Technical Memorandum

To: Reuben Maxbauer (Edw. C. Levy Co.)
From: Ryan Conway and Katy Lindstrom, PE (Barr Engineering Co.)
Subject: Hydrogeologic Evaluation of Potential Sand and Gravel Mine – Springfield, Township, MI
Date: May 17, 2025
Project: 22631250.00
c: Tom Green (Edw. C. Levy Co.)

The Edw. C. Levy Co. (Levy) D.B.A. Burroughs Materials Corp. (BMC) has an interest in developing a sand and gravel mine on an approximate 480-acre property in Oakland County, Michigan located on the west side of Ormond Road beginning approximately 1.1 miles south of Davisburg Road. A portion of this property is part of Springfield Township's Eagle Road resource protection overlay district. Refer to Figure 1 for the site location relative to the resource protection overlay area. The topography is rolling, with flat to gently rolling agricultural land to the east along Ormond Road, sloping more steeply to the west on the western portion of the property down to lower-laying upland woods, wetlands, and a man-made lake.

BMC intends to mine portions of the property that are not in the protection overlay district for sand and gravel, including removing and stockpiling topsoil and overburden, excavating above and below the water table, thereby creating a lake, and processing aggregate for commercial sale. No groundwater dewatering is planned. A groundwater supply well will be constructed on the northeastern portion of the property near Ormond Road and used for a sand and gravel wash plant and firefighting water supply for Springfield Township. At mine closure, the mining area will be reclaimed, graded, and seeded as appropriate for future use of the property. See Figure 2 for the approximate 240-acre mining area proposed on the eastern half of the property.

BMC retained Barr Engineering Co. (Barr) to characterize and assess hydrogeologic (i.e., groundwater) conditions under current and proposed (i.e., full mine development) conditions.

1 Existing Hydrogeologic Conditions

A hydrogeologic evaluation of existing conditions (before mine development) was completed to assess the potential for impacts to resources on and adjacent to the property. The hydrogeologic understanding was prepared using topographic data, aerial imagery, property-specific observations, regional hydrogeologic resources, publicly available information regarding water supply wells, and groundwater monitoring wells on the property. The following sub-sections describe hydrogeology on regional and site scales.

1.1 Regional Hydrogeology

The property is located within the Michigan Basin, a regional-scale sequence of unconsolidated deposits and sedimentary rocks that underlie the Lower Peninsula of Michigan and beyond. The geology of the Michigan Basin informs the regional understanding of the hydrogeology. The regional geologic units are generally divided into the following three hydrostratigraphic units, or units of rock or soil with a reasonably distinct hydrologic system (reference (1)):

- Unconsolidated deposits;

- Bedrock aquifer (Marshall Sandstone); and
- Bedrock confining unit (Coldwater Shale).

Most water supply wells in Oakland County are completed in unconfined, unconsolidated deposits, and the groundwater flow direction is likely influenced by surface water features and topographic relief. Higher water levels were recorded along the northern edge of an outwash plain, which corresponds to the highest topographic elevations in Oakland County and creates a groundwater-flow divide running southwest to northeast east of the property (reference (2)). Groundwater flow north of this divide is expected to be to the northwest and groundwater flow south of this divide is expected to be to the southeast.

Except for the northwestern portion of Oakland County, the primary bedrock surface in the county is the Coldwater Shale, a regional confining unit that ranges in thickness from 500 feet in western Michigan to more than 1,300 feet in eastern Michigan (reference (3)). This confining unit forms the base of the Michigan regional aquifer system and covers the majority of Michigan's lower peninsula (reference (3)).

Throughout the central portion of the Lower Peninsula, Marshall Sandstone overlays the Coldwater Shale, and in northwestern Oakland County, the Marshall Sandstone is the bedrock surface (reference (3)). In Oakland County, the Marshall aquifer produces adequate water supplies for northwestern communities, including Holly, Groveland, Brandon, and Rose Townships (reference (4)), but wells completed in the unconsolidated deposits are still the main source of water (references (2); (4)).

1.2 Site Hydrogeology

Information used to characterize site hydrogeology includes boring logs, water level measurements from groundwater monitoring wells, and sieve analyses. Twenty-five monitoring wells (i.e., Well #1 through Well #25) were installed across the property with the bottom of the screened intervals at elevations ranging from 965 feet to 1012 feet, with an average elevation of 996 feet. Monitoring wells are screened within the unconsolidated deposits, which include layers of well to poorly sorted, fine- to coarse-grained sands with varying amounts of clays and silts, frequent gravel, and occasional boulders. The sandy layers range in thickness from 30 feet to 80 feet. Discontinuous clay, sandy clay, silty clay, and silt lenses are commonly found within the sand and gravel layers. Unconsolidated deposits in Oakland County range from 20 feet to 350 feet thick (reference (4)); however, the total thickness of the unconsolidated deposits at the site has not been characterized (i.e., borings have not been drilled to the top of the bedrock).

A groundwater contour map developed using groundwater elevations calculated from static water level measurements collected April 2023 is shown on Figure 3. Groundwater flow is toward the west to northwest and influenced by local topography, surface water features, and heterogeneity in local lithology, consistent with regional groundwater flow in Oakland County. A 9.15-acre, man-made lake is present in the west central portion of the property. The surface elevation is approximately 1010 feet, consistent with groundwater elevations in shallow monitoring wells in the area, indicating the lake is at least partially groundwater-fed and its surface likely reflects the water table in this area.

Hydraulic conductivity was estimated using sieve analysis results from site samples and the spreadsheet tool HydrogeoSieveXL. The geometric mean hydraulic conductivity from 36 samples is approximately 70.5 feet per day. This value is a representative hydraulic conductivity estimate for the unconsolidated deposits at the mine.

2 Proposed Hydrogeologic Conditions

Barr conducted a hydrogeologic evaluation based on proposed mining operations and updated groundwater supply well information provided by Levy in May 2025. Four potential factors impacting groundwater elevations were evaluated: 1) excavation of the unconsolidated deposits from below the water table, 2) evaporation from the proposed lake, 3) the post-excavation steady-state water table, and 4) groundwater withdrawal for aggregate processing.

2.1 Excavation of Unconsolidated Deposits from Below the Water Table

When solid material is removed from below the water table in the excavation, there will be a temporary water level decline before water flows into the excavation and fills the space previously occupied by the material excavated. A decline of approximately 3 inches at the boundary of the waterbody was conservatively estimated by assuming instantaneous removal of one week's worth of excavated material. This decline represents a conservative estimate. In reality, the assumed weekly excavation volume is unlikely to be realized due to production downtime and actual production rates less than the maximum possible rate. In addition, mining is not instantaneous, and water would fill the excavated space continuously as mining progresses throughout the week. Therefore, the decline in groundwater elevations from excavation of unconsolidated deposits is expected to have a negligible impact on surrounding wetlands, water bodies, and groundwater.

2.2 Evaporation from the Proposed Lake

Evaporation from an open water surface at the location of the mine for the growing season of May to October is estimated to be 25 inches based on the National Weather Service (reference (5)). For the growing season of 184 days, the evaporation rate is 0.135 inches per day. For conservative evaluation, the groundwater elevation decline was estimated for instantaneous removal of a week of evaporation at a rate of 0.135 inches per day, or 0.951 inches per week. That is, the hypothetical instantaneous decline due to evaporation is estimated to be 0.951 inches. This decline represents a conservative estimate. In reality, a week's worth of evaporation would not occur instantaneously, evaporation would likely be offset by precipitation, and groundwater would continuously refill the excavation as evaporation is occurring. Therefore, the decline in groundwater elevations from evaporation is expected to have a negligible impact on surrounding wetlands, water bodies, and groundwater.

2.3 Post-excavation Steady-state Water Table

Groundwater tables generally slope from the highest elevations located in recharge areas to the lowest elevations located in discharge areas. For a waterbody that is not perched above the water table, the water table is flat across the waterbody. If a waterbody is constructed in an area with a sloped water table, the elevation of the water across the waterbody will theoretically be equal to the average elevation of the groundwater elevation in the area prior to the waterbody being formed (i.e., the average of the groundwater elevation at the upgradient boundary of the waterbody and the groundwater elevation at the downgradient boundary of the waterbody). This will generally lower the groundwater elevation on the upgradient side of the waterbody and raise the groundwater elevation on the downgradient side.

To estimate the average water table in the area of the proposed lake, Barr reviewed groundwater elevation data provided by Levy from four monitoring events (August and November, 2022 and February and April, 2023). The average of the pre-mining water table (i.e., the predicted lake water elevation after construction) was calculated to be 1015.9 feet. This estimates a maximum increase in the water table of 2.72 feet downgradient of the lake and maximum decrease in water table of 1.06 feet upgradient of the

lake. The existing 9.15-acre, man-made lake and wetlands are not upgradient of the proposed lake where reductions in the water table are likely to occur and therefore are not expected to have a reduction in hydrology due to mining below the water table.

2.4 Groundwater withdrawal and drawdown

The proposed mine plan includes construction of a water supply well in the northeast portion of the property near Ormond Road to provide water for a wash plant, dust control, and firefighting by Springfield Township. Construction details for the well are not known at this time; however, it is assumed the well will be screened in the deep, unconsolidated aquifer.

The processing plant will feature a closed-loop water recycling system, ensuring the absence of wastewater discharge into the environment. The plant has a water containment capacity of approximately 135,000 gallons, which will be filled once (annually) at each start-up. This once-annual groundwater withdrawal is not expected to have a significant impact on groundwater resources due to the temporary nature of the withdrawal.

During operation, the processing plant will require approximately 30 gallons per minute of make-up water to compensate for water lost through evaporation and entrainment within the aggregate products from approximately from April 1 to November 30, 12 hours per day, six days per week. A desktop evaluation of the potential impacts to groundwater resources from this withdrawal was completed. The withdrawal is not expected to adversely impact groundwater or surface water resources for the following reasons:

- The well will be located on the eastern portion of the property, more than 2,000 feet from the groundwater-fed man-made lake and wetlands on the western portion of the property. The horizontal separation of the water supply well and the man-made lake and wetlands west of the mining area is expected to limit any reductions in groundwater discharge to these surface water features.

- Based on review of publicly available well logs (reference (6)), wells in this area are typically screened in unconsolidated deposits over 100 feet deep. Many are over 200 feet deep. A thick (approximately 50- to 150 feet-thick) clay/sandy clay layer is observed above the deep interval where groundwater is extracted from these wells. The water supply well to be installed is likely to be deep and may have low-permeability clay layers between the pumped interval and shallower groundwater. The vertical separation of and the likely presence of low-permeability clay layers between the likely interval to be pumped by Levy and shallower groundwater is expected to limit any reductions in groundwater discharge to the man-made lake and wetlands west of the mining area.

- A screening-level estimate of drawdown of 3 feet at the water supply well was calculated using the Theis equation, an analytical solution for confined aquifers. The estimated drawdown at the nearest wells neighboring Levy's property was 1.25 feet. Based on review of the publicly available well logs, drawdown on the order of 1.25 feet is not expected to affect neighboring wells.

- Levy has an existing groundwater monitoring well network that can be used to collect site-specific data after the water supply well is installed and pumped. Site-specific estimates of drawdown can be updated based on this information, and the monitoring well network can be used to implement

contingency measures (e.g., decreased pumping rates) if adverse impacts to groundwater resources are anticipated based on the site-specific data.

Additional water will be needed for dust control at the mine and for Springfield Township firefighting. These water supply needs will be intermittent and dependent on site-specific conditions. Groundwater withdrawal for dust control and firefighting is not expected to have a significant impact on groundwater or surface water resources due to the intermittent nature of the withdrawals and can be evaluated in the future with site-specific data collection at the time of pumping.

3 Summary

Groundwater elevation changes due to excavation of unconsolidated deposits from below the water table, evaporation from the proposed lake, the post-expansion steady-state water table, and groundwater withdrawals from an onsite well were evaluated. The potential changes to groundwater levels are not expected to result in changes to hydrology of wetlands or other water bodies or adverse impacts to neighboring wells based on the available information. Site-specific information on lithology, pumping well construction, and aquifer properties would be needed to more accurately estimate drawdown from the water supply well. Levy has an existing groundwater monitoring well network that can be used to collect site-specific data after the water supply well is installed and pumped. Site-specific estimates of drawdown can be updated based on this information, and the monitoring well network can be used to implement contingency measures (e.g., decreased pumping rates) if adverse impacts to groundwater resources are anticipated based on the site-specific data.

4 References

1. **Seaber, Paul R.** Hydrostratigraphic units. [book auth.] William Back, Joseph S. Rosenshein and Paul R. Seaber. *Hydrogeology: The Geology of North America.* s.l. : Geological Society of of America, Inc., 1988, Vol. 2.

2. **U.S. Geological Survey.** Ground-Water Quality Atlas of Oakland County, Michigan. August 2000. Water-Resources Investigation Report 00-4120.

3. —. Hydrogeologic Framework of the Michigan Basin Regional Aquifer System. 1998. Professional Paper 1418. ISBN 0-607-88068-6.

4. **Apple, Beth A. and Reeves, Howard W.** Summary of Hydrogeologic Conditions by County for the State of Michigan. 2007. p. 78. U.S. Geological Survey Open-File Report 2007-1236.

5. **Farnsworth, R K, Peck, E L and Thompson, E S.** Evaporation Atlas for the Contiguous 48 United States, NOAA Technical Report NWS 33. s.l. : U.S. Dept. of Commerce, Washington, D.C., 1982. p. 26.

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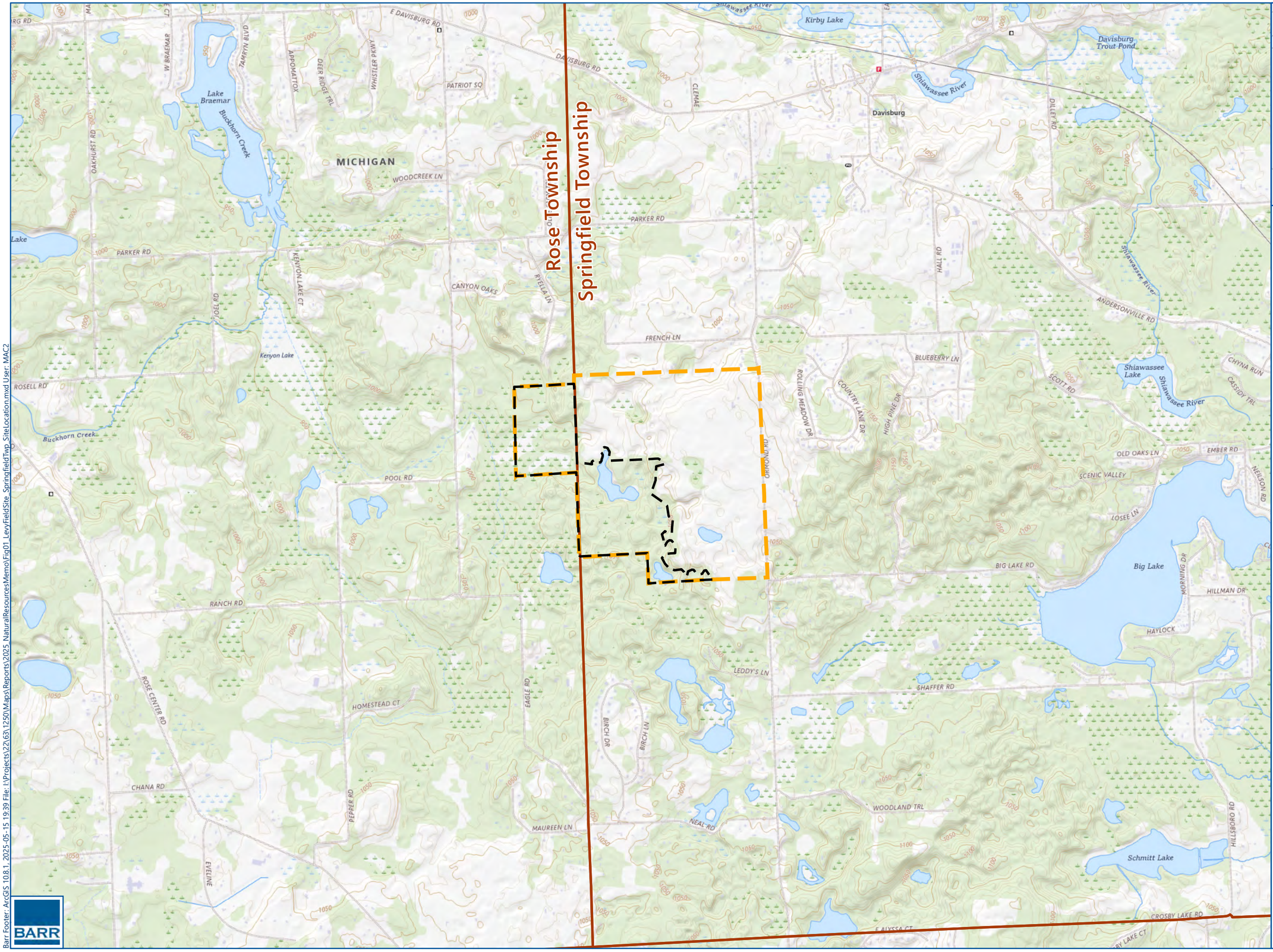

SITE LOCATION
LEVY FIELD SITE
Springfield Township, Michigan

FIGURE 1

BARR

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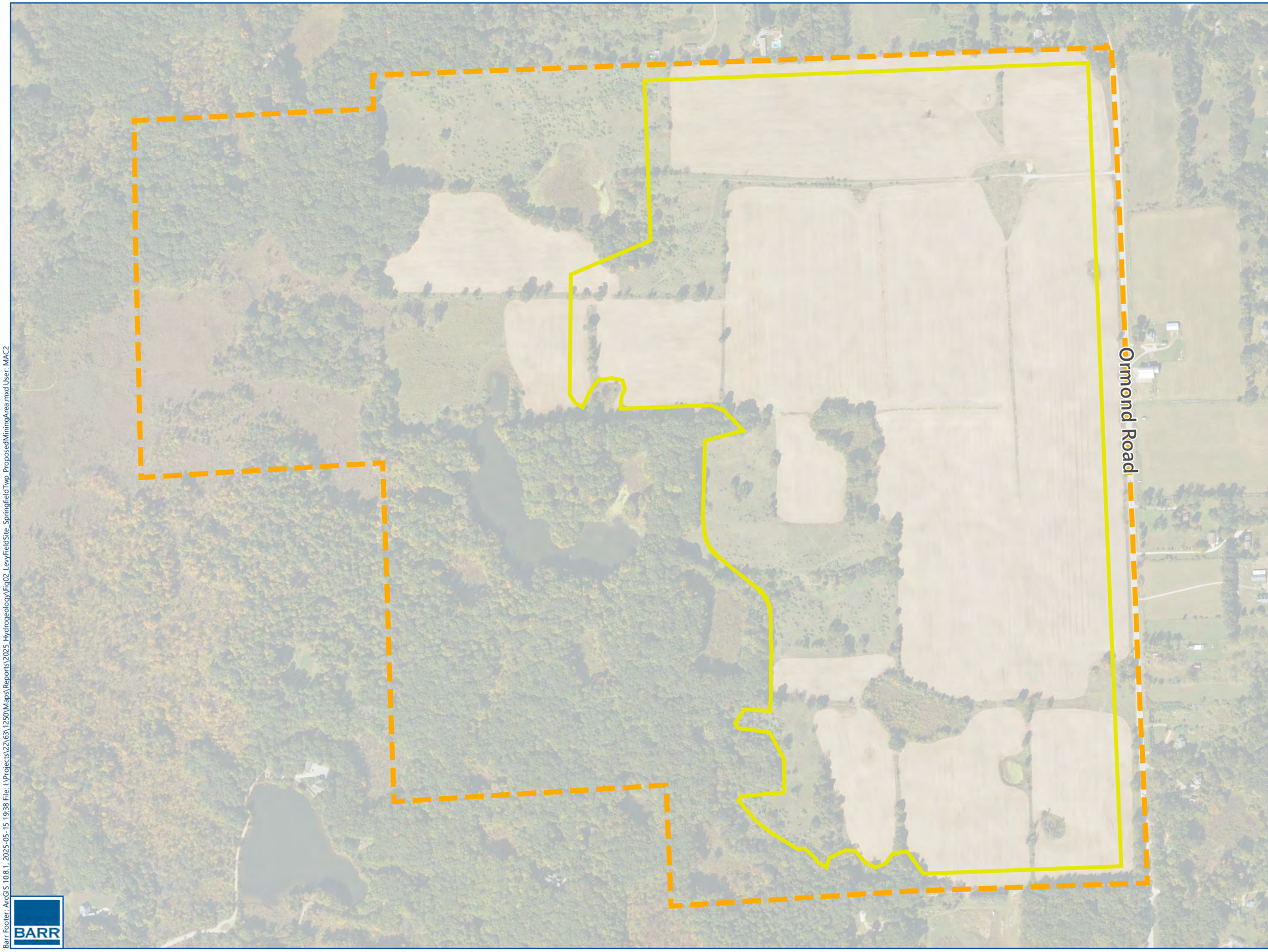

Property Boundary

Approximate Mining Boundary

Notes:

- Property boundary shown on this figure based on data from the Oakland County Property Gateway and should be considered approximate. Available online at: *https://gis.oakgov.com/PropertyGateway/Home.mvc*

N

0 500 1,000

Feet

Aerial Image: USDA NAIP 2024

PROPOSED MINING AREA
LEVY FIELD SITE
Springfield Township, Michigan

FIGURE 2

BARR

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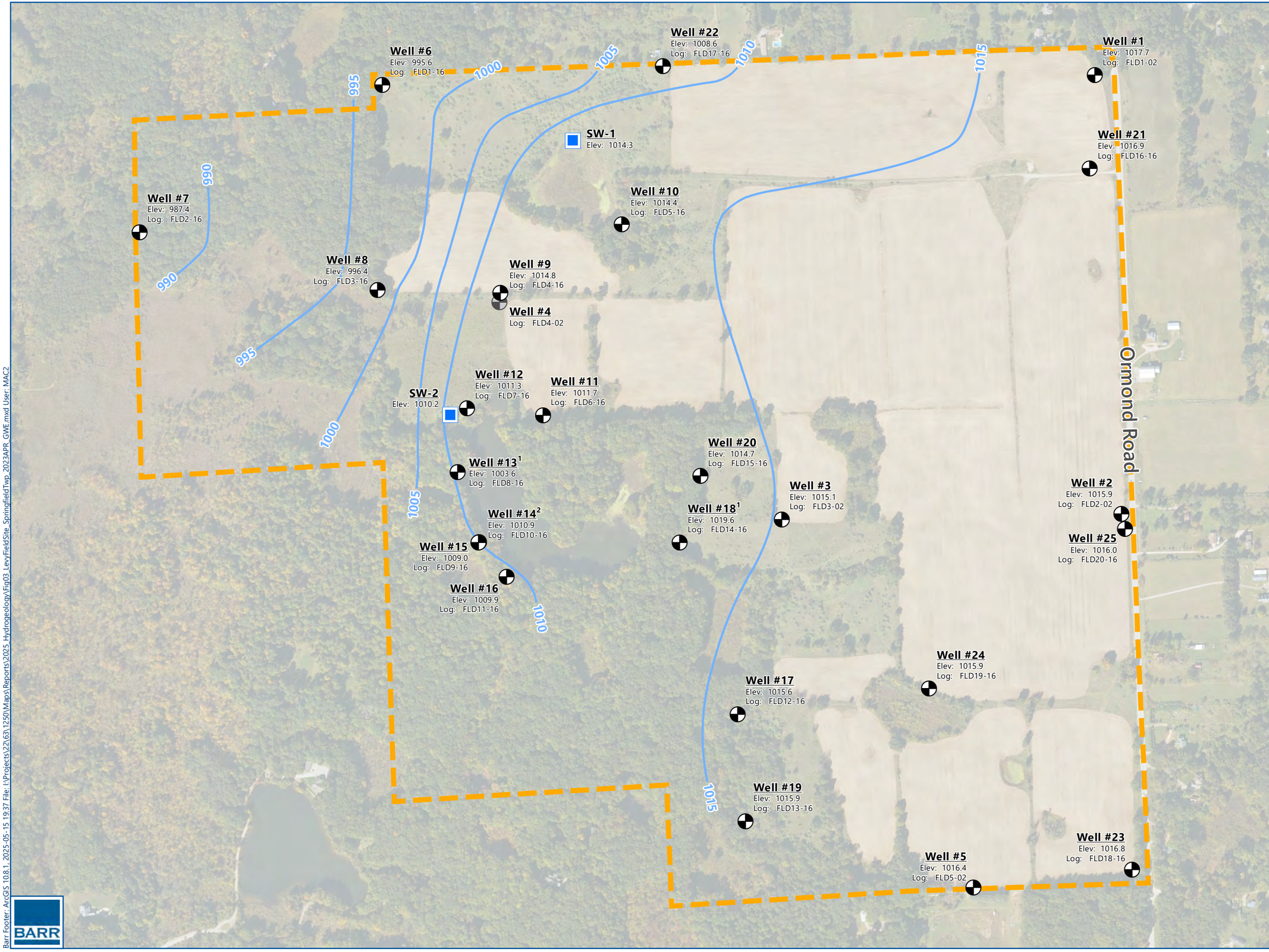

Property Boundary

Groundwater Contour (Feet)

Surface Water Measurement

Monitoring Well

Abandoned Well

Well #1	Well ID
Elev: 1017.7	Groundwater Elevation
Log: FLD1-02	Well Log

Notes:

- Property boundary shown on this figure based on data from the Oakland County Property Gateway and should be considered approximate. Available online at: *https://gis.oakgov.com/PropertyGateway/Home.mvc*
- Water levels measured on 4/11/2023.
- [1]Not used for contouring due to perched groundwater or anomalous elevation.
- [2]Not used for contouring due to anomalous elevation.

N

0 500 1,000

Feet

Aerial Image: USDA NAIP 2024

GROUNDWATER ELEVATIONS APRIL 2023 LEVY FIELD SITE

Springfield Township, Michigan

FIGURE 3

BARR

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Technical Memorandum

To: Reuben Maxbauer (Edw. C. Levy Co.)
From: Fran Thompson and Shaughn Barnett (Barr Engineering Co.)
Subject: Natural Resources Characterization and Potential Impacts Summary of Potential Sand and Gravel Mine – Springfield Township, MI
Date: May 17, 2025
Project: 22631250.00
c: Tom Green (Edw. C. Levy Co.), Katy Lindstrom (Barr Engineering Co.)

1 Introduction

The Edw. C. Levy Co. (Levy) D.B.A. Burroughs Materials Corp. (BMC) has an interest in developing a sand and gravel mine on an approximate 480-acre property in Oakland County, Michigan located on the west side of Ormond Road beginning approximately 1.1 miles south of Davisburg Road. A portion of this property is part of Springfield Township's Eagle Road resource protection overlay district. Refer to Figure 1 for the site location relative to the resource protection overlay area. The topography is rolling, with flat to gently rolling agricultural land to the east along Ormond Road, sloping more steeply to the west on the western portion of the property down to lower-laying upland woods, wetlands, and a man-made lake.

BMC intends to mine portions of the property that are not in the protection overlay district for sand and gravel, including removing and stockpiling topsoil and overburden, excavating above and below the water table, thereby creating a lake, and processing aggregate for commercial sale. No groundwater dewatering is planned. A groundwater supply well will be constructed on the northeastern portion of the property near Ormond Road and used for a sand and gravel wash plant and firefighting water supply for Springfield Township. At mine closure, the mining area will be reclaimed, graded, and seeded as appropriate for future use of the property.

BMC retained Barr Engineering Co. (Barr) to characterize and assess potential impacts from mining to potential natural features including wetlands, streams, water bodies, and woodlands; threatened and endangered (T&E) species; as well as wildlife habitat.

2 Wetlands/Natural Features

Data review and field reconnaissance were performed to complete an inventory of natural features found on the property. This included field investigations conducted by Barr in April and May 2023 to review and confirm or update work previously completed by King and MacGregor Environmental (KME) in 2002 (Barr acquired KME in October 2020). Following KME's delineation of wetland boundaries in 2002, a Level 3 Wetland Assessment request was submitted to the Michigan Department of Environmental Quality (MDEQ) Wetland Assessment Program (now referred to as the Wetland Identification Program). In October 2002, the MDEQ issued a letter confirming all wetland boundaries. The letter also listed wetlands that the MDEQ considered to be state-regulated.

Based on Barr's field visits and site evaluations in 2023, the natural features on the property remain the same as those documented in 2002 by KME including the wetland boundaries with one exception; one small, additional wetland was identified in the 2023 field evaluation.

Figure 2 shows natural features at the site relative to the proposed mining area. In total, the property contains 40 wetlands and a lake totaling 66.81 acres, of which 55.72 acres (83%) are anticipated to be regulated by the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The following subsections provide additional details on specific natural features observed on the property.

2.1 Bogs and Fens

Bogs and fens are wetlands that accumulate peat and develop a unique, characteristic vegetative community. They occur commonly in northern Michigan but are relatively uncommon in Oakland County. Bogs are generally formed in depressions and are dependent on precipitation for hydrology. Cool climates and abundant moisture slow the rate of decomposition, resulting in an accumulation of organic matter and a “floating blanket” of peat moss. Fens receive hydrology from the watershed from inflowing streams or groundwater moving beneath the soil surface. The plant community of a fen is more varied than that of a bog, and sedges tend to be more plentiful.

2.2 Emergent Marsh

Emergent marshes are wetlands that are frequently or continually inundated with water, characterized by persistent emergent and soft-stemmed or floating-leaved herbaceous vegetation. They occur commonly throughout Michigan and Oakland County. Emergent marshes generally form in poorly drained depressions and in shallow water along the banks of lakes, ponds, and rivers.

2.3 Wet Meadow

Wet meadows are wetlands that occur on poorly drained, low-lying areas. They are typically drier than other marshes except during seasons of high water. They typically resemble grasslands and are void of standing water, but the soils remain saturated due to the presence of a high water table.

2.4 Forested Wetland

Forested wetlands are defined as wetlands that have an overall canopy cover of 50% or more with trees greater than 8 meters in height. Forested wetlands occur on a variety of landforms and are common throughout Michigan and Oakland County. They can have a variety of characteristics depending on where in the landscape they occur. Forested wetlands include both organic and mineral soils.

2.5 Inundated Shrub Swamp

Inundated shrub swamps are shrub-dominated wetlands that occur in small to large kettle depressions. Kettle depressions are isolated low-lying areas that formed as glaciers detached and became wholly or partially buried in sediment and slowly melted, leaving behind pot-hole-shaped depressions in the landscape. They occur commonly in southern Michigan and Oakland County.

2.6 Dry-mesic Southern Forest

Dry-mesic southern forests are oak-hickory forest types that exist south of the climatic tension zone in southern Michigan. They are fire-dependent systems which maintain semi-open conditions that promote oak regeneration and shrub diversity. The soils within these forests are coarse-textured and slightly acidic to neutral in pH. Dry-mesic southern forest is common throughout southern Michigan and Oakland County. The upland areas on the property that have not been used for agricultural purposes can be classified as dry-mesic southern forest.

2.7 Old Field

Areas of abandoned agriculture and grazing on the property are classified as old field and are degraded due to dominance of invasive species. These areas persist between the active agricultural fields and the overlay district and remain fairly open, with non-native shrubs and pasture grasses making up the majority of the plant community.

2.8 Active Agricultural Land

A large portion of the eastern and northern portions of the property is active agricultural land. This land is actively managed to produce row crops such as corn and wheat. There are hedgerows of dry-mesic southern forest acting as wind breaks along the border of the fields. Due to the continuous agricultural practices in these areas, there are no notable plant communities found here.

3 Threatened and Endangered Species

A desktop review within the proposed mining area was completed, including a review of aerial photographs, the Michigan Natural Resources Inventory (MNFI) database, the United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) database, and a floristic quality assessment and plant survey completed in May 2023. Federally-listed species are those identified as needing review following input of the project area into the USFWS IPaC tool. State-listed species are those that have been identified by the MNFI within a 1-mile radius of the property.

3.1 Federally Listed Species

In accordance with the Endangered Species Act of 1973, the Migratory Bird Treaty Act (MBTA), and the Bald and Golden Eagle Protection Act (BGEPA), the likelihood for federally listed T&E species to be impacted by mining was evaluated using USFWS IPaC information. Database information obtained from IPaC (current as of May 14, 2025) identified seven federally listed species and one grouping for review within the mining area as shown in Table 1.

Table 1 Federally Listed Species Summary

Common Name	Scientific Name	Federal Status	Group
Bald Eagle	*Haliaeetus leucocephalus*	BGEPA/MBTA	Bird
Migratory Birds	*N/A*	MBTA	Bird
Whooping Crane	*Grus americanus*	Experimental/MBTA	Bird
Eastern Massasauga	*Sistrurus catenatus*	Threatened	Reptile
Indiana Bat	*Myotos sodalis*	Endangered	Mammal
Northern Long-eared Bat	*Myotis septentrionalis*	Endangered	Mammal
Monarch Butterfly	*Danaus plexippus*	Proposed Threatened	Insect
Poweshiek skipperling	*Oarisma poweshiek*	Endangered	Insect

The mining area is located within the vicinity of suitable nesting habitat for bald eagle and migratory birds. No bald eagle nests have been observed within the property (inclusive of the proposed mining area) nor were any bald eagles observed flying over or perched on the property. If non-agricultural vegetation removal will occur during the approximate bald eagle nesting season (January 15 to July 31) and/or the migratory bird nesting season (April 15 to August 15), a nest survey is recommended prior to the start of project activities.

Potential stopover habitat for whooping crane is located within the line-of-sight of mining activities, consisting of scattered wetland areas. However, mining activities are not anticipated to adversely impact this species. Areas outside the property provide equal and/or better stopover habitat, and whooping crane would likely use those areas during migration and mining.

The mining area is located within the Eastern Massasauga Rattlesnake (EMR) range but located outside of Tier 1 and Tier 2 EMR habitat. Tier 1 areas are areas known to be occupied by EMR or highly likely to be occupied by EMR. Tier 1 EMR habitat is present west of the mining area within high-quality interconnected wetland and upland areas of the property. Shrub swamps and emergent marsh habitat within the mining limits exhibit low-quality habitat for this species and are isolated from higher-quality continuous wetlands located to the west. Due to nearby Tier 1 EMR habitat, general USFWS best management practices (BMPs) are recommended, including use of wildlife safe materials for erosion control, to prevent take and reduce agency concerns with impacting EMR.

The property is located within the range of Indiana Bat and Northern Long-eared Bat (NLEB) and may contain suitable roosting habitat. Tree removal is proposed to occur during the project, but is limited to small, forested patches, occasional trees in wetland areas, and hedgerows within the mining area. It is recommended to perform any necessary tree removal outside the summer occupancy period (i.e., perform tree removal from October 1 to March 31) and to use downward-facing lights and/or direct temporary lighting away from suitable roosting habitat during the active season from April 1 to September 30 to avoid potential impacts to roosting bats.

Milkweed was not identified in the May 2023 vegetation assessment. As a result, no effect to the Monarch Butterfly is expected, as the larval stage of this species is dependent on Milkweed and no Milkweed is anticipated to be impacted.

The host plants for Poweshiek Skipperling are found exclusively within prairie fen habitat in Michigan which is not present within the mining area. No potential host plants for this species were identified during the May 2023 vegetation assessment. Fen habitat is located west of the mining limits; however, fen habitat is not anticipated to be impacted by mining activities with mining impacts limited to active agriculture, pasture, and low-quality shrub swamps and emergent marsh areas. Additionally, as discussed in Barr's Technical Memorandum re: *Hydrogeologic Evaluation of Potential Sand and Gravel Mine – Springfield, Township, MI* dated May 15, 2025, potential changes to groundwater levels from mining are not expected to result in changes to hydrology of wetlands or other water bodies. Therefore, no effect to Poweshiek Skipperling is anticipated.

Additional coordination with USFWS is recommended early in the project permitting process to identify any agency concerns with federally-protected species.

3.2 State-Listed Species

The purpose of the state-listed species review was to assess the potential for adverse impacts to species protected by the Michigan Natural Resources and Environmental Protection Act (NREPA). The MNFI database information was searched to identify any state records of T&E species within the property, and field data collected from the floristic quality assessment and endangered plant survey conducted in May 2023 were reviewed.

During the field visit, plant lists were completed for various representative wetland and upland areas. Database information obtained from MNFI as of March 2024 identified 13 state-listed species and one natural community type with element occurrences, within the vicinity of the property (see Table 2). Element occurrences are defined as a documented, field-verified occurrences of species and natural communities that have been recorded in MNFI's database.

Table 2 State-Listed Species Summary

Common Name	Scientific Name	State Status	Group
Prairie Fen Natural Community	*N/A*	N/A	Natural Community
Blanding's Turtle	*Emydoidea blandingii*	Special Concern	Reptile
Eastern Massasauga	*Sistrurus catenatus*	Threatened	Reptile
Copper-bellied Water Snake	*Nerodia erythrogaster neglecta*	Endangered	Reptile
Pickerel Frog	*Lithobates palustris*	Special Concern	Amphibian
Small-mouthed Salamander	*Ambystoma texanum*	Endangered	Amphibian
Poweshiek skipperling	*Oarisma poweshiek*	Endangered	Insect
Huron River Leafhopper	*Flexamia huroni*	Endangered	Insect
Blazing Star Borer	*Papaipema beeriana*	Special Concern	Insect
Rainbow	*Cambarunio iris*	Special Concern	Mussel
Goldenseal	*Hydrastis canadensis*	Threatened	Plant
Hairy Angelica	*Angelica venenosa*	Special Concern	Plant
Mat muhly	*Muhlenbergia richardsonis*	Threatened	Plant
White Lady Slipper	*Cypripedium candidum*	Threatened	Plant

Suitable habitat for Goldenseal may be present within forested areas of the property located west of the mining area where this species was identified during a vegetation survey in 2002. However, there is no suitable habitat for Goldenseal within the mining area which consists of active agriculture, pasture, and isolated low-quality wetlands. Suitable habitat for Pickerel Frog and Blanding's Turtle may be located within the mining area; however, these areas consist of low-quality shrub swamps and emergent marsh habitat that are surrounded by agriculture and pasture and are isolated from higher-quality continuous habitat located to the west of the mining area. Overall habitat quality and the risk of impacting these species is considered low. Exclusionary fencing or other exclusionary measures may be an option to prevent Blanding's Turtle from using the mining limits for traversal. Copper-bellied Water Snake can use the above wetland types; however, these areas are surrounded by active agriculture and pasture and are isolated from larger wetland-upland complexes. This species generally requires forested areas interconnected to suitable aquatic and wetland types which are not present within the project area. Impacts to this species are not anticipated.

Small-mouthed Salamander are predominantly associated with vernal woodland pools floodplain areas with sufficient leaf litter and woody debris. Areas within the project footprint are not ideal for this species. Marsh and swamp areas within the project footprint are isolated and adjacent areas are unlikely to provide suitable habitat for this species. Impacts to this species are not anticipated.

The Prairie Fen Natural Community, Poweshiek Skipperling, Huron River Leafhopper, Blazing Star Borer, Hairy Angelica, Mat Muhly, and White Lady Slipper are not anticipated to be impacted by project activities. These species and natural community are found predominantly within high-quality prairie and/or prairie fen habitat that are not present within the mining limits. Impacts to these species and natural community are not anticipated.

The Rainbow mussel is found exclusively within riverine habitats which are not present within the mining limits. No impacts to this species are anticipated.

Additional coordination with EGLE is recommended early in the project permitting process to identify any agency concerns with state-protected species.

4 Wildlife Habitat

Wildlife observed during field surveys (2002 by KME and 2023 by Barr) included sandhill cranes, red-tailed hawks, mallard ducks, Canada geese, whitetail deer, ruffed grouse, green and northern leopard frogs, wild turkey, a Blanding's turtle, and a wide variety of songbirds. Evidence of use of the property by muskrats, crayfish, raccoons, and groundhogs was also observed. The highest quality wildlife habitat – the areas containing physical characteristics within which wildlife can easily access basic life cycle requirements such as shelter, nesting, foraging, and water – was found in the continuous forested area in the southwest part of the property.

5 Summary

Potential impacts from the proposed mine plan to resources were evaluated. Assessments were completed to evaluate the significance of potential impacts to resources resulting from mine development. The assessments considered the relative extent of direct and indirect impacts to protected species as well as regulated and/or locally special or unique natural features.

5.1 Wetlands/Natural Features

The mine plan proposes no direct impact to the approximately 163-acre protection overlay district within the property boundary. This area contains the highest quality wetlands and natural features (woodlands, streams, lake) on the property. Further, no direct impacts to streams are proposed.

The proposed mining area will directly impact 11 non-EGLE-regulated wetlands totaling 5.51 acres.

The potentially impacted wetland functions associated with direct wetland impacts include stormwater attenuation, wildlife habitat, erosion control, and water quality treatment. Impacts to these functions are unlikely to adversely affect the surrounding local environment because there will be no runoff from the mining area (drainage will be inward) and there is ample high-quality habitat suitable for wildlife west of the mining area within the property.

The potential for indirect impacts to wetlands and surface water features that will remain after mining was also assessed and is anticipated to be insignificant. Proposed grading within the mining area near

Wetland V (an EGLE-regulated wetland that is perched above the water table) will maintain or increase the overall drainage area to the wetland. It is recommended that final, detailed grading plans incorporate drainage swales to direct runoff from adjacent upland areas to Wetland V. Wetland and surface water hydrology for other features adjacent to the proposed mining area are largely driven by shallow groundwater flow. As discussed in Barr's Technical Memorandum re: *Hydrogeologic Evaluation of Potential Sand and Gravel Mine – Springfield, Township, MI* dated May 15, 2025, potential changes to groundwater levels from mining are not expected to result in changes to hydrology of wetlands or other water bodies.

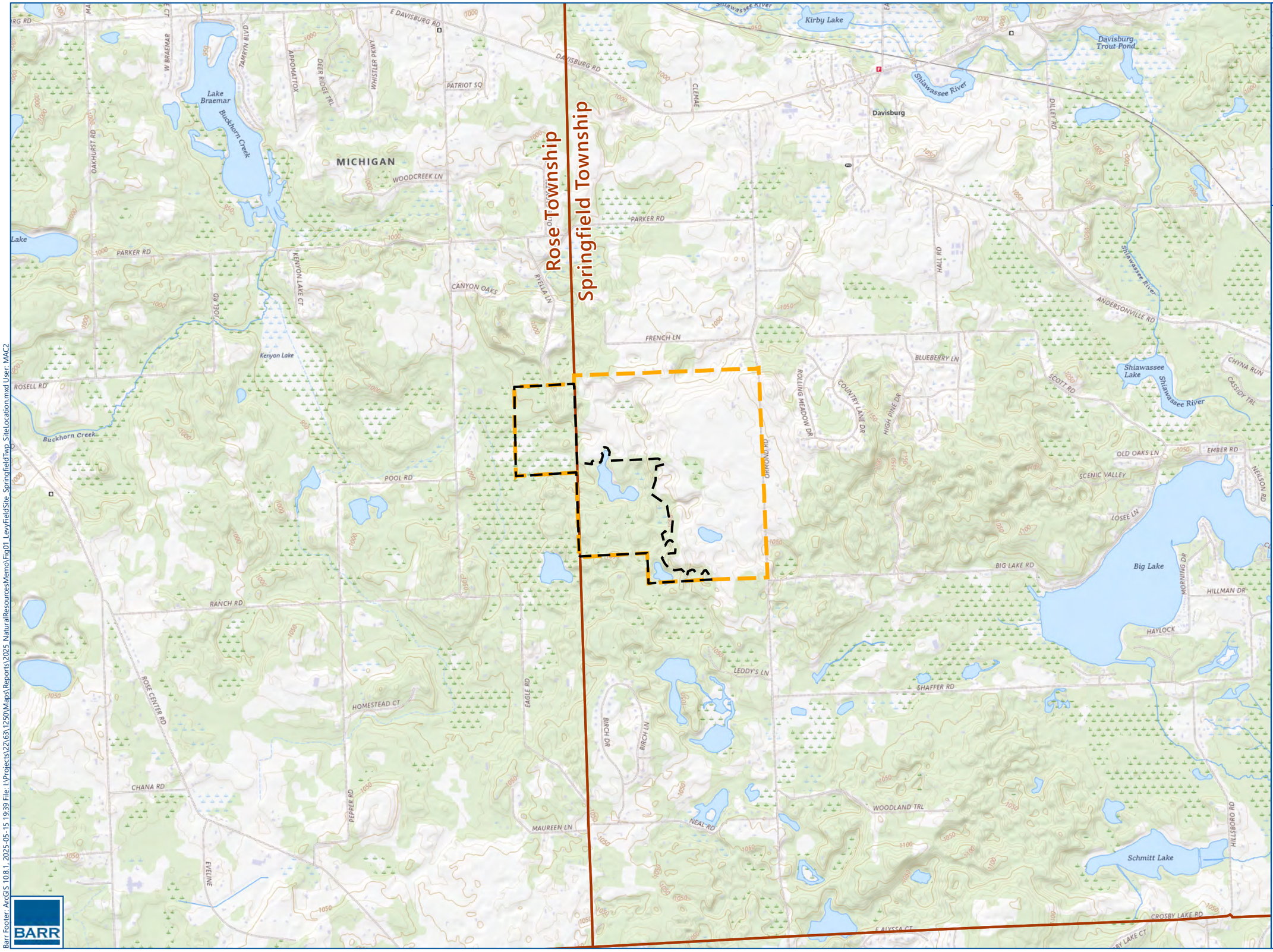
The potential for soil erosion discharge to deposit sediments from the mining area into the remaining wetlands on the property is minimal based on the porosity of the soils, but this can be addressed through site grading that keeps bare slopes draining into the mining area and through post-mining restoration.

5.2 Threatened and Endangered Species

Proposed mining is concentrated in areas with actively cultivated fields, degraded formerly cultivated old fields, isolated wetland areas, and scattered brush and trees. These areas have limited habitat to support federal- or state-protected species; however, there is potential for them to be located within the mining area, given they are known to occur within the surrounding landscape. If any listed species are encountered, impacts to T&E species are anticipated to be avoidable through BMPs. Further, with the anticipated minimal impacts to groundwater hydrology, indirect impacts to protected species habitats outside the mining area are not expected to be significant. Additional coordination with USFWS and EGLE are recommended early in the project permitting process to identify any agency concerns with protected species.

5.3 Wildlife Habitat

The project will result in direct and indirect impacts to habitat and subsequently to wildlife; however, the highest-quality habitat is contained within the protection overlay district, and the proposed mining area is currently active farmland, degraded old field, and small isolated wetlands. Because of the avoidance of impact to the higher-quality habitat within the protection overlay district, proposed mining is determined to not have a significant impact on the diversity or quality of local wildlife populations.

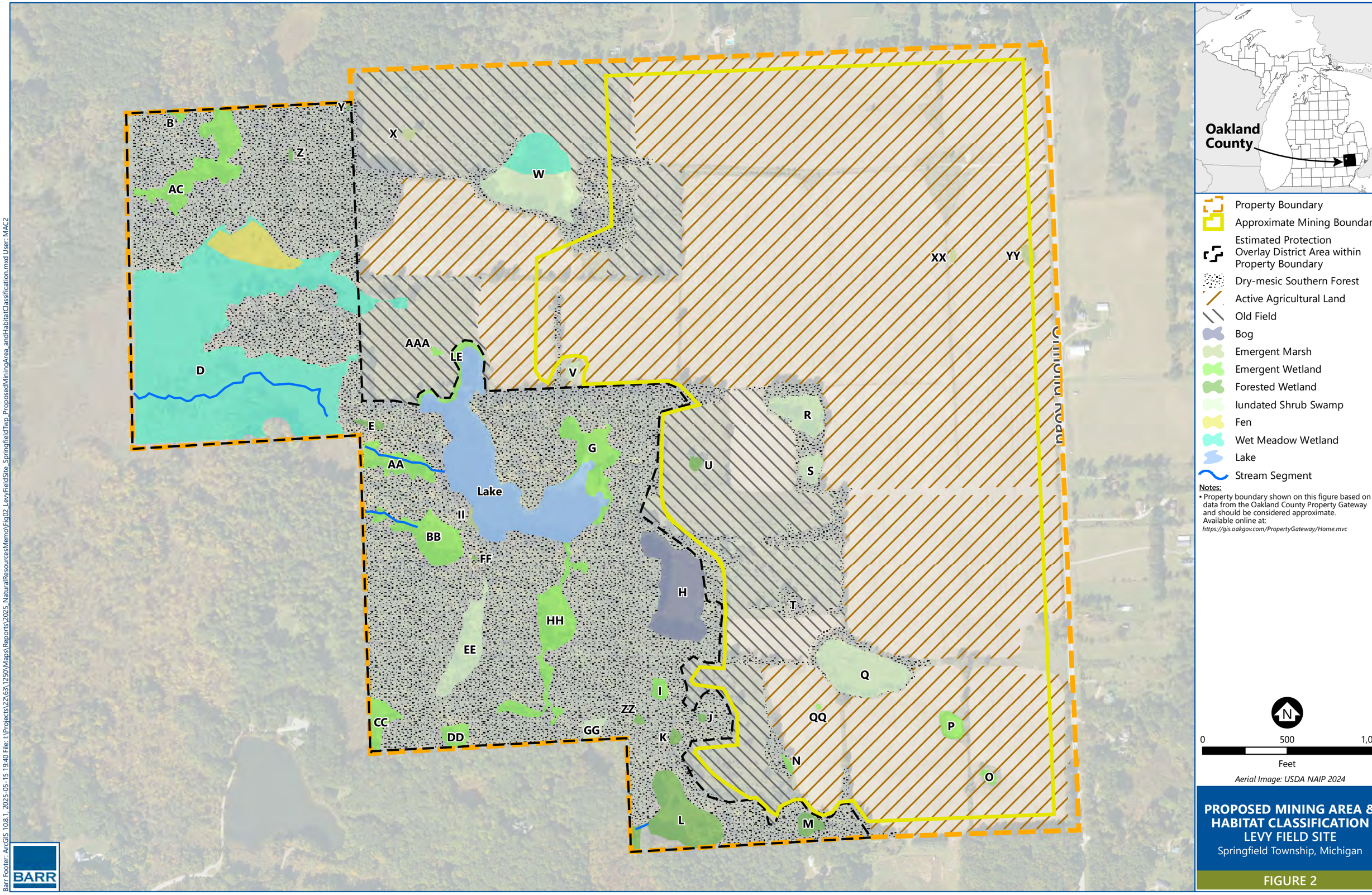


SITE LOCATION
LEVY FIELD SITE
Springfield Township, Michigan

FIGURE 1

BARR

Barr Footer: ArcGIS 10.8.1, 2025-05-15 19:39 File: I:\Projects\23\63\125\Maps\Reports\2025_NaturalResourcesMemo\Fig01_LevyFieldSite_SpringfieldTwp_SiteLocation.mxd User: MAC2



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Memo

TO:	Thomas Forster – Varnum LLP *Attorney-Client Privilege*		
FROM:	Timothy J. Likens, PE, PTOE		
DATE:	December 20, 2023	PROJECT NO.:	230233
SUBJECT:	Traffic Impact Study – Field Site Alternative Routes (M-59)		

Overview

Fishbeck has been providing traffic engineering services for the Levy site in Springfield Township, Oakland County, Michigan. Per our conference call on October 4, 2023 the following routes have been evaluated:

2a. Ormond Road ⟺ Davisburg Road ⟺ Milford Road ⟺ Clyde Road ⟺ Hickory Ridge ⟺ M-59

2b. Ormond Road ⟺ Davisburg Road ⟺ Milford Road ⟺ M-59

Along these alternative haul routes, the following intersections will experience truck turning movements and are therefore included in this evaluation:

a. Ormond Road and Davisburg Road (minor stop-control);
b. Davisburg Road and Milford Road (minor stop-control);
c. Milford Road and Clyde Road East (all-way stop-control);
d. Milford Road and Clyde Road West (all-way stop-control);
e. Clyde Road and Hickory Ridge Road (all-way stop-control);
f. Hickory Ridge Road and M-59 (signalized boulevard);
g. M-59 and WB to EB Crossover at Hickory Ridge Road (signalized); and
h. M-59 and EB to WB Crossover at Hickory Ridge Road (signalized).

Evaluation of these alternative haul routes included completion of the following key tasks:

1. Visit the site and drive these alternative routes, while recording photos and videos. General observation of pavement conditions were noted and PASER ratings were evaluated based on current conditions.
2. Review current Road Commission for Oakland County (RCOC) and Michigan Department of Transportation (MDOT) maps to identify currently published PASER ratings, classifications, and truck operator designations (seasonal restrictions).
3. Develop maps to highlight key observations from the field review including areas of interest that may relate to hauling operations.

4. Collect turning movement count data at each of the study intersections on a single weekday from 7:00to 9:00 a.m. and 4:00 to 6:00 p.m. and identify the peak hour volumes at each intersection.
5. Model the study intersections along the alternative routes in Synchro traffic analysis software and evaluate operations (vehicle delay, Level of Service, queues) with and without the proposed hauling activity.

Field Review

Fishbeck engineers visited the site and drove the alternative haul routes on October 18, 2023. Field notes, photos, and videos were condensed into PDF maps and Google Earth KMZ files that provide an overview of physical elements along the alternative haul routes. Recorded observations include intersection traffic controls, speed limits, PASER ratings, centerline corrugations, and shoulder widths. A secure cloud file location has been established to deliver these materials for review by Levy.

Operations

Operational results were calculated based on Highway Capacity Manual (HCM) methodologies based on the recorded traffic volumes, intersection geometries, and traffic controls. Overall, the network operates acceptably and will continue to do so with the proposed hauling operation. Changes to vehicle delay and Level of Service are negligible. Current intersection operations are not expected to inhibit hauling operations. Results for future conditions with and without the proposed project are outlined in tables on the following pages of this memo.

Two operational deficiencies were noted in the analyses of future conditions. These issues are currently present and are respective of movements not on the proposed haul routes:

Haul Route 2a (Hickory Ridge Road Route)

At the intersection of M-59 (Highland Road) and Hickory Ridge Road, the NB right turn movement and the NB approach operate at LOS F in the p.m. peak hour. Additionally, significant queueing occurs on this approach, with 95th percentile queues of 991 feet (40 vehicles) in the northbound direction. Currently, there is 100 feet of storage for the right turn movement (4-5 vehicles). During the p.m. peak hour, the NB right turn movement is approximately 2 times heavier than the NB thru movement. The NB right turn movement exceeds the provided storage length for the majority of the peak hour, leading to the queueing issues for northbound traffic. It is not uncommon for thru traffic to be stuck behind a right turning vehicle waiting to merge into the right turn lane and missing the green phase due to these delays.

Haul Route 2b (Milford Road Route)

At the intersection of M-59 (Highland Road) and Milford Road, the EB right turn movement operates at a LOS E in the a.m. and p.m. peak hours. Review of the 95th percentile queue lengths indicates that the 95th percentile queue does not exceed 152 feet (6 vehicles) in the a.m. peak hour and 152 feet (6 vehicles) in the p.m. peak hour. Both of these queue lengths are typical for a signalized intersection.

Outcomes

Based on our field observations, modeling, and analysis of the alternative haul routes, we believe the decision to utilize either of these routes would be based on the physical rather than operational characteristics. Factors such as pavement condition, shoulder widths, curvature/turning radii, and adjacent land uses are expected to drive decision-making rather than operational impacts or concerns. We recommend the best course of action is to review these findings with you to determine Levy's direction to select a preferred route, update the traffic impact study report, and/or conduct further investigation.

Table 1 – LOS Analysis for No-Build Conditions – Haul Route 2a (without hauling operations)

Approach	Lane Group	LOS/Delay(s)			
		a.m. Peak Hour		p.m. Peak Hour	
Ormond Road and Davisburg Road (NB Stop-Controlled)					
EB Davisburg Road	Thru	A	0.0	A	0.0
	Right	A	0.0	A	0.0
	Overall	A	0.0	A	0.0
WB Davisburg Road	Left	A	8.1	A	7.9
	Thru	A	0.0	A	0.0
	Overall	A	4.0	A	3.6
NB Ormond Road	Overall	B	12.0	B	14.0
	Overall	A	4.8	A	5.5
Milford Road and Davisburg Road (EB/WB Stop-Controlled)					
EB Davisburg Road	Overall	C	16.7	B	13.2
WB Davisburg Road	Overall	B	12.4	B	13.9
NB Milford Road	Overall	A	0.0	A	0.1
SB Milford Road	Overall	A	3.2	A	3.6
	Overall	A	4.8	A	5.5
Milford Road and Harvey Lake Road and White Lake Road (All-Way Stop-Controlled)					
EB Milford Road	Overall	B	11.0	B	14.9
WB White Lake Road	Overall	B	11.1	C	15.2
NB Harvey Lake Road	Left/Thru	A	9.9	C	17.7
	Right	A	9.0	A	9.5
	Overall	A	9.5	C	16.1
SB Milford Road	Left/Thru	B	12.6	B	12.4
	Right	A	8.5	A	9.6
	Overall	B	11.7	B	11.7
	Overall	B	11.0	B	14.9
Milford Road and Clyde Road (All-Way Stop-Controlled)					
EB Clyde Road	Overall	A	8.4	A	9.8
WB Milford Road	Overall	A	9.0	B	10.6
NB Milford Road	Overall	A	8.3	A	9.9
	Overall	A	8.6	B	10.1
Hickory Ridge Road and Clyde Road (All-Way Stop-Controlled)					
EB Clyde Road	Left	B	10.1	B	10.3
	Thru/Right	B	10.2	B	10.1
	Overall	B	10.2	B	10.2
WB Clyde Road	Left	B	11.2	B	10.5
	Thru/Right	A	9.7	B	10.8
	Overall	B	10.7	B	10.7
NB Hickory Ridge Road	Left	A	9.3	A	9.6
	Thru/Right	B	10.4	C	15.7
	Overall	B	10.3	B	15.0
SB Hickory Ridge Road	Left	A	9.5	A	9.7
	Thru/Right	B	14.7	B	10.1
	Overall	B	14.0	A	10.0
	Overall	B	12.2	B	12.5
M-59 (Highland Road) and Hickory Ridge Road (Signalized)					
EB M-59 (Highland Road)	Thru	A	6.3	A	8.2
	Right	A	3.5	A	2.0
	Overall	A	5.5	A	7.2
WB M-59 (Highland Road)	Thru	B	10.6	A	9.8
	Right	A	9.9	A	2.6
	Overall	B	10.6	A	8.8
NB Hickory Ridge Road	Thru	C	23.8	C	32.4
	Right	C	33.1	F	158.0
	Overall	C	31.2	F	111.9
SB Hickory Ridge Road	Thru	C	34.3	C	26.0
	Right	C	26.0	C	26.5
	Overall	C	30.9	C	26.3
	Overall	B	15.6	D	38.6
EB M-59 (Highland Road) and WB to EB Crossover/True Value Hardware (Signalized)					
EB M-59 (Highland Road)	Overall	A	8.6	A	6.8
NB True Value Hardware	Overall	C	24.4	C	28.1
SB Crossover	Overall	C	27.9	C	28.0
	Overall	B	11.5	A	9.7
WB M-59 (Highland Road) and EB to WB Crossover (Signalized)					
WB M-59 (Highland Road)	Overall	A	6.6	B	15.1
NB Crossover	Overall	D	47.2	C	32.3
	Overall	B	12.6	B	19.6

Table 2 – LOS Analysis for Future Conditions – Haul Route 2a (with hauling operations)

Approach	Lane Group	LOS/Delay(s)			
		a.m. Peak Hour		p.m. Peak Hour	
Ormond Road and Davisburg Road (NB Stop-Controlled)					
EB Davisburg Road	Thru	A	0.0	A	0.0
	Right	A	0.0	A	0.0
	Overall	A	0.0	A	0.0
WB Davisburg Road	Left	A	8.2	A	7.9
	Thru	A	0.0	A	0.0
	Overall	A	4.1	A	3.6
NB Ormond Road	Overall	B	14.4	C	17.7
	Overall	A	5.6	A	6.9
Milford Road and Davisburg Road (EB/WB Stop-Controlled)					
EB Davisburg Road	Overall	C	17.1	B	13.4
WB Davisburg Road	Overall	C	17.4	C	17.4
NB Milford Road	Overall	A	0.0	A	0.1
SB Milford Road	Overall	A	3.2	A	3.6
	Overall	A	6.2	A	6.7
Milford Road and Harvey Lake Road and White Lake Road (All-Way Stop-Controlled)					
EB Milford Road	Overall	C	15.1	C	19.0
WB White Lake Road	Overall	B	11.7	C	16.3
NB Harvey Lake Road	Left/Thru	B	10.5	C	19.1
	Right	A	9.4	A	9.8
	Overall	A	10.0	C	17.3
SB Milford Road	Left/Thru	B	13.4	B	12.9
	Right	A	9.2	B	10.3
	Overall	B	12.2	B	12.0
	Overall	B	12.6	C	16.6
Milford Road and Clyde Road (All-Way Stop-Controlled)					
EB Clyde Road	Overall	A	9.2	B	10.9
WB Milford Road	Overall	A	9.1	B	11.2
NB Milford Road	Overall	A	8.4	B	10.3
	Overall	A	9.0	B	10.8
Hickory Ridge Road and Clyde Road (All-Way Stop-Controlled)					
EB Clyde Road	Left	B	10.4	B	10.5
	Thru/Right	B	10.5	B	10.3
	Overall	B	10.5	B	10.4
WB Clyde Road	Left	B	12.6	B	11.9
	Thru/Right	A	9.9	B	11.0
	Overall	B	11.8	B	11.4
NB Hickory Ridge Road	Left	A	9.5	A	9.7
	Thru/Right	B	11.2	C	17.6
	Overall	B	11.1	C	16.8
SB Hickory Ridge Road	Left	A	9.8	A	9.9
	Thru/Right	C	15.5	B	10.4
	Overall	B	14.7	B	10.3
	Overall	B	12.8	B	13.6
M-59 (Highland Road) and Hickory Ridge Road (Signalized)					
EB M-59 (Highland Road)	Thru	A	6.5	A	8.2
	Right	A	3.6	A	1.5
	Overall	A	5.6	A	7.0
WB M-59 (Highland Road)	Thru	B	11.3	A	9.3
	Right	B	12.1	A	2.9
	Overall	B	11.4	A	8.3
NB Hickory Ridge Road	Thru	C	23.8	C	32.4
	Right	C	33.5	F	158.0
	Overall	C	31.6	F	111.9
SB Hickory Ridge Road	Thru	C	34.3	C	26.0
	Right	C	28.0	C	27.9
	Overall	C	31.6	C	27.2
	Overall	B	16.4	D	38.3
EB M-59 (Highland Road) and WB to EB Crossover/True Value Hardware (Signalized)					
EB M-59 (Highland Road)	Overall	A	9.3	A	7.4
NB True Value Hardware	Overall	C	23.8	C	27.4
SB Crossover	Overall	C	29.0	C	29.1
	Overall	B	12.3	B	10.5
WB M-59 (Highland Road) and EB to WB Crossover (Signalized)					
WB M-59 (Highland Road)	Overall	A	7.4	B	16.2
NB Crossover	Overall	D	46.9	C	32.0
	Overall	B	13.6	C	20.4
Ormond Road and Site Driveway (EB Stop-Controlled)					
EB Site Driveway	Overall	B	13.3	B	13.9
NB Ormond Road	Overall	A	0.2	A	0.0
SB Ormond Road	Overall	A	0.0	A	0.0
	Overall	A	0.8	A	0.7

Table 3 – LOS Analysis for No-Build Conditions – Haul Route 2b (without hauling operations)

Approach	Lane Group	LOS/Delay(s)			
		a.m. Peak Hour		p.m. Peak Hour	
Ormond Road and Davisburg Road (NB Stop-Controlled)					
EB Davisburg Road	Thru	A	0.0	A	0.0
	Right	A	0.0	A	0.0
	Overall	A	0.0	A	0.0
WB Davisburg Road	Left	A	8.1	A	7.9
	Thru	A	0.0	A	0.0
	Overall	A	4.0	A	3.6
NB Ormond Road	Overall	B	12.0	B	14.0
	Overall	A	4.8	A	5.5
Milford Road and Davisburg Road (EB/WB Stop-Controlled)					
EB Davisburg Road	Overall	C	16.7	B	13.2
WB Davisburg Road	Overall	B	12.4	B	13.9
NB Milford Road	Overall	A	0.0	A	0.1
SB Milford Road	Overall	A	3.2	A	3.6
	Overall	A	4.8	A	5.5
Milford Road and Harvey Lake Road and White Lake Road (All-Way Stop-Controlled)					
EB Milford Road	Overall	B	11.0	B	14.9
WB White Lake Road	Overall	B	11.1	C	15.3
NB Harvey Lake Road	Left/Thru	A	9.9	C	17.7
	Right	A	9.0	A	9.5
	Overall	A	9.5	C	16.1
SB Milford Road	Left/Thru	B	12.6	B	12.5
	Right	A	8.5	A	9.6
	Overall	B	11.7	B	11.8
	Overall	B	11.0	B	14.9
Milford Road and Clyde Road (All-Way Stop-Controlled)					
EB Clyde Road	Overall	A	8.4	A	9.8
WB Milford Road	Overall	A	9.0	B	10.6
NB Milford Road	Overall	A	8.3	A	9.9
	Overall	A	8.6	B	10.1
Milford Road and E Wardlow Road/Apollo Center Bus Driveway (Signalized)					
EB Apollo Center Bus Driveway	Left	C	20.5	A	0.0
	Thru/Right	B	19.8	B	19.8
	Overall	C	20.2	B	19.8
WB Wardlow Road	Left	C	22.6	C	21.8
	Thru/Right	C	20.2	C	21.0
	Overall	C	22.2	C	21.5
NB Milford Road	Left/Thru	A	8.4	B	11.6
	Right	A	8.0	A	8.5
	Overall	A	8.3	B	11.0
SB Milford Road	Left	A	9.4	B	15.2
	Thru/Right	B	10.2	A	9.5
	Overall	B	10.2	B	10.2
	Overall	B	11.9	B	12.1
M-59 (Highland Road) and Milford Road (Signalized)					
EB M-59 (Highland Road)	Left	B	15.9	B	18.3
	Thru	C	24.5	C	26.0
	Right	E	56.6	E	69.5
	Overall	C	29.5	C	33.6
WB M-59 (Highland Road)	Thru	B	11.7	B	17.8
	Right	A	7.9	A	9.1
	Overall	B	11.3	B	16.9
NB Hickory Ridge Road	Thru	C	23.9	C	28.0
	Right	C	25.8	C	32.5
	Overall	C	25.1	C	30.3
SB Milford Road	Thru	C	29.5	C	23.9
	Right	C	26.3	C	23.3
	Overall	C	28.1	C	23.7
	Overall	C	25.2	C	29.8
EB M-59 (Highland Road) and WB to EB Crossover (Signalized)					
EB M-59 (Highland Road)	Overall	B	12.4	B	12.3
SB Crossover	Overall	B	19.7	C	24.5
	Overall	B	13.9	B	14.9
WB M-59 (Highland Road) and EB to WB Crossover (NB Stop-Controlled)					
WB M-59 (Highland Road)	Overall	A	0.0	A	0.0
NB Crossover	Overall	B	14.5	C	19.0
	Overall	A	0.4	A	1.1

Table 4 – LOS Analysis for Future Conditions – Haul Route 2b (with hauling operations)

Approach	Lane Group	LOS/Delay(s)			
		a.m. Peak Hour		p.m. Peak Hour	
Ormond Road and Davisburg Road (NB Stop-Controlled)					
EB Davisburg Road	Thru	A	0.0	A	0.0
	Right	A	0.0	A	0.0
	Overall	A	0.0	A	0.0
WB Davisburg Road	Left	A	8.2	A	8.0
	Thru	A	0.0	A	0.0
	Overall	A	4.1	A	3.7
NB Ormond Road	Overall	B	13.6	B	17.8
	Overall	A	5.3	A	6.7
Milford Road and Davisburg Road (EB/WB Stop-Controlled)					
EB Davisburg Road	Overall	C	17.1	B	13.4
WB Davisburg Road	Overall	C	17.4	B	17.4
NB Milford Road	Overall	A	0.0	A	0.1
SB Milford Road	Overall	A	3.2	A	3.6
	Overall	A	6.2	A	6.7
Milford Road and Harvey Lake Road and White Lake Road (All-Way Stop-Controlled)					
EB Milford Road	Overall	C	15.1	C	19.0
WB White Lake Road	Overall	B	11.7	C	16.3
NB Harvey Lake Road	Left/Thru	B	10.5	C	19.1
	Right	A	9.4	A	9.8
	Overall	A	10.0	C	17.3
SB Milford Road	Left/Thru	B	13.4	B	12.9
	Right	A	9.2	B	10.3
	Overall	B	12.2	B	12.0
	Overall	B	12.6	C	16.6
Milford Road and Clyde Road (All-Way Stop-Controlled)					
EB Clyde Road	Overall	A	8.6	B	10.1
WB Milford Road	Overall	B	10.1	B	12.1
NB Milford Road	Overall	A	8.5	B	10.5
	Overall	A	9.2	B	11.0
Milford Road and E Wardlow Road/Apollo Center Bus Driveway (Signalized)					
EB Apollo Center Bus Driveway	Left	C	20.5	A	0.0
	Thru/Right	B	19.8	B	19.8
	Overall	C	20.2	B	19.8
WB Wardlow Road	Left	C	22.6	C	21.8
	Thru/Right	C	20.2	C	21.0
	Overall	C	22.2	C	21.5
NB Milford Road	Left/Thru	A	8.8	B	12.2
	Right	A	8.0	A	8.5
	Overall	A	8.6	B	11.4
SB Milford Road	Left	A	9.9	B	16.1
	Thru/Right	B	10.7	A	9.9
	Overall	B	10.7	B	10.6
	Overall	B	12.1	B	12.5
M-59 (Highland Road) and Milford Road (Signalized)					
EB M-59 (Highland Road)	Left	B	16.0	B	18.3
	Thru	C	24.8	C	26.1
	Right	E	56.0	E	68.4
	Overall	C	29.5	C	33.3
WB M-59 (Highland Road)	Thru	B	11.9	B	17.8
	Right	A	8.2	A	9.4
	Overall	B	11.4	B	16.9
NB Hickory Ridge Road	Thru	C	23.7	C	28.0
	Right	C	25.6	C	32.5
	Overall	C	25.0	C	30.3
SB Milford Road	Thru	C	29.1	C	23.9
	Right	C	28.9	C	24.8
	Overall	C	29.0	C	24.3
	Overall	C	25.3	C	29.7
EB M-59 (Highland Road) and WB to EB Crossover (Signalized)					
EB M-59 (Highland Road)	Overall	B	12.4	B	12.4
SB Crossover	Overall	C	20.8	C	25.0
	Overall	B	14.2	B	15.1
WB M-59 (Highland Road) and EB to WB Crossover (NB Stop-Controlled)					
WB M-59 (Highland Road)	Overall	A	0.0	A	0.0
NB Crossover	Overall	C	15.3	C	20.1
	Overall	A	0.5	A	1.2
Ormond Road and Site Driveway (EB Stop-Controlled)					
EB Site Driveway	Overall	B	13.3	B	12.8
NB Ormond Road	Overall	A	0.2	A	0.0
SB Ormond Road	Overall	A	0.0	A	0.0
	Overall	A	0.8	A	0.8

By email
Copy: Alyssa Wambold, PE, PTOE – Fishbeck
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Memo

TO:	Thomas Forster – Varnum LLP *Attorney-Client Privilege*		
FROM:	Timothy J. Likens, PE, PTOE		
DATE:	January 17, 2024	PROJECT NO.:	230233
SUBJECT:	Traffic Impact Study – Field Site Alternative Routes (M-59)		

Fishbeck has been providing traffic engineering services for the Levy site in Springfield Township, Oakland County, Michigan. To date, Fishbeck has delivered site observation materials and findings, as well as a draft traffic impact study report relative to this fixed haul route. Fishbeck also provided a memorandum dated December 20, 2023 which outlined findings of an operational analysis utilizing Milford Road and Hickory Ridge between the site and M-59.

Subsequent to completion of this work, Fishbeck staff met virtually with Levy on January 10, 2024. During this meeting the team discussed key findings of the alternative route analysis and field investigation. The following summarize those findings, points of discussion, and related information:

1. The study intersections along the alternative routes operate acceptably, resulting in the following conclusions:
    a. New truck traffic would not adversely impact operations along the alternative routes.
    b. Material hauling would not be inhibited by existing capacity deficiencies along the alternative routes.
2. Trucks destined for M-59 must make a left-turn from STOP from WB Davisburg Road to SB Milford Road. Operational results indicate that adequate gaps are available on Milford Road to complete this turn; however, there is a horizontal curve on Milford Road to the north. Overhead flashing beacons (amber for Milford Road, red for Davisburg Road) are installed above the intersection to enhance safety.
    a. Generally, vegetation clearing at intersections to improve sight distance may be desirable to both Levy and Oakland County.
3. South of Clyde Road, considerations for the use of Milford Road versus Hickory Ridge Road include:
    a. Milford Road is abutted by more densely developed land uses than Hickory Ridge Road.
    b. Traffic along Milford Road will encounter an additional traffic signal; whereas traffic along Hickory Ridge Road will encounter an additional 4-way STOP.
    c. 2023 PASER pavement condition ratings indicate fair to good pavement conditions along both alternative routes. Milford Road was resurfaced in 2019 within the limits of Highland Township.

4. The intersections of M-59 with Milford Road and Hickory Ridge Road are controlled by traffic signals and indirect left-turns (crossovers), except as noted below. Turning movements operate acceptably and turn lane storage lengths are adequate to accommodate additional truck volumes.
    a. The left-turn movement from EB M-59 to NB Milford Road is currently permitted directly at Milford Road, which is atypical of a boulevard with crossovers but functions acceptably.
    b. Portions of M-59 have recently been resurfaced and traffic signals modernized in this vicinity; therefore, removal of this direct left-turn in the immediate future is not expected.
    c. Truck traffic on EB M-59 destined for NB Milford Road should continue to utilize the signalized direct left-turn at Milford Road; whereby the EB to WB crossover east of Milford Road is STOP controlled with limited visibility of conflicting WB traffic over a crest vertical curve.
    d. Although unlikely in the near term, future elimination of this direct left-turn is expected to trigger the need for signalization of the EB to WB crossover on M-59 east of Milford Road.
5. The Road Commission for Oakland County (RCOC) truck operator's map indicates that Milford Road is "Designated" (formerly Class A) between Davisburg Road and M-59. Hickory Ridge Road is "Special Designated" between Clyde Road and M-59; however, Clyde Road is classified "Normal" (formerly Class B) between Milford Road and Hickory Ridge Road (approximately 2.25 miles).
    a. "Designated" routes carry a 25% weight reduction when Spring restrictions are in force. "Normal" routes carry a 35% reduction when Spring restrictions are in place. "Special Designated" routes do not typically carry a Spring weight restriction.
6. Michigan Department of Transportation (MDOT) Annual Average Daily Traffic (AADT) volume maps indicate the following existing (2022) two-way volumes of total and commercial (heavy vehicle) traffic. These data indicate these roadways carry approximately 3% heavy vehicle traffic. Peak hour data collected by Fishbeck across the study network indicates similar overall percentages.

Study Area AADT/CAADT Volumes (vehicles per day)

Roadway	AADT	CAADT
Ormond Road	3229	93
Davisburg Road	4054	117
Milford Road (N of Clyde)	4857	142
Milford Road (S of Clyde)	11830	343
Clyde Road	3258	95
Hickory Ridge Road	7303	212

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