indiana bat hibernaculum in Michigan is located inside Tippy Dam, a hydroelectric dam located approximately 60 miles northeast of the Project Area (USFWS 2022). Suitable habitat for Indiana bats within the Project Area includes forests/woodlots, tree rows, isolated clusters of trees, and individual trees. Additionally, approximately 131.9 acres of the Project Area are included in the USFWS Indiana Bat Habitat Suitability Model (USFWS 2025c, Appendix A: Figure 4). Based on the identified USFWS modeled Indiana bat habitat in the Project Area and the presence of suitable wooded habitat within the Project Area, the Indiana bat has a high likelihood of occurrence.

The piping plover is a small species of shorebird that is found in coastal and shoreline habitats (USFWS 2025d). Suitable habitat for the piping plover was not observed in the Project Area. Critical habitat for the piping plover is located approximately 11 miles south of the Project Area in Muskegon State Park. Due to the lack of shoreline habitat within the Project Area, the piping plover has a low likelihood of occurrence.

The rufa red knot is a robin-sized shorebird that breeds in the central Canadian Arctic and winters along the Atlantic coasts of Argentina and Chile, South America, western Gulf of America, both coasts of Central America, and southeast United States from Alabama to North Caroliina (USFWS 2025e). Migrating rufa red knots generally utilize coastal marine and estuarine habitats with large areas of exposed intertidal sediments, and there is little information to indicate whether or not rufa red knots may also use inland freshwater habits during migration (USFWS 2025e). The IPaC indicates that the species only needs to be considered for actions occurring along coastal areas during the migratory window of May 1 through September 30. Due to the lack of coastal shoreline habitat within Project Area, the rufa red knot has a low likelihood of occurrence.

The eastern massasauga rattlesnake inhabits wet prairies, marshes, fens, sedge meadows, peatlands and low areas along rivers and lakes (USFWS 2025f). Eastern massasauga rattlesnakes will use the adjoining upland habitat during the summer active period. Due to the suitable wetland habitat in the Project Area, there is a moderate likelihood of occurrence for the eastern massasauga rattlesnake.

The Karner blue butterfly is typically associated with landscapes composed of sandy soils that support oak or oak-pine savanna or barrens (MNFI 2025a). The species often occurs in openings, old fields, and rights-of-way surrounded by close-canopied oak forest. The larvae feed exclusively on wild lupine (*Lupinus perennis*). While no lupine was observed in the Project Area during the field survey, wooded areas with adjacent unmanaged and buffer strip grassland habitat are present. MNFI results included records of Karner blue butterfly within 5 miles of the Project Area between 1956 and 2013. The nearest observation record was approximately 2 miles north of the northernmost part of the Project Area in Oceana County in 2013. Based on the suitable habitat and reported occurrences in the vicinity, the Karner blue butterfly has a moderate likelihood of occurrence.

The monarch butterfly is known for its striking appearance and long migration in which the species overwinters in central Mexico before migrating north in the spring, traveling up to 2,000 miles. During migration and breeding, the monarch butterfly occupies areas such as fields, roadsides, open grassland areas, wetlands, or even urban greenspaces, laying eggs on milkweed (primarily *Asclepias* spp.) host plants (USFWS 2025g). During the site visit, milkweed was observed in road rights-of-ways throughout the Project Area, and a monarch butterfly was incidentally observed. Due to an observation of the species and its host plant (milkweed) during the site visit and the presence of grasslands and roadside habitat, the monarch butterfly has a high likelihood of occurrence within the Project Area.

Pitcher's thistle is found on open sand dunes and low open beach ridges along the shoreline of Lake Michigan (USFWS 2025h). The MNFI identified open dunes within a 5-mile buffer of the Project Area but did not identify open dune habitat within the Project Area. Due to the lack of open sand dune habitat within the Project Area, Pitcher's thistle has a low likelihood of occurrence.

3.3 – FEDERALLY-PROTECTED SPECIES

The IPaC response stated that bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are within the Project Area. While not federally endangered or threatened, the bald eagle and the golden eagle are afforded special federal protection by the Bald Eagle and Golden Eagle Protection Act (Appendix C).

The Project Area is located within the expected breeding range of the bald eagle but is not within the expected breeding range of the golden eagle (Cornell Lab of Ornithology 2025a, 2025b). Per the IPaC results, the expected breeding season for the bald eagle in the vicinity is September 1 through July 31 (Appendix C). Per USFWS guidelines, project development within 660 feet of an active bald eagle nest may require a Bald Eagle Incidental Take Permit (USFWS 2025i).

MNFI results included records of four bald eagle nests within 5 miles of the Project Area. These four records occurred between 2018 and 2019. The nearest observation record was approximately 3 miles south of the southernmost portion of the Project Area in 2018. There is a moderate potential for bald eagle to use or nest within the Project Area.

3.4 – STATE-LISTED SPECIES AND MNFI INFORMATION REQUEST

There are 10 state-listed endangered species, 38 state-listed threatened species, and 6 species of special concern (reptiles or amphibians) with recorded occurrences in Muskegon County (MNFI 2025b). There are 6 state-listed endangered species, 29 state-listed threatened species, and 4 species of special concern (reptiles or amphibians) with recorded occurrences in Oceana County (MNFI 2025b).

A MNFI Information Request was submitted and results received May 14, 2025, included recorded occurrences of 8 state-listed threatened and 2 species of special concern (reptiles or amphibians) within 5 miles of the Project Area[1] (Appendix D, Table 4). Available information on species habitat was reviewed on MNFI's County Element Data (MNFI 2025b) webpage. Based on these descriptions and a review of documented natural resource areas in the Project Area, limited or no suitable habitat was identified for three species and the likelihood of occurrence for these species is low. Suitable habitat was identified for the remaining seven species and the likelihood of occurrence for these species is moderate.

Table 4. State Threatened and Special Concern Reptile and Amphibian Species with Recorded Occurrences within 5 Miles of the Project Area.

Common Name	Scientific Name	State Status	Last Observed	Species Habitat in Project Area	Likelihood of Occurrence Within the Project Area
Amphibian					
Blanchard's cricket frog	*Acris blanchardi*	Threatened	1996	Wetland habitat present	Moderate
Mudpuppy	*Necturus maculosus*	Special Concern	2013	Wetland habitat containing permanent waters present	Moderate
Arthropod					
Karner blue butterfly	*Lycaeides melissa samuelis*	Threatened	2013	While no lupine was observed in the Project Area during the field survey, wooded areas with adjacent unmanaged and buffer strip grassland habitat is present. Additionally, occurrences have been reported in the Project Area vicinity.	Moderate

[1] Due to confidentiality, MNFI provided species location based on Township, Range, and Section.

Common Name	Scientific Name	State Status	Last Observed	Species Habitat in Project Area	Likelihood of Occurrence Within the Project Area
Persius dusky wing	*Erynnis persius persius*	Threatened	1956	While no lupine was observed in the Project Area during the field survey, wooded areas with adjacent unmanaged and buffer strip grassland habitat is present. Additionally, occurrences have been reported in the Project Area vicinity.	Moderate
Bird					
Cerulean warbler	*Setophaga cerulea*	Threatened	1999	Contiguous forest habitat on northern, western, and southern edges of the Project Area	Moderate
Mussel					
Black sandshell	*Ligumia recta*	Threatened	2004	No rivers with strong currents or lake habitat	Low
Plant					
Nodding pogonia (three birds orchid)	*Triphora trianthophora*	Threatened	1899	Forest habitat is present. While recorded occurrences were identified within the Project Area, all were from 1899.	Low
Pitcher's thistle	*Cirsium pitcher*	Threatened	2012	Lack of sand dune habitat	Low
Reptile					
Blanding's turtle	*Emydoidea blandingii*	Special Concern	2021	Shallow bodies of standing or slow-flowing water with muddy or mucky bottoms and aquatic or emergent vegetation	Moderate
Eastern box turtle	*Terrapene carolina carolina*	Threatened	2024	Forested habitats with sandy soils near a source of water such as a stream, pond, or wetland	Moderate

[1]Likelihood of Occurrence: Low- species range overlaps with Project Area and marginally suitable habitat in Project Area; Moderate- species range overlaps with Project Area and suitable habitat present in Project Area, or species known to occur in habitat similar to Project Area; High- species observed during site visit, highly suitable habitat present in Project Area, or known populations exist in Project Area.

The Blanchard's cricket frog typically inhabits the open edges of permanent ponds, lakes, floodings, bogs, seeps and slow-moving streams and rivers (MNFI 2025c). They also can utilize temporary water bodies if near permanent

water. They prefer open or partially vegetated mud flats, muddy or sandy shorelines, and mats of emergent aquatic vegetation in shallow water. Blanchard's cricket frog was recorded approximately 0.25 to 1 mile north of the Project Area in 1996. Based on suitable habitat and reported occurrences, the Blanchard's cricket frog has a moderate likelihood of occurrence.

The mudpuppy occurs in areas with permanent waters, such as rivers, ponds, and lakes (MNFI 2025d). Mudpuppy was recorded approximately 3 miles north and 5 miles east of the Project Area in 2013. Based on suitable habitat and reported occurrences, there is a moderate likelihood of occurrence for the mudpuppy.

The Karner blue butterfly is discussed in Section 3.2 above.

The Persius dusky wing is typically found in oak-pine barrens and adjacent prairies and brushy fields, and along trails and utility rights-of-way through barrens (MNFI 2025e). The eggs are laid on wild blue lupine (*Lupinus perennis*). Persius dusky wing was recorded approximately 5 miles northeast of the Project Area in 1956. Based on the suitable habitat and reported occurrences, the Persius dusky wing has a moderate likelihood of occurrence.

The cerulean warblers prefer mesic sites and are most commonly found in the canopy of large tracts of mature deciduous forest (MNFI 2025f). The cerulean warbler was recorded approximately 4 miles southeast of the Project Area in 1999. Based on the suitable habitat and reported occurrences, the cerulean warbler has a moderate likelihood of occurrence.

The Blanding's turtle inhabits shallow ponds and marshes with abundant aquatic vegetation and soft muddy bottoms and nest in adjacent upland habitat with well-drained, sandy soils (MNFI 2025g). The Blanding's turtle was recorded approximately 5 miles east of the Project Area in 2021. Based on reported occurrences near the Project Area and the presence of suitable habitat and sandy soils in the Project Area (Table 2), the Blanding's turtle has a moderate likelihood of occurrence.

The eastern box turtle typically occurs in forested habitats with sandy soils near streams, ponds, lakes, and wetlands (MNFI 2025h). 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. Eastern box turtles were reported approximately 0.25 miles east of the Project Area in 2024. Based on the suitable habitat and reported occurrences and sandy soils in the Project Area (Table 2), there is a moderate likelihood of occurrence for eastern box turtles.

MNFI recorded floodplain forest, Great Lakes marsh, mesic northern forest, and open dunes outside of the Project Area within the 5-mile buffer (Appendix D).

4.0 – RECOMMENDATIONS

The review of federal and state protected species determined that species with high or moderate likelihood of occurrence prefer grassland, forest, and wetland habitats. Tetra Tech recommends siting facilities in cultivated cropland or grassland-hay areas to avoid and minimize the potential impacts to identified species. If impacts to suitable habitat are unavoidable, additional recommendations are provided below.

4.1 FEDERALLY-LISTED SPECIES

Consultation with USFWS is recommended to identify agency concerns on potential impacts to federally listed species with a moderate or high likelihood of occurrence. However, consultation with the USFWS concerning proposed solar projects is on hold given current U.S. Department of the Interior (DOI) policies, which require submission to the submission to the Office of the Executive Secretariat and Regulatory Affairs, subsequent review by the Office of the Deputy Secretary, and final review by the Office of the Secretary of the DOI. While the process for implementation of this policy is reportedly still being determined, it has resulted in the pause of all review and comment by any federal agency under the DOI on any action associated with solar facilities.

Absent a federal nexus, the Project may determine the likelihood of impacts to federally listed species (Indiana bat, eastern massasauga rattlesnake, and Karner blue butterfly) based species-specific surveys to drive appropriate avoidance and minimization measures and in lieu of consultation with the USFWS, conduct consultation with MDNR to identify acceptable survey protocols.

Based on recent consultation with the USFWS, formal technical assistance has not yet been developed by the USFWS concerning the monarch butterfly. However, the USFWS anticipates that actions with the potential to result in the take of the species would include actions that affect milkweed plants or sources of nectar while monarch butterfly eggs, caterpillars, or adults are present. To help projects avoid potential impacts to the monarch butterfly, the USFWS's current recommendation is for projects to enroll in the Nationwide Candidate Conservation Agreement with Assurance (CCAA) for the Monarch Butterfly, which provides regulatory assurance under the Endangered Species Act that no additional conservation measures would be required if the monarch butterfly becomes a listed species in the future (Board of Trustees of the University of Illinois 2018). Enrollment in the CCAA entails contributing to the conservation of the species through the implementation of voluntary habitat management practices while maintaining flexibility in land use activities. If the Project has the potential to impact the monarch butterfly, Tetra Tech recommends enrolling in the CCAA.

4.2 FEDERALLY-PROTECTED SPECIES

Tetra Tech recommends conducting bald eagle nest surveys of the Project Area and a 660-foot buffer during leaf off (late fall through early spring) to confirm the presence or absence of bald eagle nests.

4.3 STATE LISTED SPECIES

The Project may determine the likelihood of impacts to state listed species with a moderate likelihood of occurrence (Blanchard's cricket frog, mudpuppy, Karner blue butterfly, Persius dusky wing, cerulean warbler, Blanding's turtle, and the eastern box turtle) through the MNFI Rare Species Review. Results would provide a list of all species that are located within 1.5 miles of the Project Area and discuss specific management recommendations and recommendations for species-specific surveys, if warranted.

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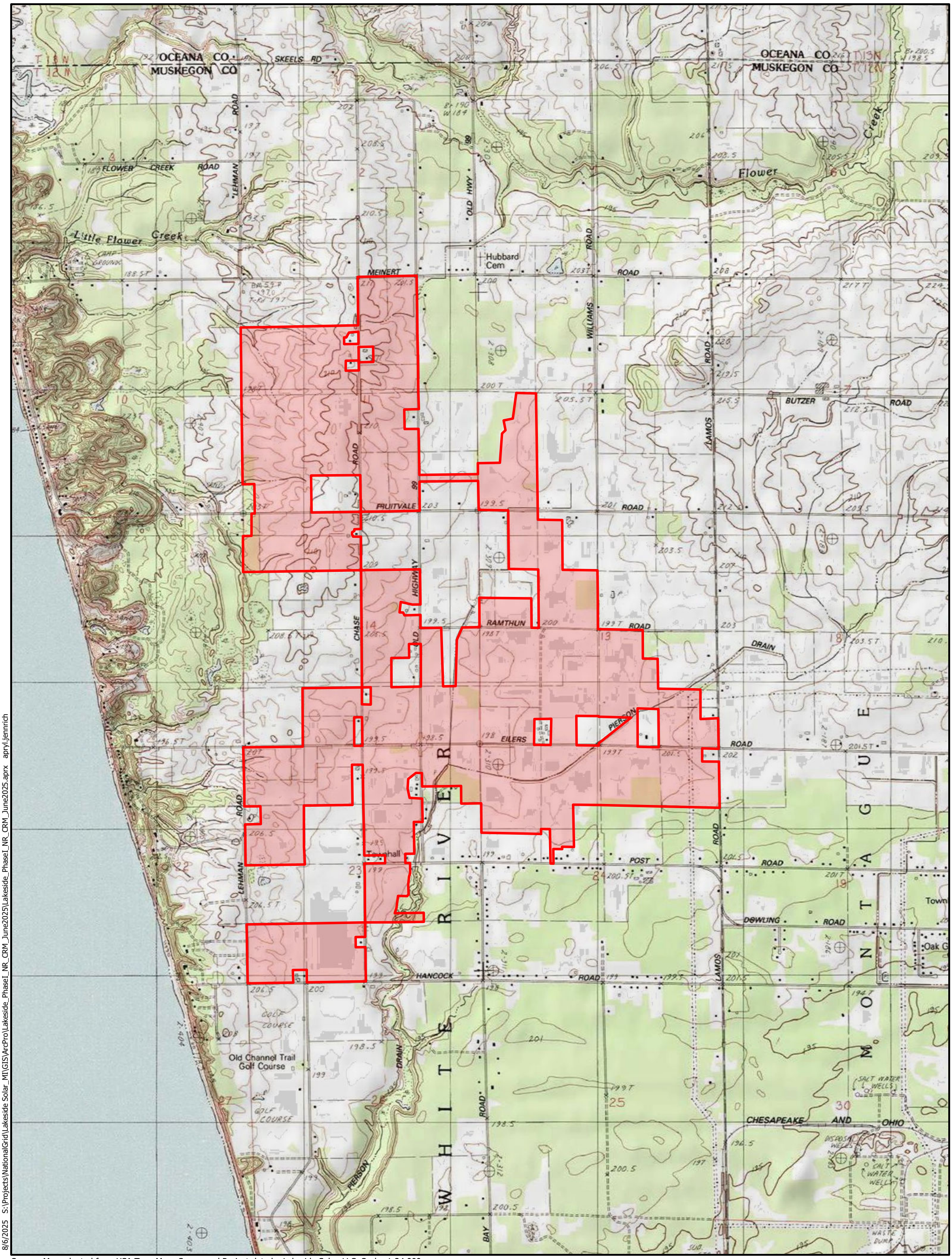
USFWS. 2025f. Massasauga. Available online at https://www.fws.gov/species/massasauga-sistrurus-catenatus, accessed on June 24, 2025.

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USFWS. 2025h. Pitcher's Thistle. Available online at https://www.fws.gov/species/pitchers-thistle-cirsium-pitcheri, accessed on August 6, 2025.

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APPENDIX A. FIGURES



8/6/2025 S:\Projects\NationalGrid\Lakeside Solar_MI\GIS\ArcPro\Lakeside_PhaseI_NR_CRM_June2025\Lakeside_PhaseI_NR_CRM_June2025.aprx apryl.jennrich

Source: Map adapted from USA Topo Maps Server and Project data by Lakeside Solar, LLC. Scale: 1:24,000



Project Area

0 0.25 0.5 0.75 1 Mile

Figure 1
Project Location

Lakeside Solar
Muskegon County, Michigan

TETRA TECH

Meinert Park Rd
Chase Rd
Williams Rd
Lamos Rd
Fruitvale Rd
Ramthun Rd
Eilers Rd
Old Highway 99
Pierson Drain
Lehman Rd
White River
Post Rd
Hancock Rd
N William Rd

6 11 9 19 13 2 29 1 16 15 36 21 33 4 14 24 12 7 10 3 26 37 32 31 25 5 8 28 35 20 23 27 18 30 17 34 22

8/7/2025 S:\Projects\NationalGrid\Lakeside Solar_MI\GIS\ArcPro\Lakeside_PhaseI_NR_CRM_June2025\Lakeside_PhaseI_NR_CRM_June2025.aprx apryl.jennrich

Source: Map adapted from USDA 2024 NAIP, Tetra Tech natural resource field data, and Project data by Lakeside Solar, LLC. Scale: 1:15,000



Project Area
Photo Point

Natural Resource Area

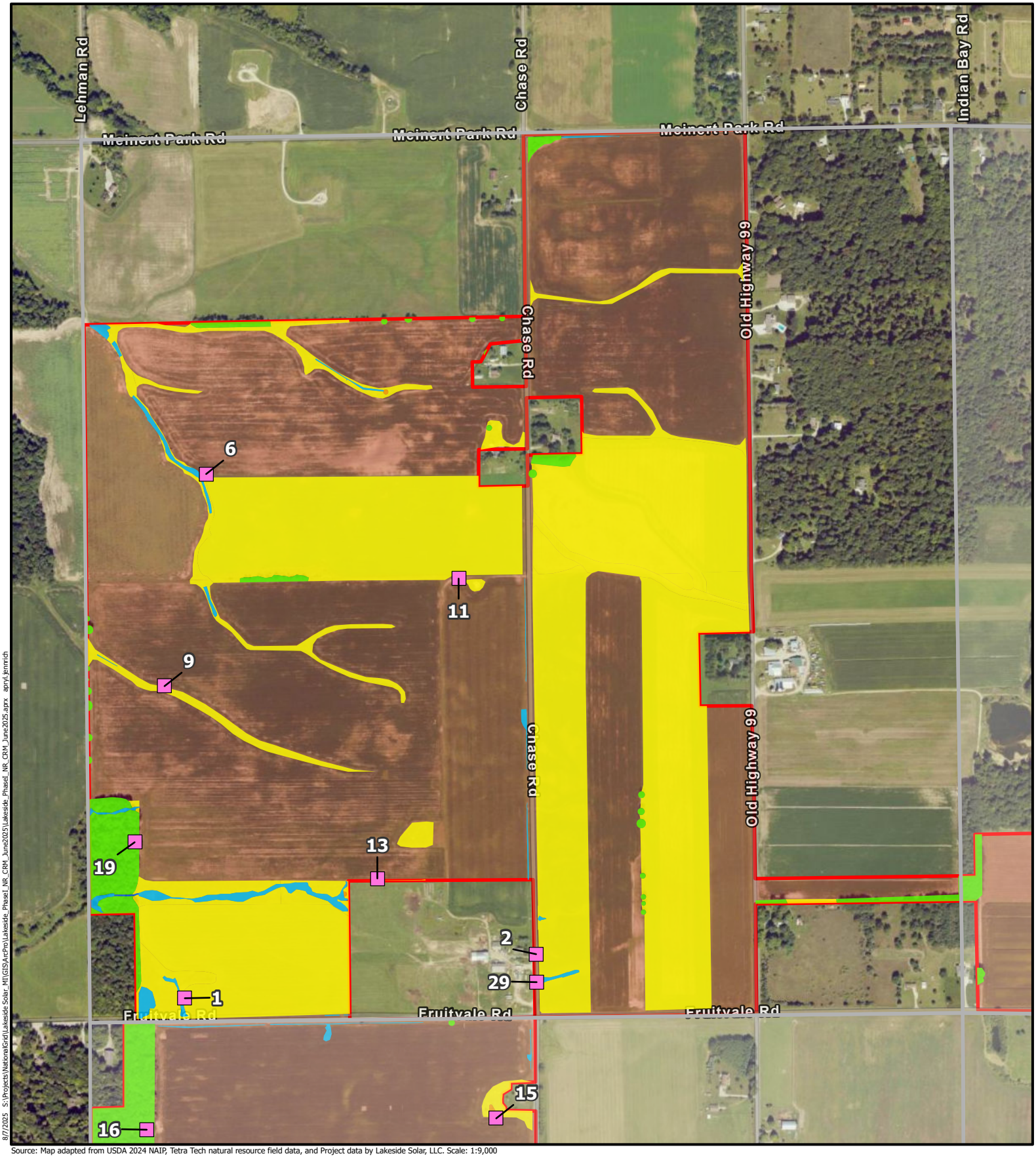
Grassland Herbaceous
Shrub Scrub
Trees
Riparian
Stream
Wetland

0 0.25 0.5 0.75 1 Mile

Figure 2
Natural Resource Areas Overview

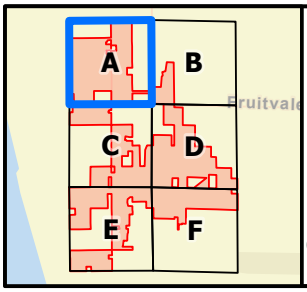
Lakeside Solar
Muskegon County, Michigan

TETRA TECH



Source: Map adapted from USDA 2024 NAIP, Tetra Tech natural resource field data, and Project data by Lakeside Solar, LLC. Scale: 1:9,000

8/7/2025 S:\Projects\NationalGrid\Lakeside Solar_MI\GIS\ArcPro\Lakeside_Phase1_NR_CRM_June2025\Lakeside_Phase1_NR_CRM_June2025.aprx aprvl.jenrich



Project Area

Photo Point

Natural Resource Area

Grassland Herbaceous

Shrub Scrub

Trees

Riparian

Stream

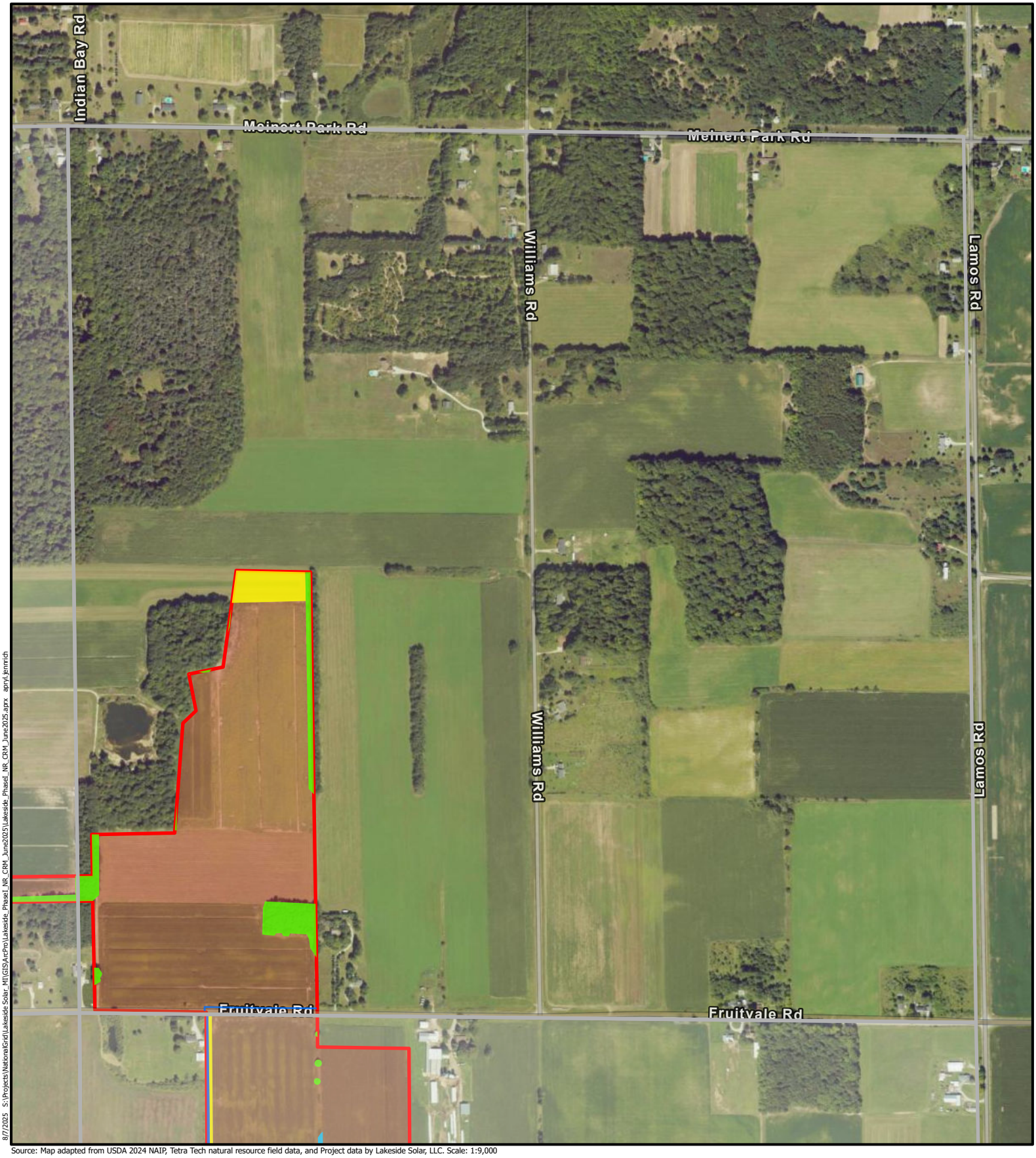
Wetland

0 0.25 0.5 Mile

Figure 3A
Natural Resource Areas

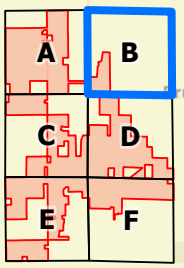
Lakeside Solar
Muskegon County, Michigan

TETRA TECH



8/7/2025 S:\Projects\NationalGrid\Lakeside Solar_MI\GIS\ArcPro\Lakeside_Phase1_NR_CRM_June2025\Lakeside_Phase1_NR_CRM_June2025.aprx aprn\jennrich

Source: Map adapted from USDA 2024 NAIP, Tetra Tech natural resource field data, and Project data by Lakeside Solar, LLC. Scale: 1:9,000



Project Area

Photo Point

Natural Resource Area

Grassland Herbaceous

Shrub Scrub

Trees

Riparian

Stream

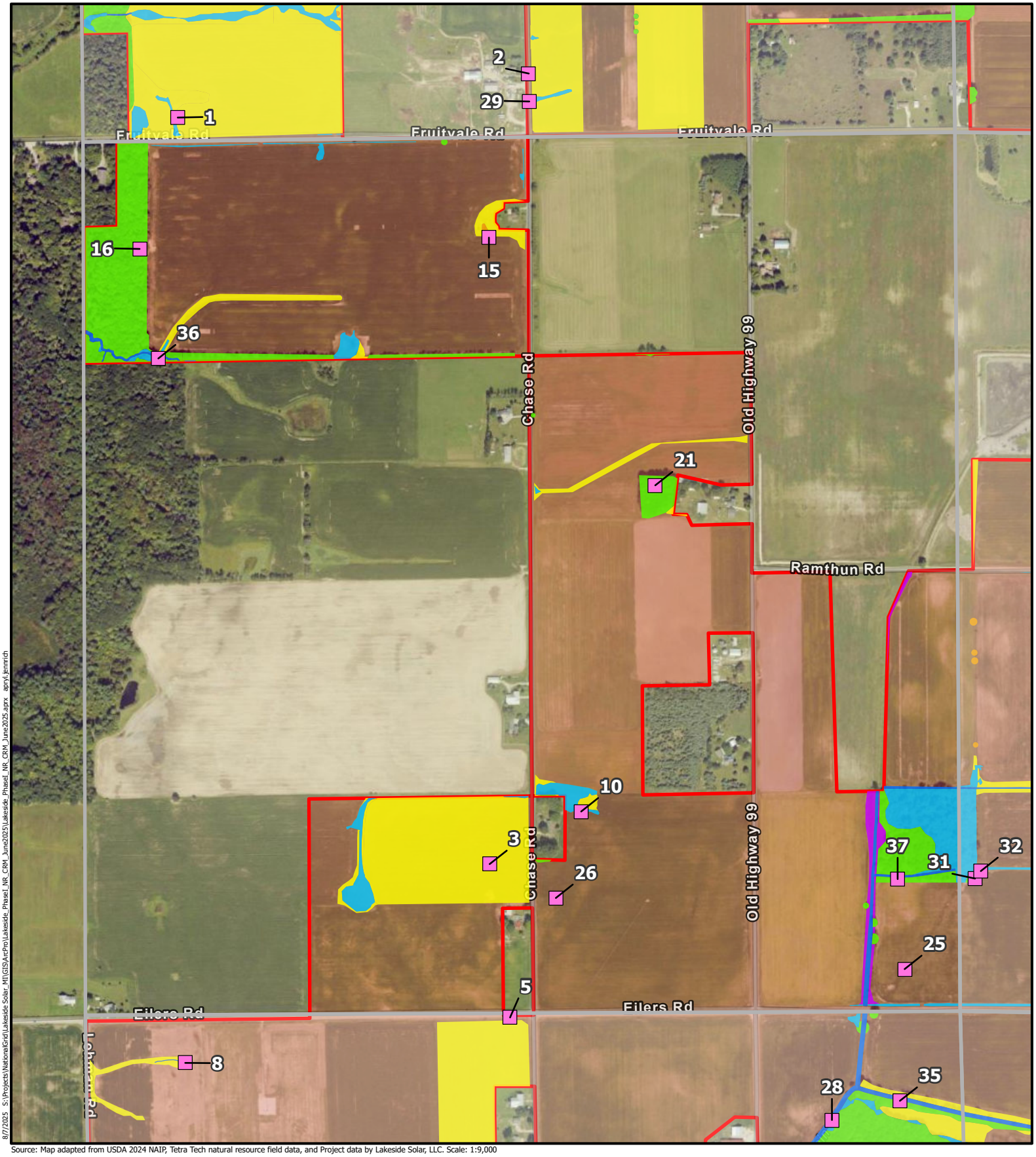
Wetland

0 0.25 0.5 Mile

Figure 3B
Natural Resource Areas

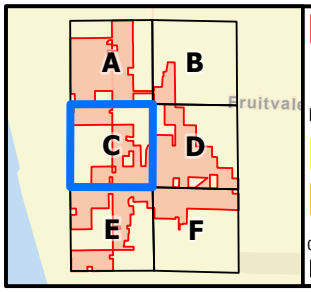
Lakeside Solar
Muskegon County, Michigan

TETRA TECH



Source: Map adapted from USDA 2024 NAIP, Tetra Tech natural resource field data, and Project data by Lakeside Solar, LLC. Scale: 1:9,000

8/7/2025 S:\Projects\NationalGrid\Lakeside Solar_MI\GIS\ArcPro\Lakeside_Phase1_NR_CRM_June2025\Lakeside_Phase1_NR_CRM_June2025.aprx aprvl.jenrich



Project Area

Photo Point

Natural Resource Area

Grassland Herbaceous

Shrub Scrub

Trees

Riparian

Stream

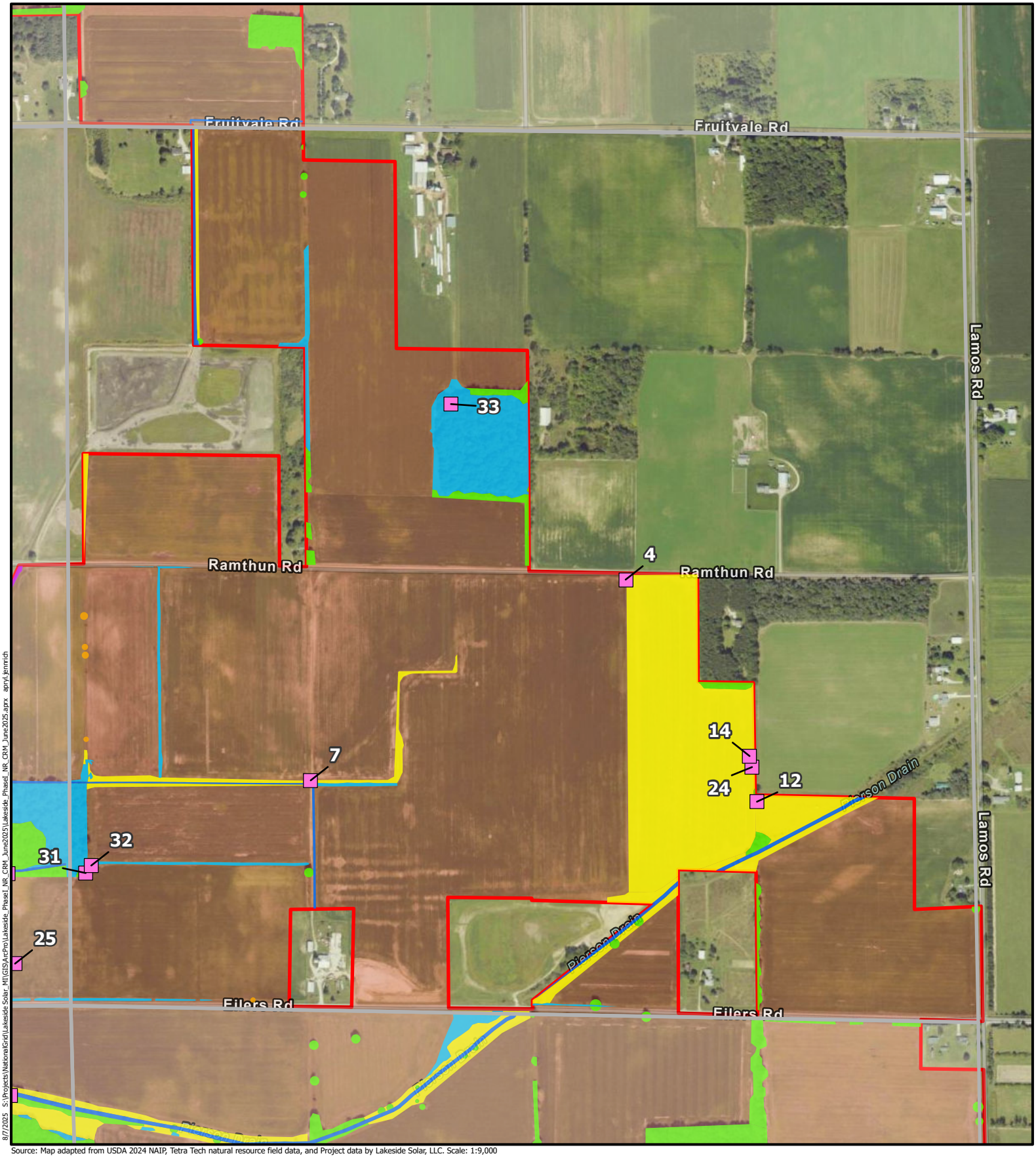
Wetland

0 0.25 0.5 Mile

Figure 3C
Natural Resource Areas

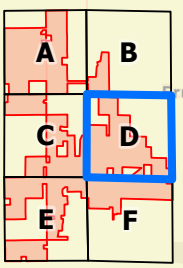
Lakeside Solar
Muskegon County, Michigan

TETRA TECH



Source: Map adapted from USDA 2024 NAIP, Tetra Tech natural resource field data, and Project data by Lakeside Solar, LLC. Scale: 1:9,000

8/7/2025 S:\Projects\NationalGrid\Lakeside Solar_MI\GIS\ArcPro\Lakeside_Phase1_NR_CRM_June2025\Lakeside_Phase1_NR_CRM_June2025.aprx aprvl.jenrich



Project Area

Photo Point

Natural Resource Area

Grassland Herbaceous

Shrub Scrub

Trees

Riparian

Stream

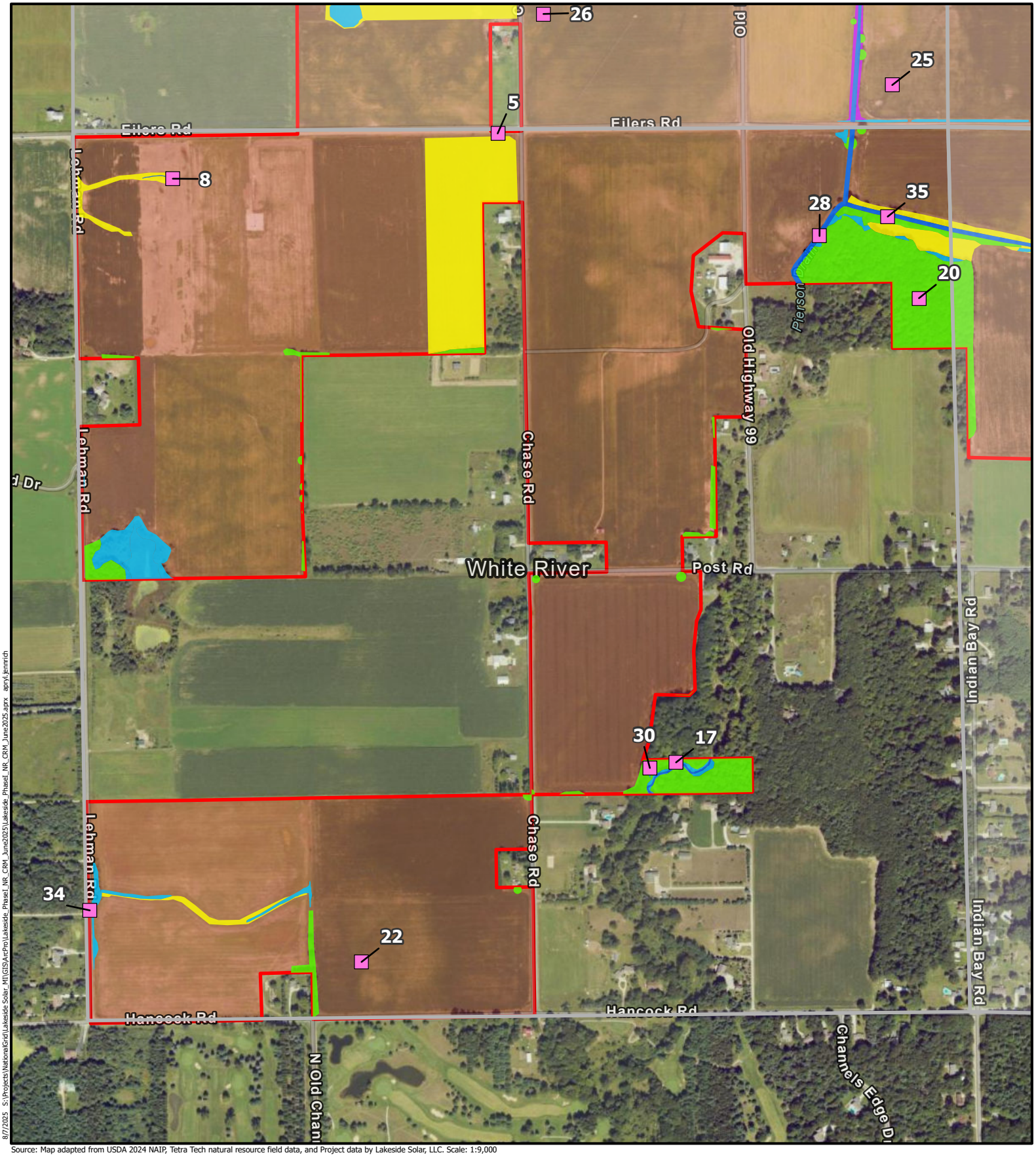
Wetland

0 0.25 0.5 Mile

Figure 3D
Natural Resource Areas

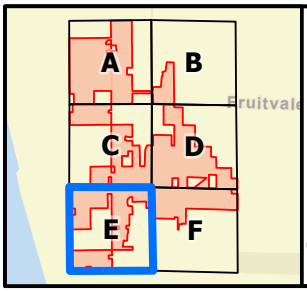
Lakeside Solar
Muskegon County, Michigan

TETRA TECH



8/7/2025 S:\Projects\NationalGrid\Lakeside Solar_MI\GIS\ArcPro\Lakeside_Phase1_NR_CRM_June2025\Lakeside_Phase1_NR_CRM_June2025.aprx aprvl.jenrich

Source: Map adapted from USDA 2024 NAIP, Tetra Tech natural resource field data, and Project data by Lakeside Solar, LLC. Scale: 1:9,000



Project Area

Photo Point

Natural Resource Area

Grassland Herbaceous

Shrub Scrub

Trees

Riparian

Stream

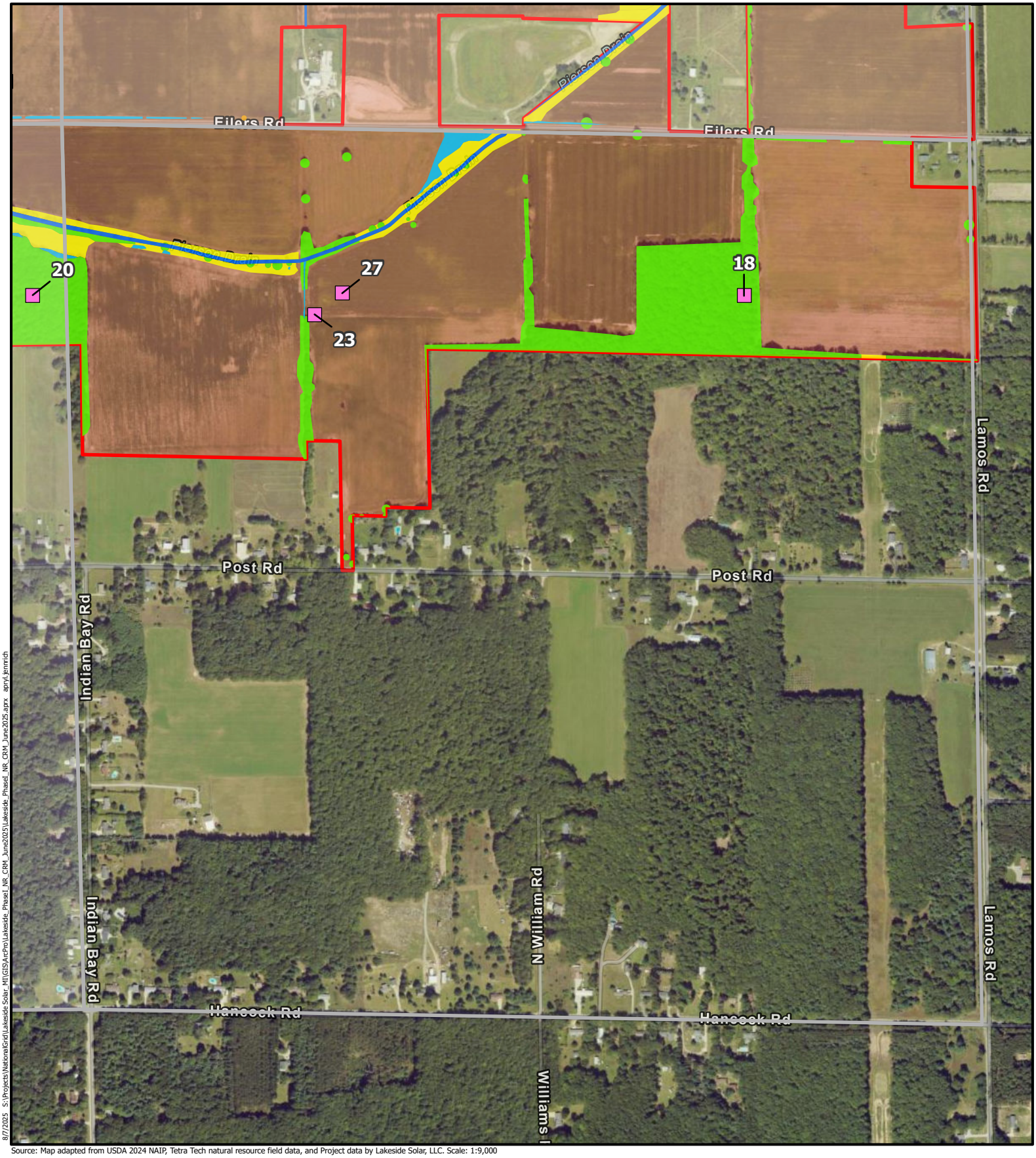
Wetland

0 0.25 0.5 Mile

Figure 3E
Natural Resource Areas

Lakeside Solar
Muskegon County, Michigan

TETRA TECH



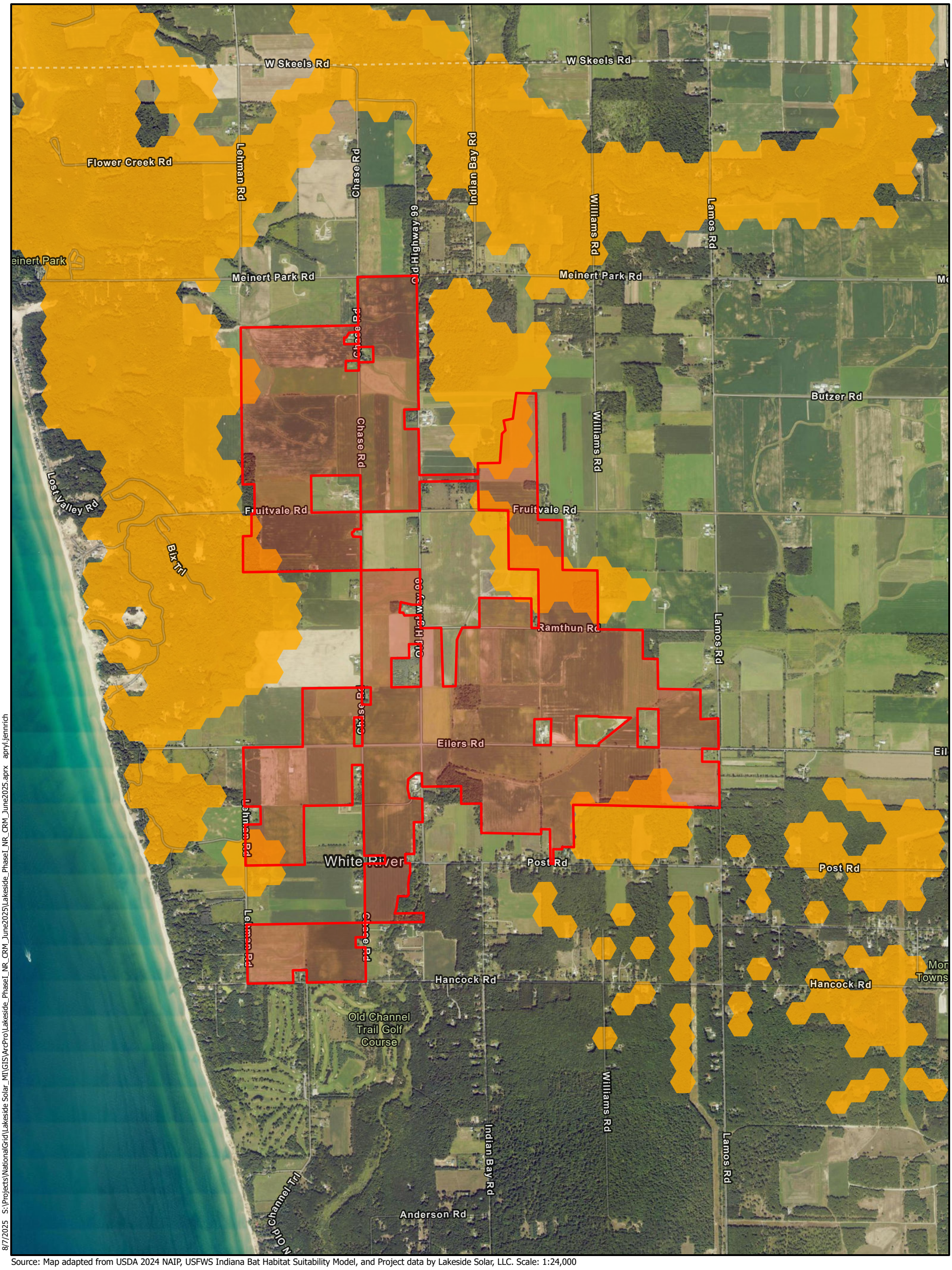
Source: Map adapted from USDA 2024 NAIP, Tetra Tech natural resource field data, and Project data by Lakeside Solar, LLC. Scale: 1:9,000

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Figure 3F
Natural Resource Areas

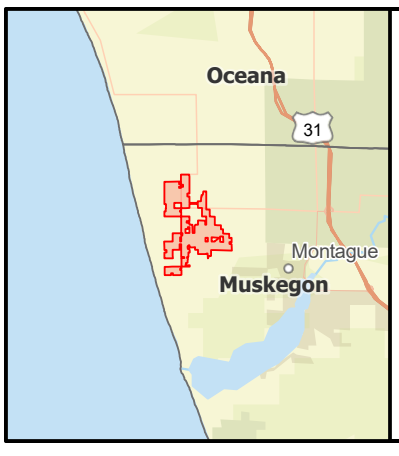
Lakeside Solar
Muskegon County, Michigan

TETRA TECH



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Source: Map adapted from USDA 2024 NAIP, USFWS Indiana Bat Habitat Suitability Model, and Project data by Lakeside Solar, LLC. Scale: 1:24,000



Project Area

USFWS Indiana Bat Modeled Habitat

0 0.25 0.5 0.75 1 Mile

Figure 4
USFWS Indiana Bat Habitat Suitability Model

Lakeside Solar
Muskegon County, Michigan

TETRA TECH

APPENDIX B. NATURAL RESOURCE PHOTOGRAPHS

Natural Resource Photographs
Lakeside Solar

Photo Point 1 **Type:** Grassland - Hay **Orientation:** East **Location:** 43.44523°, -86.43459° **Date:** 6/10/2025	

Photo Point 2 **Type:** Grassland - Hay **Orientation:** East **Location:** 43.44591°, -86.4267° **Date:** 6/11/2025	

Natural Resource Photographs
Lakeside Solar

Photo Point 3 **Type:** Grassland - Hay **Orientation:** Southwest **Location:** 43.43298°, -86.4277° **Date:** 6/11/2025	

Photo Point 4 **Type:** Grassland - Hay **Orientation:** Southeast **Location:** 43.43742°, -86.40465° **Date:** 6/12/2025	

Natural Resource Photographs
Lakeside Solar

Photo Point 5

Type: Grassland - Hay

Orientation: South

Location: 43.43047°, -86.42727°

Date: 6/11/2025



Photo Point 6

Type: Grassland - Hay

Orientation: Southeast

Location: 43.4538°, -86.43403°

Date: 6/10/2025



Natural Resource Photographs
Lakeside Solar

Photo Point 7 **Type:** Grassland - Buffer Strip or Swale **Orientation:** East **Location:** 43.43418°, -86.41174° **Date:** 6/12/2025	

Photo Point 8 **Type:** Grassland - Buffer Strip or Swale **Orientation:** West **Location:** 43.42976°, -86.43457° **Date:** 6/11/2025	

Natural Resource Photographs
Lakeside Solar

Photo Point 9 **Type:** Grassland - Buffer Strip or Swale **Orientation:** Southeast **Location:** 43.45033°, -86.435° **Date:** 6/10/2025	

Photo Point 10 **Type:** Grassland - CRP or Unmanaged **Orientation:** Northeast **Location:** 43.43383°, -86.42564° **Date:** 6/12/2025	

Natural Resource Photographs
Lakeside Solar

Photo Point 11 **Type:** Grassland - CRP or Unmanaged **Orientation:** Southeast **Location:** 43.45206°, -86.42838° **Date:** 6/11/2025	

Photo Point 12 **Type:** Grassland - CRP or Unmanaged **Orientation:** East **Location:** 43.43377°, -86.40174° **Date:** 6/12/2025	

Photo Point 13 **Type:** Grassland - Pasture **Orientation:** South-southwest **Location:** 43.44717°, -86.43025° **Date:** 6/11/2025	

Photo Point 14 **Type:** Shrub - Scrub **Orientation:** Southeast **Location:** 43.43452°, -86.40189° **Date:** 6/12/2025	

Natural Resource Photographs
Lakeside Solar

Photo Point 15

Type: Shrub - Scrub

Orientation: Northwest

Location: 43.44323°, -86.42762°

Date: 6/10/2025



Photo Point 16

Type: Tree - Forest

Orientation: Southwest

Location: 43.44308°, -86.43547°

Date: 6/10/2025



Natural Resource Photographs
Lakeside Solar

Photo Point 17 **Type:** Tree - Large Woodlot **Orientation:** West **Location:** 43.42015°, -86.42336° **Date:** 6/12/2025	

Photo Point 18 **Type:** Tree - Large Woodlot **Orientation:** Northwest **Location:** 43.42763°, -86.40189° **Date:** 6/11/2025	

Natural Resource Photographs
Lakeside Solar

Photo Point 19 **Type:** Tree - Medium Woodlot **Orientation:** West **Location:** 43.44779°, -86.4357° **Date:** 6/10/2025	

Photo Point 20 **Type:** Tree - Medium Woodlot **Orientation:** Southeast **Location:** 43.42772°, -86.41784° **Date:** 6/10/2025	

Natural Resource Photographs
Lakeside Solar

Photo Point 21 **Type:** Tree - Small Woodlot **Orientation:** South **Location:** 43.43916°, -86.42393° **Date:** 6/12/2025	

Photo Point 22 **Type:** Tree - Treerow **Orientation:** Northwest **Location:** 43.41692°, -86.43045° **Date:** 6/11/2025	

Natural Resource Photographs
Lakeside Solar

Photo Point 23 **Type:** Tree - Treerow **Orientation:** Southwest **Location:** 43.42737°, -86.41152° **Date:** 6/10/2025	

Photo Point 24 **Type:** Tree - Individual Tree and Grassland - Hay **Orientation:** South **Location:** 43.43434°, -86.40184° **Date:** 6/12/2025	

Photo Point 25 **Type:** Tree - Individual Tree **Orientation:** Northwest **Location:** 43.43121°, -86.41841° **Date:** 6/12/2025	

Photo Point 26 **Type:** Tree - Cluster of Trees **Orientation:** North **Location:** 43.43242°, -86.42622° **Date:** 6/12/2025	

Photo Point 27 **Type:** Tree - Cluster of Trees **Orientation:** Northwest **Location:** 43.42772°, -86.4109° **Date:** 6/10/2025	

Photo Point 28 **Type:** Riparian - Grasses or Forbs **Orientation:** Southwest **Location:** 43.42875°, -86.42006° **Date:** 6/10/2025	

Photo Point 29 **Type:** Wetland - Emergent and Grassland - Hay **Orientation:** East **Location:** 43.44545°, -86.4267° **Date:** 6/11/2025	

Photo Point 30 **Type:** Wetland - Emergent and Tree – Large Woodlot **Orientation:** East **Location:** 43.42006°, -86.42395° **Date:** 6/12/2025	

Photo Point 31 **Type:** Wetland - Emergent **Orientation:** East **Location:** 43.43281°, -86.41668° **Date:** 6/12/2025	

Photo Point 32 **Type:** Wetland - Forested **Orientation:** Northeast **Location:** 43.43269°, -86.41681° **Date:** 6/12/2025	

Natural Resource Photographs
Lakeside Solar

Photo Point 33

Type: Wetland - Forested

Orientation: East

Location: 43.44031°, -86.40854°

Date: 6/12/2025



Photo Point 34

Type: Wetland - Scrub Shrub

Orientation: Northeast

Location: 43.4178°, -86.43655°

Date: 6/11/2025



Natural Resource Photographs
Lakeside Solar

Photo Point 35 **Type:** Stream - Perennial and Tree – Tree – Medium Woodlot **Orientation:** Northwest **Location:** 43.42906°, -86.41853° **Date:** 6/10/2025	

Photo Point 36 **Type:** Stream – Intermittent and Tree – Forest **Orientation:** East **Location:** 43.44129°, -86.43506° **Date:** 6/10/2025	

Natural Resource Photographs
Lakeside Solar

Photo Point 37 **Type:** Stream - Intermittent **Orientation:** East **Location:** 43.43269°, -86.41855° **Date:** 6/12/2025	

APPENDIX C. IPAC RESULTS

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

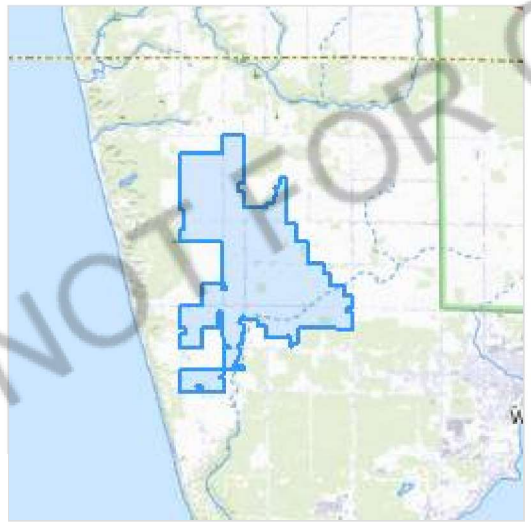
This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list 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.

NOT FOR CONSULTATION

Location

Muskegon County, Michigan



Local office

Michigan Ecological Services Field Office

(517) 351-2555
(517) 351-1443

2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360

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.

---

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.

NOT FOR CONSULTATION

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

Birds

NAME	STATUS
Piping Plover Charadrius melodus There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/6039	Endangered
Rufa Red Knot Calidris canutus rufa Wherever found This species only needs to be considered if the following condition applies: • Only actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30. There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/1864	Threatened

Reptiles

NAME	STATUS
Eastern Massasauga (=rattlesnake) Sistrurus catenatus Wherever found This species only needs to be considered if the following condition applies: • 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

NOT FOR CONSULTATION

Karner Blue Butterfly Lycaeides melissa samuelis Wherever found There is **proposed** critical habitat for this species. https://ecos.fws.gov/ecp/species/6656	Endangered
Monarch Butterfly Danaus plexippus Wherever found There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

Flowering Plants

NAME	STATUS
Pitcher's Thistle Cirsium pitcheri Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8153	Threatened

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.

NOT FOR CONSULTATION

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.

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

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.

Review the FAQs

The FAQs below provide important additional information and resources.

NAME	BREEDING SEASON

NOT FOR CONSULTATION

Bald Eagle Haliaeetus leucocephalus — Breeds Dec 1 to Aug 31

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

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

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

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presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

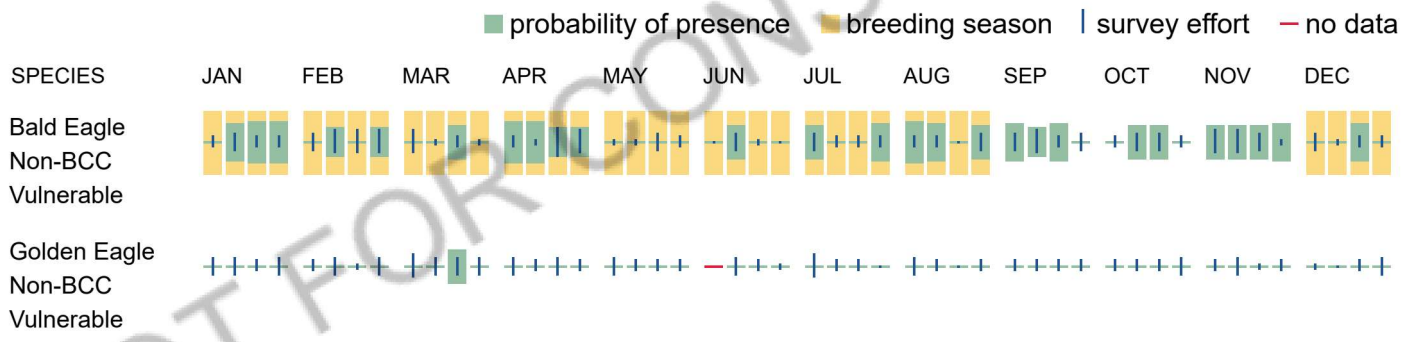
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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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Bald & Golden Eagles FAQs

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 an eagle (Bald and Golden Eagle Protection Act requirements may apply).

Proper interpretation and use of your eagle report
On the graphs provided, please look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). 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 line or no data line (red horizontal) 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 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 and associated information help you know what to look for to confirm presence and helps guide you in knowing when to implement avoidance and minimization measures to eliminate or reduce potential impacts from your project activities or get the appropriate permits should presence be confirmed.

How do I know if eagles are 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 resident), you may query your location using the RAIL Tool and view the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If an eagle on your IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your "IPaC PROBABILITY OF PRESENCE SUMMARY" at the top of your results list), 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.

Interpreting the Probability of Presence Graphs

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 taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:
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.

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.

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.

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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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).

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 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

Measures for Proactively Minimizing Migratory Bird Impacts

Your IPaC Migratory Bird list showcases birds of concern, including Birds of Conservation Concern (BCC), in your project location. This is not a comprehensive list of all birds found in your project area. However, you can help proactively minimize significant impacts to all birds at your project location by implementing the measures in the Nationwide avoidance and minimization measures for birds document, and any other project-specific avoidance and minimization measures suggested at the link Measures for avoiding and minimizing impacts to birds for the birds of concern on your list below.

Ensure Your Migratory Bird List is Accurate and Complete

If your project area is in a poorly surveyed area, 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 document, 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 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.

Review the FAQs

The FAQs below provide important additional information and resources.

NAME	BREEDING SEASON

NOT FOR CONSULTATION

Bald Eagle Haliaeetus leucocephalus — Breeds Dec 1 to Aug 31

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

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.

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

Grasshopper Sparrow Ammodramus savannarum perpallidus — Breeds Jun 1 to Aug 20

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

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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
Semipalmated Sandpiper Calidris pusilla This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Upland Sandpiper Bartramia longicauda 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/9294	Breeds May 1 to Aug 31
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

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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.

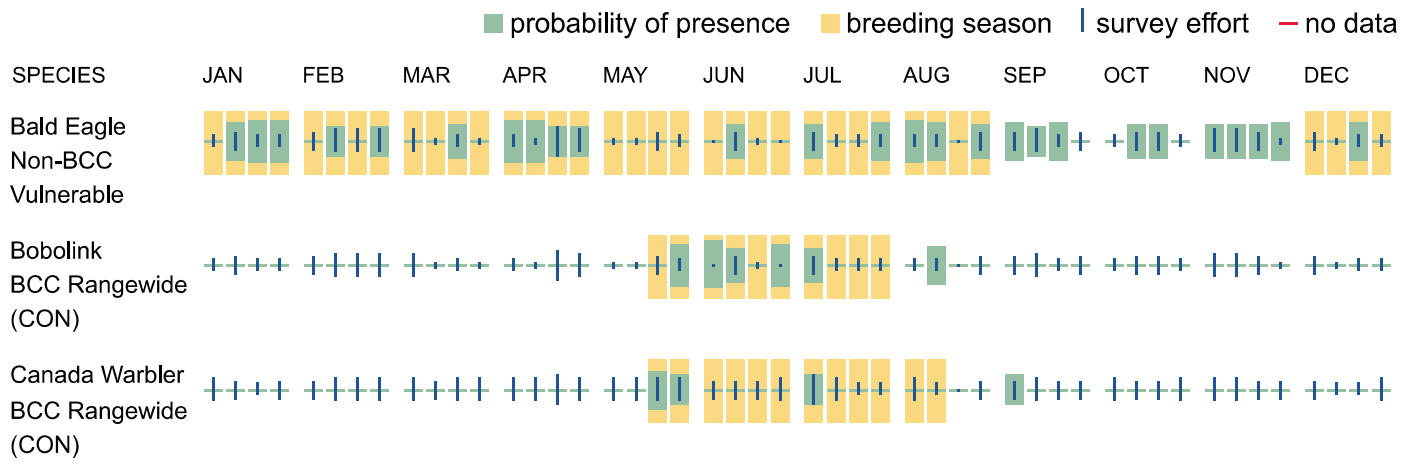
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

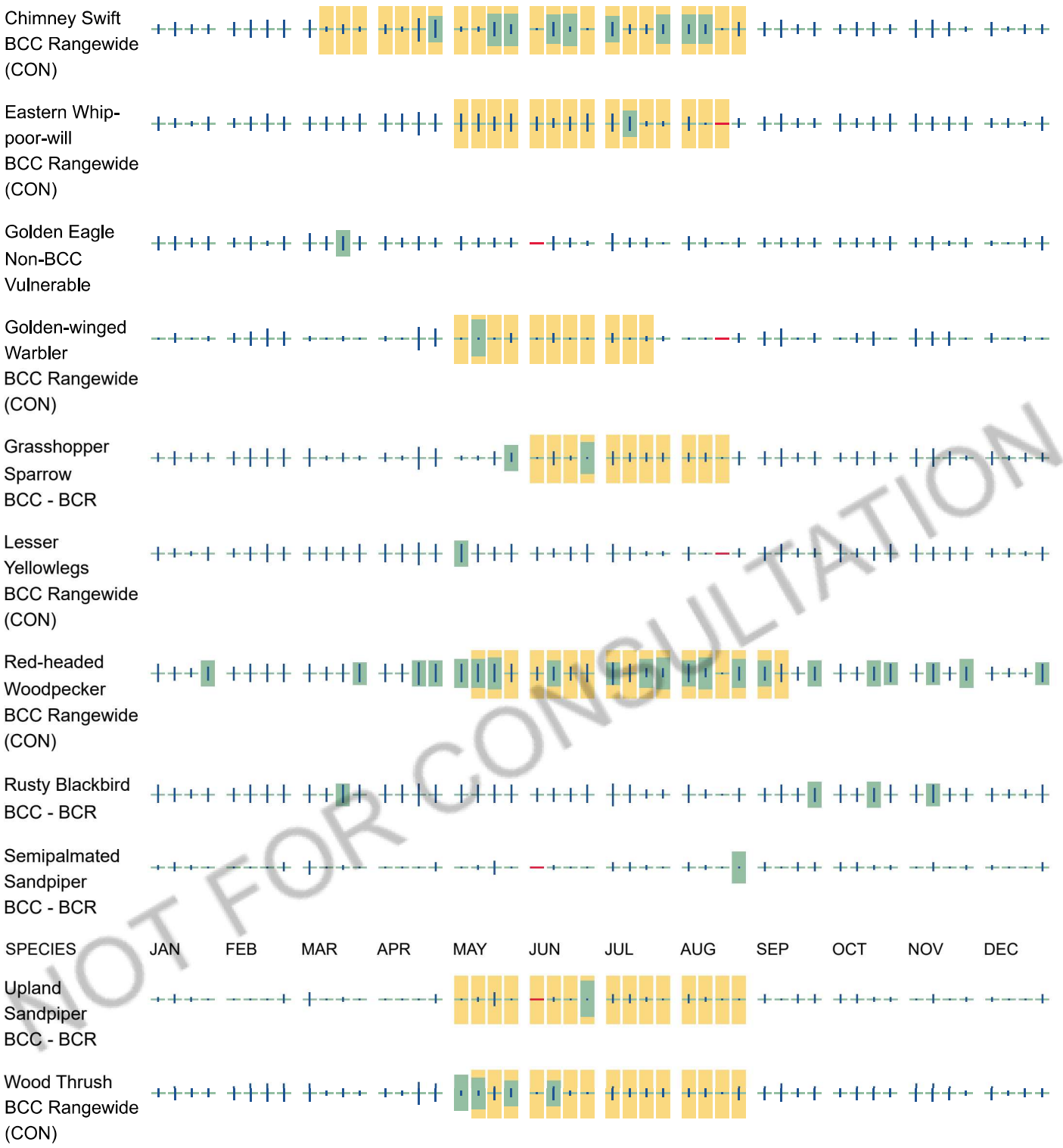
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

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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Migratory Bird FAQs

Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Avoidance & Minimization Measures for Birds describes measures that can help avoid and minimize impacts to all birds at any location year-round. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is one of the most effective ways to minimize impacts. To see

when birds are most likely to occur and breed 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 Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location, such as those listed under the Endangered Species Act or the Bald and Golden Eagle Protection Act and those species marked as “Vulnerable”. See the FAQ “What are the levels of concern for migratory birds?” for more information on the levels of concern covered in the IPaC migratory bird species list.

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) with which your project intersects. These species have been identified as warranting special attention because they are BCC species in that area, an eagle (Bald and Golden Eagle Protection 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, and to verify survey effort when no results present, please visit the Rapid Avian Information Locator (RAIL) Tool.

Why are subspecies showing up on my list?

Subspecies profiles are included on the list of species present in your project area because observations in the AKN for **the species** are being detected. If the species are present, that means that the subspecies may also be present. If a subspecies shows up on your list, you may need to rely on other resources to determine if that subspecies may be present (e.g. your local FWS field office, state surveys, your own surveys).

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 to 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 resident), you may query your location using the RAIL Tool and view 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 IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in

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your “IPaC PROBABILITY OF PRESENCE SUMMARY” at the top of your results list), 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 Bald and Golden Eagle Protection 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 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 BCC species. For more information on avoidance and minimization measures you can implement to help avoid and minimize migratory bird impacts, please see the FAQ “Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds”.

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.

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 look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). 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 does not represent all birds present in your project area. 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 and associated information help you know what to look for to confirm presence and helps guide implementation of avoidance and minimization measures to eliminate or reduce potential impacts from your project activities, should presence be confirmed. To learn more about avoidance and minimization measures, visit the FAQ "Tell me about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds".

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Interpreting the Probability of Presence Graphs
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 taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:
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.

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.

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.

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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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.

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
- PEM1Ad
- PEM1C

FRESHWATER FORESTED/SHRUB WETLAND
- PFO1C
- PSS1C

FRESHWATER POND
- PUBG

RIVERINE
- R5UBH
- R4SBC

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.

Data limitations

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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. MNFI INFORMATION REQUEST

Michigan Natural Features Inventory Information Request

Requestor: Adam Holven

Project Name: Lakeside Solar, White River Township, Muskegon County, MI

Project Location: White River Township, Muskegon County, MI

Date Created: 05/14/2025

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
Atrytonopsis hianna	Dusted skipper	SC		1
Cirsium pitcheri	Pitcher's thistle	T	LT	2
Cistothorus palustris	Marsh wren	SC		1
Emydoidea blandingii	Blanding's turtle	SC		2
Erynnis persius persius	Persius dusky wing	T		1
Haliaeetus leucocephalus	Bald eagle	SC		4
Ligumia recta	Black sandshell	T		1
Necturus maculosus	Mudpuppy	SC		1
Pandion haliaetus	Osprey	SC		1
Plebejus samuelis	Karner blue	T	LE	6
Pyganodon subgibbosa	Round lake floater	SC		1
Setophaga cerulea	Cerulean warbler	T		1
Setophaga citrina	Hooded warbler	SC		1
Terrapene carolina carolina	Eastern box turtle	T		4
Triphora trianthophora	Nodding pogonia or three birds orchid	T		1
Truncilla truncata	Deertoe	SC		1
Utterbackia imbecillis	Paper pondshell	SC		1

Number of Species: 18 **Number of Occurrences: 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.

Natural Communities

Community Type	Count
Floodplain Forest	1
Great Lakes Marsh	2
Mesic Northern Forest	2
Open Dunes	2

Number of Community Types: 4 **Number of Occurrences: 7**

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.

Acris blanchardi

Blanchard's cricket frog

Federal Status: **State Status:** T **Global Rank:** G5 **State Rank:** S2S3

Last Observed Date: 1996-06

County: Muskegon, Oceana

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR18W	3, 4
T13NR18W	34

Atrytonopsis hianna

Dusted skipper

Federal Status: **State Status:** SC **Global Rank:** G4G5 **State Rank:** S3

Last Observed Date: 1976

County: Oceana

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T13NR17W	21

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.

Cirsium pitcheri

Pitcher's thistle

Federal Status: LT **State Status:** T **Global Rank:** G3 **State Rank:** S3

Last Observed Date: 2012-06-21

County: Muskegon

Watershed: PERE MARQUETTE-WHITE, LAKE MICHIGAN

Town Range	Section
T12NR18W	3, 4, 9, 10, 15

Cirsium pitcheri

Pitcher's thistle

Federal Status: LT **State Status:** T **Global Rank:** G3 **State Rank:** S3

Last Observed Date: 2006-08-04

County: Oceana

Watershed: PERE MARQUETTE-WHITE, LAKE MICHIGAN

Town Range	Section
T13NR18W	28

Cistothorus palustris

Marsh wren

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3

Last Observed Date: 2005-05-26

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	21, 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.

Emydoidea blandingii

Blanding's turtle

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S2S3

Last Observed Date: 2005-05-26

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	21

Emydoidea blandingii

Blanding's turtle

Federal Status: **State Status:** SC **Global Rank:** G4 **State Rank:** S2S3

Last Observed Date: 2021-06-10

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	13, 26

Erynnis persius persius

Persius dusky wing

Federal Status: **State Status:** T **Global Rank:** G5T1T3 **State Rank:** S3

Last Observed Date: 1956

County: Oceana

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T13NR17W	21

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.

Floodplain Forest

Federal Status: **State Status:** **Global Rank:** G3? **State Rank:** S3

Last Observed Date: 2010-07-23

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR16W	4, 5, 6, 7, 8, 9
T12NR17W	1, 11, 12, 13, 14

Great Lakes Marsh

Federal Status: **State Status:** **Global Rank:** G2 **State Rank:** S3

Last Observed Date: 1986

County: Muskegon, Oceana

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR18W	3, 4
T13NR18W	34

Great Lakes Marsh

Federal Status: **State Status:** **Global Rank:** G2 **State Rank:** S3

Last Observed Date: 1988-07-21

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	14, 15, 16, 21, 22, 23, 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.

Haliaeetus leucocephalus

Bald eagle

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2018

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T11NR18W	2
T12NR17W	33
T12NR18W	35

Haliaeetus leucocephalus

Bald eagle

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2019

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	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.

Haliaeetus leucocephalus

Bald eagle

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2017

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	33

Haliaeetus leucocephalus

Bald eagle

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2019

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	22

Ligumia recta

Black sandshell

Federal Status: **State Status:** T **Global Rank:** G4G5 **State Rank:** S1?

Last Observed Date: 2004

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	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.

Mesic Northern Forest

Federal Status: **State Status:** **Global Rank:** G4 **State Rank:** S3

Last Observed Date: 1985-07-25

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR18W	35

Mesic Northern Forest

Federal Status: **State Status:** **Global Rank:** G4 **State Rank:** S3

Last Observed Date: 2010-07-22

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T11NR18W	24

Necturus maculosus

Mudpuppy

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3S4

Last Observed Date: 2013-08-21

County: Muskegon, Oceana

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR16W	3, 4, 5, 6, 7, 8, 9
T12NR17W	11, 14, 21, 22, 23
T13NR15W	20, 21, 29
T13NR16W	25, 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.

Open Dunes

Federal Status: **State Status:** **Global Rank:** G3 **State Rank:** S3

Last Observed Date: 1992-10-22

County: Muskegon

Watershed: PERE MARQUETTE-WHITE, LAKE MICHIGAN

Town Range	Section
T11NR18W	2

Open Dunes

Federal Status: **State Status:** **Global Rank:** G3 **State Rank:** S3

Last Observed Date: 2015-06-29

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T11NR18W	13, 24

Pandion haliaetus

Osprey

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S4

Last Observed Date: 2022-06-01

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	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.

Plebejus samuelis

Karner blue

Federal Status: LE **State Status:** T **Global Rank:** G1G2 **State Rank:** S2

Last Observed Date: 2002-07-26

County: Oceana

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T13NR17W	28, 33

Plebejus samuelis

Karner blue

Federal Status: LE **State Status:** T **Global Rank:** G1G2 **State Rank:** S2

Last Observed Date: 2003-06-05

County: Oceana

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T13NR17W	27, 33, 34

Plebejus samuelis

Karner blue

Federal Status: LE **State Status:** T **Global Rank:** G1G2 **State Rank:** S2

Last Observed Date: 1956

County: Oceana

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T13NR17W	21

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.

Plebejus samuelis

Karner blue

Federal Status: LE **State Status:** T **Global Rank:** G1G2 **State Rank:** S2

Last Observed Date: 2013-08-01

County: Muskegon, Oceana

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR16W	4, 5, 6
T12NR17W	1
T13NR16W	10, 22, 23, 26, 27, 28, 29, 31, 32, 33, 34, 35
T13NR17W	25, 26, 27, 28, 33, 34, 36

Plebejus samuelis

Karner blue

Federal Status: LE **State Status:** T **Global Rank:** G1G2 **State Rank:** S2

Last Observed Date: 2003-07-29

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	26

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.

Plebejus samuelis

Karner blue

Federal Status: LE **State Status:** T **Global Rank:** G1G2 **State Rank:** S2

Last Observed Date: 2004-07-29

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	22, 23

Pyganodon subgibbosa

Round lake floater

Federal Status: **State Status:** SC **Global Rank:** G1Q **State Rank:** S1

Last Observed Date: 1930

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T11NR17W	5, 6, 7
T11NR18W	1, 2, 11, 12
T12NR17W	21, 28, 29, 31, 32, 33

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.

Setophaga cerulea

Cerulean warbler

Federal Status: **State Status:** T **Global Rank:** G4 **State Rank:** S3

Last Observed Date: 1999-06

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T11NR17W	7, 17, 18, 19
T11NR18W	13, 24

Setophaga citrina

Hooded warbler

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S3

Last Observed Date: 1999-06

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T11NR17W	7, 17, 18, 19
T11NR18W	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.

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 2024-06-05

County: Muskegon, Oceana

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR16W	6, 7
T12NR17W	1, 12, 22
T13NR16W	31

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 1978-07

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T11NR18W	1, 2
T12NR18W	25, 26, 35, 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.

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 2020-06-08

County: Oceana

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T13NR18W	28

Terrapene carolina carolina

Eastern box turtle

Federal Status: **State Status:** T **Global Rank:** G5T5 **State Rank:** S2S3

Last Observed Date: 2021-08-03

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	20

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

Triphora trianthophora

Nodding pogonia or three birds orchid

Federal Status: **State Status:** T **Global Rank:** G4? **State Rank:** S1

Last Observed Date: 1899

County: Muskegon, Oceana

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T11NR16W	4, 5, 6, 7, 8, 17, 18, 19
T11NR17W	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24
T11NR18W	1, 2, 11, 12, 13
T12NR16W	6, 7, 8, 17, 18, 19, 20, 21, 28, 29, 30, 31, 32, 33
T12NR17W	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
T12NR18W	12, 13, 14, 23, 24, 25, 26, 35, 36
T13NR17W	33, 34, 35

Truncilla truncata

Deertoe

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S2S3

Last Observed Date: 2004

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T11NR18W	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.

Utterbackia imbecillis

Paper pondshell

Federal Status: **State Status:** SC **Global Rank:** G5 **State Rank:** S2S3

Last Observed Date: 2004

County: Muskegon

Watershed: PERE MARQUETTE-WHITE

Town Range	Section
T12NR17W	23

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.

Soils Report

United States Department of Agriculture

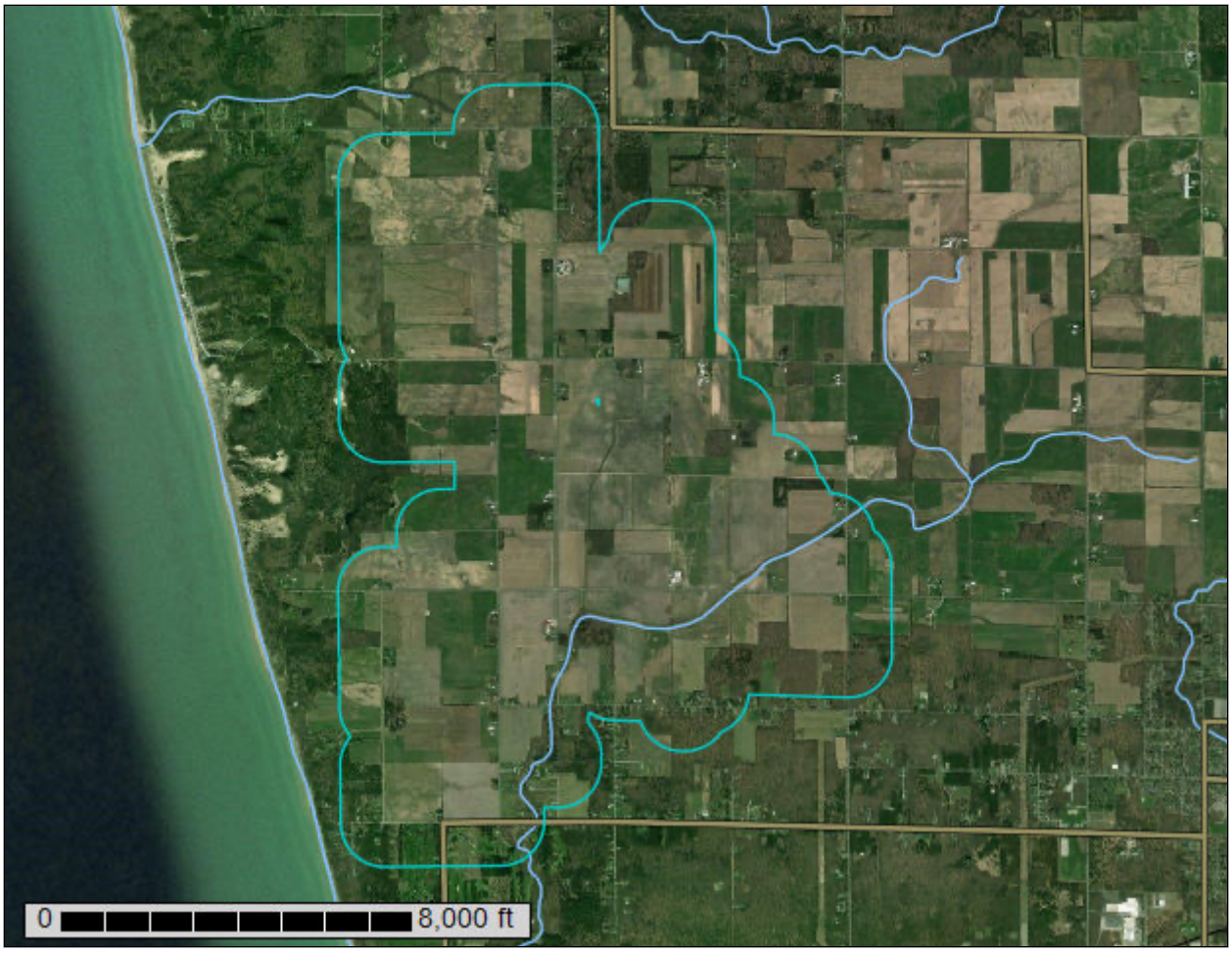
NRCS

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 Muskegon County, Michigan

Lakeside Solar Project Area and 1,000 Foot Buffer



August 7, 2025

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.

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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.

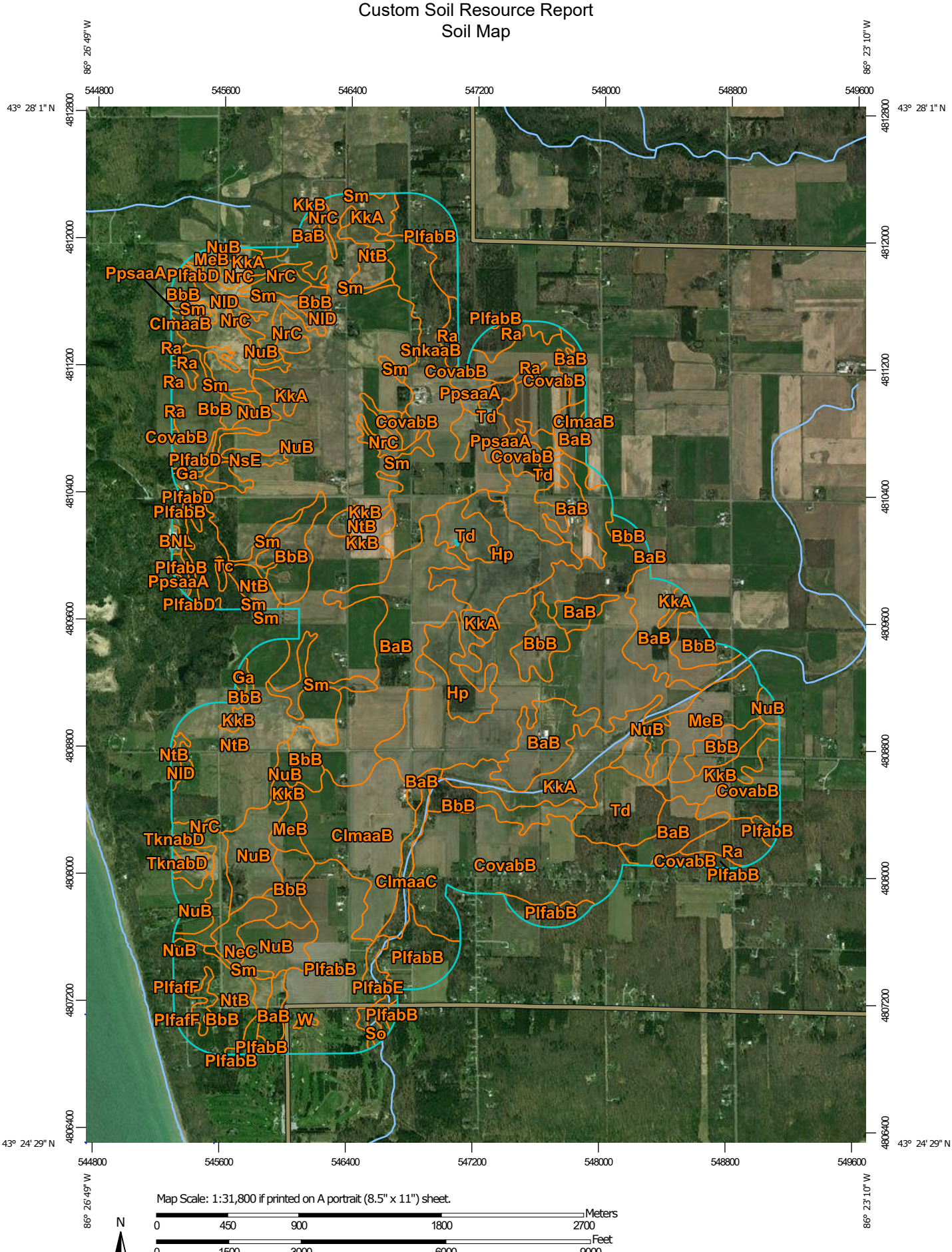
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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.


86° 26' 49" W
86° 23' 10" W
43° 28' 1" N
43° 24' 29" N
544800
545600
546400
547200
548000
548800
549600
4812800
4812000
4811200
4810400
4809600
4808800
4808000
4807200
4806400
Sm
KkB
NrC
KkA
BaB
PlfabB
NuB
MeB
NtB
PpsaaA
PlfabD
BbB
NID
ClmaaB
Ra
SnkaaB
CovabB
PpsaaA
Td
Hp
Ga
NsE
BNL
Tc
PlfabD1
TknabD
NeC
PlfafF
W
So
Map Scale: 1:31,800 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0
450
900
1800
2700
Feet
0
1500
3000
6000
9000
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: Muskegon County, Michigan
Survey Area Data: Version 20, Aug 27, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Jun 20, 2016

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
BaB	Belding and Allendale soils, 0 to 6 percent slopes	373.1	10.8%
BbB	Belding-Ubly sandy loams, 2 to 6 percent slopes	241.6	7.0%
BNL	Blownout land	2.2	0.1%
ClmaaB	Coloma-Brems-Fern complex, 0 to 6 percent slopes	127.2	3.7%
ClmaaC	Coloma-Brems-Metea complex, 6 to 12 percent slopes	18.1	0.5%
CovabB	Covert-Pipestone sands, 0 to 6 percent slopes	292.2	8.4%
Ga	Granby loamy sand, lake plain, 0 to 2 percent slopes	4.9	0.1%
Hp	Hettinger and Pickford soils	107.6	3.1%
KaB	Kalkaska-Wallace sands, 2 to 6 percent slopes	0.7	0.0%
KkA	Kawkawlin loam, 0 to 2 percent slopes	90.8	2.6%
KkB	Kawkawlin loam, 2 to 6 percent slopes	37.0	1.1%
MeB	Menominee and Ubly soils, 2 to 6 percent slopes	79.5	2.3%
NeC	Onekama loam, Lake Michigan Lobe, 6 to 12 percent slopes	17.7	0.5%
NlD	Nester soils, 12 to 25 percent slopes, lake moderated	10.2	0.3%
NrC	Nester sandy loam, 6 to 12 percent slopes	141.4	4.1%
NsE	Nester soils, 25 to 45 percent slopes	8.3	0.2%
NtB	Nester-Kawkawlin loams, 2 to 6 percent slopes	256.8	7.4%
NuB	Nester-Ubly sandy loams, 2 to 6 percent slopes	607.8	17.6%
PlfabB	Plainfield sand, lake plain, 0 to 6 percent slopes	238.2	6.9%
PlfabD	Plainfield sand, lake plain, 6 to 18 percent slopes	24.7	0.7%
PlfabE	Plainfield sand, high ecological site, 18 to 30 percent slopes	17.0	0.5%
PlfafF	Plainfield-Metea-Spinks complex, 35 to 60 percent slopes	0.5	0.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
PpsaaA	Pipestone-Covert-Saugatuck sands, 0 to 3 percent slopes	18.2	0.5%
Ra	Roscommon and Au Gres sands	56.1	1.6%
Sm	Sims loam	86.3	2.5%
SnkaaB	Spinks loamy sand, 0 to 6 percent slopes	147.9	4.3%
So	Sloan soils	2.9	0.1%
Tc	Tawas and Carlisle mucks	31.1	0.9%
Td	Tonkey and Deford soils	415.5	12.0%
TknabD	Tekenink-Spinks loamy sands, 12 to 18 percent slopes	2.1	0.1%
W	Water	1.2	0.0%
Totals for Area of Interest		**3,459.0**	**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.

Muskegon County, Michigan

BaB—Belding and Allendale soils, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 68y0
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: Farmland of local importance

Map Unit Composition

Allendale and similar soils: 50 percent
Belding and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Allendale

Setting

Landform: Lake plains, till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy lacustrine deposits over clayey lacustrine deposits

Typical profile

A - 0 to 10 inches: loamy sand
Bs - 10 to 40 inches: sand
2C - 40 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water supply, 0 to 60 inches: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Description of Belding

Setting

Landform: Lake plains, moraines

Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy lacustrine deposits and/or loamy till

Typical profile

Ap - 0 to 8 inches: sandy loam
E/B - 8 to 18 inches: sandy loam
Bt - 18 to 30 inches: loam
2C - 30 to 48 inches: clay loam

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: F097XA022MI - Moist Loamy Drift Plains
Hydric soil rating: No

Minor Components

Kawkawlin

Percent of map unit: 10 percent
Landform: Till plains, lake plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA022MI - Moist Loamy Drift Plains
Hydric soil rating: No

BbB—Belding-Ubly sandy loams, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 68y1
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: Prime farmland if drained

Map Unit Composition

Belding and similar soils: 50 percent
Ubly and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Belding

Setting

Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy lacustrine deposits and/or loamy till

Typical profile

Ap - 0 to 8 inches: sandy loam
E/B - 8 to 18 inches: sandy loam
Bt - 18 to 30 inches: loam
2C - 30 to 48 inches: clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: F097XA022MI - Moist Loamy Drift Plains, F096XB017MI - Loamy Depression
Hydric soil rating: No

Description of Ubly

Setting

Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

A - 0 to 4 inches: sandy loam
Bs - 4 to 32 inches: sandy loam
2C - 32 to 60 inches: clay loam

Properties and qualities

Slope: 2 to 6 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 high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F097XA018MI - Dry Loamy Drift Plains, F096XB016MI - Loamy Till
Hydric soil rating: No

Minor Components

Menominee

Percent of map unit: 5 percent
Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Sims

Percent of map unit: 5 percent
Landform: Till plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Nester

Percent of map unit: 5 percent
Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

BNL—Blownout land

Map Unit Setting

National map unit symbol: 2ptcd
Elevation: 570 to 1,970 feet
Mean annual precipitation: 25 to 40 inches
Mean annual air temperature: 37 to 55 degrees F
Frost-free period: 80 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Blownout: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blownout

Setting

Landform: Blowouts

ClmaaB—Coloma-Brems-Fern complex, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2tpkb
Elevation: 610 to 780 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

Coloma and similar soils: 40 percent
Brems and similar soils: 25 percent
Fern and similar soils: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Coloma

Setting

Landform: Moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope
Down-slope shape: Convex, linear

Across-slope shape: Linear
Parent material: Sandy drift

Typical profile

Ap - 0 to 9 inches: loamy sand
Bw - 9 to 39 inches: sand
E and Bt - 39 to 80 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.56 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Description of Brems

Setting

Landform: Moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits

Typical profile

Ap - 0 to 7 inches: sand
Bw - 7 to 22 inches: sand
BC - 22 to 37 inches: sand
C - 37 to 80 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.56 to 14.17 in/hr)
Depth to water table: About 24 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Description of Fern

Setting

Landform: Moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Sandy drift over loamy till

Typical profile

Ap - 0 to 7 inches: fine sand
E - 7 to 23 inches: sand
2E/B - 23 to 33 inches: sandy loam
2B/E - 33 to 50 inches: loam
2Bt - 50 to 60 inches: clay loam
2C - 60 to 80 inches: loam

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 1.42 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: B/D
Ecological site: F097XA012MI - Moist Sandy Depression
Hydric soil rating: No

Minor Components

Capac

Percent of map unit: 10 percent
Landform: Moraines
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear

Across-slope shape: Linear
Ecological site: F097XA022MI - Moist Loamy Drift Plains
Hydric soil rating: No

Perrinton

Percent of map unit: 5 percent
Landform: Ground moraines, end moraines
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA022MI - Moist Loamy Drift Plains
Hydric soil rating: No

Tekenink

Percent of map unit: 3 percent
Landform: Moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA018MI - Dry Loamy Drift Plains
Hydric soil rating: No

Kingsville

Percent of map unit: 2 percent
Landform: Moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Ecological site: F097XA008MI - Wet Sandy Flatwoods
Hydric soil rating: Yes

ClmaaC—Coloma-Brems-Metea complex, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2tpkc
Elevation: 600 to 780 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

Coloma and similar soils: 50 percent

Brems and similar soils: 30 percent
Metea and similar soils: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Coloma

Setting

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: Linear
Parent material: Sandy drift

Typical profile

Ap - 0 to 9 inches: loamy sand
Bw - 9 to 39 inches: sand
E and Bt - 39 to 80 inches: sand

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.56 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F097XA004MI - Dry Sandy Lake Plain, F096XB019MI - Rich Sandy Drift
Hydric soil rating: No

Description of Brems

Setting

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: Linear
Parent material: Sandy glaciofluvial deposits

Typical profile

Ap - 0 to 10 inches: sand
Bw - 10 to 22 inches: sand
BC - 22 to 37 inches: sand
C - 37 to 80 inches: sand

Properties and qualities

Slope: 6 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.56 to 14.17 in/hr)
Depth to water table: About 24 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods, F096XB021MI - Acidic Sandy Depression
Hydric soil rating: No

Description of Metea

Setting

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: Linear
Parent material: Sandy drift over loamy till

Typical profile

Ap - 0 to 9 inches: loamy fine sand
E - 9 to 28 inches: fine sand
Bt1 - 28 to 32 inches: sandy loam
2Bt2 - 32 to 44 inches: clay loam
2C - 44 to 80 inches: loam

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): Low to moderately high (0.00 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C
Ecological site: F097XA004MI - Dry Sandy Lake Plain, F096XB019MI - Rich Sandy Drift
Hydric soil rating: No

Minor Components

Capac

Percent of map unit: 5 percent
Landform: Moraines
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

CovabB—Covert-Pipestone sands, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2rfgw
Elevation: 580 to 830 feet
Mean annual precipitation: 33 to 37 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 129 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Covert and similar soils: 69 percent
Pipestone and similar soils: 19 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Covert

Setting

Landform: Nearshore zones (relict), outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Rise, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciolacustrine deposits

Typical profile

A - 0 to 8 inches: sand
E - 8 to 13 inches: sand
Bs1 - 13 to 18 inches: fine sand
Bs2 - 18 to 29 inches: sand
BC - 29 to 47 inches: fine sand

C - 47 to 80 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very high (20.00 to 59.98 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A/D
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Description of Pipestone

Setting

Landform: Nearshore zones (relict), outwash plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciolacustrine deposits

Typical profile

A - 0 to 2 inches: sand
E - 2 to 4 inches: sand
Bs1 - 4 to 13 inches: sand
Bs2 - 13 to 19 inches: sand
BC - 19 to 28 inches: fine sand
C - 28 to 80 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: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 59.98 in/hr)
Depth to water table: About 6 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods

Hydric soil rating: No

Minor Components

Plainfield, high ecological site

Percent of map unit: 7 percent
Landform: Outwash plains, beach ridges
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Kingsville

Percent of map unit: 2 percent
Landform: Nearshore zones (relict), outwash plains
Landform position (three-dimensional): Dip, rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA008MI - Wet Sandy Flatwoods
Hydric soil rating: Yes

Saugatuck

Percent of map unit: 1 percent
Landform: Nearshore zones (relict), outwash plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Kaleva

Percent of map unit: 1 percent
Landform: Outwash plains, beach ridges
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Covert, stratified substratum

Percent of map unit: 1 percent
Landform: Nearshore zones (relict)
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Ga—Granby loamy sand, lake plain, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2w5mw
Elevation: 580 to 770 feet
Mean annual precipitation: 34 to 41 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 170 to 230 days
Farmland classification: Farmland of local importance

Map Unit Composition

Granby, lake plain, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Granby, Lake Plain

Setting

Landform: Depressions on nearshore zones (relict), depressions on outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Sandy glaciolacustrine deposits

Typical profile

Ap - 0 to 11 inches: loamy sand
Bg - 11 to 34 inches: sand
Cg - 34 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.17 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 14 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: A/D
Ecological site: F097XA008MI - Wet Sandy Flatwoods
Hydric soil rating: Yes

Minor Components

Thetford
Percent of map unit: 5 percent
Landform: Nearshore zones (relict), outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Concave, linear
Across-slope shape: Linear
Ecological site: F097XA012MI - Moist Sandy Depression
Hydric soil rating: No

Pipestone
Percent of map unit: 3 percent
Landform: Nearshore zones (relict), outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Concave, linear
Across-slope shape: Linear
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Adrian
Percent of map unit: 1 percent
Landform: Depressions on outwash plains, depressions on nearshore zones (relict)
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, dip
Down-slope shape: Concave
Across-slope shape: Concave, linear
Ecological site: F097XA030MI - Mucky Depression
Hydric soil rating: Yes

Sickles
Percent of map unit: 1 percent
Landform: Depressions on nearshore zones (relict), depressions on outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Concave, linear
Across-slope shape: Linear
Ecological site: F097XA008MI - Wet Sandy Flatwoods
Hydric soil rating: Yes

Hp—Hettinger and Pickford soils

Map Unit Setting

National map unit symbol: 68yj
Elevation: 640 to 890 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: Farmland of local importance

Map Unit Composition

Hettinger and similar soils: 50 percent
Pickford and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hettinger

Setting

Landform: Lake plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy glaciolacustrine deposits

Typical profile

Ap - 0 to 7 inches: loam
Bg - 7 to 18 inches: silty clay loam
2Cg - 18 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 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: High (about 11.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F097XA023MI - Wet Loamy Depression
Hydric soil rating: Yes

Description of Pickford

Setting

Landform: Lake plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey lacustrine deposits

Typical profile

Ap - 0 to 8 inches: silty clay loam
Bg - 8 to 21 inches: silty clay
Cg - 21 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 30 percent
Available water supply, 0 to 60 inches: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Ecological site: F097XA023MI - Wet Loamy Depression
Hydric soil rating: Yes

Minor Components

Selkirk

Percent of map unit: 10 percent
Landform: Lake plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA022MI - Moist Loamy Drift Plains
Hydric soil rating: No

KaB—Kalkaska-Wallace sands, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 68yl

Elevation: 300 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

Kalkaska and similar soils: 50 percent
Wallace and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kalkaska

Setting

Landform: Dunes on lake plains, beach ridges on lake plains, dunes on outwash plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits and/or sandy glaciolacustrine deposits

Typical profile

A - 0 to 4 inches: sand
Bhs - 4 to 26 inches: sand
C - 26 to 60 inches: sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Negligible
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 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Description of Wallace

Setting

Landform: Beach ridges on lake plains, dunes on outwash plains, dunes on lake plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits and/or sandy glaciolacustrine deposits

Typical profile

Ap - 0 to 7 inches: sand
E - 7 to 12 inches: sand
Bhsm - 12 to 30 inches: sand
BC - 30 to 40 inches: sand
C - 40 to 60 inches: sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
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: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Minor Components

Saugatuck

Percent of map unit: 10 percent
Landform: Dunes on lake plains, beach ridges on lake plains, dunes on outwash plains
Landform position (three-dimensional): Rise, talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Au gres

Percent of map unit: 10 percent
Landform: Dunes on outwash plains, beach ridges on lake plains, dunes on lake plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

KkA—Kawkawlin loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 68ym
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: Prime farmland if drained

Map Unit Composition

Kawkawlin and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kawkawlin

Setting

Landform: Till plains, lake plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

Ap - 0 to 10 inches: loam
E/B - 10 to 18 inches: loam
Bt - 18 to 36 inches: clay loam
C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water supply, 0 to 60 inches: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F097XA022MI - Moist Loamy Drift Plains
Hydric soil rating: No

Minor Components

Sims

Percent of map unit: 10 percent
Landform: Till plains, lake plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA023MI - Wet Loamy Depression
Hydric soil rating: Yes

KkB—Kawkawlin loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 68yn
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: Prime farmland if drained

Map Unit Composition

Kawkawlin and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kawkawlin

Setting

Landform: Till plains, lake plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

Ap - 0 to 10 inches: loam
E/B - 10 to 18 inches: loam
Bt - 18 to 36 inches: clay loam
C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None

Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water supply, 0 to 60 inches: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: F097XA022MI - Moist Loamy Drift Plains
Hydric soil rating: No

Minor Components

Sims

Percent of map unit: 10 percent
Landform: Till plains, lake plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA023MI - Wet Loamy Depression
Hydric soil rating: Yes

MeB—Menominee and Ubly soils, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 68yw
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: Farmland of local importance

Map Unit Composition

Menominee and similar soils: 45 percent
Ubly and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Menominee

Setting

Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits over loamy till

Typical profile

A - 0 to 3 inches: loamy sand
Bs - 3 to 33 inches: loamy sand
2Bt - 33 to 41 inches: clay loam

2C - 41 to 60 inches: loam

Properties and qualities

Slope: 2 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 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: 40 percent
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Description of Ubly

Setting

Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

A - 0 to 4 inches: sandy loam
Bs - 4 to 32 inches: sandy loam
2C - 32 to 60 inches: clay loam

Properties and qualities

Slope: 2 to 6 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 high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F097XA018MI - Dry Loamy Drift Plains
Hydric soil rating: No

Minor Components

Belding

Percent of map unit: 4 percent
Landform: Lake plains, till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA022MI - Moist Loamy Drift Plains
Hydric soil rating: No

Nester

Percent of map unit: 4 percent
Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA018MI - Dry Loamy Drift Plains
Hydric soil rating: No

Au gres

Percent of map unit: 4 percent
Landform: Till plains, lake plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Kawkawlin

Percent of map unit: 4 percent
Landform: Lake plains, till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA022MI - Moist Loamy Drift Plains
Hydric soil rating: No

Rubicon

Percent of map unit: 4 percent
Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

NeC—Onekama loam, Lake Michigan Lobe, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2w5mc
Elevation: 610 to 920 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

Onekama, lake michigan lobe, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Onekama, Lake Michigan Lobe

Setting

Landform: Till plains, moraines
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Clayey till and/or loamy till

Typical profile

Ap - 0 to 7 inches: loam
E/B - 7 to 12 inches: loam
B/E - 12 to 16 inches: clay
Bt - 16 to 27 inches: clay
BC - 27 to 80 inches: silty clay

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 38 percent
Maximum salinity: Nonsaline (0.1 to 0.4 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: F097XA018MI - Dry Loamy Drift Plains
Hydric soil rating: No

Minor Components

Tustin

Percent of map unit: 5 percent
Landform: Till plains, moraines
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Ithaca

Percent of map unit: 5 percent
Landform: Moraines, till plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: F097XA022MI - Moist Loamy Drift Plains
Hydric soil rating: No

NID—Nester soils, 12 to 25 percent slopes, lake moderated

Map Unit Setting

National map unit symbol: 2zdhl
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: Farmland of unique importance

Map Unit Composition

Nester and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nester

Setting

Landform: Moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear

Across-slope shape: Concave, convex
Parent material: Loamy till

Typical profile

Ap - 0 to 5 inches: loam
E - 5 to 14 inches: loam
Bt - 14 to 36 inches: clay loam
C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 12 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F097XA017MI - Loamy Slopes
Hydric soil rating: No

NrC—Nester sandy loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 68z1
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: Farmland of local importance

Map Unit Composition

Nester and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nester

Setting

Landform: Moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest

Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

Ap - 0 to 5 inches: sandy loam
E - 5 to 14 inches: loam
Bt - 14 to 36 inches: clay loam
C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F097XA018MI - Dry Loamy Drift Plains
Hydric soil rating: No

Minor Components

Ubly

Percent of map unit: 10 percent
Landform: Moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Linear
Ecological site: F097XA018MI - Dry Loamy Drift Plains
Hydric soil rating: No

NsE—Nester soils, 25 to 45 percent slopes

Map Unit Setting

National map unit symbol: 68z4
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

Nester and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nester

Setting

Landform: Moraines, till plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Parent material: Loamy till

Typical profile

Ap - 0 to 5 inches: loam
E - 5 to 14 inches: loam
Bt - 14 to 36 inches: clay loam
C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 25 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F097XA017MI - Loamy Slopes
Hydric soil rating: No

NtB—Nester-Kawkawlin loams, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 68z6
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: All areas are prime farmland

Map Unit Composition

Nester and similar soils: 50 percent
Kawkawlin and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nester

Setting

Landform: Moraines, till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

Ap - 0 to 5 inches: loam
E - 5 to 14 inches: loam
Bt - 14 to 36 inches: clay loam
C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F097XA018MI - Dry Loamy Drift Plains, F096XB016MI - Loamy Till
Hydric soil rating: No

Description of Kawkawlin

Setting

Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

Ap - 0 to 10 inches: loam
E/B - 10 to 18 inches: loam

Bt - 18 to 36 inches: clay loam
C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water supply, 0 to 60 inches: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: F097XA022MI - Moist Loamy Drift Plains, F096XB017MI - Loamy Depression
Hydric soil rating: No

Minor Components

Sims

Percent of map unit: 10 percent
Landform: Moraines, till plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

NuB—Nester-Ubly sandy loams, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 68z7
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

Nester and similar soils: 50 percent
Ubly and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nester

Setting

Landform: Moraines, till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

Ap - 0 to 5 inches: sandy loam
E - 5 to 14 inches: loam
Bt - 14 to 36 inches: clay loam
C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F097XA018MI - Dry Loamy Drift Plains
Hydric soil rating: No

Description of Ubly

Setting

Landform: Moraines, till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

A - 0 to 4 inches: sandy loam
Bs - 4 to 32 inches: sandy loam
2C - 32 to 60 inches: clay loam

Properties and qualities

Slope: 2 to 6 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 high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F097XA018MI - Dry Loamy Drift Plains
Hydric soil rating: No

Minor Components

Rubicon

Percent of map unit: 5 percent
Landform: Moraines, till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Menominee

Percent of map unit: 5 percent
Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

PlfabB—Plainfield sand, lake plain, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2w4kc
Elevation: 580 to 750 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

Plainfield, lake plain, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Plainfield, Lake Plain

Setting

Landform: Nearshore zones (relict)
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Sandy glaciolacustrine deposits

Typical profile

A - 0 to 8 inches: sand
Bw - 8 to 27 inches: sand
BC - 27 to 35 inches: sand
C - 35 to 80 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 0.1 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Minor Components

Brems

Percent of map unit: 8 percent
Landform: Nearshore zones (relict)
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Kaleva

Percent of map unit: 4 percent
Landform: Nearshore zones (relict)
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope

Down-slope shape: Convex, linear
Across-slope shape: Linear
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Brethren

Percent of map unit: 2 percent
Landform: Nearshore zones (relict)
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Spinks

Percent of map unit: 1 percent
Landform: Nearshore zones (relict)
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

PlfabD—Plainfield sand, lake plain, 6 to 18 percent slopes

Map Unit Setting

National map unit symbol: 2w5ll
Elevation: 580 to 760 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

Plainfield, lake plain, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Plainfield, Lake Plain

Setting

Landform: Dunes, beach ridges
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex, linear
Parent material: Eolian sands

Typical profile

A - 0 to 6 inches: sand
Bw - 6 to 25 inches: sand
BC - 25 to 33 inches: sand
C - 33 to 80 inches: sand

Properties and qualities

Slope: 6 to 18 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 0.1 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Minor Components

Brems

Percent of map unit: 5 percent
Landform: Dunes, beach ridges
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, convex, linear
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Kaleva

Percent of map unit: 3 percent
Landform: Dunes, beach ridges
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex, linear
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Thompsonville

Percent of map unit: 2 percent
Landform: Dunes, beach ridges
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, convex, linear

Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

PlfabE—Plainfield sand, high ecological site, 18 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2rfgm
Elevation: 580 to 770 feet
Mean annual precipitation: 33 to 37 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 129 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Plainfield, high ecological site, and similar soils: 89 percent
Minor components: 11 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Plainfield, High Ecological Site

Setting

Landform: Lake plains, outwash plains
Landform position (two-dimensional): Shoulder, backslope, footslope
Landform position (three-dimensional): Head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Parent material: Sandy lacustrine deposits

Typical profile

A - 0 to 9 inches: sand
Bs1 - 9 to 16 inches: sand
Bs2 - 16 to 36 inches: sand
BC - 36 to 75 inches: sand
C - 75 to 80 inches: sand

Properties and qualities

Slope: 18 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
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
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: F097XA010MI - Sandy Slopes
Hydric soil rating: No

Minor Components

Kaleva

Percent of map unit: 5 percent
Landform: Lake plains, outwash plains
Landform position (two-dimensional): Shoulder, backslope, footslope
Landform position (three-dimensional): Head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Ecological site: F097XA010MI - Sandy Slopes
Hydric soil rating: No

Brems

Percent of map unit: 3 percent
Landform: Outwash plains, lake plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Spinks

Percent of map unit: 2 percent
Landform: Outwash plains, lake plains
Landform position (two-dimensional): Shoulder, backslope, footslope
Landform position (three-dimensional): Head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Ecological site: F097XA010MI - Sandy Slopes
Hydric soil rating: No

Tekenink

Percent of map unit: 1 percent
Landform: Lake plains, outwash plains
Landform position (two-dimensional): Shoulder, backslope, footslope
Landform position (three-dimensional): Head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Ecological site: F097XA010MI - Sandy Slopes
Hydric soil rating: No

PlfafF—Plainfield-Metea-Spinks complex, 35 to 60 percent slopes

Map Unit Setting

National map unit symbol: 2tpkh
Elevation: 620 to 780 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

Plainfield and similar soils: 35 percent
Metea and similar soils: 30 percent
Spinks and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Plainfield

Setting

Landform: Glacial drainage channels, drainageways on 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: Concave, convex
Parent material: Sandy drift

Typical profile

A1 - 0 to 2 inches: sand
A2 - 2 to 8 inches: sand
Bw - 8 to 22 inches: sand
BC - 22 to 30 inches: sand
C1 - 30 to 49 inches: sand
C2 - 49 to 80 inches: sand

Properties and qualities

Slope: 35 to 60 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.56 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: 11 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: F097XA010MI - Sandy Slopes
Hydric soil rating: No

Description of Metea

Setting

Landform: Glacial drainage channels, drainageways on 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: Concave, convex
Parent material: Sandy drift over loamy till

Typical profile

A - 0 to 9 inches: loamy fine sand
E - 9 to 28 inches: fine sand
Bt1 - 28 to 32 inches: sandy loam
2Bt2 - 32 to 44 inches: clay loam
2C - 44 to 80 inches: loam

Properties and qualities

Slope: 35 to 60 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F097XA010MI - Sandy Slopes
Hydric soil rating: No

Description of Spinks

Setting

Landform: Glacial drainage channels, drainageways on 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: Concave, convex
Parent material: Sandy drift

Typical profile

A - 0 to 4 inches: sand

Bw1 - 4 to 9 inches: sand
Bw2 - 9 to 39 inches: sand
E and Bt - 39 to 59 inches: sand
C - 59 to 80 inches: sand

Properties and qualities

Slope: 35 to 60 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): High to very high (1.56 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: 3 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: F097XA010MI - Sandy Slopes
Hydric soil rating: No

Minor Components

Tekenink

Percent of map unit: 5 percent
Landform: Glacial drainage channels, drainageways on 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: Concave, convex
Ecological site: F097XA010MI - Sandy Slopes
Hydric soil rating: No

Claybanks

Percent of map unit: 5 percent
Landform: Drainageways on ground 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: Concave, convex
Ecological site: F097XA017MI - Loamy Slopes
Hydric soil rating: No

PpsaaA—Pipestone-Covert-Saugatuck sands, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2rfgv
Elevation: 580 to 780 feet
Mean annual precipitation: 33 to 36 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 129 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Pipestone and similar soils: 50 percent
Covert and similar soils: 20 percent
Saugatuck and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pipestone

Setting

Landform: Nearshore zones (relict), outwash plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciolacustrine deposits

Typical profile

A - 0 to 2 inches: sand
E - 2 to 4 inches: sand
Bs1 - 4 to 13 inches: sand
Bs2 - 13 to 19 inches: sand
BC - 19 to 28 inches: fine sand
C - 28 to 80 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: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.56 to 14.17 in/hr)
Depth to water table: About 6 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Description of Covert

Setting

Landform: Nearshore zones (relict), outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Rise, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciolacustrine deposits

Typical profile

A - 0 to 8 inches: sand
E - 8 to 13 inches: sand
Bs1 - 13 to 18 inches: fine sand
Bs2 - 18 to 29 inches: sand
BC - 29 to 47 inches: fine sand
C - 47 to 80 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.56 to 14.17 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A/D
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Description of Saugatuck

Setting

Landform: Nearshore zones (relict), outwash plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciolacustrine deposits

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 8 inches: sand

E - 8 to 13 inches: fine sand
Bhsm - 13 to 17 inches: sand
Bs - 17 to 20 inches: fine sand
BC - 20 to 32 inches: fine sand
C - 32 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 6 to 21 inches to ortstein
Drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.02 to 0.14 in/hr)
Depth to water table: About 6 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Minor Components

Kingsville

Percent of map unit: 10 percent
Landform: Outwash plains, nearshore zones (relict)
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA008MI - Wet Sandy Flatwoods
Hydric soil rating: Yes

Jebavy

Percent of map unit: 2 percent
Landform: Nearshore zones (relict), outwash plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA007MI - Wet Acidic Sandy Flatwoods
Hydric soil rating: Yes

Antung

Percent of map unit: 2 percent
Landform: Nearshore zones (relict), outwash plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA030MI - Mucky Depression
Hydric soil rating: Yes

Plainfield, high ecological site

Percent of map unit: 1 percent

Landform: Beach ridges, outwash plains, dunes
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA004MI - Dry Sandy Lake Plain
Hydric soil rating: No

Ra—Roscommon and Au Gres sands

Map Unit Setting

National map unit symbol: 68z9
Elevation: 570 to 770 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

Roscommon and similar soils: 50 percent
Au gres and similar soils: 45 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Roscommon

Setting

Landform: Outwash plains, lake plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy lacustrine deposits

Typical profile

A - 0 to 5 inches: loamy sand
C1 - 5 to 36 inches: sand
C2 - 36 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
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: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 10 percent

Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Ecological site: F097XA008MI - Wet Sandy Flatwoods
Hydric soil rating: Yes

Description of Au Gres

Setting

Landform: Outwash plains, lake plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy lacustrine deposits

Typical profile

A - 0 to 5 inches: sand
E - 5 to 11 inches: sand
Bs - 11 to 34 inches: sand
C - 34 to 60 inches: sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Negligible
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: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Minor Components

Croswell

Percent of map unit: 5 percent
Landform: Lake plains, outwash plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA006MI - Moist Acidic Sandy Flatwoods
Hydric soil rating: No

Sm—Sims loam

Map Unit Setting

National map unit symbol: 68zj
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: Prime farmland if drained

Map Unit Composition

Sims and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sims

Setting

Landform: Depressions on till plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey till

Typical profile

Ap - 0 to 9 inches: loam
Bg - 9 to 32 inches: clay loam
Cg - 32 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 35 percent
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F097XA023MI - Wet Loamy Depression
Hydric soil rating: Yes

Minor Components

Kawkawlin

Percent of map unit: 10 percent
Landform: Till plains
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA022MI - Moist Loamy Drift Plains
Hydric soil rating: No

SnkaaB—Spinks loamy sand, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2tpkp
Elevation: 670 to 1,050 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

Spinks and similar soils: 92 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Spinks

Setting

Landform: Moraines, glacial drainage channels, outwash plains
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: Sandy drift

Typical profile

Ap - 0 to 9 inches: loamy sand
Bw - 9 to 28 inches: sand
E and Bt - 28 to 69 inches: loamy sand
C - 69 to 80 inches: 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 high to high (1.42 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: 20 percent
Maximum salinity: Nonsaline (0.0 to 0.4 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F098XA013MI - Piney Dry Sandy Drift Plains
Hydric soil rating: No

Minor Components

Thetford

Percent of map unit: 3 percent
Landform: Moraines, outwash plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Ecological site: F098XA019MI - Moist Sandy Drift Plains
Hydric soil rating: No

Tekenink

Percent of map unit: 2 percent
Landform: Moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F098XA008MI - Piney Dry Loamy Till Knolls
Hydric soil rating: No

Oshtemo

Percent of map unit: 2 percent
Landform: Moraines, outwash plains, glacial drainage channels
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: F098XA008MI - Piney Dry Loamy Till Knolls
Hydric soil rating: No

Metea

Percent of map unit: 1 percent
Landform: 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: F098XA013MI - Piney Dry Sandy Drift Plains

Hydric soil rating: No

So—Sloan soils

Map Unit Setting

National map unit symbol: 68zk
Elevation: 590 to 850 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: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Sloan and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sloan

Setting

Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 13 inches: loam
Bg - 13 to 21 inches: silt loam
2Cg - 21 to 60 inches: stratified sandy loam to silty clay loam

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 (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F097XA027MI - Wet Floodplain
Hydric soil rating: Yes

Minor Components

Saranac

Percent of map unit: 10 percent
Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA027MI - Wet Floodplain
Hydric soil rating: Yes

Tc—Tawas and Carlisle mucks

Map Unit Setting

National map unit symbol: 68zm
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: Farmland of local importance

Map Unit Composition

Tawas and similar soils: 50 percent
Carlisle and similar soils: 45 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tawas

Setting

Landform: Outwash plains, flood plains, lake plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Woody organic material over sandy glacial drift

Typical profile

Oa - 0 to 31 inches: muck
Cg - 31 to 60 inches: 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): 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

Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Very high (about 14.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Ecological site: F097XA030MI - Mucky Depression
Hydric soil rating: Yes

Description of Carlisle

Setting

Landform: Lake plains, outwash plains, flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Herbaceous organic material

Typical profile

Oa - 0 to 60 inches: muck

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): 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): 5w
Hydrologic Soil Group: A/D
Ecological site: F097XA030MI - Mucky Depression
Hydric soil rating: Yes

Minor Components

Kerston

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA027MI - Wet Floodplain
Hydric soil rating: Yes

Td—Tonkey and Deford soils

Map Unit Setting

National map unit symbol: 68zn
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: Prime farmland if drained

Map Unit Composition

Tonkey and similar soils: 50 percent
Deford and similar soils: 45 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tonkey

Setting

Landform: Outwash plains, lake plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified sandy and/or loamy glaciofluvial deposits

Typical profile

Ap - 0 to 10 inches: sandy loam
Bg - 10 to 33 inches: sandy clay loam
C - 33 to 60 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: 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: 30 percent
Available water supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Ecological site: F097XA023MI - Wet Loamy Depression
Hydric soil rating: Yes

Description of Deford

Setting

Landform: Lake plains, outwash plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy lacustrine deposits

Typical profile

A - 0 to 5 inches: loamy sand
C - 5 to 20 inches: fine sand
Cg - 20 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
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: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Ecological site: F097XA008MI - Wet Sandy Flatwoods
Hydric soil rating: Yes

Minor Components

Roscommon

Percent of map unit: 5 percent
Landform: Outwash plains, lake plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F097XA008MI - Wet Sandy Flatwoods
Hydric soil rating: Yes

TknabD—Tekenink-Spinks loamy sands, 12 to 18 percent slopes

Map Unit Setting

National map unit symbol: 2tpk8
Elevation: 660 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: Not prime farmland

Map Unit Composition

Tekenink and similar soils: 55 percent
Spinks and similar soils: 20 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tekenink

Setting

Landform: Recessionial moraines, moraines, glacial drainage channels
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Parent material: Coarse-loamy till

Typical profile

A - 0 to 6 inches: loamy sand
E - 6 to 27 inches: loamy sand
B/E - 27 to 39 inches: fine sandy loam
Bt - 39 to 52 inches: fine sandy loam
C - 52 to 80 inches: sandy loam

Properties and qualities

Slope: 12 to 18 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 (0.16 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Maximum salinity: Nonsaline (0.1 to 0.4 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F098XA008MI - Piney Dry Loamy Till Knolls
Hydric soil rating: No

Description of Spinks

Setting

Landform: Moraines, recessionial moraines, glacial drainage channels
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex

Parent material: Sandy drift

Typical profile

A - 0 to 6 inches: loamy sand
Bw1 - 6 to 9 inches: sand
Bw2 - 9 to 39 inches: sand
E and Bt - 39 to 59 inches: sand
C - 59 to 80 inches: 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): High to very high (1.56 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: 3 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F098XA013MI - Piney Dry Sandy Drift Plains
Hydric soil rating: No

Minor Components

Plainfield

Percent of map unit: 10 percent
Landform: Recessionial moraines, moraines, glacial drainage channels
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Ecological site: F098XA021MI - Sandy Slopes
Hydric soil rating: No

Filer

Percent of map unit: 10 percent
Landform: Moraines, glacial drainage channels
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Interfluve, head slope, nose slope, side slope, base slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Ecological site: F098XA008MI - Piney Dry Loamy Till Knolls
Hydric soil rating: No

Elmdale

Percent of map unit: 5 percent
Landform: Recessionial moraines, moraines, glacial drainage channels

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Concave, convex
Ecological site: F098XA011MI - Moist Loamy 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.

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the following National Soil Survey Handbook link: “National Soil Survey Handbook.”

ABC soil

A soil having an A, a B, and a C horizon.

Ablation till

Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

AC soil

A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil

The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil

Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone

A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.

Alluvial fan

A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium

Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl

A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM)

The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions

Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon

A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo

The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect

The direction toward which a slope faces. Also called slope aspect.

Association, soil

A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity)

The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low: 0 to 3
Low: 3 to 6
Moderate: 6 to 9
High: 9 to 12
Very high: More than 12

Backslope

The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp

A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland

A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada

A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area

The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation

The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology)

A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane

A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology)

from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedding system

A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock

The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography

A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace

A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum

Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout (map symbol)

A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed. The adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Borrow pit (map symbol)

An open excavation from which soil and underlying material have been removed, usually for construction purposes.

Bottom land

An informal term loosely applied to various portions of a flood plain.

Boulders

Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks

A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height

An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management

Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte

An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding

A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil

A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche

A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR)

The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy

The leafy crown of trees or shrubs. (See Crown.)

Canyon

A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water

Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena

A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation

An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity

The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps

See Terracettes.

Cement rock

Shaly limestone used in the manufacture of cement.

Channery soil material

Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment

Control of unwanted vegetation through the use of chemicals.

Chiseling

Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque

A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).

Clay

As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions

See Redoximorphic features.

Clay film

A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay spot (map symbol)

A spot where the surface texture is silty clay or clay in areas where the surface layer of the soils in the surrounding map unit is sandy loam, loam, silt loam, or coarser.

Claypan

A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community

The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil

Sand or loamy sand.

Cobble (or cobblestone)

A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material

Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility)

See Linear extensibility.

Colluvium

Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope

Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil

A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions

See Redoximorphic features.

Conglomerate

A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system

Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage

A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil

Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping

Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section

The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat)

A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology)

A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations)

Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop

A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management

Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system

Growing crops according to a planned system of rotation and management practices.

Cross-slope farming

Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown

The upper part of a tree or shrub, including the living branches and their foliage.

Cryoturbate

A mass of soil or other unconsolidated earthy material moved or disturbed by frost action. It is typically coarser than the underlying material.

Cuesta

An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Culmination of the mean annual increment (CMAI)

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave

The walls of excavations tend to cave in or slough.

Decreasers

The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing

Postponing grazing or resting grazing land for a prescribed period.

Delta

A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer

A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression, closed (map symbol)

A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and that does not have a natural outlet for surface drainage.

Depth, soil

Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement

A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth

A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope

A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace)

A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming

A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural)

Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface

Runoff, or surface flow of water, from an area.

Drainageway

A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw

A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Drift

A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin

A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Duff

A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune

A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill

See Mine spoil.

Ecological site

An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation

The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation

A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit

Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream

A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation

A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion

The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (accelerated)

Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic)

Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement

A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface

A land surface shaped by the action of erosion, especially by running water.

Escarpment

A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Escarpment, bedrock (map symbol)

A relatively continuous and steep slope or cliff, produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.

Escarpment, nonbedrock (map symbol)

A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.

Esker

A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left

behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Extrusive rock

Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth's surface.

Fallow

Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant

A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil

The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat)

The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity

The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope

A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil

Sandy clay, silty clay, or clay.

Firebreak

An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom

An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material

Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone

A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain

The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms

A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay

A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step

An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial

Of or pertaining to rivers or streams; produced by stream or river action.

Foothills

A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope

The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb

Any herbaceous plant not a grass or a sedge.

Forest cover

All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type

A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan

A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil

The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai

Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glaciofluvial deposits

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits

Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil

Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping

Growing crops in strips that grade toward a protected waterway.

Grassed waterway

A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel

Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravel pit (map symbol)

An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel.

Gravelly soil material

Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol)

A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area that has less than 15 percent rock fragments.

Green manure crop (agronomy)

A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water

Water filling all the unblocked pores of the material below the water table.

Gully (map symbol)

A small, steep-sided channel caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage whereas a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock

Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim

Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan

A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology)

A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat)

Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops

Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill

A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope

A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil

A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon: An organic layer of fresh and decaying plant residue.

L horizon: A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon: The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon: The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon: The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon: The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon: Soft, consolidated bedrock beneath the soil.

R layer: Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

M layer: A root-limiting subsoil layer consisting of nearly continuous, horizontally oriented, human-manufactured materials.

W layer: A layer of water within or beneath the soil.

Humus

The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups

Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock

Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation

The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil

A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers

Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration

The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity

The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate

The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate

The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Very low: Less than 0.2
Low: 0.2 to 0.4
Moderately low: 0.4 to 0.75
Moderate: 0.75 to 1.25
Moderately high: 1.25 to 1.75
High: 1.75 to 2.5
Very high: More than 2.5

Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology)

A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream

A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders

On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions

See Redoximorphic features.

Irrigation

Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin: Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border: Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding: Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation: Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle): Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow: Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler: Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation: Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding: Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame

A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Karst (topography)

A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll

A small, low, rounded hill rising above adjacent landforms.

Ksat

See Saturated hydraulic conductivity.

Lacustrine deposit

Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain

A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace

A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol)

An area of accumulated waste products of human habitation, either above or below natural ground level.

Landslide

A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones

Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava flow (map symbol)

A solidified, commonly lobate body of rock formed through lateral, surface outpouring of molten lava from a vent or fissure.

Leaching

The removal of soluble material from soil or other material by percolating water.

Levee (map symbol)

An embankment that confines or controls water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility

Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^{1}/_{3}$- or $^{1}/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit

The moisture content at which the soil passes from a plastic to a liquid state.

Loam

Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess

Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength

The soil is not strong enough to support loads.

Low-residue crops

Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl

An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Marsh or swamp (map symbol)

A water-saturated, very poorly drained area that is intermittently or permanently covered by water. Sedges, cattails, and rushes are the dominant vegetation in marshes, and trees or shrubs are the dominant vegetation in swamps. Not used in map units where the named soils are poorly drained or very poorly drained.

Mass movement

A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses

See Redoximorphic features.

Meander belt

The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar

A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll

One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment

Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil

Very fine sandy loam, loam, silt loam, or silt.

Mesa

A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock

Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth’s crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol)

An open excavation from which soil and underlying material have been removed and in which bedrock is exposed. Also denotes surface openings to underground mines.

Mine spoil

An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil

Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage

Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area

A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous water (map symbol)

Small, constructed bodies of water that are used for industrial, sanitary, or mining applications and that contain water most of the year.

Moderately coarse textured soil

Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil

Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon

A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine

In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil

The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil

Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain

A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can

occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Muck

Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat

See Hemic soil material.

Mudstone

A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation

A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon

A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil

A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules

See Redoximorphic features.

Nose slope (geomorphology)

A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant

Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter

Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low: Less than 0.5 percent
Low: 0.5 to 1.0 percent
Moderately low: 1.0 to 2.0 percent
Moderate: 2.0 to 4.0 percent
High: 4.0 to 8.0 percent
Very high: More than 8.0 percent

Outwash

Stratified and sorted sediments (chiefly sand and gravel) removed or “washed out” from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain

An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace

An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan

A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material

The unconsolidated organic and mineral material in which soil forms.

Peat

Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped

An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment

A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon

The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation

The movement of water through the soil.

Perennial water (map symbol)

Small, natural or constructed lakes, ponds, or pits that contain water most of the year.

Permafrost

Ground, soil, or rock that remains at or below 0 degrees C for at least 2 years. It is defined on the basis of temperature and is not necessarily frozen.

pH value

A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil

A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping

Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting

Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit

The moisture content at which a soil changes from semisolid to plastic.

Plasticity index

The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology)

A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa

The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite

The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan

A compacted layer formed in the soil directly below the plowed layer.

Ponding

Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded

Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings

See Redoximorphic features.

Potential native plant community

See Climax plant community.

Potential rooting depth (effective rooting depth)

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning

Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil

The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil

A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use

Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and

promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland

Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil

A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid: Less than 3.5
Extremely acid: 3.5 to 4.4
Very strongly acid: 4.5 to 5.0
Strongly acid: 5.1 to 5.5
Moderately acid: 5.6 to 6.0
Slightly acid: 6.1 to 6.5
Neutral: 6.6 to 7.3
Slightly alkaline: 7.4 to 7.8
Moderately alkaline: 7.9 to 8.4
Strongly alkaline: 8.5 to 9.0
Very strongly alkaline: 9.1 and higher

Red beds

Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations

See Redoximorphic features.

Redoximorphic depletions

See Redoximorphic features.

Redoximorphic features

Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
   B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
   C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
   B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix

See Redoximorphic features.

Regolith

All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief

The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material)

Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill

A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser

The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut

A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments

Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol)

An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit.

Root zone

The part of the soil that can be penetrated by plant roots.

Runoff

The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil

A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline spot (map symbol)

An area where the surface layer has an electrical conductivity of 8 mmhos/cm more than the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has an electrical conductivity of 2 mmhos/cm or less.

Sand

As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone

Sedimentary rock containing dominantly sand-sized particles.

Sandy spot (map symbol)

A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils in the surrounding map unit is very fine sandy loam or finer.

Sapric soil material (muck)

The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat)

The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as "Ksat." Terms describing saturated hydraulic conductivity are:

Very high: 100 or more micrometers per second (14.17 or more inches per hour)

High: 10 to 100 micrometers per second (1.417 to 14.17 inches per hour)

Moderately high: 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour)

Moderately low: 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour)

Low: 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour)

Very low: Less than 0.01 micrometer per second (less than 0.001417 inch per hour).

To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation

Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification

The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock

A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum

A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil

A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol)

An area where, on the average, 75 percent or more of the original surface layer has been lost because of accelerated erosion. Not used in map units in which “severely eroded,” “very severely eroded,” or “gullied” is part of the map unit name.

Shale

Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion

The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope (map symbol)

A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.

Shoulder

The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell

The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune

A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology)

A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica

A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio

The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt

As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone

An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils

Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol)

A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Site index

A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic)

Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slide or slip (map symbol)

A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces.

Slope

The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope alluvium

Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill

The slow filling of ponds, resulting from restricted water transmission in the soil.

Slow water movement

Restricted downward movement of water through the soil. See Saturated hydraulic conductivity.

Sodic (alkali) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodic spot (map symbol)

An area where the surface layer has a sodium adsorption ratio that is at least 10 more than that of the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has a sodium adsorption ratio of 5 or less.

Sodicity

The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity and their respective ratios are:

Slight: Less than 13:1
Moderate: 13-30:1
Strong: More than 30:1

Sodium adsorption ratio (SAR)

A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock

Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil

A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates

Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand: 2.0 to 1.0
Coarse sand: 1.0 to 0.5
Medium sand: 0.5 to 0.25
Fine sand: 0.25 to 0.10
Very fine sand: 0.10 to 0.05
Silt: 0.05 to 0.002
Clay: Less than 0.002

Solum

The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol)

A pile of earthy materials, either smoothed or uneven, resulting from human activity.

Stone line

In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones

Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony

Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot (map symbol)

A spot where 0.01 to 0.1 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surrounding soil has no surface stones.

Strath terrace

A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace

One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping

Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil

The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:

Platy: Flat and laminated

Prismatic: Vertically elongated and having flat tops

Columnar: Vertically elongated and having rounded tops

Angular blocky: Having faces that intersect at sharp angles (planes)

Subangular blocky: Having subrounded and planar faces (no sharp angles)

Granular: Small structural units with curved or very irregular faces

Structureless soil horizons are defined as follows:

Single grained: Entirely noncoherent (each grain by itself), as in loose sand

Massive: Occurring as a coherent mass

Stubble mulch

Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil

Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling

Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum

The part of the soil below the solum.

Subsurface layer

Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow

The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit

The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer

The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil

The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus

Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts

Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine

An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation)

An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field

generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology)

A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes

Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil

The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer

Otherwise suitable soil material that is too thin for the specified use.

Till

Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain

An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil

The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope

The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil

The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements

Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread

The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Tuff

A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.

Upland

An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill

The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation

Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve

A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very stony spot (map symbol)

A spot where 0.1 to 3.0 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surface of the surrounding soil is covered by less than 0.01 percent stones.

Water bars

Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering

All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth’s surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded

Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wet spot (map symbol)

A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit.

Wilting point (or permanent wilting point)

The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow

The uprooting and tipping over of trees by the wind.

Wetland Delineation Report

Wetlands and Waters Survey

Lakeside Solar

White River Township, Muskegon County, Michigan



May 9, 2025

PRESENTED TO

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EXECUTIVE SUMMARY

This report presents the findings of a Wetlands and Waters Survey completed for the proposed Lakeside Solar facility (Project) located in Muskegon County, Michigan. This investigation included a review of approximately 1,780 acres (Project Area). Lakeside Solar, LLC contracted Tetra Tech, Inc. (Tetra Tech) to identify and survey wetlands and waters within the Project Area.

During Tetra Tech's 2024 field survey, a total of 106 wetlands and 9 streams were identified within the Project Area. A review of the identified wetlands and waters for potential U.S. Army Corps of Engineers (USACE) and Michigan Department of Environment, Great Lakes, and Energy (EGLE) jurisdiction found that none of the wetlands or streams are likely under the jurisdiction of the USACE. This finding is based on the list of navigable waters of the United States within the regulatory jurisdiction of the USACE Detroit District. However, the USACE cutoff point based on the ordinary high-water mark (OHWM) can be determined by USACE in a preliminary or approved jurisdictional determination. Of the 106 wetlands, 71 are likely subject to EGLE regulatory jurisdiction under Part 303 of the Natural Resources and Environmental Protection Act (NREPA). The 35 remaining wetlands do not appear to meet the criteria for regulation by EGLE. All 9 streams are likely subject to EGLE regulatory jurisdiction under Part 301 of NREPA. The 100-year floodplain associated with Pierson Swamp Drain is likely subject to EGLE regulatory jurisdiction under Part 31 of NREPA. However, only EGLE and the USACE can make the final determination on the jurisdiction of wetlands and waters in the Project Area.

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1.0 INTRODUCTION

1.1 PURPOSE

Lakeside Solar, LLC (Lakeside Solar) is proposing to develop the Lakeside Solar energy facility (Project) on an approximately 1,780-acre site located in Muskegon County, Michigan (Project Area). In 2019, Atwell, LLC (Atwell) conducted a field survey for wetlands and waters in 1,495 acres of the Project Area. In 2022, Lakeside Solar contracted with Tetra Tech, Inc. (Tetra Tech) to continue wetlands and waters investigations for the Project including field verification of Atwell's 2019 wetland delineations, and desktop and field investigations of the portions of the Project Area not previously reviewed by Atwell to identify the presence and location of wetlands and other surface waters.

In Fall 2024, Lakeside Solar contracted with Tetra Tech to review and update, if needed, all wetlands and waters previously delineated in the Project Area, and conduct desktop and field investigations of approximately 58 acres of the Project Area not previously reviewed to identify the presence and location of wetlands and other surface waters. Tetra Tech also reviewed all identified wetlands and waters in the Project Area to determine which, if any, may be subject to U.S. Army Corps of Engineers (USACE) or Michigan Department of Environment, Great Lakes, and Energy (EGLE) regulatory jurisdiction.

This report describes the Project Area, regulatory framework, methods, survey results and conclusions, and references used to support the conclusions. Appendices include figures illustrating the Project Area and survey results, wetland determination data forms, and photographs.

1.2 SITE LOCATION AND ENVIRONMENTAL SETTING

The Project Area is within portions of Sections 11, 12, 13, 14, 23, and 24 of White River Township (Township 12 North, Range 18 West) in Muskegon County, Michigan (Appendix A: Figure 1). The Project Area is located west of Lamos Road, east of Lehman Road, north of Hancock Road, and south of Meinert Park Road. The Project Area consists primarily of privately owned agricultural cropland and land use within the adjoining areas consists of farmland, rural residences, lakes, forest, wetlands, and sand dunes.

The physiography of Muskegon County resulted from the Wisconsin glacial period (USDA 1968). Glacial deposits range from approximately 150 feet thick to more than 400 feet thick. The present surface topography of the county ranges from nearly level to rolling and hilly. A belt of strongly rolling sand dunes occurs along the shore of Lake Michigan. The dunes are postglacial in origin but are now generally stationary. For several miles inland, smaller dunes are scattered throughout the poorly drained areas of the lake plain.

The Project Area consists of varying topography. Lake Michigan is located approximately 0.5 mile west of the Project Area and White Lake is located approximately 2.5 miles southeast of the Project Area. There are three watersheds that encompass the Project Area (Appendix A: Figure 2): the Pierson Drain Watershed in the center, the Flower Creek Watershed in the north, and drainage to Lake Michigan in the west (MI DNR 2022). The Pierson

Drain (also referenced as 'Pierson Swamp Drain') is located within the southeast Project Area and then flows south into White Lake, which subsequently flows into Lake Michigan.

1.3 REGULATORY FRAMEWORK

1.3.1 U.S. Army Corps of Engineers (USACE)

The USACE has regulatory jurisdiction over waters of the U.S. (WOTUS) under the Clean Water Act (CWA) as defined by 33 CFR Part 328. A final rule amending the definition of WOTUS was issued by U.S. Environmental Protection Agency (EPA) and the Department of the Army on August 29, 2023. Michigan is currently implementing this rule. According to the rule, WOTUS includes (USEPA 2025):

1) waters which are
   (i) currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
   (ii) the territorial seas;
   (iii) interstate waters;
2) impoundments of waters otherwise defined as WOTUS under this definition, other than impoundments of waters identified under paragraph (5) of this section;
3) tributaries of the waters identified in paragraph (1) or (2) of this section that are relatively permanent, standing, or continuously flowing bodies of water;
4) wetlands adjacent to the following waters:
   (i) waters identified in paragraph (1) of this section; or
   (ii) relatively permanent, standing or continuously flowing bodies of water identified in paragraph (2) or (3) of this section and with a continuous surface connection to those waters; and
5) intrastate lakes and ponds not identified in paragraphs (1) through (4) of this section that are relatively permanent, standing or continuously flowing bodies of water with a continuous surface connection to the waters identified in paragraph (1) or (3) of this section.

EGLE has been authorized to administer Section 404 of the CWA in most areas of the state (see Section 1.3.2). The USACE retains jurisdictional authority over coastal areas and certain other waters in Michigan, including the Great Lakes, connecting channels, other waters connected to the Great Lakes where navigable conditions are maintained, and wetlands directly adjacent to these waters (EGLE 2025a). In most cases, a Joint Permit Application (JPA) for impacts to wetlands and waters of the state is submitted to EGLE for review and approval with no additional federal review. If a JPA were to be submitted for this Project, EGLE would provide a copy to the USACE Detroit Office to determine if the USACE has jurisdiction over any of the wetlands or waters.

EGLE and USACE are the sole authorities in determining whether state and/or federal jurisdiction extends to specific wetlands or waters. Suggestions regarding the EGLE and USACE jurisdiction of wetlands and waters in this report are preliminary and based on Tetra Tech's interpretation of the guidance issued by the USACE, EPA, and EGLE, review of available desktop data, and evidence observed in the field.

1.3.2 Michigan Department of Environment, Great Lakes, and Energy (EGLE)

Wetlands are regulated in Michigan under Part 303, Wetlands Protection, of the State Natural Resources and Environmental Protection Act (NREPA), Public Act (PA) 451 of 1994, as amended, which is consistent with and more stringent than the federal CWA (see Section 1.3.1). Part 303 regulates wetlands that meet any of the following criteria (EGLE 2025a):

- Connected to one of the Great Lakes or Lake St. Clair;
- Located within 1,000 feet of one of the Great Lakes or Lake St. Clair;
- Connected to an inland lake, pond, river, or stream;
- Located within 500 feet of an inland lake, pond, river, or stream;
- Not connected to one of the Great Lakes or Lake St. Clair, or an inland lake, pond, stream, or river, but are more than 5 acres in size; and
- Not connected to one of the Great Lakes or Lake St. Clair, or an inland lake, pond, stream, or river, and less than 5 acres in size, but EGLE has determined that these wetlands are essential to the preservation of the state's natural resources and has notified the property owner.

A permit is required from the state for anyone proposing to drain, fill, dredge, or maintain a use within a Part 303 regulated wetland. EGLE also regulates impacts to inland lakes, streams, and ponds under Part 301, Inland Lakes and Streams, and 100-year floodplains under Part 31, Water Resources Protection, of the NREPA. The 100-year floodplain of a river, stream, or drain with an upstream drainage area of two square miles or greater is regulated by EGLE under Part 31 (EGLE 2025b). A single permit application for activities regulated under Section 404, Part 303, Part 301, and Part 31 can be submitted to EGLE for permit approval by the appropriate district office. The Grand Rapids District Office is the Water Resources Division (WRD) permitting office for the Project Area.

2.0 METHODS

The wetlands and waters survey of the Project Area has been conducted in multiple phases from 2019 through 2024. An initial survey of 1,495 acres of the Project Area was completed by Atwell in 2019. In 2022 and 2024, Tetra Tech field reviewed the delineations completed by Atwell and completed wetlands and waters surveys for the remaining 285 acres of the Project Area.

2.1 EXISTING INFORMATION REVIEW

Tetra Tech reviewed available information to identify potential wetlands and waters within the Project Area. The following data sources were reviewed:

- National Wetlands Inventory (NWI) (U.S. Fish and Wildlife Service [USFWS] 2024);
- National Hydrography Dataset (NHD) (United States Geological Survey [USGS] 2024);
- Part 303 Wetland Inventory Maps (WIM) (EGLE 2025c);

- Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL) for Muskegon County, Michigan (FEMA 2015); and
- Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) Soils (USDA NRCS 2024).

2.2 DESKTOP WETLANDS AND WATERS MAPPING

Prior to the wetlands and waters field surveys, available information was reviewed to identify and map areas within portions of the Project Area that were not previously field surveyed that may exhibit wetland and other surface water characteristics. Aerial photographs from Google Earth Pro (Google Earth Pro 2024) were reviewed in combination with the NWI, NHD, WIM, and SSURGO soils to identify potential wetlands and waters (desktop wetlands and waters). The locations of desktop wetlands and waters were digitized using ArcGIS mapping software.

2.3 WETLANDS AND WATERS FIELD SURVEY

Tetra Tech's October 2024 field survey consisted of field verification of all previously delineated wetlands and waters in 1,722 acres of the Project Area, and field investigations of approximately 58 acres of previously unsurveyed portions of the Project Area to identify the presence and location of wetlands and other surface waters. Desktop wetlands and waters were field checked during the wetlands and waters survey and delineated, if present. Wetlands or waters encountered during the field investigation that were not identified during the desktop data review were also delineated. Previously delineated wetlands were reviewed and the wetland boundary was revised if there was more than a five-foot variance from the previously delineated boundary to allow for seasonal and temporal differences. New wetland determination data forms were not completed unless a new wetland was identified or there were significant changes to a previously delineated feature.

The wetlands delineated in the Project Area by Tetra Tech were completed using the level two on-site routine determination method set forth in the Corps of Engineers Wetlands Delineation Manual (USACE 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0 (USACE 2012). A transect was established in a representative transition zone of the potential wetland. The transect consisted of one sample point in the potential wetland, and if wetland criteria were met, one point in non-wetland. Vegetation, soils, and hydrology data was recorded on data forms. Plant species dominance at sample points was based on the percent cover visually estimated within a 5-foot radius of the sample point for the herbaceous layer, a 15-foot radius for the shrub layer, and a 30-foot radius for tree and vine layers. Wetland indicator status for all plant species followed the National Wetland Plant List, Version 3.6 (USACE 2022a). The wetland/non-wetland boundary was established based on the recorded sample point information. If a potential wetland did not meet all three wetland delineation criteria (hydrophytic vegetation, hydric soils, and hydrology) based on observations made at the time of the field visit it was determined to be non-wetland.

Boundaries for non-wetland waters (i.e., ponds and streams) were established based on observations of the ordinary high water mark (OHWM), which is defined as the "line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes

in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas" (51 FR 41251, November 13, 1986).

Wetlands and waters boundaries were established only within the Project Area. If the boundary extended outside of the Project Area, only that portion of the boundary within the Project Area was delineated, and observations regarding that portion of the feature extending outside of the Project Area were recorded. Tetra Tech photographed each wetland and classified it as palustrine emergent, scrub shrub, or forested according to the Cowardin wetland classification system (Federal Geographic Data Committee [FGDC] 2013).

For the October 2024 field survey, an Arrow 100 GPS receiver with sub-meter accuracy paired with a tablet running ESRI's Survey 123 for ArcGIS was used in the field to survey the locations of sample points, the wetland/non-wetland boundaries, and OHWM boundaries. Upon completion of the survey, the wetland specialist who captured the field data conducted a quality control review to ensure the spatial and attribute data of the features collected correspond with field observations.

3.0 RESULTS

3.1 EXISTING INFORMATION REVIEW AND DESKTOP MAPPING

3.1.1 National Wetlands Inventory (NWI)

There are 20 NWI mapped wetlands within the Project Area (Appendix A: Figure 2). There are 4 freshwater emergent wetlands (1 PEM1F, 3 PEM1C), 4 freshwater forested/shrub wetlands (3 PFO1C, 1 PSS1C), 2 freshwater ponds (1 PUBGx, 1 PUBG), and 10 riverine features (7 R5UBH, 3 R4SBC). The wetlands are primarily on the western side of the Project Area, with an isolated forested wetland and freshwater pond in the northeast corner, and a forested wetland along Pierson Swamp Drain in the south. A key to the Cowardin wetland classification system used by USFWS for NWI is included in Appendix B.

3.1.2 National Hydrography Dataset (NHD)

There are 9 unnamed NHD streams and 1 named NHD stream (Pierson Swamp Drain) mapped in the Project Area (Appendix A: Figure 2). The unnamed streams are tributaries or ditches: 7 streams flow west to large wetland complexes or Lake Michigan via Little Flower Creek, 1 stream flows northeast to Flower Creek, and 1 stream flows south to Pierson Swamp Drain. Pierson Swamp Drain flows southwest from the eastern edge of the Project Area, turns south in the central Project Area and flows south to White Lake outside the Project Area. All the NHD-mapped streams in the Project Area correlate with the riverine features mapped in the NWI (see Section 3.1.1) and are also depicted on the USGS topographic map (Appendix A: Figure 1).

3.1.3 EGLE Wetland Inventory Maps

There are 12 wetlands mapped on the EGLE Wetlands Map Viewer within the Project Area (2 scrub shrub, 6 forested, and 4 emergent). The EGLE WIM were drafted pursuant to Part 303 of NREPA to show potential and approximate locations of wetlands on a county-by-county basis (EGLE 2025c). The EGLE-mapped wetlands in the

Project Area generally correlate with aquatic resources mapped in the NWI (see Section 3.1.1), with minor exceptions.

3.1.4 Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL)

Flood hazard data from FEMA were reviewed for the Project Area and found that areas of 100-year floodplain (Zone A) are mapped along the Pierson Swamp Drain in the southeastern and southern portions of the Project Area (Appendix A: Figure 2).

3.1.5 Soil Survey Geographic (SSURGO) Soils

Soils data for the Project Area were obtained from the USDA NRCS (NRCS 2024). This information was used to study the distribution of hydric soils within the Project Area. Soils were categorized according to the five hydric classes listed below based on the hydric rating of the soil series on the National List of Hydric Soils (USDA NRCS 2025b).

- Non-hydric – all soils series components rated as non-hydric
- Predominantly non-hydric – minority of soil components that are considered hydric accounting for 1 to 32 percent of the series
- Partially hydric – a mix of hydric and non-hydric soil components with hydric components accounting for 33 to 65 percent of the series
- Predominantly hydric – majority of soil components that are considered hydric accounting for 66 to 99 percent of the series
- Hydric – all soils series components rated as hydric

Nearly half (47.6 percent) of the soils in the Project Area are classified as non-hydric and an additional 28.1 percent of the soils in the Project Area are classified as predominantly non-hydric (Appendix A: Figure 3). Partially hydric soils comprise 0.4 percent of the Project Area, while predominantly hydric soils comprise 5.9 percent and hydric soils comprise 17.8 percent (Appendix A: Figure 3). The predominantly hydric and hydric soils primarily occur in the eastern half of the Project Area, with smaller areas located near the western boundary. The non-hydric and predominantly non-hydric soils primarily comprise the southern and western portions of the Project Area. The partially hydric soils occur along the northeastern and southeastern boundary. The areas of hydric and predominantly hydric soils in the Project Area correlate with some of the NWI wetlands (see Section 3.1.1).

3.1.6 Desktop Wetlands and Waters Mapping

Aerial photographs were reviewed to identify and map potential wetlands and waters (desktop wetlands and waters) within 285 acres of the Project Area that were not previously surveyed. All the historical aerial photograph layers available in Google Earth Pro (2024) were reviewed. The desktop data review found 10 desktop wetlands and waters within the area reviewed totaling approximately 7.9 acres (Appendix A: Figure 2). Three of the desktop wetlands and waters features mapped on Figure 2 correspond with previously mapped features in the NWI, NHD,

and EGLE WIM databases and seven of the desktop wetlands and waters features mapped on Figure 2 were identified based on aerial photograph review.

3.2 WETLANDS AND WATERS SURVEY

The wetlands and waters field survey was completed from October 16 through 26, 2024 during a period with normal antecedent precipitation based on methods described in technical guidance (USDA 2015) and data from the NRCS Agricultural Applied Climate Information System (AgACIS) (USDA NRCS 2025a). Antecedent precipitation data are presented in Table 1.

Table 1. Antecedent Precipitation Analysis

Precipitation data for target wetland location:				
County: **Muskegon**	Township Number: **12N**	**Site visit dates:**		
Township Name: **White River**	Range Number: **18W**	**October 16-26, 2024**		
Nearest Community: **Whitehall**	Section Number: **11-14, 23, 24**			
Score using 1991-2020 normal period				
Values are in inches		first prior month: **September 2024**	second prior month: **August 2024**	third prior month: **July 2024**
estimated precipitation total for this location:		**3.44**	**3.19**	**3.00**
there is a 30% chance this location will have less than:		2.03	2.15	2.05
there is a 30% chance this location will have more than:		3.90	4.08	3.36
type of month: dry normal wet		**normal**	**normal**	**normal**
monthly score		**3 * 2 = 6**	**2 * 2 = 4**	**1 * 2 = 2**
multi-month score: 6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)		**12 (Normal)**		

A total of 115 aquatic resources were identified and delineated in the Project Area at the completion of the field survey, including 106 wetlands and 9 streams. The delineated resources are depicted and labeled on Figure 4 (Appendix A) and general field survey results and observations are summarized in the following sections.

3.2.1 Wetlands

The 106 wetlands in the Project Area are summarized in Table 2 below. Wetland determination data forms and photographs of delineated wetlands are provided in Appendix C and Appendix D, respectively, including data forms and photographs from Atwell's 2019 field survey. Atwell did not include vegetation specific to each wetland in their data forms. During Tetra Tech's review of the previously delineated boundaries in 2022, dominant vegetation was documented where growth was sufficient.

Table 2. Surveyed Wetlands

Feature ID*	Wetland Classification†	Surveyed Area (acres)	Regulatory Jurisdiction		Dominant Vegetation
			USACE	EGLE	
WL1	PEM	0.12	No	Yes	Reed canary grass (*Phalaris arundinacea*)
WL2	PEM	0.10	No	Yes	Rice cutgrass (*Leersia oryzoides*)
WL3	PEM	0.01	No	Yes	Spotted jewelweed (*Impatiens capensis*) Rice cutgrass (*Leersia oryzoides*)
WL4	PEM	0.01	No	Yes	Green ash (*Fraxinus pennsylvanica*) Rice cutgrass (*Leersia oryzoides*)
WL5	PEM/PSS	3.04	No	Yes	Reed canary grass (*Phalaris arundinacea*) Redtop (*Agrostis gigantea*) Common buttonbush (*Cephalanthus occidentalis*)
WL6	PEM	0.03	No	No	Reed canary grass (*Phalaris arundinacea*) Yellow nut sedge (*Cyperus esculentus*) Smartweed (*Persicaria pensylvanica*)
WL13	PEM	2.58	No	Yes	Reed canary grass (*Phalaris arundinacea*)
WL14	PEM/PFO	0.51	No	No	Willow (*Salix spp.*) Reed canary grass (*Phalaris arundinacea*)
WL15	PEM	0.08	No	Yes	Blue vervain (*Verbena hastata*) Reed canary grass (*Phalaris arundinacea*)
WL16	PEM	0.05	No	No	Narrow-leaved cattail (*Typha angustifolia*) Jointed rush (*Juncus articulatus*) Redtop (*Agrostis gigantea*)
WL17	PEM	0.003	No	Yes	Horsetail (*Equisetum arvense*) Northern water plantain (*Alisma triviale*)
WL18	PEM	0.004	No	Yes	Horsetail (*Equisetum arvense*)
A3	PEM/PSS	0.08	No	Yes	Sandbar willow (*Salix interior*) Reed canary grass (*Phalaris arundinacea*)
A4	PEM	1.15	No	Yes	Reed canary grass (*Phalaris arundinacea*) Redtop (*Agrostis gigantea*)
B2	PFO	0.15	No	Yes	Red maple (*Acer rubrum*) American elm (*Ulmus americana*) Spotted jewelweed (*Impatiens capensis*) Gray's sedge (*Carex grayi*)
B3	PFO	0.03	No	Yes	Gray's sedge (*Carex grayi*) Reed canary grass (*Phalaris arundinacea*) Green ash (*Fraxinus pennsylvanica*) Cottonwood (*Populus deltoides*)
B4	PEM	0.14	No	Yes	Sparsely vegetated concave surface

Feature ID*	Wetland Classification†	Surveyed Area (acres)	Regulatory Jurisdiction		Dominant Vegetation
			USACE	EGLE	
B5	PFO	0.11	No	Yes	Reed canary grass (*Phalaris arundinacea*) Green ash (*Fraxinus pennsylvanica*) Cottonwood (*Populus deltoides*)
B6	PFO	0.03	No	Yes	Spotted jewelweed (*Impatiens capensis*) Green ash (*Fraxinus pennsylvanica*) Cottonwood (*Populus deltoides*)
B7	PEM	0.15	No	Yes	Sparsely vegetated concave surface
B8	PEM	0.004	No	Yes	Soft-stemmed rush (*Juncus effusus*)
B9	PEM	0.73	No	Yes	Sparsely vegetated concave surface
B10	PEM	0.21	No	Yes	Yellow nut sedge (*Cyperus esculentus*)
B12	PEM	0.04	No	Yes	Soft-stemmed rush (*Juncus effusus*)
B13	PEM	0.05	No	Yes	Carex (*Carex bebbii*)
B14	PEM	0.06	No	Yes	Fox sedge (*Carex vulpinoidea*)
B15	PEM	0.08	No	Yes	Sparsely vegetated concave surface
C1	PEM	0.31	No	Yes	Sparsely vegetated concave surface
C2	PEM	0.29	No	No	Sparsely vegetated concave surface
C3	PEM	0.46	No	Yes	Sparsely vegetated concave surface
C4	PEM	0.07	No	Yes	Sparsely vegetated concave surface
C5	PEM	0.06	No	Yes	Spikerush (*Eleocharis* sp.)
C6	PEM	0.08	No	No	Sparsely vegetated concave surface
C7	PEM/PSS	2.49	No	Yes	Narrow-leaved cattail (*Typha angustifolia*) Willow (*Salix spp.*)
C8	PEM	0.01	No	No	Narrow-leaved cattail (*Typha angustifolia*)
C9	PEM	0.05	No	Yes	Yellow nut sedge (*Cyperus esculentus*)
C10	PEM/PSS	0.97	No	No	Reed canary grass (*Phalaris arundinacea*) Common buckthorn (*Rhamnus cathartica*)
D1	PEM	0.11	No	Yes	Reed canary grass (*Phalaris arundinacea*)
D3	PEM	0.07	No	Yes	Sparsely vegetated concave surface
D4	PEM	0.92	No	Yes	Sparsely vegetated concave surface
D5	PEM	0.03	No	Yes	Sparsely vegetated concave surface
D6	PEM	0.09	No	Yes	Sparsely vegetated concave surface
D7	PEM	0.06	No	Yes	Sparsely vegetated concave surface
D8	PEM	0.03	No	Yes	Sparsely vegetated concave surface
D9	PEM	0.15	No	Yes	Sparsely vegetated concave surface
D11	PEM	0.22	No	Yes	Sedge (*Carex bebbii*) Rush (*Juncus* sp.)

Feature ID*	Wetland Classification†	Surveyed Area (acres)	Regulatory Jurisdiction		Dominant Vegetation
			USACE	EGLE	
D12	PEM	0.02	No	No	Sparsely vegetated concave surface
E1	PEM	0.07	No	No	Reed canary grass (*Phalaris arundinacea*)
E2	PEM	0.73	No	No	Reed canary grass (*Phalaris arundinacea*)
E3	PEM	0.02	No	Yes	Sparsely vegetated concave surface
E4	PEM	0.02	No	No	Reed canary grass (*Phalaris arundinacea*)
E5	PEM	0.04	No	No	Reed canary grass (*Phalaris arundinacea*)
E7	PEM	0.34	No	No	Sparsely vegetated concave surface
E8	PEM/PFO	0.19	No	Yes	Green ash (*Fraxinus pennsylvanica*) American elm (*Ulmus americana*) Calico aster (*Symphyotrichum lateriflorum*)
E9	PEM	0.01	No	Yes	Yellow nut sedge (*Cyperus esculentus*)
E11/E10	PEM	0.18	No	Yes	Reed canary grass (*Phalaris arundinacea*)
E11	PEM	0.09	No	Yes	Reed canary grass (*Phalaris arundinacea*)
F1/H1	PEM/PFO	5.59	No	Yes	Silver maple (*Acer saccharinum*) Dark-green bulrush (*Scirpus atrovirens*) Broad-leaved cattail (*Typha latifolia*) Rice Cutgrass (*Leersia oryzoides*)
F1	PEM	0.09	No	No	Sparsely vegetated concave surface
F3	PEM	0.04	No	No	Sparsely vegetated concave surface
F4	PEM	0.19	No	No	Yellow nut sedge (*Cyperus esculentus*)
F5	PEM	0.08	No	No	Sparsely vegetated concave surface
F6	PEM	0.02	No	No	Sparsely vegetated concave surface
F7	PEM	0.92	No	Yes	Reed canary grass (*Phalaris arundinacea*)
F8	PEM	0.10	No	Yes	Panic grass (*Panicum dichotomiflorum*)
F9	PEM	0.01	No	No	Spike-rush (*Eleocharis palustris*)
F12	PEM	0.42	No	No	Sparsely vegetated concave surface
F15	PEM	0.08	No	Yes	Sparsely vegetated concave surface
F16	PEM	0.04	No	Yes	Sparsely vegetated concave surface
F17	PEM	0.23	No	No	Sparsely vegetated concave surface
G1	PEM	0.09	No	No	Sparsely vegetated concave surface
G2	PEM	0.02	No	No	Sparsely vegetated concave surface
G3	PEM	0.10	No	No	Sparsely vegetated concave surface
G4	PEM	0.002	No	Yes	Curly dock (*Rumex crispus*)
G5	PEM	0.02	No	Yes	Sparsely vegetated concave surface

Feature ID*	Wetland Classification†	Surveyed Area (acres)	Regulatory Jurisdiction		Dominant Vegetation
			USACE	EGLE	
G6	PEM	0.02	No	Yes	Smartweed (*Persicaria pensylvanica*)
G7	PEM	0.03	No	Yes	Reed canary grass (*Phalaris arundinacea*)
G8	PEM	6.29	No	Yes	Reed canary grass (*Phalaris arundinacea*) Smartweed (*Persicaria pensylvanica*)
G9	PEM/PFO	8.73	No	Yes	Red maple (*Acer rubrum*)
G10	PEM	0.16	No	Yes	Sparsely vegetated concave surface
H1	PEM	0.42	No	Yes	Horsetail (*Equisetum arvense*) Curly dock (*Rumex crispus*)
H2	PEM	0.01	No	Yes	Meadowsweet (*Spiraea alba*) Reed canary grass (*Phalaris arundinacea*) Sedges (*Carex spp.*)
H4	PEM	0.13	No	Yes	Reed canary grass (*Phalaris arundinacea*)
I6	PEM/Open Water	2.72	No	Yes	Cattail (*Typha sp.*)
I7	PEM	0.02	No	No	Narrow-leaved cattail (*Typha angustifolia*)
I8	PEM	0.13	No	No	Reed canary grass (*Phalaris arundinacea*)
I9	PEM	0.001	No	No	Narrow-leaved cattail (*Typha angustifolia*)
I11	PEM	0.08	No	Yes	Narrow-leaved cattail (*Typha angustifolia*) Reed canary grass (*Phalaris arundinacea*)
I13	PEM	0.06	No	No	Sparsely vegetated concave surface
I14	PEM	0.11	No	No	Sparsely vegetated concave surface
I15	PEM	0.08	No	No	Narrow-leaved cattail (*Typha angustifolia*)
J1	PEM	0.32	No	Yes	Redtop (Agrostis gigantea) Sedge (*Carex* sp.)
J2	PEM	1.20	No	Yes	Reed canary grass (*Phalaris arundinacea*)
J3	PFO	0.10	No	Yes	Red maple (*Acer rubrum*)
J4	PEM	0.01	No	Yes	Fox sedge (*Carex vulpinoidea*)
J6	PEM	0.10	No	No	Yellow nut sedge (*Cyperus esculentus*)
J7	PEM	0.15	No	Yes	Reed canary grass (*Phalaris arundinacea*)
J8	PEM	0.05	No	Yes	Reed canary grass (*Phalaris arundinacea*)
J10	PEM	0.41	No	Yes	Narrow-leaved cattail (*Typha angustifolia*)

Feature ID*	Wetland Classification†	Surveyed Area (acres)	Regulatory Jurisdiction		Dominant Vegetation
			USACE	EGLE	
J12	PEM	0.01	No	Yes	Narrow-leaved cattail (*Typha angustifolia*)
J14	PEM	0.08	No	Yes	Reed canary grass (*Phalaris arundinacea*)
WA019	PEM	0.17	No	No	Hairy crabgrass (*Digitaria sanguinalis*) Lamb's-quarters (*Chenopodium album*) Creeping yellowcress (*Rorippa sylvestris*)
WA020	PEM	0.35	No	No	Path rush (*Juncus tenuis*) Barnyard grass (*Echinochloa crus-galli*)
WA021	PEM	1.83	No	Yes	Panic grass (*Panicum dichotomiflorum*)
WA022	PEM	0.52	No	No	Broad-leaved cattail (*Typha latifolia*) Blue-joint grass (*Calamagrostis canadensis*)
WA023	PEM	0.21	No	No	Barnyard grass (*Echinochloa crus-galli*) Water smartweed (*Persicaria amphibia*) Reed canary grass (*Phalaris arundinacea*)

* IDs for wetlands delineated by Tetra Tech begin with "WL" and "WA". All other wetlands were delineated by Atwell and field verified by Tetra Tech.
† PEM is palustrine emergent; PSS is palustrine scrub-shrub; PFO is palustrine forested.

As shown in Table 2, most (92) of the wetlands in the Project Area are palustrine emergent (PEM) wetlands. Additionally, Tetra Tech identified 5 palustrine forested (PFO) wetlands, 4 PEM/PSS wetlands, 4 PEM/PFO wetlands, and 1 PEM wetland with an open water area. General observations of wetland vegetation, soils, and hydrology conditions recorded during the field surveys are summarized below.

3.2.1.1 Vegetation

The majority of the wetlands within the Project Area are emergent, occurring in rowed crop fields, ditches, and fallow field areas. Wetlands in agricultural fields contained either sparse and/or stunted crops (wheat, beans, or corn) or sparse emergent vegetation, most commonly smartweed *(Persicaria amphibia),* smooth witchgrass (*Panicum dichotomiflorum*), and reed canary grass *(Phalaris arundinacea)*.

Emergent wetland vegetation in ditches, swales, and fallow areas was dominated by reed canary grass *(Phalaris arundinacea)*, cattails *(Typha spp.),* sedges (Carex *spp.*), rushes (*Juncus spp.*), rice cutgrass (*Leersia oryzoides*), jewelweed (*Impatiens capensis*), barnyard grass (*Echinochloa crus-galli*), and redtop (*Agrostis gigantea*).

Vegetation in forested wetland areas was dominated by trees including red maple *(Acer rubrum),* silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), and river birch *(Betula nigra)*.

Shrubs identified in scrub-shrub wetland areas include willows (*Salix spp.*), buttonbush (*Cephalanthus occidentalis*), and common buckthorn (*Rhamnus cathartica*).

3.2.1.2 Soils

Soils within the delineated wetlands were typically sandy or loamy with textures ranging from sand to sandy loam or sandy clay loam. Clay loam and sandy clay were also observed in some wetlands. The sandy redox (S5) and redox dark surface (F6) hydric soil indicators were documented most often at wetland sample plots. Loamy mucky mineral (F1), sandy mucky mineral (S1), depleted below dark surface (A11), and depleted matrix (F3) were also observed in some wetland sample plots. A gley horizon was noted at one location, resulting in a loamy gleyed matrix (F2).

3.2.1.3 Hydrology

The wetland hydrology criteria was established based on the observation of both primary and secondary hydrology indicators for the majority of wetlands. Primary hydrology indicators frequently observed included surface water (A1), high water table (A2), saturation (A3), algal mat or crust (B4), inundation visible on aerial imagery (B7), and sparsely vegetated concave surface (B8). Secondary hydrology indicators most frequently documented included surface soil cracks (B6), saturation visible on aerial imagery (C9), stunted or stressed plants (D1), geomorphic position (D2), and FAC-neutral test (D5).

3.2.2 Streams

Nine streams are present within the Project Area (Table 3; Appendix A: Figure 4). Representative stream photographs are provided in Appendix D, including photographs from previous surveys. All nine surveyed streams have a defined bed, banks, and visible evidence of continued flow or continued occurrence of water.

Streams WC1, WCA1, and WCA2 are segments of Pierson Swamp Drain. Pierson Swamp Drain (WCA2) begins in the eastern Project Area and flows southwest toward the center of the Project Area, where it turns south and eventually flows south outside of the Project Area. WCA1 is also Pierson Swamp Drain, which begins in the northeast Project Area and flows south into WCA2. According to the Muskegon County Public Drain System Viewer all three segments of Pierson Swamp Drain (WC1, WCA1, and WCA2) are Muskegon County Drains (Muskegon County 2020).

Streams WCF1 and WCH1 are small tributaries of WCA1, occurring in the central Project Area and flowing west into WCA1. The three tributaries WCA1, WCF1, and WCH1 are channelized streams which were likely straightened, altered, or created for agricultural drainage.

Streams WCE1 and WCE2 are located along the northwestern side of the Project Area. WCE1 begins in the Project Area and continues offsite into the forested complex to the west. WCE2 is a small tributary flowing north into WCE1.

Stream SA001 is a small, wooded stream along the northwestern side of the Project Area that connects two sections of Wetland J2, flowing west.

Stream SA002 is a small stream present in an agricultural field along the southwestern side of the Project Area, flowing west and dissipating in an upland area.

Table 3. Surveyed Streams

Stream ID	Stream Type	Regulatory Jurisdiction		Description
		USACE	EGLE	
WC1-Pierson Swamp Drain	Perennial	No	Yes	Natural stream Average width 18 feet; average total depth 3 feet; average water depth 2 inches Flows west and then flows south outside of the Project Area
WCA1 - Pierson Swamp Drain	Perennial	No	Yes	Channelized stream/County Drain Flows south into WCA2
WCA2 - Pierson Swamp Drain	Perennial	No	Yes	Channelized stream/County Drain Flows southwest and then flows south outside of the Project Area
WCE1	Intermittent	No	Yes	Natural stream Flows west outside of the Project Area
WCE2*	Intermittent	No	Yes	Natural Stream Flows north into WCE1 Average width 10 feet; average depth 1 foot; average water depth 6 inches.
WCF1	Intermittent	No	Yes	Channelized stream Flows north and then west into WCA1
WCH1	Intermittent	No	Yes	Channelized Stream Flows west into WCA1
SA001*	Intermittent	No	Yes	Natural Stream Average width 12 feet; average total depth 1.5 feet; average water depth 6 inches Flows between sections of Wetland J2
SA002*	Intermittent	No	Yes	Natural Stream Average width 6 feet; average depth 1.5 feet; average water depth 6 inches Flows west through upland area of agricultural field

3.3 REGULATORY IMPLICATIONS

3.3.1 USACE

In 1984, Michigan received authorization from the federal government to administer the CWA Section 404 permit program in most areas of the state. Under Section 10 of the Federal Rivers and Harbors Act, the USACE retains jurisdiction in coastal areas and certain other waters in Michigan, including the Great Lakes, connecting channels, other waters connected to the Great Lakes where navigational conditions are maintained, and wetlands directly adjacent to these waters. The USACE Detroit District maintains a list of navigable waters, creeks, and streams inundated by the OHWM of Section 10 navigable waters, and their approximate regulatory cutoff. The regulatory cutoff is the upper limit to navigability, where there is a marked decrease in navigable capacity of the river (USACE 2022b).

Each of the identified wetlands and waters within the Project Area was reviewed for potential USACE jurisdiction as described above and in Section 1.3 of this report. The identified wetlands and waters located onsite are likely

not under USACE jurisdiction based on the USACE Detroit District list of Section 10 navigable waters and creeks or streams inundated by the OHWM of a Section 10 navigable water. There are wetlands in the northwest Project Area that are connected to Little Flower Creek, which eventually flows into Lake Michigan. Lake Michigan is a Section 10 Navigable Water that is located approximately 0.5 mile west of the Project Area. Little Flower Creek is not on the USACE list; however, the USACE cutoff point based on the OHWM can be determined by USACE in a preliminary or approved jurisdictional determination. It is Tetra Tech's opinion that the Project Area is under the regulatory authority of EGLE only. However, only EGLE and the USACE can make the final determination on the jurisdiction of wetlands and waters.

3.3.2 EGLE

A review of the identified wetlands and waters for potential EGLE jurisdiction under NREPA as described in Section 1.3 of this report found that 71 of the 106 wetlands identified during the survey are likely subject to EGLE regulatory jurisdiction under Part 303, Wetlands Protection, of NREPA (Appendix A: Figure 5). The remaining 35 wetlands do not appear to meet the criteria for regulation under NREPA. EGLE regulatory jurisdiction for the surveyed wetlands is listed in Table 2. All nine of the streams have a defined bed, banks, and visible evidence of continued flow or continued occurrence of water and are likely subject to EGLE regulatory jurisdiction under Part 301, Inland Lakes and Streams, of NREPA (Appendix A: Figure 5). EGLE regulatory jurisdiction for the streams is listed in Table 3. Additionally, FEMA mapped 100-year floodplain associated with Pierson Swamp Drain is located in the Project Area and is likely subject to EGLE regulatory jurisdiction under Part 31, Water Resources Protection, of NREPA. However, only EGLE and USACE can make a final determination on the regulatory status of wetlands and waters in the Project Area.

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APPENDIX A: FIGURES

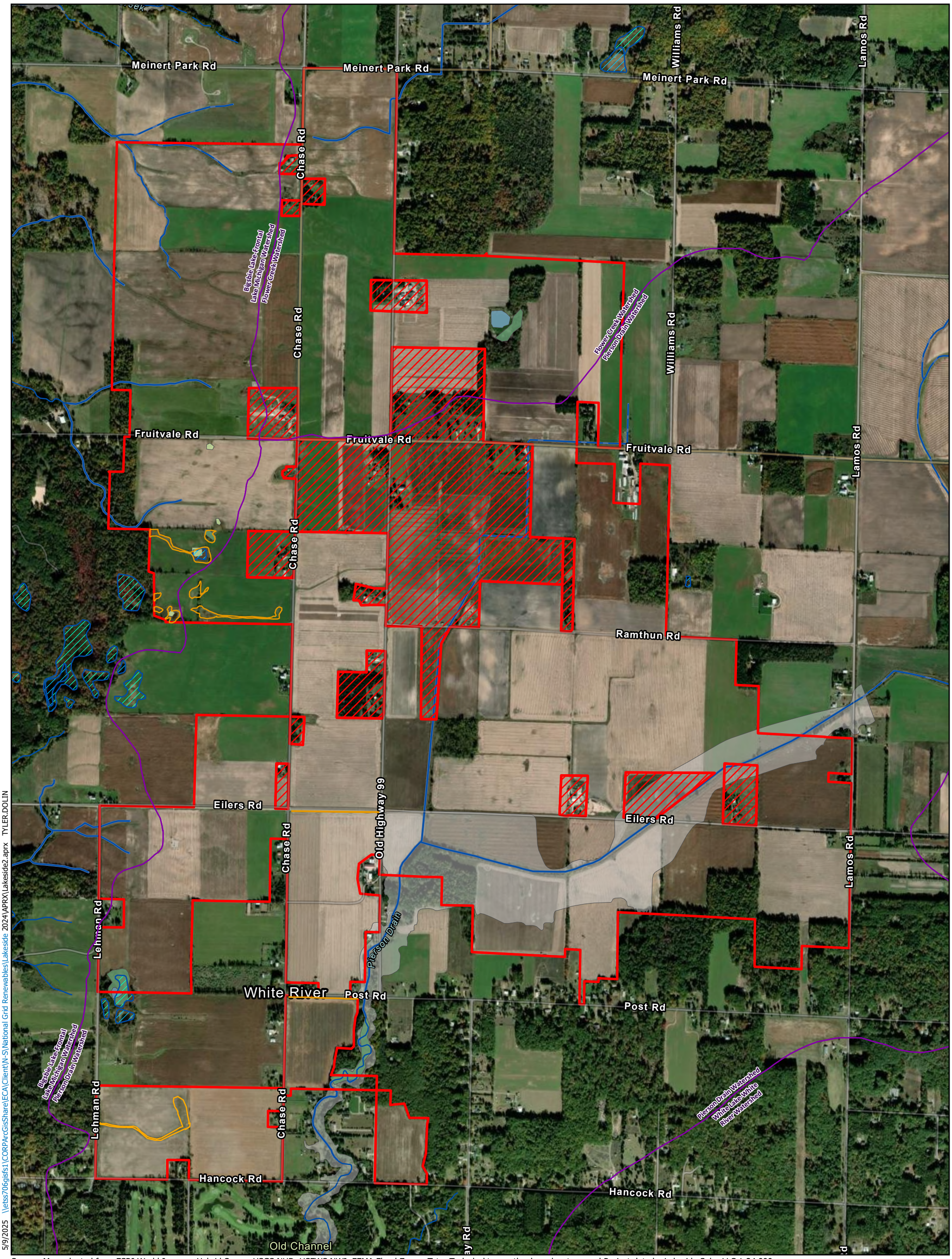
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Source: Map adapted from USA Topo Maps Server Server and Project data by Lakeside Solar, LLC. Scale: 1:24,000

Figure 1
Project Location

Lakeside Solar
Muskegon County, Michigan

TETRA TECH



Source: Map adapted from ESRI World Imagery Hybrid Server, USGS NHD, USFWS NWI, FEMA Flood Zones, Tetra Tech desktop wetlands and waters, and Project data by Lakeside Solar LLC.1:24,000



Project Area (1,780 Acres)

Outside Project Area

Flood Zones

FEMA Zone A Flood Hazard

Desktop Mapping

Desktop Potential Wetlands and Waters

Watershed Boundary Dataset

12-digit Hydrologic Unit Subbasin

NWI Wetlands

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Riverine

NHD Classification

Connector

Perennial Stream/River

Intermittent Stream/River

Lake/Pond

SwampMarsh

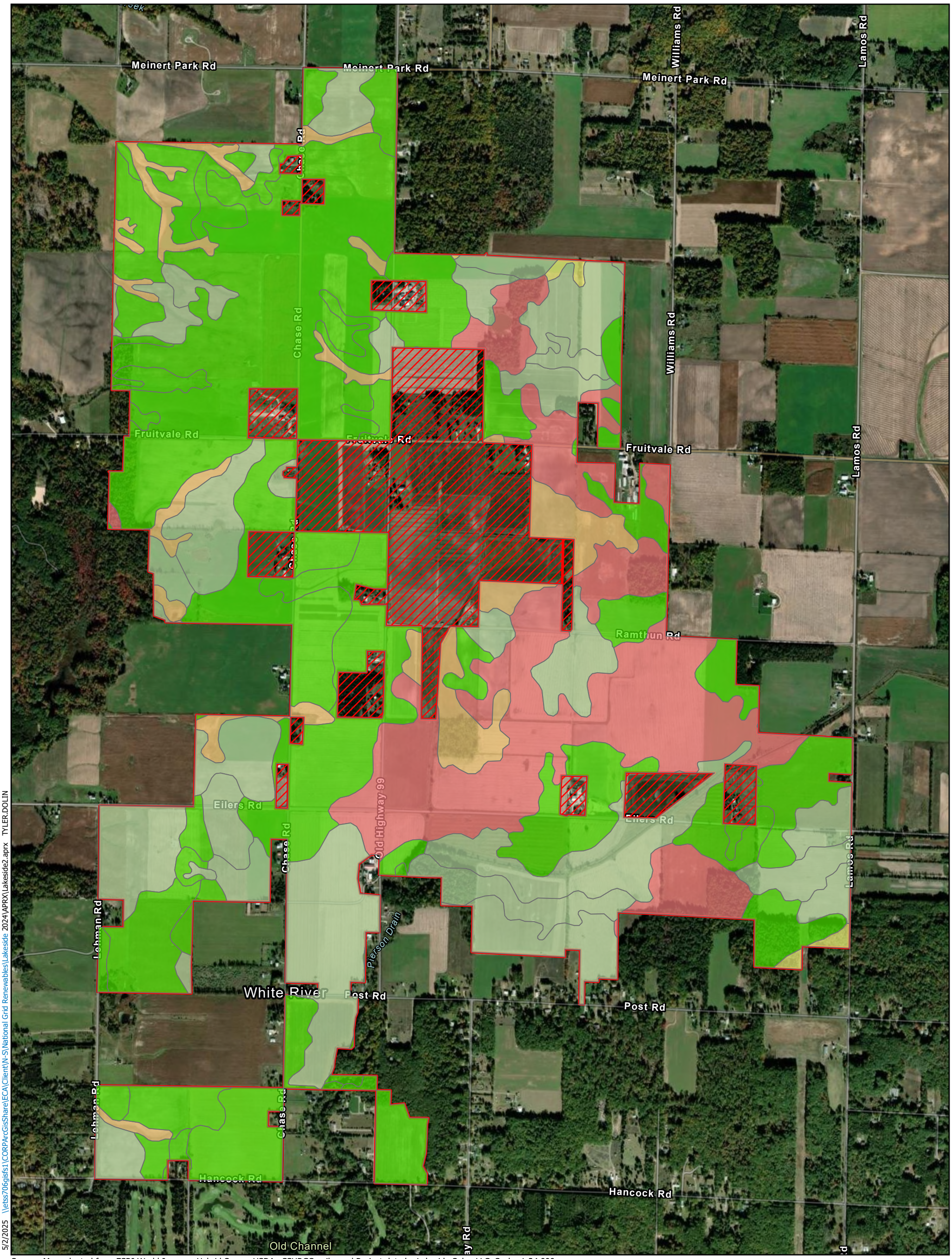
0 0.25 0.5 Mile

Figure 2
Desktop Wetlands and Waters Mapping

Lakeside Solar
Muskegon County, Michigan

TETRA TECH

5/9/2025 \\etss706gisfs1\CORPArcGisShare\ECA\Client\N-S\National Grid Renewables\Lakeside 2024\APRX\Lakeside2.aprx TYLER.DOLIN



5/2/2025 \\etss706gisfs1\CORPArcGisShare\ECA\Client\N-S\National Grid Renewables\Lakeside 2024\APRX\Lakeside2.aprx TYLER.DOLIN

Source: Map adapted from ESRI World Imagery Hybrid Server, USDA gSSURGO soils, and Project data by Lakeside Solar, LLC. Scale: 1:24,000



Project Area (1,780 Acres)

Outside Project Area

Hydric Classification

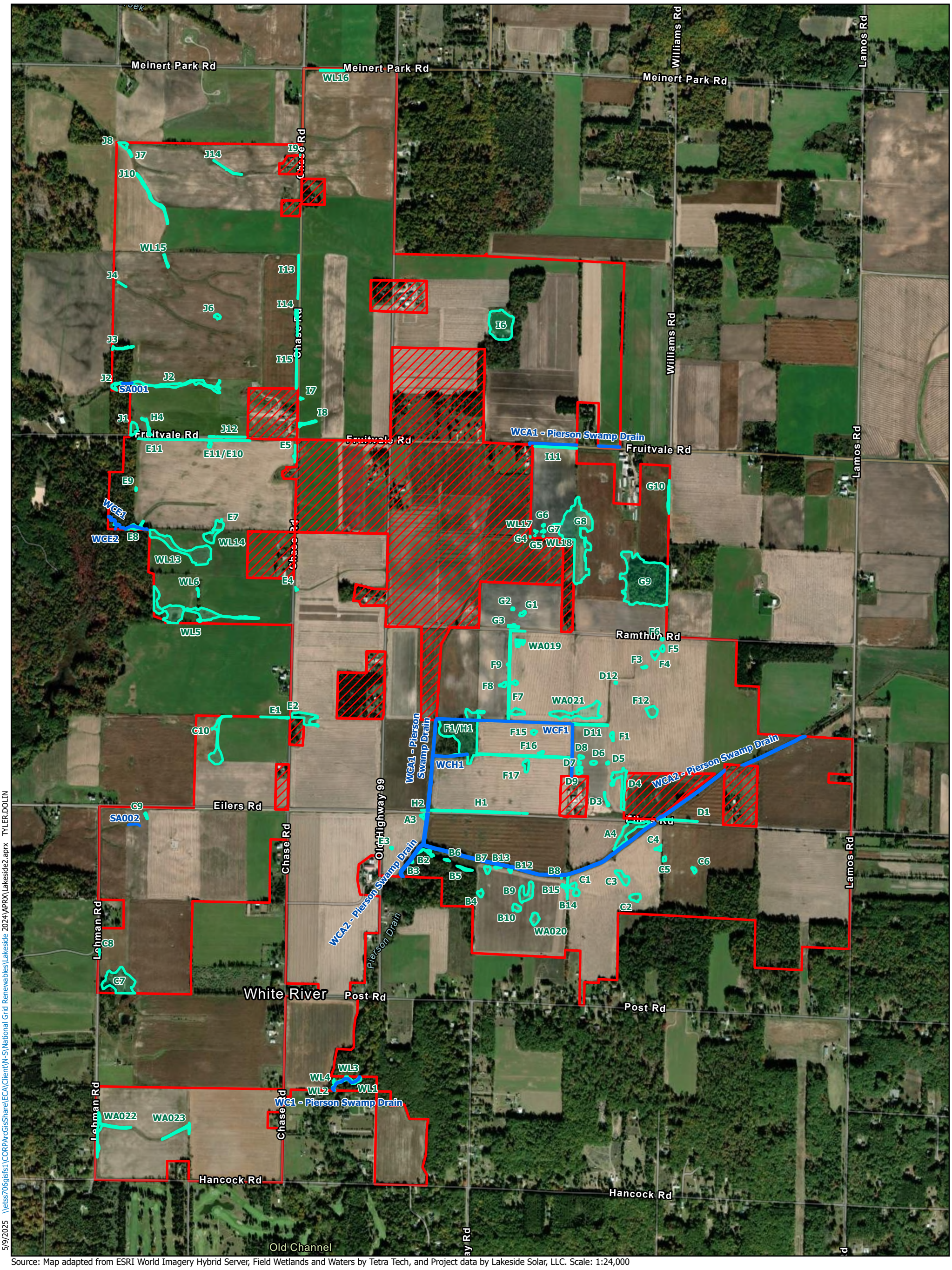
- Hydric
- Predominantly Hydric
- Partially Hydric
- Predominantly Non-Hydric
- Non-Hydric

0 0.25 0.5 Mile

Figure 3
SSURGO Soils

Lakeside Solar
Muskegon County, Michigan

TETRA TECH



Source: Map adapted from ESRI World Imagery Hybrid Server, Field Wetlands and Waters by Tetra Tech, and Project data by Lakeside Solar, LLC. Scale: 1:24,000



Project Area (1,780 Acres)

Outside Project Area

Delineated Wetlands and Waters

Surveyed Wetland

Surveyed Stream

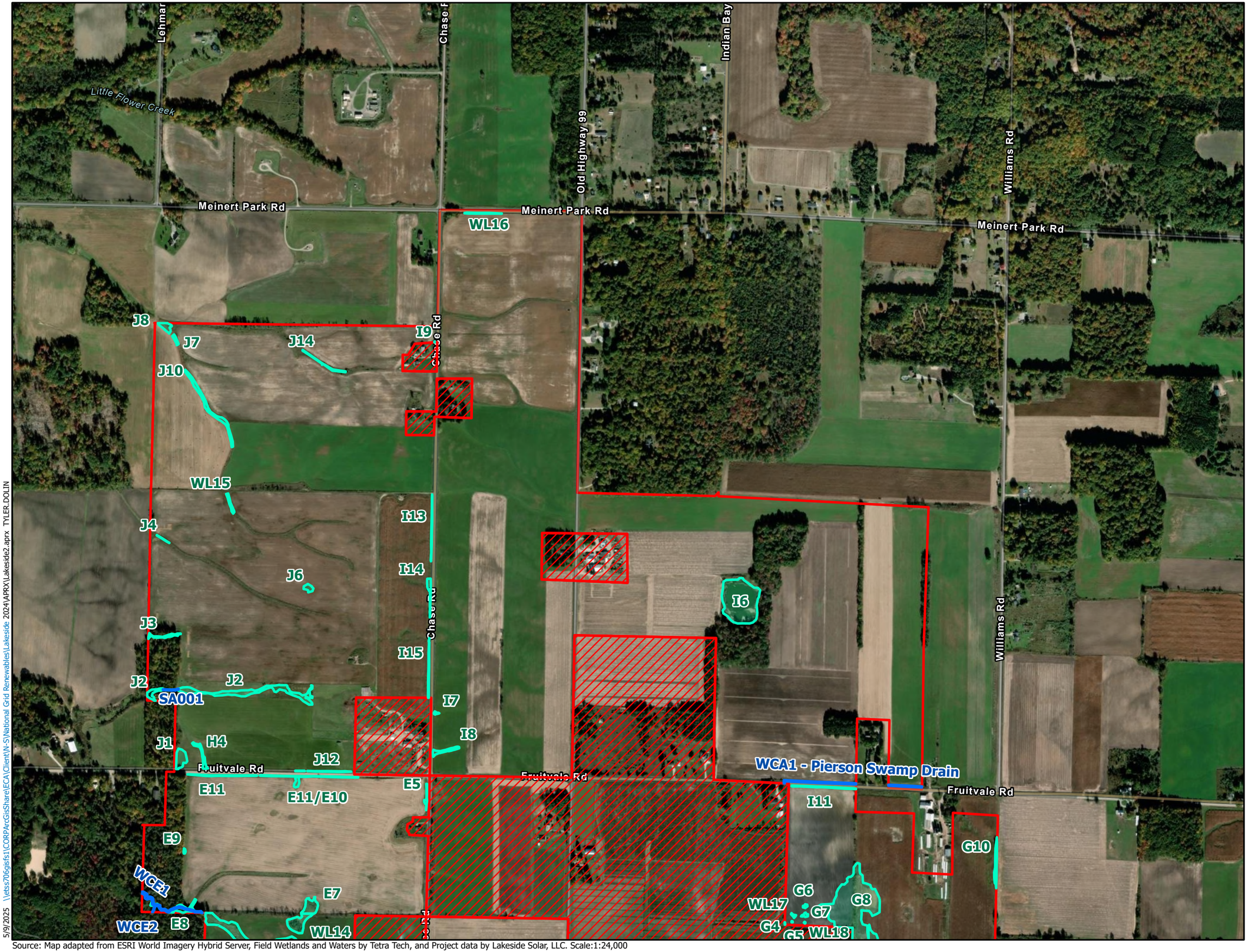
0 0.25 0.5 Mile

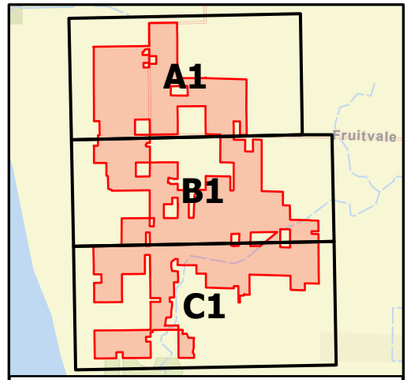
Figure 4
Overview Wetlands and Waters Survey Results

Lakeside Solar
Muskegon County, Michigan

TETRA TECH

5/9/2025 \\etss706gisfs1\CORPArcGisShare\ECA\Client\N-S\National Grid Renewables\Lakeside 2024\APRX\Lakeside2.aprx TYLER.DOLIN





Project Area (1,780 Acres)

Outside Project Area

Delineated Wetlands and Waters

Surveyed Wetland

Surveyed Stream

0 375 750 1,125 1,500 Feet

N

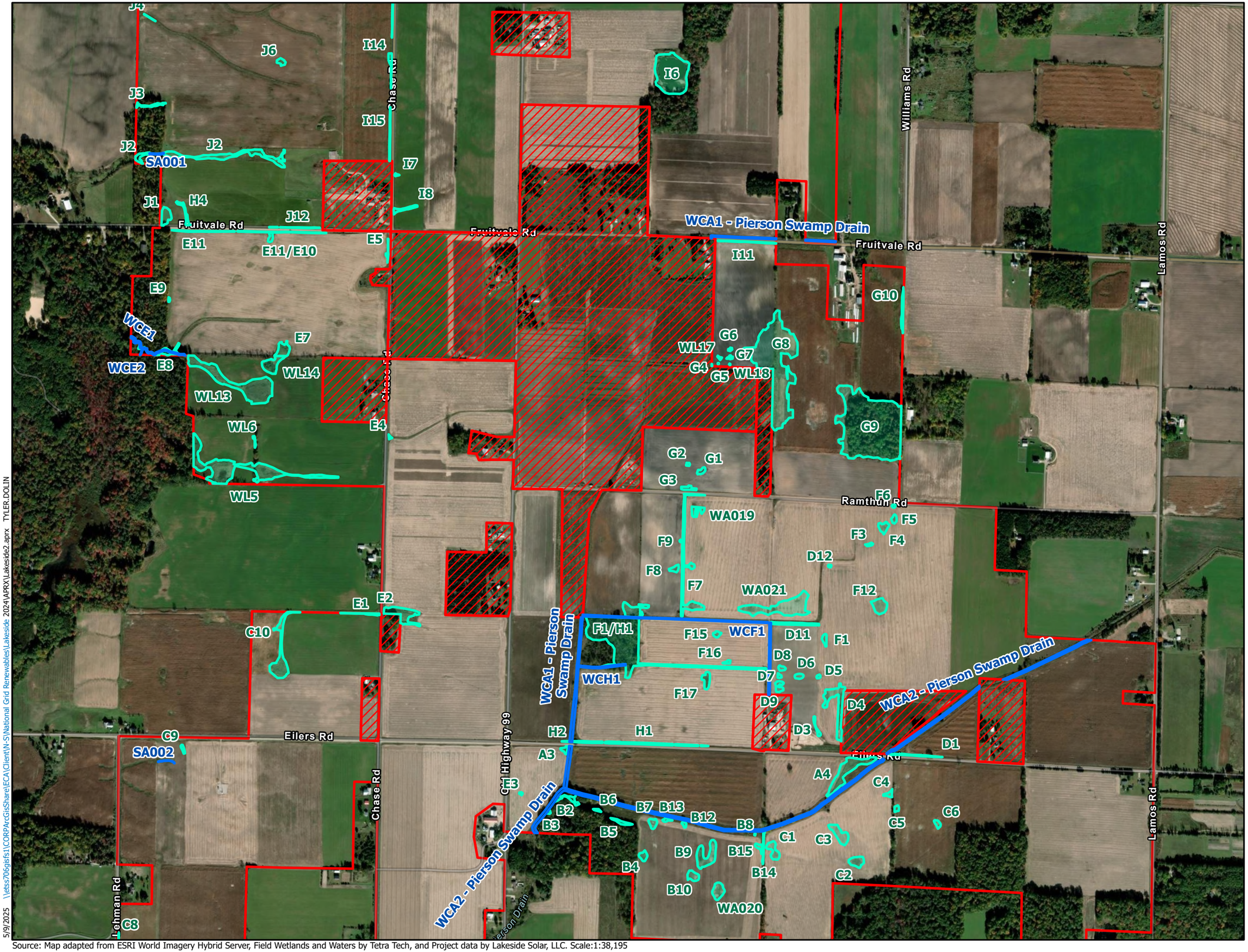
Figure 4 - A1
Wetlands and Waters Survey Results

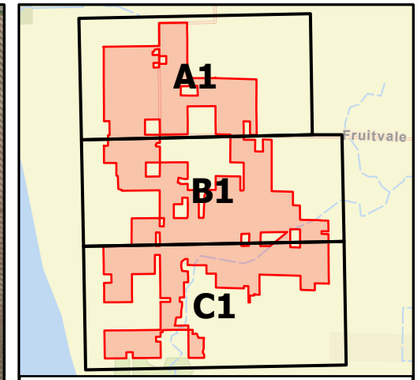
Lakeside Solar
Muskegon County, Michigan

TETRA TECH

5/9/2025 \\ets706gisfs1\CORPArcGisShare\ECA\Client\N-S\National Grid Renewables\Lakeside 2024\APRX\Lakeside2.aprx TYLER.DOLIN

Source: Map adapted from ESRI World Imagery Hybrid Server, Field Wetlands and Waters by Tetra Tech, and Project data by Lakeside Solar, LLC. Scale:1:24,000





Project Area (1,780 Acres)

Outside Project Area

Delineated Wetlands and Waters

Surveyed Wetland

Surveyed Stream

0 375 750 1,125 1,500 Feet

N

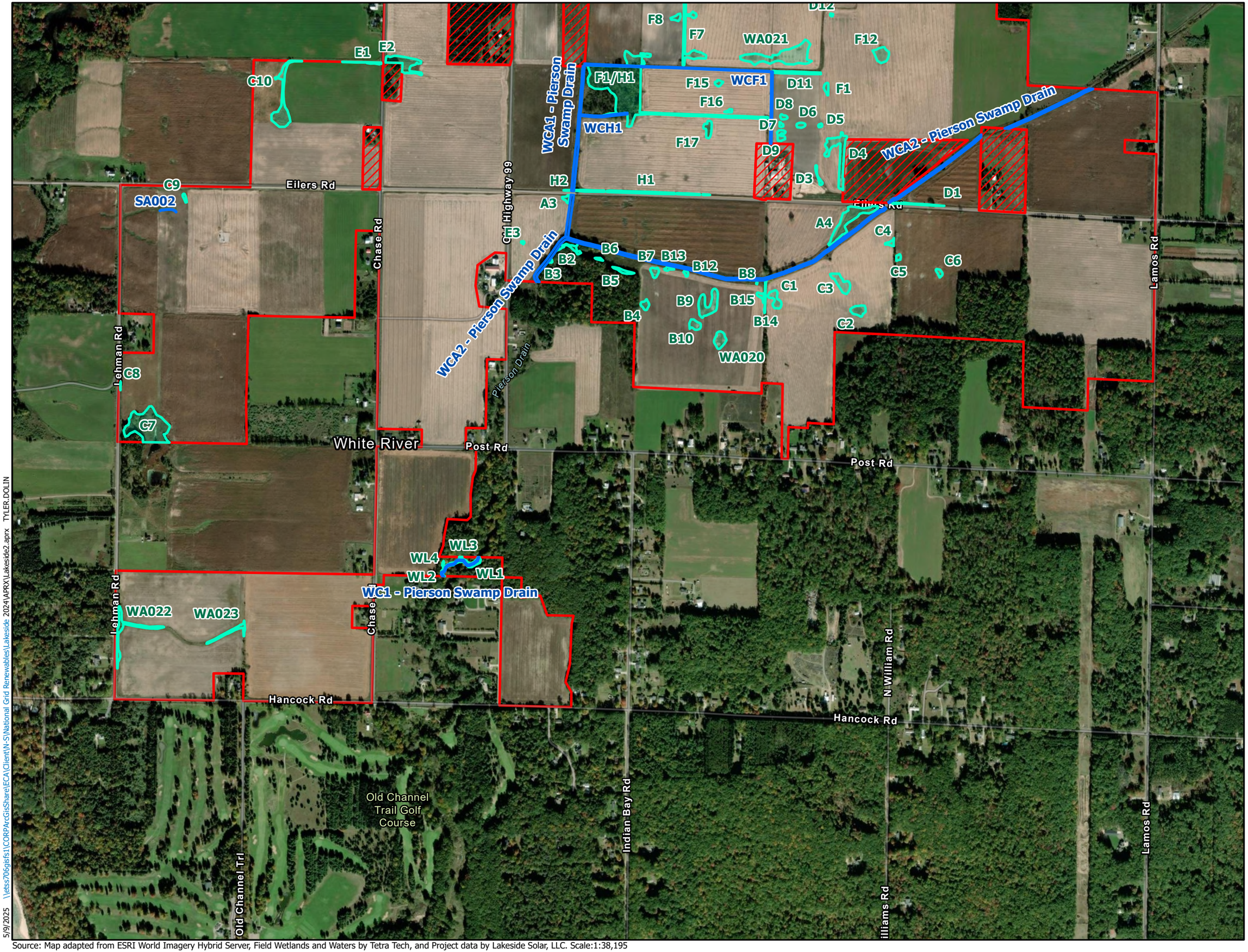
Figure 4 - B1
Wetlands and Waters Survey Results

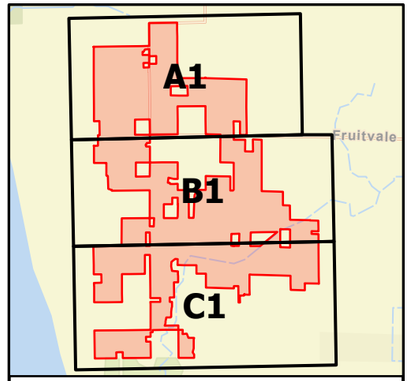
Lakeside Solar
Muskegon County, Michigan

TETRA TECH

Source: Map adapted from ESRI World Imagery Hybrid Server, Field Wetlands and Waters by Tetra Tech, and Project data by Lakeside Solar, LLC. Scale:1:38,195

5/9/2025 \\ets706gisfs1\CORPArcGisShare\ECA\Client\N-S\National Grid Renewables\Lakeside 2024\APRX\Lakeside2.aprx TYLER.DOLIN





Project Area (1,780 Acres)

Outside Project Area

Delineated Wetlands and Waters

Surveyed Wetland

Surveyed Stream

0 375 750 1,125 1,500 Feet

N

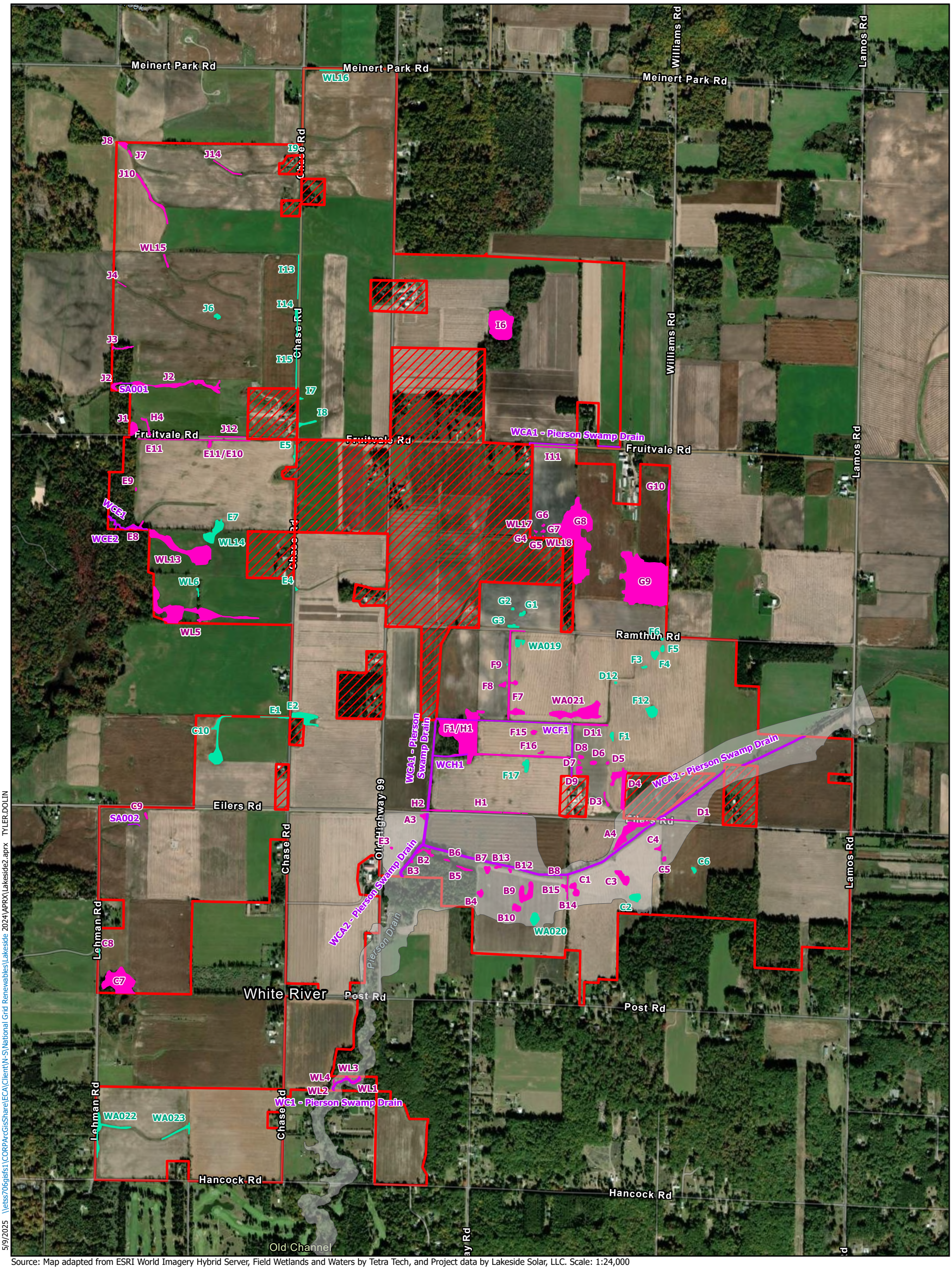
Figure 4 - C1 Wetlands and Waters Survey Results

Lakeside Solar
Muskegon County, Michigan

TETRA TECH

Source: Map adapted from ESRI World Imagery Hybrid Server, Field Wetlands and Waters by Tetra Tech, and Project data by Lakeside Solar, LLC. Scale:1:38,195

5/9/2025 \\etss706gisfs1\CORPArcGisShare\ECA\Client\N-S\National Grid Renewables\Lakeside 2024\APRX\Lakeside2.aprx TYLER.DOLIN


Meinert Park Rd
Meinert Park Rd
Meinert Park Rd
Williams Rd
Lamos Rd
Chase Rd
Chase Rd
Williams Rd
Lamos Rd
Fruitvale Rd
Fruitvale Rd
Fruitvale Rd
Ramthun Rd
Eilers Rd
Eilers Rd
Old Highway 99
Chase Rd
Lehman Rd
Lamos Rd
Post Rd
Post Rd
Hancock Rd
Hancock Rd
White River
Old Channel
Pierson Drain
WCA1 - Pierson Swamp Drain
WCA2 - Pierson Swamp Drain
WCA2 - Pierson Swamp Drain
WCA1 - Pierson Swamp Drain
WC1 - Pierson Swamp Drain
WL16
WL15
WL13
WL6
WL5
WL14
WL17
WL18
WL3
WL4
WL2
WL1
WA019
WA021
WA020
WA022
WA023
WCH1
WCF1
WCE1
WCE2
SA001
SA002
I6
G9
J8
J7
J14
I9
J10
J4
I13
J6
I14
J3
I15
J2
J2
I7
I8
J1
H4
J12
E11
E11/E10
E5
I11
G10
E9
E7
E8
E4
G6
G7
G8
G4
G5
G2
G1
G3
F6
F5
F3
F4
F9
D12
F8
F7
F12
E1
E2
F1/H1
F15
F16
D11
F1
D8
D6
D5
D7
F17
D9
D4
D3
D1
H2
H1
A3
A4
C4
E3
B6
B7
B13
B12
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B3
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C6
C5
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B10
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E51

APPENDIX B: WETLAND CLASSIFICATION KEY

Cowardin Wetland Classification System

Systems	Subsystems	System Specific Classes
L – Lacustrine	(1) Limnetic (2) Littoral	RB, UB, AB, RS, US, EM,
P – Palustrine	None	RB, UB, AB, US, ML, EM, SS, FO
R – Riverine	(1) Tidal (2) Lower Perennial (3) Upper Perennial (4) Intermittent (5) Unknown Perennial	RB, UB, SB, AB, RS, US, EM
Classes	**Water Regimes**	**Special Modifiers**
RB - Rock Bottom **UB -** Unconsolidated Bottom **SB -** Streambed **AB -** Aquatic Bed **RS -** Rocky Shore **US -** Unconsolidated Shore **EM -** Emergent **ML -** Moss Lichen **SS -** Scrub Shrub **FO** - Forested	**A** – Temporarily flooded **B** – Saturated **C** – Seasonally flooded **E** – Seasonally flooded/saturated **F** – Semi-permanently flooded **G** – Intermittently exposed **H** – Permanently flooded **J** – Intermittently flooded **K** – Artificially flooded	**b** – Beaver **d** – Partly drained/ditched **f** – Farmed **h** – Diked/impounded **r** – Artificial **s** – Spoil **x** – Excavated

Source: Classification of Wetlands and Deepwater Habitats of the United States (FGDC 2013)

APPENDIX C: WETLAND DETERMINATION DATA FORMS

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/05/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP01
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Floodplain Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.41972883 Long: -86.42395617 Datum: NAD83
Soil Map Unit Name: ClmaaC NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes No X (If no, explain in Remarks.)
Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X	No	If yes, optional Wetland Site ID: Wetland 1
Wetland Hydrology Present?	Yes X	No	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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)
- X 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 Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	No X	Depth (inches):
Water Table Present?	Yes	No X	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes	No X	Depth (inches):

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: WP01

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. *Phalaris arundinacea* / Reed canarygrass, Reed canary gras	18	Yes	FACW
2. *Leersia* / Cutgrass	15	Yes	NI
3. *Carex lupulina* / Hop sedge	10	Yes	OBL
4. *Rumex crispus* / Curly dock	10	Yes	FAC
5. *Carex vulpinoidea* / Fox sedge, Brown fox sedge	10	Yes	OBL
6. *Carex stipata* / Awlfruit sedge	5	No	OBL
7. *Impatiens capensis* / Spotted jewelweed	5	No	FACW
8. *Urtica dioica* / Stinging nettle	5	No	FAC
9.			
10.			
11.			
12.			
	78	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= 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: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	25	x 1 =	25
FACW species	23	x 2 =	46
FAC species	15	x 3 =	45
FACU species	0	x 4 =	0
UPL species	15	x 5 =	75
Column Totals:	78 (A)		191 (B)

Prevalence Index = B/A = 2.45

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 5/3	100					Sand	
2-16	7.5YR 5/2		7.5YR 5/8	15	C		Fine Sndy Lm	

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/05/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP01
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.41972133 Long: -86.42391517 Datum: NAD83
Soil Map Unit Name: ClmaaC NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___
Hydric Soil Present? Yes ___ No X
Wetland Hydrology Present? Yes ___ No X

Is the Sampled Area within a Wetland? Yes X No ___
If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: UP01

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1. *Equisetum arvense* / Common horsetail	30	Yes	FAC
2. *Dichanthelium clandestinum* / Deer-tongue rosette grass	20	Yes	FACW
3. *Silene latifolia* / Bladder campion, White campion	5	No	NI
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	55	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	30	x 3 =	90
FACU species	0	x 4 =	0
UPL species	5	x 5 =	25
Column Totals:	55 (A)		155 (B)

Prevalence Index = B/A = 2.82

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 6/4						Sand	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/05/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP02
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Slope Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.4217075 Long: -86.42229983 Datum: NAD83
Soil Map Unit Name: ClmaaC NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is the Sampled Area within a Wetland? Yes X No ___
If yes, optional Wetland Site ID: Wetland 2

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X 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)
- X 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 Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes X No ___ Depth (inches): 6
Saturation Present? Yes X No ___ Depth (inches): 0
(includes capillary fringe)

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: WP02

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. *Leersia* / Cutgrass	60	Yes	OBL
2. *Phalaris arundinacea* / Reed canarygrass, Reed canary gras	10	No	FACW
3. *Juncus articulatus* /jointed rush	10	No	OBL
4. *Carex lupulina* / Hop sedge	5	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	85	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	75	x 1 =	75
FACW species	10	x 2 =	20
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	85 (A)		95 (B)

Prevalence Index = B/A = 1.12

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	95	10YR 4/6	10	C	M		

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/05/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP02
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Hilltop Local relief (concave, convex, none): concave Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.4217215 Long: -86.42230533 Datum: NAD83
Soil Map Unit Name: ClmaaC NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X
Hydric Soil Present? Yes ___ No X
Wetland Hydrology Present? Yes ___ No X

Is the Sampled Area within a Wetland? Yes X No ___
If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: UP02

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fagus grandifolia / American beech	70	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	0	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	70	x 4 =	280
UPL species	0	x 5 =	0
Column Totals:	70 (A)		280 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 6/4							sand

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/06/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP03
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Depression/ oxbow Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.42021633 Long: -86.423274 Datum: NAD83
Soil Map Unit Name: ClmaaC NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes No X (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No
Hydric Soil Present? Yes X No
Wetland Hydrology Present? Yes X No

Is the Sampled Area within a Wetland? Yes X No
If yes, optional Wetland Site ID: Wetland 3

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X 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)
- X 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 Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No Depth (inches): 6
Water Table Present? Yes X No Depth (inches): 3
Saturation Present? (includes capillary fringe) Yes X No Depth (inches): 0

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: WP03

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fagus grandifolia* / American beech	16	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	16	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. *Impatiens capensis* / Spotted jewelweed	15	Yes	FACW
2. *Leersia oryzoides* / Rice cutgrass	15	Yes	OBL
3. *Scirpus atrovirens* / Green bulrush	5	No	OBL
4. *Dichanthelium clandestinum* / Deer-tongue rosette grass	5	No	FACW
5. *Carex crinita* / Fringed sedge	5	No	OBL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	45	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	25	x 1 =	25
FACW species	20	x 2 =	40
FAC species	0	x 3 =	0
FACU species	16	x 4 =	64
UPL species	0	x 5 =	0
Column Totals:	61 (A)		129 (B)

Prevalence Index = B/A = 2.11

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/3	97	10YR 4/6	3	C	M	Loamy Sand	Mucky
6-16	10YR 3/2	100					Loamy Sand	Mucky

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/06/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP03
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Hill Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.42020483 Long: -86.423336 Datum: NAD83
Soil Map Unit Name: ClmaaC NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___
Hydric Soil Present? Yes ___ No X
Wetland Hydrology Present? Yes ___ No X

Is the Sampled Area within a Wetland? Yes ___ No X
If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: UP03

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fagus grandifolia* / American beech	50	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	50	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. *Dichanthelium clandestinum* / Deer-tongue rosette grass	55	Yes	FACW
2. *Laportea canadensis* / Canadian wood-nettle	5	No	FACW
3. *Urtica dioica* / Stinging nettle	5	No	FAC
4. *Phytolacca americana* / Pokeweed	2	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	67	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	5	x 3 =	15
FACU species	52	x 4 =	208
UPL species	0	x 5 =	0
Column Totals:	117 (A)		343 (B)

Prevalence Index = B/A = 2.93

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 5/3	100					Sand	
8-16	10YR 3/2	95	10YR 5/6	5		M	Sand	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/06/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP04
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.41995 Long: -86.423998 Datum: NAD83
Soil Map Unit Name: ClmaaC NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is the Sampled Area within a Wetland? Yes X No ___
If yes, optional Wetland Site ID: Wetland 4

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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)
- X 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 Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: WP04

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fraxinus pennsylvanica* / Green ash	15	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. *Leersia oryzoides* / Rice cutgrass	40	Yes	OBL
2. *Phalaris arundinacea* / Reed canarygrass, Reed canary gras	15	No	FACW
3. *Urtica dioica* / Stinging nettle	10	No	FAC
4. *Carex grayi* / Gray's sedge	10	No	FACW
5. *Impatiens capensis* / Spotted jewelweed	5	No	FACW
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	40	x 1 =	40
FACW species	45	x 2 =	90
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	95 (A)		160 (B)

Prevalence Index = B/A = 1.68

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	90	2.5YR 4/6	10			Sndy Clay Lm	
5-16	10YR 3/1	85	2.5YR 6/8	15		M	Sndy Clay Lm	

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/06/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP04
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.41995 Long: -86.423998 Datum: NAD83
Soil Map Unit Name: ClmaaC NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** Yes ___ No X
Hydric Soil Present?	Yes ___	No X	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ___	No X	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X	Depth (inches):
Water Table Present?	Yes ___	No X	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: UP04

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. *Lonicera morrowii* / Morrow's honeysuckle	1	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	1	= Total Cover	
Herb Stratum (Plot size:)			
1. *Bromus inermis* / Smooth Brome	90	Yes	UPL
2. *Asclepias syriaca* / Common milkweed	5	No	UPL
3. *Daucus carota* / Carrot, Carrot, Queen anne's lace	3	No	UPL
4. *Phytolacca americana* / Pokeweed	2	No	FACU
5. *Rumex crispus* / Curly dock	1	No	FAC
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	101	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	1	x 3 =	3
FACU species	3	x 4 =	12
UPL species	98	x 5 =	490
Column Totals:	102 (A)		505 (B)

Prevalence Index = B/A = 4.95

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/3	100					Sandy Loam	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/06/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP05
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Ditch Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.43796033 Long: -86.4289315 Datum: NAD83
Soil Map Unit Name: Nub NWI classification: PEM/PSS/PFO
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is the Sampled Area within a Wetland? Yes X No ___
If yes, optional Wetland Site ID: Wetland 5

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: WP05

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. *Phalaris arundinacea* / Reed canarygrass, Reed canary gras	40	Yes	FACW
2. *Agrostis gigantea* / Creeping bentgras, Redtop	40	Yes	FACW
3. *Verbena hastata* / Swamp verbena	5	No	FACW
4. *Trifolium hybridum* / Alsike clover	4	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	89	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	85	x 2 =	170
FAC species	0	x 3 =	0
FACU species	4	x 4 =	16
UPL species	0	x 5 =	0
Column Totals:	89 (A)		186 (B)

Prevalence Index = B/A = 2.09

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP05

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2	85	7.5YR 6/8	15		M	Sndy Clay Lm	

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/06/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP05
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Local relief (concave, convex, none): Slope (%): 0
Subregion (LRR or MLRA): LRR L Lat: Long: Datum: NAD83
Soil Map Unit Name: NuB NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)
Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X
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 X	**Is the Sampled Area**		
Hydric Soil Present?	Yes X	No	**within a Wetland?**	Yes	No X
Wetland Hydrology Present?	Yes	No X	If yes, optional Wetland Site ID:		

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X	Depth (inches):	
Water Table Present?	Yes ____ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ____ No X	Depth (inches):	

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry. UP05 is located in an agricultural field.

VEGETATION - Use scientific names of plants. Sampling Point: UP05

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1. *Zea mays* / Corn	50	Yes	NI
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	50	x 5 =	250
Column Totals:	50 (A)		250 (B)

Prevalence Index = B/A = 5.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP05

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2	90	10YR 5/8	10		M		

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/07/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP06
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.43898083 Long: -86.43184983 Datum: NAD83
Soil Map Unit Name: NtB NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes No X (If no, explain in Remarks.)
Are Vegetation X, Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No X
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 X	No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X	No	If yes, optional Wetland Site ID: Wetland 6
Wetland Hydrology Present?	Yes X	No	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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)

- X Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible 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 X	Depth (inches):
Water Table Present?	Yes	No X	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes	No X	Depth (inches):

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry. WP06 is located in an agricultural field.

VEGETATION - Use scientific names of plants. Sampling Point: WP06

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. *Prunus serotina* / Black cherry	25	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	25	= Total Cover	
Herb Stratum (Plot size:)			
1. *Cyperus esculentus var. leptostachyus* / Yellow nutsedge	30	Yes	FACW
2. *Persicaria amphibia* / Water smartweed	10	Yes	OBL
3. *Eupatorium perfoliatum* / Common boneset	5	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	45	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.6 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	35	x 2 =	70
FAC species	0	x 3 =	0
FACU species	25	x 4 =	100
UPL species	0	x 5 =	0
Column Totals:	70 (A)		180 (B)

Prevalence Index = B/A = 2.57

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP06

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	7.5YR 3/2	98	7.5YR 5/8	2		M	Sand	
10-16	10YR 5/4	100				M	Sandy loam	

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/07/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP06
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Local relief (concave, convex, none): Slope (%): 10
Subregion (LRR or MLRA): LRR L Lat: Long: Datum: NAD83
Soil Map Unit Name: NuB NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ____	No X	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X	Depth (inches):
Water Table Present?	Yes ____	No X	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches):

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: UP06

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Prunus serotina* / Black cherry	10	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	10	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1. *Solidago altissima* / Canada goldenrod	20	Yes	FACU
2. *Daucus carota* / Carrot, Carrot, Queen anne's lace	10	Yes	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	30	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	30	x 4 =	120
UPL species	10	x 5 =	50
Column Totals:	40 (A)		170 (B)

Prevalence Index = B/A = 4.25

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)
Rosa multiflora, eleagnus umbellata

SOIL

Sampling Point: UP06

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5YR 4/3	100					Sandy loam	
12-16	10YR 7/2	100					Sandy loam	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/07/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP08
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.43761883 Long: -86.43510067 Datum: NAD83
Soil Map Unit Name: NTB NWI classification: PFO
Are climatic / hydrologic conditions on the site typical for this time of year? Yes No X (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No
Hydric Soil Present? Yes X No
Wetland Hydrology Present? Yes X No

Is the Sampled Area within a Wetland? Yes X No
If yes, optional Wetland Site ID: Wetland 8

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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)
- X Sparsely Vegetated Concave Surface (B8)
- X 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 Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: WP08

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum* / Red maple	15	Yes	FAC
2. *Fraxinus pennsylvanica* / Green ash	2	No	FACW
3.			
4.			
5.			
6.			
7.			
	17	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. *Ilex verticillata* / Common winterberry	10	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	10	= Total Cover	
Herb Stratum (Plot size:)			
1. *Carex lupulina* / Hop sedge	30	Yes	OBL
2. *Carex scoparia var. tessellata* / Broom sedge	15	Yes	NI
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	45	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	30	x 1 =	30
FACW species	12	x 2 =	24
FAC species	15	x 3 =	45
FACU species	0	x 4 =	0
UPL species	15	x 5 =	75
Column Totals:	72 (A)		174 (B)

Prevalence Index = B/A = 2.42

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP08

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/1	95	10YR 4/6	5		M	Sndy Clay Lm	
6-16	10YR 5/3	100		5		M	Sand	

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/07/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP08
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Local relief (concave, convex, none): convex Slope (%): 15
Subregion (LRR or MLRA): LRR L Lat: 43.437853 Long: -86.434775 Datum: NAD83
Soil Map Unit Name: NtB NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___
Hydric Soil Present? Yes ___ No X
Wetland Hydrology Present? Yes ___ No X

Is the Sampled Area within a Wetland? Yes ___ No X
If yes, optional Wetland Site ID: ___

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X 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 X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: UP08

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharinum* / Silver maple	70	Yes	FACW
2. *Betula papyrifera* / Paper birch	10	No	FACU
3. *Quercus rubra* / Northern red oak	10	No	FACU
4.			
5.			
6.			
7.			
	90	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	0	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	70	x 2 =	140
FAC species	0	x 3 =	0
FACU species	20	x 4 =	80
UPL species	0	x 5 =	0
Column Totals:	90 (A)		220 (B)

Prevalence Index = B/A = 2.44

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP08

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	7.5YR 4/2	100					Loam	
10-16	10YR 6/2	100					Sand	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/07/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP09
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.437685 Long: -86.435647 Datum: NAD83
Soil Map Unit Name: Tc NWI classification: PSS/ PFO
Are climatic / hydrologic conditions on the site typical for this time of year? Yes No X (If no, explain in Remarks.)
Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No	**Is the Sampled Area within a Wetland?** Yes X No
Hydric Soil Present?	Yes X	No	If yes, optional Wetland Site ID: Wetland 9
Wetland Hydrology Present?	Yes X	No	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X 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)
- X Sparsely Vegetated Concave Surface (B8)
- X 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 Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	No X	Depth (inches):
Water Table Present?	Yes	No X	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes X	No	Depth (inches): 0

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: WP09

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum* / Red maple	50	Yes	FAC
2. *Betula nigra* / River birch	15	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	65	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1. *Cephalanthus occidentalis* / Common buttonbush, California	50	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
	50	= Total Cover	

Herb Stratum (Plot size:)			
1. *Carex lupulina* / Hop sedge	10	Yes	OBL
2. *Solanum dulcamara* / Bittersweet	5	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	15	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	15	x 2 =	30
FAC species	55	x 3 =	165
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	130 (A)		255 (B)

Prevalence Index = B/A = 1.96

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP09

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 2/1	90	2.5YR 3/4	10	RM	M	Clay Loam	
10-16	7.5YR 4/1	100			D	M	Loamy Sand	

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/07/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP09
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): forest slope Local relief (concave, convex, none): none Slope (%): 10
Subregion (LRR or MLRA): LRR L Lat: 43.437775 Long: -86.435523 Datum: NAD83
Soil Map Unit Name: Tc NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X
If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: UP09

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fagus grandifolia* / American beech	30	Yes	FACU
2. *Acer rubrum* / Red maple	10	No	FAC
3. *Quercus alba* / White oak	10	No	FACU
4. *Quercus rubra* / Northern red oak	10	No	FACU
5.			
6.			
7.			
	60	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. *Hamamelis virginiana* / American witch-hazel	10	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	10	= Total Cover	
Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	0	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:		
OBL species	0	x 1 =	0	
FACW species	0	x 2 =	0	
FAC species	10	x 3 =	30	
FACU species	60	x 4 =	240	
UPL species	0	x 5 =	0	
Column Totals:	70	(A)	270	(B)

Prevalence Index = B/A = 3.86

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP09

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 6/3	100					Sand	
8-16	10YR 3/2	100					Loam	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/08/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP13
Investigator(s): T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): concave Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.44002017 Long: -86.43196483 Datum: NAD83
Soil Map Unit Name: BnB NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is the Sampled Area within a Wetland? Yes X No ___
If yes, optional Wetland Site ID: Wetland 13

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- X Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- X 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 Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes X No ___ Depth (inches): 0.5
Saturation Present? Yes X No ___ Depth (inches): 4
(includes capillary fringe)

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: WP13

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1. *Phalaris arundinacea* / Reed canarygrass, Reed canary gras	30	Yes	FACW
2. *Cirsium arvense* / Canada thistle	5	No	FACU
3. *Equisetum arvense* / Horsetail	5	No	FAC
4. *Typha angustifolia* / Narrow-leaved cattail	15	Yes	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	55	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	30	x 2 =	60
FAC species	5	x 3 =	15
FACU species	5	x 4 =	20
UPL species	0	x 5 =	0
Column Totals:	55 (A)		110 (B)

Prevalence Index = B/A = 2.0

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 3/2	85	10YR 6/6	15	C	M	Sndy Clay Lm	
15-16	10GY 6/1	90	10YR 6/8	15		M	Clay Loam	

[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)**
- X Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/08/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP13
Investigator(s): T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): hillslope Local relief (concave, convex, none): none Slope (%): 15
Subregion (LRR or MLRA): LRR L Lat: Long: Datum: NAD83
Soil Map Unit Name: BbB NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)
Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X
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 X
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X
If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? Yes ____ No X Depth (inches): ____
(includes capillary fringe)

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry. UP13 is located in an agricultural field.

VEGETATION - Use scientific names of plants. Sampling Point: UP13

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1. *Zea mays* / Corn	50	Yes	NI
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	50	x 5 =	250
Column Totals:	50 (A)		250 (B)

Prevalence Index = B/A = 5.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/2						Sandy Loam	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/12/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP14
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.4409 Long: 86.414692 Datum: NAD83
Soil Map Unit Name: BnB NWI classification: PEM/PSS
Are climatic / hydrologic conditions on the site typical for this time of year? Yes No X (If no, explain in Remarks.)
Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No
Hydric Soil Present? Yes X No
Wetland Hydrology Present? Yes X No

Is the Sampled Area within a Wetland? Yes X No
If yes, optional Wetland Site ID: Wetland 14

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- X 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 Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes No X Depth (inches):
Water Table Present? Yes No X Depth (inches):
Saturation Present? (includes capillary fringe) Yes No X Depth (inches):

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: WP14

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1. Salix discolor	20	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1. *Phalaris arundinacea* / Reed canarygrass, Reed canary grass	50	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	55	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	70	x 2 =	140
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	70 (A)		140 (B)

Prevalence Index = B/A = 2.0

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 3/2	85	10YR 6/6	15	C	M		Sandy clay loam

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/12/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP14
Investigator(s): T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Slope Local relief (concave, convex, none): convex Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.4449615 Long: -86.40986533 Datum: NAD83
Soil Map Unit Name: BaB NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation X, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No X
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 X
Hydric Soil Present? Yes ___ No X
Wetland Hydrology Present? Yes ___ No X

Is the Sampled Area within a Wetland? Yes ___ No X
If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? Yes ___ No X Depth (inches): ___
(includes capillary fringe)

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry. UP14 is located in an agricultural field.

VEGETATION - Use scientific names of plants. Sampling Point: UP14

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1. *Zea mays* / Corn	20	Yes	NI
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	0	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	20	x 5 =	100
Column Totals:	0	(A)	0 (B)

Prevalence Index = B/A = 5.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/2	100					Loam	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/14/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP15
Investigator(s): M. Davis, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.45166164 Long: -86.4339254 Datum: NAD83
Soil Map Unit Name: Kka/Sm NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is the Sampled Area within a Wetland? Yes X No ___
If yes, optional Wetland Site ID: Wetland 15

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: WP15

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. *Verbena hastata* / Swamp verbena	25	Yes	FACW
2. *Phalaris arundinacea* / Reed canarygrass, Reed canary gras	20	Yes	FACW
3. *Rumex crispus* / Curly dock	10	No	FAC
4. *Agrostis gigantea* / Creeping bentgras, Redtop	10	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	65	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	55	x 2 =	110
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	65 (A)		140 (B)

Prevalence Index = B/A = 2.15

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 2/2	95	10YR 3/6	5				sandy clay loam
5-16	10YR 5/3							sand

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/14/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP15
Investigator(s): M. Davis, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.45162633 Long: -86.433995 Datum: NAD83
Soil Map Unit Name: Kka/Sm NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation X, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No X
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 X	**Is the Sampled Area within a Wetland?** Yes ___ No X
Hydric Soil Present?	Yes ___	No X	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ___	No X	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X	Depth (inches):
Water Table Present?	Yes ___	No X	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on this site were dry. UP15 is located in an agricultural field.

VEGETATION - Use scientific names of plants. Sampling Point: UP15

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. *Panicum dichotomiflorum* / Smooth witchgrass	25	Yes	FACW
2. *Cirsium arvense* / Canada thistle	25	Yes	FACU
3. *Glycine* / Soybean	20	Yes	NI
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	70	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	25	x 2 =	50
FAC species	0	x 3 =	0
FACU species	25	x 4 =	100
UPL species	20	x 5 =	100
Column Totals:	70 (A)		250 (B)

Prevalence Index = B/A = 3.57

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2	100					Loam	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/14/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP16
Investigator(s): M. Davis, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.45927364 Long: -86.42522951 Datum: NAD83
Soil Map Unit Name: NtB NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is the Sampled Area within a Wetland? Yes X No ___
If yes, optional Wetland Site ID: Wetland 16

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X 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 Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: WP16

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. *Typha angustifolia* / Narrow leaf cattail, Narrow-leaved cattail	30	Yes	OBL
2. *Juncus articulatus* / Rush	25	Yes	OBL
3. *Agrostis gigantea* / Creeping bentgras, Redtop	20	Yes	FACW
4. *Carex vulpinoidea var. vulpinoidea* / Fox sedge	5	No	NI
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	55	x 1 =	55
FACW species	20	x 2 =	40
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	5	x 5 =	25
Column Totals:	80 (A)		120 (B)

Prevalence Index = B/A = 1.5

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	95	10YR 3/6	5		M	Sndy Clay Lm	
4-16	10YR 5/3	100					Sand	

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/14/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP16
Investigator(s): M. Davis, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.45925108 Long: -86.42523614 Datum: NAD83
Soil Map Unit Name: NtB NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation X, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No X
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 X
Hydric Soil Present? Yes ___ No X
Wetland Hydrology Present? Yes ___ No X

Is the Sampled Area within a Wetland? Yes ___ No X
If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry. UP16 is located in an agricultural field.

VEGETATION - Use scientific names of plants. Sampling Point: UP16

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1. *Glycine* / Soybean	50	Yes	NI
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	50	x 5 =	250
Column Totals:	50 (A)		250 (B)

Prevalence Index = B/A = 5.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 2/2	100					Loam	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/14/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP17
Investigator(s): M. Davis, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): concave Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.4413785 Long: -86.41396367 Datum: NAD83
Soil Map Unit Name: Hp NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation X, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No X
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	X	No		
Hydric Soil Present?	Yes	X	No		
Wetland Hydrology Present?	Yes	X	No		

Is the Sampled Area within a Wetland? Yes X No ___
If yes, optional Wetland Site ID: Wetland 17

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X 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)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- X 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)

- X Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- X Crayfish Burrows (C8)
- ___ Saturation Visible 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	X	Depth (inches): ___
Water Table Present?	Yes	___	No	X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry. WP17 is in an agricultural field.

VEGETATION - Use scientific names of plants. Sampling Point: WP17

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1. *Equisetum arvense* / Horsetail	15	Yes	FAC
2. *Alisma triviale* / Water plantain	10	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	25	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	0	x 2 =	0
FAC species	15	x 3 =	45
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	25 (A)		55 (B)

Prevalence Index = B/A = 2.2

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 2/1	90	7.5R 3/6	10	C	M		Sandy mucky loam

[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)**
- X Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/14/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP17
Investigator(s): M. Davis, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Flat ag field Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.44137683 Long: -86.4139625 Datum: NAD83
Soil Map Unit Name: Hp NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes No X (If no, explain in Remarks.)
Are Vegetation X, Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No X
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 X	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes	No X	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes	No X	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X	Depth (inches):
Water Table Present?	Yes	No X	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes	No X	Depth (inches):

Wetland Hydrology Present? Yes No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry. UP17 is located in an agricultural field.

VEGETATION - Use scientific names of plants. Sampling Point: UP17

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. *Zea mays* / Corn	25	Yes	NI
2. *Equisetum arvense* / Horsetail	25	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	25	x 3 =	75
FACU species	0	x 4 =	0
UPL species	25	x 5 =	125
Column Totals:	50	(A)	200 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 2/1	100					Clay Loam	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/14/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: WP18
Investigator(s): M. Davis, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): concave Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.44136 Long: -86.413496 Datum: NAD83
Soil Map Unit Name: Hp NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation X, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No X
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 X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is the Sampled Area within a Wetland? Yes X No ___
If yes, optional Wetland Site ID: Wetland 18

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X 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)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- X 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)

- X Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- X Crayfish Burrows (C8)
- ___ Saturation Visible 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 X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry. WP18 is in an agricultural field.

VEGETATION - Use scientific names of plants. Sampling Point: WP18

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. *Equisetum arvense* / Horsetail	60	Yes	FAC
2. *Alisma triviale* / Water plantain	10	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	25	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	0	x 2 =	0
FAC species	60	x 3 =	180
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	70 (A)		190 (B)

Prevalence Index = B/A = 2.7

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting
- ___ 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 X No ___

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: WP18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 2/1	90	7.5R 3/6	10	C	M		Sandy mucky loam

[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)**
- X Loamy Mucky Mineral (F1) **(LRR K, L)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/14/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UP18
Investigator(s): M. Davis, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Flat ag field Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.441356 Long: -86.413511 Datum: NAD83
Soil Map Unit Name: Hp NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation X, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No X
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 X	**Is the Sampled Area**		
Hydric Soil Present?	Yes ___	No X	**within a Wetland?**	Yes ___	No X
Wetland Hydrology Present?	Yes ___	No X	If yes, optional Wetland Site ID:		

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X	Depth (inches):	
Water Table Present?	Yes ___ No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes ___ No X	Depth (inches):	

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry. UP18 is located in an agricultural field.

VEGETATION - Use scientific names of plants. Sampling Point: UP18

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. *Zea mays* / Corn	25	Yes	NI
2. *Equisetum arvense* / Horsetail	25	Yes	NI
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	50	x 5 =	250
Column Totals:	50 (A)		250 (B)

Prevalence Index = B/A = 5.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UP18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 2/1	100					Clay Loam	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/06/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UPA1
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Roadside ditch Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.42318667 Long: -86.42593433 Datum: NAD83
Soil Map Unit Name: PLFABB NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes No X (If no, explain in Remarks.)
Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X
Hydric Soil Present? Yes No X
Wetland Hydrology Present? Yes No X

Is the Sampled Area within a Wetland? Yes No X
If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X Depth (inches):
Water Table Present? Yes No X Depth (inches):
Saturation Present? (includes capillary fringe) Yes No X Depth (inches):

Wetland Hydrology Present? Yes No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: UPA1

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1. *Bromus inermis* / Smooth brome, Smooth brome, Hungarian	50	Yes	UPL
2. *Lolium perenne* / Perennial rye grass	15	Yes	FACU
3. *Dactylis* / Orchardgrass	5	No	NI
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	70	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	15	x 4 =	60
UPL species	55	x 5 =	275
Column Totals:	70 (A)		335 (B)

Prevalence Index = B/A = 4.79

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UPA1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/3	100				M	Loamy Sand	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/07/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UPA2
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Ag field Local relief (concave, convex, none): Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.43869517 Long: -86.43184417 Datum: NAD83
Soil Map Unit Name: NuB NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes No X (If no, explain in Remarks.)
Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes X	No	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes	No X	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X	Depth (inches):
Water Table Present?	Yes	No X	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes	No X	Depth (inches):

Wetland Hydrology Present? Yes No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: UPA2

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Malus* / Apple	20	Yes	NI
2.			
3.			
4.			
5.			
6.			
7.			
	20	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. *Rosa multiflora* / Multiflora rose, Multiflora rosa	3	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	3	= Total Cover	
Herb Stratum (Plot size:)			
1. *Phalaris arundinacea* / Reed canarygrass, Reed canary gras	10	Yes	FACW
2. *Ambrosia* / Ragweed	4	Yes	NI
3. *Cirsium vulgare* / Bullthistle, Bull thistle	3	No	FACU
4. *Abutilon theophrasti* / Velvet leaf, Velvet-leaf	2	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	19	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	0	x 3 =	0
FACU species	8	x 4 =	32
UPL species	24	x 5 =	120
Column Totals:	42 (A)		172 (B)

Prevalence Index = B/A = 4.1

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UPA2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	7.5YR 3/2	50	7.5YR 6/8	50	D	M	Clay Loam	
6-16	2.5YR 5/6	80	7.5YR 5/2	20		M	Clay Loam	

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/12/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UPA3
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): concave Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.43028933 Long: -86.3988185 Datum: NAD83
Soil Map Unit Name: BbB NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X
If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions at the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: UPA3

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1. *Bromus inermis* / Smooth brome, Smooth brome, Hungarian	100	Yes	UPL
2. *Berteroa incana* / Hoary alyssum	5	No	NI
3. *Saponaria* / Soapwort	5	No	NI
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	110	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	110	x 5 =	550
Column Totals:	110 (A)		550 (B)

Prevalence Index = B/A = 5.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UPA3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 5/3	100					Loamy sand	
5-12	10YR 6/6	100					Sand	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/12/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UPA4
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Depression Local relief (concave, convex, none): concave Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.43049267 Long: -86.42344617 Datum: NAD83
Soil Map Unit Name: Td NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? Yes ____ No X
If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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? Yes ____ No ____ Depth (inches): ____
(includes capillary fringe)

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry.

VEGETATION - Use scientific names of plants. Sampling Point: UPA4

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. *Lonicera morrowii* / Morrow's honeysuckle	3	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	3	= Total Cover	
Herb Stratum (Plot size:)			
1. *Bromus inermis* / Smooth brome, Smooth brome, Hungarian	80	Yes	UPL
2. *Asclepias syriaca* / Common milkweed	10	No	UPL
3. *Phytolacca americana* / Pokeweed	8	No	FACU
4. *Rumex crispus* / Curly dock	1	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	99	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	1	x 3 =	3
FACU species	11	x 4 =	44
UPL species	90	x 5 =	450
Column Totals:	102 (A)		497 (B)

Prevalence Index = B/A = 4.87

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

2 - Dominance Test is >50%

___ 3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UPA4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 5/2	100					Loamy Sand	
5-10	10YR 8/1	100					Fine Sndy Lm	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River Township, Muskegon County, Sampling Date: 07/12/2022
Applicant/Owner: Lakeside Solar, LLC State: Michigan Sampling Point: UPA5
Investigator(s): M. Davis, T. Dolin, J. Herrington – Tetra Tech, Inc. Section, Township, Range: T12N, R18W, S10,11,12,15,14,12,22,23,24
Landform (hillslope, terrace, etc): Ag field Local relief (concave, convex, none): none Slope (%):
Subregion (LRR or MLRA): LRR L Lat: 43.41833417 Long: -86.430757 Datum: NAD83
Soil Map Unit Name: NuB NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)
Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X
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 X	**Is the Sampled Area**		
Hydric Soil Present?	Yes ____	No X	**within a Wetland?**	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID:		

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one 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 Visible 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 X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Conditions on the site were dry. UPA5 is located in an agricultural field.

VEGETATION - Use scientific names of plants. Sampling Point: UPA5

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0	= Total Cover	

Herb Stratum (Plot size:)			
1. *Glycine* / Soybean	95	Yes	NI
2. *Asclepias syriaca* / Common milkweed	1	No	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	96	= Total Cover	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	96	x 5 =	480
Column Totals:	96 (A)		480 (B)

Prevalence Index = B/A = 5.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

3 - Prevalence Index ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting

___ 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 X

Remarks: (Explain alternative procedures here or in a separate report.)

SOIL

Sampling Point: UPA5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	100					Sndy Clay Lm	
12-16	7.5YR 6/3	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 X

Remarks:

Wetland ID

WA019

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project Site: Lakeside City/County: Muskegon Sampling Date: 10/25/2024

Applicant/Owner: National Grid State: Michigan Sampling Point: WA019

Investigator(s): Tyler Dolin Section, Township, Range: Sec. 13 T 12N, R 18W

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR or MLRA): LRR L Lat: 43.43735 Long: -86.41474 Datum: WGS84

Soil Map Unit Name: Tonkey and Deford soils NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____ Soil _____ or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation X 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 X No _____

Hydric Soil Present? Yes X No _____

Wetland Hydrology Present? Yes X No _____

Is the sampled Area Within a wetland? **Yes X No _____**

If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

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)
- X Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- X 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)

- X Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? **Yes X No _____**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WA019

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Digitaria sanguinalis*	25	Y	FACU
2. *Chenopodium album*	15	Y	FACU
3. *Rorippa sylvestris*	15	Y	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	55 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1=	15
FACW speices	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	40	x 4 =	160
UPL species	0	x 5 =	0
Column Totals:	55 (A)		175 (B)

Prevalence Index = B/A = 3.18

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)

X 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** X **No** ___

Remarks: (include photo numbers here or on a separate sheet.)
Open water: 0% Bare Ground: 0%
Disturbed field

SOIL Sampling WA019

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/1	98	7.5YR 6/6	2	C	M	Coarse Sandy Clay	Prominent
6-10	10YR 6/1	94	7.5YR 5/8	6	C	M	Fine Loamy Sand	Prominent

[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)
_X_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, MLRA149B**)
___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, MLRA149B**)
___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 (F22)
___Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Compacted
Depth (inches): 10

Hydric Soil Present? **Yes** _X_ **No** _____

Remarks:

Non-Wetland ID

NWA019

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project Site: Lakeside City/County: Muskegon Sampling Date: 10/25/2024

Applicant/Owner: National Grid State: Michigan Sampling Point: NWA019

Investigator(s): Tyler Dolin, Jenna Herrington Section, Township, Range: Sec. 13 T 12N, R 18W

Landform (hillslope, terrace, etc.): Hilltop Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR or MLRA): LRR K Lat: 43.43749 Long: -86.41472 Datum: WGS84

Soil Map Unit Name: Tonkey and Deford soils NWI Classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation X 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 X	**Is the sampled Area**
Hydric Soil Present?	Yes ____	No X	**Within a wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

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 Visible 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 X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: NWA019

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Digitaria sanguinalis*	25	Y	FACU
2. *Trifolium pratense*	15	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	40 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1=	0
FACW speices	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	40	x 4 =	160
UPL species	0	x 5 =	0
Column Totals:	40 (A)		160 (B)

Prevalence Index = B/A = 4

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 X

Remarks: (include photo numbers here or on a separate sheet.)
Open water: 0% Bare Ground: 50%

SOIL

Sampling NWA019

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/1	100					Sand	

[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, MLRA149B**)
- ___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, MLRA149B**)
- ___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 (F22)
- ___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** **X**

Remarks:

Wetland ID

WA020

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project Site: Lakeside City/County: Muskegon Sampling Date: 10/27/2024

Applicant/Owner: National Grid State: Michigan Sampling Point: WA020

Investigator(s): Tyler Dolin, Jenna Herrington Section, Township, Range: Sec. 24 T12 N, R 18W

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR or MLRA): LRR K Lat: 43.42651 Long: -86.41348 Datum: WGS84

Soil Map Unit Name: Belding-Ubly sandy loams, 2 to y percent slopes NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____ Soil _____ or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation X 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 X No _____	**Is the sampled Area**	
Hydric Soil Present?	Yes X No _____	**Within a wetland?**	**Yes X No _____**
Wetland Hydrology Present?	Yes X No _____	If yes, optional Wetland Site ID:	_____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Water-Stained Leaves (B9)	Secondary Indicators (minimum of two required)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Drainage Patterns (B10)
___ Saturation (A3)	___ Marl Deposits (B15)	___ Moss Trim Lines (B16)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Dry Season Water Table (C2)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Crayfish Burrows (C8)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Saturation Visible on Aerial Imagery (C9)
X Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Stunted or Stressed Plants (D1)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	X Geomorphic Position (D2)
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	___ Shallow Aquitard (D3)
___ Sparsely Vegetated Concave Surface (B8)		___ Microtopographic Relief (D4)
		___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____ **Wetland Hydrology Present? Yes X No _____**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WA020

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Juncus tenuis*	70	Y	FAC
2. *Echinochloa crus-galli*	35	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	105 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1=	0
FACW speices	0	x 2 =	0
FAC species	105	x 3 =	315
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	105 (A)		315 (B)

Prevalence Index = B/A = 3

Hydrophytic Vegetation Indicators:

- ___ 1 – Rapid Test for Hydrophytic Vegetation
- X 2 – Dominance Test is >50%
- X 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** X **No** ___

Remarks: (include photo numbers here or on a separate sheet.)
Open water: 0% Bare Ground: 10%

SOIL Sampling WA020

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	2.5Y 4/1	95	7.5YR 5/8	5	C	M	Sandy Clay	Prominent
4-16	2.5Y 5/2	80	7.5YR 6/8	15	C	M	Sandy Clay	Prominent
			10YR 7/1	5	D	M		

[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, MLRA149B**)
___Loamy Mucky Mineral (F1) (**LRR K, L**)
___Loamy Gleyed Matrix (F2)
_X_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, MLRA149B**)
___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 (F22)
___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** _X_ **No** _____

Remarks:

Non-Wetland ID

NWA020

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project Site: Lakeside City/County: Muskegon Sampling Date: 10/27/2024

Applicant/Owner: National Grid State: Michigan Sampling Point: NWA020

Investigator(s): Tyler Dolin, Jenna Herrington Section, Township, Range: Sec. 24 T 12N, R 18W

Landform (hillslope, terrace, etc.): Hilltop Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR or MLRA): LRR K Lat: 43.42697 Long: -86.41347 Datum: WGS84

Soil Map Unit Name: Belding-Ubly sandy loams, 2 to 6 percent slopes NWI Classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____ Soil _____ or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation X 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 X	**Is the sampled Area**
Hydric Soil Present?	Yes _____	No X	**Within a wetland?** **Yes** _____ **No** X
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

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 Visible 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 X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: NWA020

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4			
5.			
6.			
7.			
	= Total Cover		

Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1=	
FACW speices		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

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** X

Remarks: (include photo numbers here or on a separate sheet.)
Open water: 0% Bare Ground: 50%

SOIL Sampling NWA020

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/2	100					Sandy Clay Loam	
5-7	10YR 4/1	97	10YR 7/1	3	D	M	Sandy Clay Loam	

[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, MLRA149B**)
___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, MLRA149B**)
___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 (F22)
___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** **X**

Remarks:

Wetland ID

WA021

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project Site: Lakeside City/County: Muskegon Sampling Date: 10/28/2024

Applicant/Owner: National Grid State: Michigan Sampling Point: WA021

Investigator(s): Tyler Dolin, Jenna Herrington Section, Township, Range: Sec. 13 T 12N, R 18W

Landform (hillslope, terrace, etc.): Broad Depression Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR or MLRA): LRR L Lat: 43.4344 Long: -86.41158 Datum: WGS84

Soil Map Unit Name: Tonkey and Deford soils NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____ Soil _____ or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation X 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 X No _____	**Is the sampled Area**	
Hydric Soil Present?	Yes X No _____	**Within a wetland?**	**Yes X No _____**
Wetland Hydrology Present?	Yes X No _____	If yes, optional Wetland Site ID:	_____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Water-Stained Leaves (B9)	
___ High Water Table (A2)	___ Aquatic Fauna (B13)	
___ Saturation (A3)	___ Marl Deposits (B15)	
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	
X Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	
___ Sparsely Vegetated Concave Surface (B8)		

Secondary Indicators (minimum of two required)

X Surface Soil Cracks (B6)	
___ Drainage Patterns (B10)	
___ Moss Trim Lines (B16)	
___ Dry Season Water Table (C2)	
___ Crayfish Burrows (C8)	
X Saturation Visible on Aerial Imagery (C9)	
___ Stunted or Stressed Plants (D1)	
X Geomorphic Position (D2)	
___ Shallow Aquitard (D3)	
X Microtopographic Relief (D4)	
___ FAC-Neutral Test (D5)	

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____ **Wetland Hydrology Present? Yes X No _____**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WA021

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Panicum dichotomiflorum*	50	Y	FACW
2. *Rorippa sylvestris*	10	N	OBL
3. *Amaranthus retroflexus*	10	N	FACU
4. *Echinochloa crus-galli*	5	N	FAC
5. *Abutilon theophrasti*	5	N	FACU
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1=	10
FACW speices	50	x 2 =	100
FAC species	5	x 3 =	15
FACU species	15	x 4 =	60
UPL species	0	x 5 =	0
Column Totals:	80 (A)		185 (B)

Prevalence Index = B/A = 2.31

Hydrophytic Vegetation Indicators:

- ___ 1 – Rapid Test for Hydrophytic Vegetation
- X 2 – Dominance Test is >50%
- X 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** X **No** ___

Remarks: (include photo numbers here or on a separate sheet.)
Open water: 0% Bare Ground: 20%

SOIL Sampling WA021

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100					Sandy Loam	
4-8	10YR 3/1	95	10YR 6/8	5	C	M	Sandy Loam	Prominent
8-16	10YR 7/2	93	10YR 6/8	7	C	M	Sand	Prominent

[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)
_X_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, MLRA149B**)
___Loamy Mucky Mineral (F1) (**LRR K, L**)
___Loamy Gleyed Matrix (F2)
___Depleted Matrix (F3)
_X_Redox Dark Surface (F6)
___Depleted Dark Surface (F7)
___Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___2 cm Muck (A10) (**LRR K, L, MLRA149B**)
___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 (F22)
___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** _X_ **No** _____

Remarks:

Non-Wetland ID

NWA021

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project Site: Lakeside City/County: Muskegon Sampling Date: 10/29/2024

Applicant/Owner: National Grid State: Michigan Sampling Point: NWA021

Investigator(s): Tyler Dolin, Jenna Herrington Section, Township, Range: Sec. 13 T 12N, R 18W

Landform (hillslope, terrace, etc.): Hilltop Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR or MLRA): LRR L Lat: 43.43475 Long: -86.41156 Datum: WGS84

Soil Map Unit Name: Belding-Ubly sandy loams, 0 to 6 percent slopes NWI Classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____ Soil _____ or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation X 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 X	**Is the sampled Area**
Hydric Soil Present?	X	Yes _____	No _____	**Within a wetland?** **Yes** _____ **No** X
Wetland Hydrology Present?		Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

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 Visible 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 X	Depth (inches): _____	
Water Table Present?	Yes _____	No X	Depth (inches): _____	
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____	**Wetland Hydrology Present?** **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: NWA021

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Trifolium pratense*	10	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	10 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1=	0
FACW speices	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	10 (A)		40 (B)

Prevalence Index = B/A = 4

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 X

Remarks: (include photo numbers here or on a separate sheet.)
Open water: 0% Bare Ground: 50%

SOIL Sampling NWA021

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/2	95	7.5YR 5/8	5	C	M	Sandy Loam	Prominent
6-12	10YR 2/1	92	7.5YR 5/8	4	C	M	Sandy Loam	Prominent
			10YR 7/1	4	D	M		
12-16	10YR 2/1	50					Sandy Clay Loam	
	7.5YR 3/3	50						Mixed Matrix

[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, MLRA149B**)
___Loamy Mucky Mineral (F1) (**LRR K, L**)
___Loamy Gleyed Matrix (F2)
___Depleted Matrix (F3)
_X_Redox Dark Surface (F6)
___Depleted Dark Surface (F7)
___Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___2 cm Muck (A10) (**LRR K, L, MLRA149B**)
___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 (F22)
___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** _X_ **No** _____

Remarks:

Wetland ID

WA022

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project Site: Lakeside City/County: Muskegon Sampling Date: 10/28/2024

Applicant/Owner: National Grid State: Michigan Sampling Point: WA022

Investigator(s): Tyler Dolin, Jenna Herrington Section, Township, Range: Sec. 23 T 12N, R 18W

Landform (hillslope, terrace, etc.): Ditch Local relief (concave, convex, none): Concave Slope (%): 5

Subregion (LRR or MLRA): LRR L Lat: 43.41686 Long: -86.43646 Datum: WGS84

Soil Map Unit Name: Nester-Kawkawlin loams, 2 to 6 percent slopes NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____ Soil _____ or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No _____	**Is the sampled Area**	
Hydric Soil Present?	Yes X No _____	**Within a wetland?**	**Yes X No _____**
Wetland Hydrology Present?	Yes X No _____	If yes, optional Wetland Site ID:	_____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Water-Stained Leaves (B9)	
___ High Water Table (A2)	___ Aquatic Fauna (B13)	
___ Saturation (A3)	___ Marl Deposits (B15)	
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	
X Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	
___ Sparsely Vegetated Concave Surface (B8)		

Secondary Indicators (minimum of two required)

X Surface Soil Cracks (B6)	
___ Drainage Patterns (B10)	
___ Moss Trim Lines (B16)	
___ Dry Season Water Table (C2)	
___ Crayfish Burrows (C8)	
X Saturation Visible on Aerial Imagery (C9)	
___ Stunted or Stressed Plants (D1)	
X Geomorphic Position (D2)	
___ Shallow Aquitard (D3)	
___ Microtopographic Relief (D4)	
X FAC-Neutral Test (D5)	

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____ **Wetland Hydrology Present? Yes X No _____**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WA022

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Typha latifolia*	60	Y	OBL
2. *Calamagrostis canadensis*	30	Y	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	90	x 1=	90
FACW speices	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	90 (A)		90 (B)

Prevalence Index = B/A = 1

Hydrophytic Vegetation Indicators:

- X 1 – Rapid Test for Hydrophytic Vegetation
- X 2 – Dominance Test is >50%
- X 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** X **No** ___

Remarks: (include photo numbers here or on a separate sheet.)
Open water: 0% Bare Ground: 10%

SOIL Sampling WA022

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100					Mucky Sandy Clay	
4-7	10YR 3/1	45	10YR 6/8	10	C	PL	Sandy Clay	
	10YR 6/1	45						Mixed Matrix
7-16	10YR 6/2	90	10YR 6/8	5	C	M	Sandy Clay	Prominent
			Gley1 5GY 6/1	5	D	M		

[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)
_X_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, MLRA149B**)
___Loamy Mucky Mineral (F1) (**LRR K, L**)
___Loamy Gleyed Matrix (F2)
___Depleted Matrix (F3)
_X_Redox Dark Surface (F6)
___Depleted Dark Surface (F7)
___Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___2 cm Muck (A10) (**LRR K, L, MLRA149B**)
___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 (F22)
___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** _X_ **No** _____

Remarks:

Wetland ID

WA023

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project Site: Lakeside City/County: Muskegon Sampling Date: 10/29/2024

Applicant/Owner: National Grid State: Michigan Sampling Point: WA023

Investigator(s): Tyler Dolin, Jenna Herrington Section, Township, Range: Sec. 23 T12 N, R 18W

Landform (hillslope, terrace, etc.): Swale Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR or MLRA): LRR L Lat: 43.41811 Long: -86.43171 Datum: WGS84

Soil Map Unit Name: Nester-Ubly sandy loams, 2 to 6 percent slopes NWI Classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____ Soil _____ or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation X 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 X No _____	**Is the sampled Area**	
Hydric Soil Present?	Yes X No _____	**Within a wetland?**	**Yes X No _____**
Wetland Hydrology Present?	Yes X No _____	If yes, optional Wetland Site ID:	_____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Water-Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	X Drainage Patterns (B10)
___ Saturation (A3)	___ Marl Deposits (B15)	___ Moss Trim Lines (B16)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Dry Season Water Table (C2)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Crayfish Burrows (C8)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	X Saturation Visible on Aerial Imagery (C9)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Stunted or Stressed Plants (D1)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	X Geomorphic Position (D2)
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	___ Shallow Aquitard (D3)
___ Sparsely Vegetated Concave Surface (B8)		___ Microtopographic Relief (D4)
		X FAC-Neutral Test (D5)

Secondary Indicators (minimum of two required)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____ **Wetland Hydrology Present? Yes X No _____**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WA023

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Echinochloa crus-galli*	30	Y	FAC
2. *Persicaria amphibia*	15	Y	OBL
3. *Phalaris arundinacea*	15	Y	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1=	15
FACW speices	15	x 2 =	30
FAC species	30	x 3 =	90
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	60 (A)		135 (B)

Prevalence Index = B/A = 2.25 X

Hydrophytic Vegetation Indicators:

- ___ 1 – Rapid Test for Hydrophytic Vegetation
- X 2 – Dominance Test is >50%
- X 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** X **No** ___

Remarks: (include photo numbers here or on a separate sheet.)
Open water: 0% Bare Ground: 0%

SOIL Sampling WA023

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	96	7.5YR 5/8	4	C	PL	Clay Loam	Prominent
4-10	10YR 3/1	90	5YR 5/8	10	C	M	Clay Loam	Prominent
10-16	10YR 6/2	96	10YR 6/8	4	C	M	Sand	Prominent

[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)
_X_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, MLRA149B**)
___Loamy Mucky Mineral (F1) (**LRR K, L**)
___Loamy Gleyed Matrix (F2)
___Depleted Matrix (F3)
_X_Redox Dark Surface (F6)
___Depleted Dark Surface (F7)
___Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___2 cm Muck (A10) (**LRR K, L, MLRA149B**)
___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 (F22)
___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** **_X_ No** _____

Remarks:

Non-Wetland

ID NWA022-023

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project Site: Lakeside City/County: Muskegon Sampling Date: 10/28/2024

Applicant/Owner: National Grid State: Michigan Sampling Point: NWA022-023

Investigator(s): Tyler Dolin, Jenna Herrington Section, Township, Range: Sec. 23 T12 N, R 18W

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 2

Subregion (LRR or MLRA): LRR L Lat: 43.4179 Long: -86.43468 Datum: WGS84

Soil Map Unit Name: Sims loam NWI Classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____ Soil _____ or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation X 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 X	**Is the sampled Area**
Hydric Soil Present?	Yes _____	No X	**Within a wetland?** **Yes** _____ **No** X
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

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 Visible 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 X	Depth (inches): _____	
Water Table Present?	Yes _____	No X	Depth (inches): _____	
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____	**Wetland Hydrology Present?** **Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: NWA022-023

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5)			
1. *Glycine max*	10	Y	UPL
2. *Digitaria sanguinalis*	10	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	20 = Total Cover		
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1=	0
FACW speices	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	10	x 4 =	40
UPL species	10	x 5 =	50
Column Totals:	20 (A)		90 (B)

Prevalence Index = B/A = 4.5

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 X

Remarks: (include photo numbers here or on a separate sheet.)
Open water: 0% Bare Ground: 80%

SOIL Sampling NWA022-023

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/2	100					Loamy Sand	
3-5	10YR 3/2	90					Sandy Loam	
	5YR 4/6	10						Mixed Matrix
5-6	5YR 4/6	100					Sand	
6-10	10YR 6/6	100					Sand	

[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, MLRA149B**)
___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, MLRA149B**)
___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 (F22)
___Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Compacted
Depth (inches): 10

Hydric Soil Present? **Yes** ____ **No** X

Remarks:

ATWELL, LLC WETLAND DETERMINATION DATA FORMS

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River TWP, Muskegon County Sampling Date: 6/12/2020

Applicant/Owner: Geronimo Energy, LLC State: MI Sampling Point: Group 1

Investigator(s): E. Schenk, B. Zachariahs, C. Bovee, C. Scholten - Atwell, LLC Section, Township, Range: 13, 12N, 18W

Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope %: 0-2

Subregion (LRR or MLRA): LRR L Lat: 43.430959 Long: -86.414893 Datum: NAD 83

Soil Map Unit Name: Tonkey and Deford soils NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ____	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** X **No** ____
Wetland Hydrology Present?	Yes X	No ____	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

Group 1 consists of farmed emergent wetlands. Wetlands in this Group include B1, B4, B6-B13, B15, C1-C6, C9, D2-D9, E2, E3, E6, E7, E9, F2-F6, F9, F12, F13, F15-F17, G1-G3, G5-G8, G10-G13, H1, H4, I4, I5, I7, I8, J2, J5-J9, and J13.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- X Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- X 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)
- X Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- X Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- X Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- X Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 4
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: Group 1

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size:)			
1. *Phalaris arundinacea*	15	Yes	FACW
2. *Ranunculus sceleratus*	10	Yes	OBL
3. *Rumex crispus*	5	No	FAC
4. *Carex vulpinoidea*	5	No	OBL
5. *Juncus effusus*	10	Yes	OBL
6. *Eleocharis palustris*	10	Yes	OBL
7. *Alisma subcordatum*	5	No	OBL
8. *Alopecurus pratensis*	5	No	FAC
9.			
10.			
11.			
12.			
	65 =Total Cover		
Woody Vine Stratum (Plot size:)			
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: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	40	x 1 =	40
FACW species	15	x 2 =	30
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	65 (A)		100 (B)

Prevalence Index = B/A = 1.54

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 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** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Group 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/1	90	10YR 4/6	10				Sandy clay loam
8-18	10YR 3/1	30	10YR 4/6	10				Clay loam
			10YR 6/1	60				

[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)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ High Chroma Sands (S11) (**LRR K, L)**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
X Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) (**LRR K, L**)

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**)
? 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 (F22)
___ 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** X **No** ____

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River TWP, Muskegon County Sampling Date: 6/13/2020

Applicant/Owner: Geronimo Energy, LLC State: MI Sampling Point: Group 2

Investigator(s): E. Schenk, B. Zachariahs, C. Bovee, C. Scholten - Atwell, LLC Section, Township, Range: 11, 12N, 18W

Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope %: 2-5

Subregion (LRR or MLRA): LRR L Lat: 43.454987 Long: -86.435576 Datum: NAD 83

Soil Map Unit Name: Nester soils, 12 to 25 percent slopes NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ____	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** X **No** ____
Wetland Hydrology Present?	Yes X	No ____	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)
Group 2 consists of herbaceous or fallow emergent wetlands and roadside ditches. Wetlands in this Group include A1, A2, A4, B3, B5, B14, C7, C8, C10, D1, D10-D12, E1, E4, E5, E10, E11, F1, F7, F8, F10, F18, H2, I2, I6, I9-I15, J1, J4, J10-J12, J14, and J15.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- X 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)
- X 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)

- X Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 3
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: Group 2

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. *Salix discolor*	5	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	5	=Total Cover	
Herb Stratum (Plot size:)			
1. *Phalaris arundinacea*	20	Yes	FACW
2. *Typha angustifolia*	10	Yes	OBL
3. *Typha latifolia*	10	Yes	OBL
4. *Carex vulpinoidea*	8	Yes	OBL
5. *Carex stipata*	8	Yes	OBL
6. *Juncus effusus*	8	Yes	OBL
7. *Eleocharis palustris*	8	Yes	OBL
8. *Carex grayi*	5	No	FACW
9. *Carex hystericina*	5	No	OBL
10. *Ranunculus sceleratus*	3	No	OBL
11. *Solidago altissima*	3	No	FACU
12.			
	88	=Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 8 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	30	x 2 =	60
FAC species	0	x 3 =	0
FACU species	3	x 4 =	12
UPL species	0	x 5 =	0
Column Totals:	93 (A)		132 (B)

Prevalence Index = B/A = 1.42

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 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** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point Group 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/2	95	10YR 5/6	5			Loamy/Clayey	

[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)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

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**)
- ___ 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 (F22)
- ___ 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** X **No** ___

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River TWP, Muskegon County Sampling Date: 6/13/2020

Applicant/Owner: Geronimo Energy, LLC State: MI Sampling Point: Group 3

Investigator(s): E. Schenk, B. Zachariahs, C. Bovee, C. Scholten - Atwell, LLC Section, Township, Range: 12, 12N, 18W

Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope %: 2-5

Subregion (LRR or MLRA): LRR L Lat: 43.450002 Long: -86.416436 Datum: NAD 83

Soil Map Unit Name: Tonkey and Deford soils NWI classification: PEM/OW

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ____	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** X **No** ____
Wetland Hydrology Present?	Yes X	No ____	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

Group 3 consists of emergent wetlands with an open water component. Wetlands in this Group include I3.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- X Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- X Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- X Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- X 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)
- X Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 60
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: Group 3

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. *Salix discolor*	5	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	5	=Total Cover	
Herb Stratum (Plot size:)			
1. *Phalaris arundinacea*	10	Yes	FACW
2. *Typha latifolia*	10	Yes	OBL
3. *Typha angustifolia*	10	Yes	OBL
4. *Ranunculus sceleratus*	5	No	OBL
5. *Juncus effusus*	5	No	OBL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	40	=Total Cover	
Woody Vine Stratum (Plot size:)			
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: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	30	x 1 =	30
FACW species	15	x 2 =	30
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	45 (A)		60 (B)

Prevalence Index = B/A = 1.33

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 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** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point Group 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 2/1	100					Mucky Loam/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)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- X 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)
- ___ Marl (F10) (**LRR K, L**)

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**)
- ___ 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 (F22)
- ___ 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** X **No** ____

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River TWP, Muskegon County Sampling Date: 6/9/2020

Applicant/Owner: Geronimo Energy, LLC State: MI Sampling Point: Group 4

Investigator(s): E. Schenk, B. Zachariahs, C. Bovee, C. Scholten - Atwell, LLC Section, Township, Range: 23, 12N, 18W

Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope %: 0-2

Subregion (LRR or MLRA): LRR L Lat: 43.430414 Long: -86.419558 Datum: NAD 83

Soil Map Unit Name: Tonkey and Deford soils NWI classification: PEM/PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ____	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** X **No** ____
Wetland Hydrology Present?	Yes X	No ____	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

Group 4 consist of emergent wetlands with a scrub-shrub component. Wetlands in this Group include A3 and G4.

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)

- X Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: Group 4

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. *Salix discolor*	40	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	40	=Total Cover	
Herb Stratum (Plot size:)			
1. *Phalaris arundinacea*	30	Yes	FACW
2. *Rumex crispus*	20	Yes	FAC
3. *Juncus effusus*	5	No	OBL
4. *Carex vulpinoidea*	5	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60	=Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	70	x 2 =	140
FAC species	20	x 3 =	60
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		210 (B)

Prevalence Index = B/A = 2.10

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 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** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point Group 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/2	100						Loam
10-18	10YR 3/2	90	10YR 4/6	10				Clay/loam

[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)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

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**)
- ___ 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 (F22)
- ___ 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** X **No** ___

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River TWP, Muskegon County Sampling Date: 6/12/2020

Applicant/Owner: Geronimo Energy, LLC State: MI Sampling Point: Group 5

Investigator(s): E. Schenk, B. Zachariahs, C. Bovee, C. Scholten - Atwell, LLC Section, Township, Range: 13, 12N, 18W

Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope %: 0-2

Subregion (LRR or MLRA): LRR L Lat: 43.432705 Long: -86.417125 Datum: NAD 83

Soil Map Unit Name: Hettinger and Pickford soils NWI classification: PEM/PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ____	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** X **No** ____
Wetland Hydrology Present?	Yes X	No ____	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

Group 5 consists of emergent wetlands with a forested component. Wetlands in this Group include E8 and H3.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- X Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- X Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- X 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)
- X Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 8
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: Group 5

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fraxinus pennsylvanica*	15	Yes	FACW
2. *Ulmus americana*	15	Yes	FACW
3. *Populus deltoides*	5	No	FAC
4.			
5.			
6.			
7.			
	35	=Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. *Salix discolor*	10	Yes	FACW
2. *Cornus amomum*	5	Yes	FACW
3. *Cornus racemosa*	5	Yes	FAC
4. *Sambucus canadensis*	2	No	FACW
5.			
6.			
7.			
	22	=Total Cover	
Herb Stratum (Plot size:)			
1. *Phalaris arundinacea*	30	Yes	FACW
2. *Typha latifolia*	10	Yes	OBL
3. *Typha angustifolia*	10	Yes	OBL
4. *Carex stricta*	5	No	OBL
5. *Onoclea sensibilis*	5	No	FACW
6. *Impatiens capensis*	3	No	FACW
7. *Carex vulpinoidea*	3	No	OBL
8. *Carex grayi*	3	No	FACW
9. *Eleocharis palustris*	3	No	OBL
10. *Juncus effusus*	3	No	OBL
11. *Ranunculus sceleratus*	5	No	OBL
12. *Lemna minor*	2	No	OBL
	82	=Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 8 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	41	x 1 =	41
FACW species	88	x 2 =	176
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	139 (A)		247 (B)

Prevalence Index = B/A = 1.78

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 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** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point Group 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	98	10YR 4/6	2				Loam
12-18	10YR 6/2	60	10YR 4/6	40				Clay loam

[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)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

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**)
- ___ 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 (F22)
- ___ 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** X **No** ___

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Lakeside Solar City/County: White River TWP, Muskegon County Sampling Date: 6/12/2020

Applicant/Owner: Geronimo Energy, LLC State: MI Sampling Point: Group 6

Investigator(s): E. Schenk, B. Zachariahs, C. Bovee, C. Scholten - Atwell, LLC Section, Township, Range: 13, 12N, 18W

Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope %: 0-2

Subregion (LRR or MLRA): LRR L Lat: 43.440215 Long: -86.408738 Datum: NAD 83

Soil Map Unit Name: Tonkey and Deford soils NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ____	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** X **No** ____
Wetland Hydrology Present?	Yes X	No ____	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

Group 6 consists of forested wetlands. Wetlands in this Group include B2, G9, and J3.

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)

- X Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: Group 6

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	50	Yes	FAC
2. *Ulmus americana*	20	Yes	FACW
3. *Fraxinus americana*	10	No	FACU
4.			
5.			
6.			
7.			
	80	=Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. *Lindera benzoin*	10	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	10	=Total Cover	
Herb Stratum (Plot size:)			
1. *Carex grayi*	20	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	20	=Total Cover	
Woody Vine Stratum (Plot size:)			
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: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	50	x 2 =	100
FAC species	50	x 3 =	150
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	110 (A)		290 (B)

Prevalence Index = B/A = 2.64

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 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** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point Group 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/2	100						Sandy loam
8-18	10YR 3/2	30	10YR 5/2	60				Sandy loam/clay
			10YR 5/6	10				

[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)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

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**)
- ___ 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 (F22)
- ___ 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** X **No** ___

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

APPENDIX D: DELINEATED WETLANDS AND WATERS PHOTOGRAPHS

Appendix D – Delineated Wetlands and Waters Photographs



1 - Watercourse 1 (WC1 - Pierson Drain) and Wetland WL1 overview, facing southeast.



2 - Wetland sample point WP1.



3 - Upland sample point UP1.

Photos taken 07/05/2022

Appendix D – Delineated Wetlands and Waters Photographs



4 – Watercourse 1 (WC1 - Pierson Drain) and Wetland WL2 overview, facing northeast.



5 - Wetland sample point WP2.



6 - Upland sample point UP2.

Photos taken 07/05/2022



7 - Wetland WL3 overview, facing north.



8 - Wetland sample point WP3.



9 - Upland sample point UP3.

Photos taken 07/06/2022

Appendix D – Delineated Wetlands and Waters Photographs



10 – Wetland WL4 overview, facing north.



11 - Wetland sample point WP4.



12 - Upland sample point UP4.

Photos taken 07/06/2022

Appendix D – Delineated Wetlands and Waters Photographs



13 – Wetland WL5 overview, facing north.



14 - Wetland sample point WP5.



15 - Upland sample point UP5.

Photos taken 07/06/2022



16 – Wetland WL6 overview, facing south.



17 - Wetland sample point WP6.



18 - Upland sample point UP6.

Photos taken 07/07/2022

Appendix D – Delineated Wetlands and Waters Photographs



19 - Wetland WL8 overview, facing south.



20 - Wetland sample point WP8.



21 – Upland sample point UP8.

Photos taken 07/07/2022



22 - Wetland WL9 overview, facing southwest.



23 - Wetland sample point WP9.



24 - Upland sample point UP9.

Photos taken 07/07/2022



25 - Wetland WL13 overview, facing northeast.



26 - Wetland sample point WP13.

Photos taken 07/12/2022

Appendix D – Delineated Wetlands and Waters Photographs



27 – Wetland WL14 overview, facing east.



28 - Wetland sample point WP14.



29 - Upland sample point UP14.

Photos taken 07/12/2022

Appendix D – Delineated Wetlands and Waters Photographs



30 – Wetland WL15 overview, facing north.



31 - Wetland sample point WP15.



32 - Upland sample point UP15.

Photos taken 07/14/2022



33 - Wetland WL16 overview, facing west.



34 - Wetland sample point WP16.



35 - Upland sample point UP16.

Photos taken 07/14/2022



36 – Wetland WL17 overview, facing north.



37 – Wetland sample point WP17.



38 – Upland sample point UP17.

Photos taken on 07/14/2022



39 - Wetland WL18 overview, facing north. Photo taken 7/14/2022.



40 - Typical agricultural wheat (*Triticum aestivum*), facing south (Atwell, LLC - 6/10/2020).



41 – Typical planted corn (*Zea mays*), facing west, (Atwell, LLC – 6/9/2020).



42 - Typical upland fallow area, facing west (Atwell, LLC - 6/13/2020).



43 – Wetland C3 overview, facing south (Atwell, LLC – 6/10/2022).



44 – Wetland D4 overview, facing northwest (Atwell, LLC - 6/10/2020).



46 – Wetland A3 overview, facing northwest (Atwell, LLC – 6/9/2020).



47 – Wetland G4 overview, facing northwest (Atwell, LLC - 6/12/2020).



48 - Wetland E8 overview (Atwell, LLC – 6/11/2020).



49 – Wetland G9 overview (Atwell, LLC - 6/12/2020).



50 – Watercourse A2 (WCA2 - Pierson Drain) overview (Atwell, LLC – 6/9/2020).



51 – Watercourse E1 (WCE1) overview (Atwell, LLC - 6/11/2020).



52 – Wetland I3/I1 overview, facing north (Atwell, LLC – 6//2020).



53 - Wetland WA019 overview, facing east.



54 - Wetland sample point WA019.



55 - Upland sample point NWA019.

Photos taken 10/25/2024 – 10/29/2024



56 – Wetland WA020 overview, facing west.



57 - Wetland sample point WA020



58 - Upland sample point NWA020.



59 – Wetland WA021 overview, facing north.



60 - Wetland sample point WA021.



61 - Upland sample point NWA021.

Photos taken 10/25/2024 – 10/29/2024



62 - Wetland WA022 overview, facing north.



63 - Wetland sample point WA022.



64 - Upland sample point NWA022/023.



65 – Wetland WA023 overview, facing southwest.



66 - Wetland sample point WA023.



67 – Upland sample point NWA022/023.

Photos taken 10/25/2024 – 10/29/2024



68 – Upstream view of stream SA001, facing north.



69 – Upstream view of stream SA002, facing east.