Finding of Fact and Conclusion of Law

The Michigan Department of Environmental Quality, Water Resources Division (WRD) has completed review of permit application # 2NN-5PE0-MT3W
April 30, 2018

Regulatory Authority

The application was submitted under authority of the following Parts of the Natural Resources and Environmental Protection Act 451 of 1994, as amended:
Part 31, Water Resources Protection.
Part 301, Inland Lakes and Streams;
Part 303, Wetland Protection;
Part 13, Permits

Finding

After due consideration of the permit application, on-site investigation and review of other pertinent materials, the WRD finds that the project does not demonstrate that an unacceptable disruption to the aquatic resources of the State will not occur and that the activities associated with the project are not consistent with the permitting criteria for an acceptable impact to the resources regulated under Parts 301, Inland Lakes and Streams, and Part 303, Wetlands Protection.

Floodplain Authority Found in Part 31, Water Resources Protection
Part 13. Rules for Floodplains and Floodways

Definition of Floodplain Authority as found in Part 31:

324.3104 Cooperation and negotiation with other government as to water resources; alteration of water courses; federal assistance; formation of Great Lakes aquatic nuisance species coalition; report; requests for appropriations; recommendations; permit to alter floodplain; application; fees; disposition of fees; other acts subject to single highest permit fee.

Sec. 3104. (1) The department is designated the state agency to cooperate and negotiate with other governments, governmental units, and governmental agencies in matters concerning the water resources of the state, including, but not limited to, flood control, beach erosion control, water quality control planning, development, and management, and the control of aquatic nuisance species. The department shall have control over the alterations of natural or present watercourses of all rivers and streams in the state to assure that the channels and portions of the floodplains that are the floodways are not inhabited and are kept free and clear of interference or obstruction that will cause any undue restriction of the capacity of the floodway. The department may take steps as may be necessary to take advantage of any act of congress that may be of

assistance in carrying out the purposes of this part, including the water resources planning act, 42 USC 1962 to 1962d-3, and the federal water pollution control act, 33 USC 1251 to 1387.

Finding: Section 324.3104(1) establishes the WRD's legal basis for requiring a Part 31 permit for the proposed activities, as some activities are proposed within the floodplain of the Menominee River.

Sec. 3104. (4) A person shall not alter a floodplain except as authorized by a floodplain permit issued by the department pursuant to Part 13. An application for a permit shall include information that may be required by the department to assess the proposed alteration's impact on the floodplain. If an alteration includes activities at multiple locations in a floodplain, 1 application may be filed for combined activities.

Finding: The project plans propose installation of 11.0 cu.yds. of rock riprap and an 15-inch diameter HDPE discharge pipe within the floodplain of the Menominee River. Therefore, per Section 324.3104(4), review under the Floodplain Authority found in Part 31 is required. The WRD received all of the information required to assess the impacts of the proposed alteration of the floodplain.

324.3108 Unlawful occupation, filling, or grading of floodplain, stream bed, or channel of stream; exceptions; construction of building with basement.

Sec. 3108. (1) A person shall not occupy or permit the occupation of land for residential, commercial, or industrial purposes or fill or grade or permit the filling or grading for a purpose other than agricultural of land in a floodplain, stream bed, or channel of a stream, as ascertained and determined for the record by the department, or undertake or engage in an activity on or with respect to land that is determined by the department to interfere harmfully with the discharge or stage characteristics of a stream, unless the occupation, filling, grading, or other activity is permitted under this part.

Finding: The proposed discharge pipe and riprap installation within the river's floodplain are for a purpose other than agriculture. Therefore, the proposed activities require a permit under Part 31.

R323.1311 Definitions

Rule 311. As used in this part:

(a) "A 100-year flood" means a flood with a magnitude which has a 1% chance of occurring or being exceeded in any given year.

(b) "Department" means the Michigan department of environmental quality.

(c) "Encroachment" means any structure, filling, grading, or deposition of materials in, upon, across, or projecting into, a floodplain, channel, or floodway.

(d) "Flood" means a temporary increase in the stage of a river or stream resulting in the inundation of lands not normally covered by water.

(e) "Floodplain" means that area of land adjoining a river or stream that will be inundated by a 100-year flood.
(f) "Floodway" means the channel of a river or stream and the portions of the floodplain adjoining the channel that are reasonably required to carry and discharge a 100-year flood.
(g) "Harmful interference" means causing an increased stage or change in direction of flow of a river or stream that causes, or is likely to cause, any of the following:
(i) Damage to property.
(ii) A threat to life.
(iii) A threat of personal injury.
(iv) Pollution, impairment, or destruction of water or other natural resources.

Finding: The proposed riprap and discharge pipe within the Floodplain constitute fill and a structure, and are therefore defined as an Encroachment.

The Floodplain as defined above was delineated by the permit applicant, based on 100-year flood elevations provided to the applicant by the Department. The elevations supplied by the Department were sourced from what was determined to be the best available data, that being the September 1992 Special Study of the Menominee River completed by the U.S. Army Corps of Engineers (USACE), Detroit District. The proposed activities of installing 11 cu.yds. of riprap and the HDPE discharge pipe are the only portions of the proposed Mine Site project, which, as a result of this Floodplain delineation, lie within the Floodplain.

The proposed mine site is on a stretch of the Menominee River where floodways were not previously defined by the Federal Emergency Management Agency (FEMA), nor by USACE.

See Rule Sections below for discussion regarding Harmful Interference findings.

R 323.1312 Applicability of rules.

Rule 312. These rules do not apply to any of the following:
(a) A watershed that has a drainage area of less than 2 square miles when measured at the downstream limits of the proposed project.
(b) An improvement proposed under Act No. 40 of the Public Acts of 1956, as amended, being §280.1 et seq. of the Michigan Compiled Laws.
(c) A flood control project designed by the United States army corps of engineers.
(d) A flood control project designed by the United States soil conservation service.
(e) Bridge or culvert replacements, upon certification, by the owner or by the owner's engineering consultant, that the replacement is designed with an equal or of greater hydraulic capacity, that the existing bridge or culvert and its approaches do not cause harmful interference, and that deletion of existing auxiliary openings and road overflow areas is not planned.
(f) New bridges or culverts, upon certification, by the owner or by the owner's engineering consultant, that the bridge or culvert is designed to pass the 100-year flood without causing harmful interference. Preliminary bridge or culvert plans, hydraulic waterway design

calculations and construction methods, and procedures covering protection of natural resources shall be furnished with the certification to the department.
(g) The extension of an existing bridge or culvert where the total extended length is not more than 24 feet.
(h) A deck replacement of an existing bridge or resurfacing over an existing culvert.
(i) A roadway resurfacing project where the road grade or shoulders will be increased only by the addition of a new wearing course.
(j) Utility crossings of a floodplain where the floodplain will be restored essentially to existing elevations.
(k) Noncommercial piers, docks, spring piles, pile clusters, and streambank restorations, including seawalls, bulkheads, and other permanent revetment structures, that are classified as minor projects under R 281.816 (1) (a), (b), and (c).
(l) Excavating or dredging activities where dredged materials are placed in an upland area that is out of the floodplain.
(m) Boat ramps that conform to existing streambank contours.

Finding: The proposed activities within the Floodplain do not meet any of the definitions of exempt activities listed in Rule 312. Therefore, it requires a permit to be issued by the WRD.

R 323.1315 Criteria for determining permissibility of encroachments.

Rule 315.
(1) An encroachment in the floodway which, acting alone or in combination with existing or future similar works, may cause harmful interference shall not be approved. In making this determination, an analysis shall be made for a range of discharges up to and including the 100-year flood discharge modified to reflect changes in land use and development reasonably anticipated to occur within the watershed up to twenty years from the date of application.
(2) A bridge or culvert, constructed or reconstructed, shall be capable of passing the 100-year flood without causing harmful interference.
(3) An encroachment in the floodplain, landward of the floodway limits, which, acting alone or in combination with existing or future similar works, does not cause harmful interference may be permitted.

Finding: The proposed activities of installing 11.0 cu.yds. of riprap and one 18-inch diameter HDPE discharge pipe are proposed within the Floodplain of the Menominee River. Based on available site and topographic data provided by the applicant, as well as an on-site field inspection of the proposed discharge pipe location, it appears unlikely that the discharge pipe and riprap are located within the Floodway. Given this information, along with the proposed volume, orientation and location of the proposed riprap and pipe, it is not anticipated that these activities will cause a flood stage increase, and therefore will not cause a Harmful Interference.

After due consideration of the permit application, on-site investigation and review of other pertinent materials, the WRD finds:

The activities proposed within the 100-year floodplain of the Menominee River will not cause a Harmful Interference to flood flows, and as such are permittable under the Floodplain Authority found in Part 31 and the Administrative Rules for Floodplains and Floodways.

Inland Lakes and Streams Review Criteria

324.30101 Definitions (applicable)

(i) "Inland lake or stream" means a natural or artificial lake, pond, or impoundment; a river, stream, or creek which may or may not be serving as a drain as defined by the drain code of 1956, 1956 PA 40, MCL 280.1 to 280.630; or any other body of water that has definite banks, a bed, and visible evidence of a continued flow or continued occurrence of water, including the St. Marys, St. Clair, and Detroit rivers. Inland lake or stream does not include the Great Lakes, Lake St. Clair, or a lake or pond that has a surface area of less than 5 acres.

(n) "Project" means an activity that requires a permit pursuant to section 30102.

(q) "Riparian interest area" means that portion of an inland lake or stream over which a riparian owner has an ownership interest.

(r) "Riparian owner" means a person who has riparian rights.

(s) "Riparian rights" means those rights which are associated with the ownership of the bank or shore of an inland lake or stream.

R281.811 Definitions (applicable)

(f) "Public trust" means all of the following:
- (i) The paramount right of the public to navigate and fish in all inland lakes and streams that are navigable.
- (ii) The perpetual duty of the state to preserve and protect the public's right to navigate and fish in all inland lakes and streams that are navigable.
- (iii) The paramount concern of the public and the protection of the air, water, and other natural resources of this state against pollution, impairment, and destruction.
- (iv) The duty of the state to protect the air, water, and other natural resources of this state against pollution, impairment, or destruction.

(2) "Riparian rights," as defined in the act, means all the rights accruing to the owners of riparian property, including the following rights, subject to the public trust:
- (a) Access to the navigable waters.
- (b) Dockage to boatable waters, known as wharfage.
- (c) Use of water for general purposes, such as bathing and domestic use.
- (d) Title to natural accretions.

324.30102 Operations prohibited without permit; exception.

Sec. 30102. (1) Except as provided in this part, a person without a permit from the department shall not do any of the following:

(a) Dredge or fill bottomland.

(b) Construct, enlarge, extend, remove, or place a structure on bottomland.

(c) Construct, reconfigure, or expand a marina.

(d) Create, enlarge, or diminish an inland lake or stream.

(e) Structurally interfere with the natural flow of an inland lake or stream.

(f) Construct, dredge, commence, extend, or enlarge an artificial canal, channel, ditch, lagoon, pond, lake, or similar waterway where the purpose is ultimate connection with an existing inland lake or stream, or where any part of the artificial waterway is located within 500 feet of the ordinary high-water mark of an existing inland lake or stream.

(g) Connect any natural or artificially constructed waterway, canal, channel, ditch, lagoon, pond, lake, or similar water with an existing inland lake or stream for navigation or any other purpose.

(2) A person shall not remove submerged logs from rivers or streams for the purpose of submerged log recovery. This subsection does not prohibit the department from issuing a permit under this part for other purposes, including removing logjams or removing logs that interfere with navigation of the river or stream.

Finding: The applicant proposes to place fill material within 253 linear feet of stream channel and to drain or redirect water inflow that will diminish flow in 297 linear feet of stream channel. The application also proposes the placement of 11 cubic yards of riprap water ward of the ordinary high watermark of the Menominee River for the purpose of erosion control associated with an outfall pipe proposed above the ordinary high water mark.

A permit is required under Section 301.

324.30106, Prerequisite to issuance of permit; specification in permit:

The department shall issue a permit if it finds that the structure or project will not adversely affect the public trust or riparian rights. In passing upon an application, the department shall consider the possible effects of the proposed action upon the inland lake or stream and upon waters from which or into which its waters flow and the uses of all such waters, including uses for recreation, fish and wildlife, aesthetics, local government, agriculture, commerce, and industry. The department shall not grant a permit if the proposed project or structure will unlawfully impair or destroy any of the waters or other natural resources of the state. This part does not modify the rights and responsibilities of any riparian owner to the use of his or her riparian water. A permit shall specify that a project completed in accordance with this part shall not cause unlawful pollution as defined by part 31.

Finding: In consideration of the possible effects of the proposed action upon the inland lake or stream, the Water Resources Division (WRD) reviewed the information provided in the application. The direct placement of fill material within 253 linear feet of channel will result in the permanent loss of the stream habitat and function. The project proposes that the fill material

will remain in this location permanently and there will be a complete loss of the resource function and value.

The project proposes to drawdown regional groundwater by means of installing a pump in the proposed mine pit. There are known streams within the modeled drawdown envelope. The WRD provided guidance to the applicant in a correction request letter issued on January 17, 2017 that stated: "Provide significant detail on proposed pit dewatering and the impacts this activity will have on groundwater levels in regulated wetlands and streams. Provide significant detail on how dewatering operations may impact wetlands and streams. As previously discussed, all ground water and surface water impacts both within the project area and on adjacent properties must be accessed for changes in the hydrologic regime. Impacts that alter the hydrologic regime six inches or greater may be considered an impact to water resources. All water resources and potential impacts within this cone of depression must be identified and a thorough feasible and prudent alternatives analysis must be conducted for all potential impacts. The applicant must demonstrate that these impacts cannot be avoided or further minimized. All water resource impacts related to pit dewatering activities must be included with this wetlands, lakes and streams application."

WRD conducted a technical review of the application, which included comments received from the public hearing and public comment period. Several deficiencies have been identified with the groundwater model and the wetland watershed budgets that have led to the determination that the applicant has not provided a clear scope of impacts that will result from this project. It is the determination of the WRD that the applicant has provided information that supports a direct relationship between the groundwater and surface water resources (wetlands and streams) throughout the project site and these resources function as both recharge and discharge areas for groundwater.

Wetlands B1/B2, C1/40/41, 2b/A1/A3 support perennial streams on or near the project site. Wetlands 14 and 6 support streams on or near the project site which have been classified by the applicant as seasonal; however, limited data has been collected on these features to determine the periods of discharge. Portions of these streams exist in the modeled cone of depression and the applicant is proposing that the groundwater will be reduced in the areas indicated by this model. When groundwater levels are reduced by the proposed pit dewatering activities, the rate of infiltration below streams will be increased and the surface water flow will be diminished as more water infiltrates into the groundwater system than is currently discharging by surface water flows. The application does not acknowledge the loss of flows to regulated streams as a result of the proposed dewatering.

The extent of dewatering impacts cannot be determined by the information contained in the application. The groundwater model provided to demonstrate the extent of impacts related to dewatering is not an appropriate model to support impacts to resources at the land and water interface. (Refer to Attachment A for a WRD comments specific to the model construction and applicability.) The model is not unique to the site, specifically:

- The model uses inappropriate target levels used for the steady-state calibration that ignores wetland growing season water levels;
- Incorrect assumptions are used in the groundwater model conceptual design for wetland impact determination that ignores actual site conditions in the wetlands (for example, groundwater mounding observed in June);
- Lack of monthly seasonal variations in the transient simulations with appropriate recharge rates;
- Lack of infiltration rate information in the site wetlands;
- The use of River Boundary Cells with generic values are not representative of site wetlands;
- Not all wetlands and only portions of some wetlands identified onsite are explicitly modeled using river cells. Therefore, there is no direct connection with the definitions of the river cells to the actual wetland resource other than the information presented in the Foth groundwater modeling report that the river cells were used to help lower the mass balance error;
- The use of River Boundary Cells that are not, or cannot, be defined to correctly represent actual site wetland conditions.

The applicant provided onsite wetland and stream delineation information, soil borings, piezometer data, monitoring well locations and water levels, and information that was used to create the calibration of the groundwater model. Based upon this information, the WRD finds that the proposed impacts to regulated streams is likely underestimated as the application fails to address pit dewatering influence on increased infiltration values that will likely diminish flows and impact stream habitat, function and value.

The application asserts that some stream and wetland systems are surface water driven but the application fails to support that assertion. The applicant has not collected any flow or discharge data on the known streams, has not provided a mass balance assessment for the stream watersheds, nor provided substantive documentation to support the source of hydrology for the water body. The application states that the soil profiles onsite provide a restrictive feature that limits hydrology interaction between ground and surface water but the application fails to provide any consistent soils information that demonstrates that infiltration values are restricted by soil composition or density to the extent that stream hydrology is restricted to inputs from precipitation and runoff only.

The unnamed stream in wetland B1is located in an area where the modeled drawdown from pit dewatering is anticipated to reduce groundwater elevation by 2.5 to 10 feet for the length of the stream channel. The application provides figures and cross-sections of this area that shows a distance of ground surface to groundwater table ranging from 0-5 feet (Figure 4-6, Indirect Impacts Report, Depth to Groundwater, January 2017) to 10-15 feet (Figure 5-41, Cross-section L-L' Through WL-B3, Wetland Hydrology Impacts Report, September 2017). Referencing this information with the location of the piezometer in the wetland (PZ-10) with the ground elevation at the location of the piezometer (724.2 feet) with the recorded water elevations (723.0-724.1 feet). This information supports the WRD's assumption that the water table is at or near the ground surface during the growing season and is in a position to directly interact and influence

this stream. Impacts to the groundwater, including groundwater reductions from proposed pit dewatering, will impact this stream. The application fails to address these impacts to this resource.

There is an unnamed perennial stream located in wetland C1 and the application does not address impacts or propose to mitigate impacts to this stream. The applicant has stated that this stream and wetland system is connected to groundwater and the figures provided in the application and corresponding data supports that conclusion. The stream is located within drawdown envelope of the drawdown model. This stream is a discharging stream which flows northerly, off the property, and ultimately discharges to the Menominee River. The applicant has provided information that the groundwater elevations will be reduced 0.5-2.5 feet in this wetland complex and within areas occupied by this stream feature.

In the groundwater model, wetland C1 is represented by river cells in portions of the wetland both on and off site. The use of river cells allows the wetland and stream to hydrologically refill when the groundwater drops below the specified parameter of the cell thickness, the wetland is allowed to recharge but does not take into account the availability of water as the parameter is set at a constant rate rather than a rate of available recharge. This design in the model artificially minimizes the realized groundwater drawdown impacts by providing additional water to the wetland complex and stream. (For further details of this model, please refer to Attachment A.) The influx of water from wetlands, and specifically the location of river cells, is demonstrated in the shape of the groundwater contours provided by the model output (Figure 1 (Updated) Groundwater Drawdown and Wetland Locations, Wetland Permit Application, Version 3, August 2016).

The stream will be impacted by reductions in groundwater at this location. With a reduction of groundwater currently modeled between 0.5 and 2.5 feet, surface water infiltration will be increased through this reach and it is likely that the stream that will have a significant reduction of flow to the extent that the habitat and function of the resource will be either completely lost or substantially degraded. The assessment of impact is assumed and incomplete, being based upon the information available from WRD review at this time.

The WRD cannot assume or verify the extent and scope of impacts that the proposed action will have on this stream due to the misuse of river cells in the construction of the groundwater model and the lack of applicable data that would define a mass balance assessment on this stream's watershed; however, based upon the available information it appears that the groundwater impacts may be greater than what is demonstrated in the current groundwater model.

The application requests authorization to indirectly impact 297 linear feet of stream in wetland B1 but has not defined the criteria on how the impact has been determined. These impacts cannot not be verified or assessed.

Consideration was given to waters from which or into which stream waters flow. The project proposes reductions to groundwater which will impact the flow of streams on and near the project site. Without a relevant model and a comprehensive assessment of the mass water

balance of each stream system, it can be said that the applicant has demonstrated that the flow of these streams will be impacted but it is not demonstrated to what extent the flow will be diminished. Based upon the available information, the WRD expects the drawdown impacts to be greater than what has been modeled and provided in the application.

Consideration was also given to constituent loading in groundwater that will discharge to the land and water interface. The application proposes backfilling the pit with amended waste rock material. Most of the materials that will be removed during mining operations contain sulfides. Exposing this material to oxygen and water is expected to mobilize constituents from the mined/backfilled material at concentrations exceeding GSI criteria. Table 5-1 of the Foth modeling report estimates the projected pore water concentrations for several constituents of concern. These values exceed generic DEQ GSI criteria. The modeling report (Foth) attempts to demonstrate that these constituents will not be an issue by using a diffusion calculation (Fick's law) to show that the final concentrations will be below GSI criteria. However, using Fick's law in this way is both inappropriate (Fick's law is for one dimensional situations) and based on incorrect assumptions (i.e, the groundwater concentration gradient is calculated with a zero constituent background) and does not accurately reflect the constituent loading to the groundwater. The concentration of constituents in groundwater should be based on pilot tests that reflect the three dimensional impact of the waste rock. If concentrations are to be modeled, they should be modeled numerically with the entire volume of sulfide deposits, capable of mobilizing constituents, modeled as a whole.

Based on WRD review of the available data, the proposed mining activities will mobilize constituents and ultimately impact nearby groundwater and surface waters at the site. The use of carbonate to mitigate the effects of the ARD has been proposed for when the pit is backfilled. However, the amount of carbonate required would be enormous and the logistics/reliability of such a proposal would require a detailed plan with confirmatory pilot tests. Such a plan/report has not been provided in either the modeling report or the Mining application.

There is a high likelihood that elevated constituent concentrations will be observed in the groundwater that discharges to the Menominee River and the Shakey River. Hydraulic conductivities indicate that flow into and through the surrounding material will occur at all depths of the excavated area. However, groundwater flows/hydraulic conductivities are expected to be much higher in the shallower zones and decrease with depth. Significant flow through the host rock (crystalline Precambrian) is evidenced by several residential wells in the area that extract their water solely from these crystalline Precambrian units. Given the hydrogeologic setting, impacted groundwater from the backfilled pit is expected to migrate to local surface water sources. Assessing these impacts would require an in depth analysis using three dimensional methods. Such an analysis is not available in the documents that have been made available to the WRD.

It is the WRD's opinion that this activity would either require a Part 22 groundwater discharge permit or demonstrate that no discharge from the proposed mine area into the groundwater aquifer would occur. To demonstrate that no discharge occurs would require the pit to be lined

per Part 22 Rule 2237 liner requirements, or the applicant would have to demonstrate equivalency of such.

Consideration was also given to the uses of all such waters, including uses for recreation, fish and wildlife, aesthetics, local government, agriculture, commerce, and industry. The Menominee River is heavily used for recreational fishing near the project site. Fishing and recreation are an economic driver of the area and this activity is dependent on the water resources of the Menominee River, Shakey River and Shakey Lakes. Shakey Lakes County Park lies approximately 1.5 miles from the proposed pit and supports recreation throughout the Shakey Lakes and River system including camping, fishing, boating and swimming.

The unnamed local streams within the modeled drawdown envelope support a range of mammals, birds and aquatic organisms. The habitat structure of headwater streams and riparian corridors, similar to what is seen on and near the project site, supports nutrient development, macroinvertebrate and amphibian life cycles, and much of the biological cycle of downstream reaches in the watershed. These small, unnamed streams support sediment retention, groundwater recharge, and flood control. These streams also support the conditions of the rivers into which they flow and provide nutrient fluxes for many species in the river system, including mussels and baitfish or juvenile sport fish.

There is minimal agricultural, commerce and industry use in the direct vicinity of the project site.

R 281.814 Environmental assessment

Rule 4. In each application for a permit, all existing and potential adverse environmental effects shall be determined and the department shall not issue a permit unless the department determines both of the following:

(a) That the adverse impacts to the public trust, riparian rights, and the environment will be minimal.

(b) That a feasible and prudent alternative is not available.

Finding: (a) The WRD has determined that that adverse impacts to the public trust and the environment will not be minimal.

(b) The applicant has failed to demonstrate that no feasible and prudent alternative is available. To meet this requirement, the application would have to demonstrate that no discharge from the proposed mine area into the groundwater aquifer will occur. The applicant would also have to demonstrate that pit dewatering will not result in the degradation of the habitat, function and value of streams through diminishment of flows. The application does not demonstrate any feasible and prudent alternatives that meet these permitting requirements.

In consideration of the permitting requirements of Part 30106: The WRD determines that the project has a high likelihood of adversely impacting the public trust through the long-term constituent concentrations that will be carried in groundwater and discharge to surface waters at the land and water interface. These concentrations will alter the water quality of the unnamed

streams and riparian wetlands that discharge to the Menominee River. The constituents also are anticipated to discharge directly to the Menominee River as groundwater that will travel through the backfilled pit discharges to the River. Due to the lack of substantiating information in the application, the WRD cannot determine with any certainty where or to what extent the constituents will migrate once the pit has backfilled with groundwater and groundwater direction balances to a post-operational flow, but it is a known condition that groundwater flows away from the site into the Menominee and Shakey River watersheds and that mobilized constituents in concentrations will follow those flow patterns once the mine site has been reclaimed and the site wide hydrology has rebounded.

The constituents anticipated to be mobilized will impact water chemistry and have a high likelihood to result in degradation to the aquatic communities within the unnamed streams that discharge to the Menominee, direct discharges of groundwater from the project site to the Menominee River and to the waters of the Shakey River watershed. This alteration of water chemistry will result in changes to the trophic assemblages within these waterbodies impacting micro and macro invertebrates, mussels, fish species, and amphibians, birds and mammals that rely on these aquatic communities to complete their life cycle. It is unknown if the discharges of constituents will result in a degradation of resource or result in a loss of resource due to the lack of information and lack comprehensive testing and modeling of the material and groundwater flows. Based upon the limited amount of information the applicant has provided for WRD review, the application does not demonstrate that the project will not adversely impact water quality of the unnamed streams on and near the project site, the Menominee River, and the Shakey River watershed.

The WRD is unable to determine if the project will impact riparian rights. The models that were provided with the application are inappropriate for this purpose and the impact assessment. The applicant proposes a drawdown from pit dewatering that will impact rivers and streams. The applicant stated that the Menominee River will be drawn down by an estimated 38 m^3/hr (0.370 cfs). In consideration of the discharge of the Menominee River, this withdrawal is de minimis as it is not anticipated to impact the flow, function or value of the river.

The application provides a modeled drawdown envelope that shows that drawdown in wetlands that support streams will exceed the property under control of the applicant. The applicant has been unable to demonstrate that there will not be a diminishment of flow to regulated streams under the control of adjacent property owners, which may impact their riparian rights. It is likely that there will be direct impacts to the flow of the stream in wetland B1, which is under control and management by the State of Michigan. The applicant has retained authorization from DNR to submit an application for the project.

Section 301 states: the department shall not grant a permit if the proposed project or structure will unlawfully impair or destroy any of the waters or other natural resources of the state. It is the determination of the WRD that this project is not consistent with the permitting criteria of Part 301 and that a permit may not be issued under this part.

Wetlands Protection Review Criteria

324.30301 Definitions; technical wetland delineation standards (applicable)

(1) As used in this part:

(a) "Department" means the department of environmental quality.

(d) "Fill material" means soil, rocks, sand, waste of any kind, or any other material that displaces soil or water or reduces water retention potential.

(l) "Water dependent" means requiring access or proximity to or siting within an aquatic site to fulfill its basic purpose.

(m) "Wetland" means land characterized by the presence of water at a frequency and duration sufficient to support, and that under normal circumstances does support, wetland vegetation or aquatic life, and is commonly referred to as a bog, swamp, or marsh, and which is any of the following:

(i) Contiguous to the Great Lakes or Lake St. Clair, an inland lake or pond, or a river or stream.

(ii) Not contiguous to the Great Lakes, an inland lake or pond, or a river or stream; and more than 5 acres in size.

(iii) Not contiguous to the Great Lakes, an inland lake or pond, or a river or stream; and 5 acres or less in size if the department determines that protection of the area is essential to the preservation of the natural resources of the state from pollution, impairment, or destruction and the department has so notified the owner.

(2) The department and local units of government shall apply the technical wetland delineation standards set forth in the United States army corps of engineers January 1987 wetland delineation manual, technical report Y-87-1, and appropriate regional United States army corps of engineers supplements, in identifying wetland boundaries under this part, including, but not limited to, section 30307.

In Section 30302(1) The Legislature finds that:

(a) Wetland conservation is a matter of State concern since a wetland of one county may be affected by acts on a river, lake, stream or wetland of other counties.

Finding: The application is being processed under the State permitting authority of Part 303 of the NREPA.

(b) A loss of a wetland may deprive the people of the state of some or all of the following benefits to be derived from the wetland:

(i) Flood and storm control by the hydrologic absorption and storage capacity of the wetland.

Finding: The wetlands proposed to be impacted by this project perform flood control through hydrologic absorption and retention of storm waters and snow melt. The fine soil particulates of the wetlands hold surface waters and stormwater runoff and slow the discharge and/or allow

these surface waters to infiltrate to groundwater. This function protects soils within the wetlands and the streams they support which allows for the protection of the habitat, function, and values of these aquatic systems.

(ii) Wildlife habitat by providing breeding, nesting, and feeding grounds and cover for many forms of wildlife, waterfowl, including migratory waterfowl, and rare, threatened, or endangered wildlife species.

Finding: The wetlands and riparian wetland corridors provide habitat cover for a variety of mammals, birds and aquatic organisms whose lifecycle depends on wetland habitats. These species include threatened and endangered and species of special concern including Grey Wolf, Bald Eagle, Northern Leopard Frog, Wood Turtle, Four-toed Salamander, Red-shouldered Hawk, Northern Harrier, Merlin, Osprey and Grasshopper Sparrow and Swainson's Thrush. Habitat for these species is present in the wetlands observed onsite. The Four-toed salamander were surveyed on the project site and the Wood Turtle and Northern Leopard Frog were surveyed near the project site.

(iii) Protection of subsurface water resources and provision of valuable watersheds and recharging ground water supplies.

Finding: The application demonstrates that the wetlands proposed to be impacted are connected to groundwater systems and function as recharging areas for ground water aquifers. The project proposes the complete and permanent loss of 11.2 acres of regulated wetland and loss or impairment of 17.2 acres of regulated wetland. The 11.2 acres will no longer function to recharge the groundwater aquifer. The 17.2 acres may continue to recharge groundwater aquifers. The WRD has determined that the assessments of impact to wetlands are underestimated and the extent of impacts to this function cannot be determined by the information current provided in the application.

In consideration of the protection of subsurface resources, the project has been determined to adversely impact subsurface water resources through constituent mobilization from groundwater flowing through the backfilled mine pit post-reclamation. Please see Attachment C for WRD comments on impacts to subsurface water resources.

(iv) Pollution treatment by serving as a biological and chemical oxidation basin.

Finding: The application is proposing the permanent loss of 11.2 acres of regulated wetland function for pollution treatment. The application also proposes the impairment or loss of 17.2 acres of regulated wetland that will not perform this function under operation and reclamation conditions. The WRD has determined that these assessments of impact are underestimated and the extent of impacts to this function provided by wetlands cannot be determined with the information provided in the application.

The site is currently a low-use/ low-impact site and no significant pollution is anticipated by the current land use. The proposed project would change the land use to a high impact.

(v) Erosion control by serving as a sedimentation area and filtering basin, absorbing silt and organic matter.

Finding: The project will remove 11.2 acres of wetland from performing this function. The proposed additional impacts to 17.2 acres of wetland will allow those wetlands to continue to operate as a sedimentation basin but those wetlands, and potential others, will or may be impaired to varying degrees during the life of the project to the extent that they will not perform the expected filtering function of biologically intact wetlands. The extent of the impact to this function of wetlands cannot be determined in the application.

(vi) Sources of nutrients in water food cycles and nursery grounds and sanctuaries for fish.

Finding: The onsite wetlands do not perform as nursery grounds and sanctuaries for fish. The onsite wetlands do function as nutrient sources for aquatic food cycles. The project will remove 11.2 acres of wetland from performing this function. Seasonal surface waters are an important factor in this ecological wetland process. The application states that surface waters may be reduced or eliminated in 17.2 acres of wetland. Further impacts to wetlands and streams are anticipated and the extent of this impact is not defined in the application.

(c) Wetlands are valuable as an agricultural resource for the production of food and fiber, including certain crops which may only be grown on sites developed from wetland.

Finding: The current land use of this area is silviculture and recreation. Neither activity is wetland dependent. No wetland dependent food or fiber production is proposed by the application.

(d) That the extraction and processing of nonfuel minerals may necessitate the use of wetland, if it is determined pursuant to section 30311 that the proposed activity is dependent upon being located in the wetland, and that a prudent and feasible alternative does not exist.

Finding: The application does not demonstrate that the activity is wetland dependent. Although it may be appreciated that a portion of the direct impacts to regulated wetlands lie over an economic and extractable portion of the ore body, and that to extract the nonfuel mineral may necessitate the use of a wetland, the applicant fails to consider the full criteria detailed in Section 30311 for the alternatives for processing the nonfuel minerals. The extraction of nonfuel minerals does not obviate the requirements of the statutory permitting criteria of Section 30311. The application does not demonstrate that a feasible and prudent alternative does not exist. The application fails to fully define the extent of impacts to regulated resources that will result from the proposed project and associated activities.

The application provides alternative facility layouts and design, but fails to detail and substantiate the alternatives presented for the activities associated with the extraction of nonfuel minerals. The application also fails to provide an economic assessment for the alternatives determined to

not be economical. Without detailed economic considerations, the reasonableness of the alternative costs cannot be determined.

Section 30304, of Part 303, Prohibited activities.

Sec. 30304. Except as otherwise provided in this part or by a permit issued by the department under sections 30306 to 30314 and pursuant to part 13, a person shall not do any of the following:

(a) Deposit or permit the placing of fill material in a wetland.
(b) Dredge, remove, or permit the removal of soil or minerals from a wetland.
(c) Construct, operate, or maintain any use or development in a wetland.
(d) Drain surface water from a wetland.

Finding: The application proposes to impact regulated wetlands through the development and operation of a polymetallic main. The application proposes the dredge of approximately 980,820 cubic yards of soil material from 5.3 acres of regulated wetland and place approximately 803,453 cubic yards of fill material in 5.9 acres of regulated wetland. The project also proposes reductions and drainage of water in regulated wetlands through loss of water contributions to the wetland watersheds that will impact 17.2 acres of regulated wetland.

A permit is required under Part 303.

Section 30311, of Part 303, states in a pertinent part:

(1) A permit for an activity listed in section 30304 shall not be approved unless the department determines that the issuance of a permit is in the public interest, that the permit is necessary to realize the benefits derived from the activity, and that the activity is otherwise lawful.

Finding: The activity is not demonstrated to be within the public interest.

(2) In determining whether the activity is in the public interest, the benefit which reasonably may be expected to accrue from the proposal shall be balanced against the reasonably foreseeable detriments of the activity. The decision shall reflect the national and state concern for the protection of natural resources from pollution, impairment, and destruction. The following general criteria shall be considered:

(a) The relative extent of the public and private need for the proposed activity.

Finding: The application states that the project has a public interest and will result in the creation of jobs and enhance economic development within the region. The application also states that the project will expand the U.S. mineral availability. The application does not provide further details on what benefits to the public the project will provide nor does the application demonstrate a public need that the benefits of the project will fulfill.

The WRD received public input on the proposed project from Tribal, State and local governments in the form of resolutions of support or opposition.

One resolution, Michigan Senate, Senate Resolution 85 of 2017, was received in support of the proposed project citing: economic sustainability, economic growth with a balanced use of natural resources, and local and state benefits from tax revenues.

Fourteen public resolutions, listed below, were received in opposition of the proposed project citing: long-term environmental impacts from mine wastes, potential economic losses through reduction in property values and loss of tourism revenues, loss of cultural resources of the Menominee Tribe of Indians of Wisconsin, loss of habitat for species of concern, loss of recreational value, and risks to drinking water:

Chippewa Ottawa Resource Authority, Resolution 01-28-16 B;
Menominee County Board of Commissioners, Resolution 2017-16;
Marinette County Board of Supervisors, Resolution 461-16;
City of Marinette, Resolution 18-2017;
Shawno County Board of Supervisors, Resolution 48-17;
Brown County Board of Supervisors, 10i;
Door County Board of Supervisors, Resolution 217-49;
Menominee County Board of Supervisors, Resolution 2017-03;
City of Peshtigo, Resolution 2017-05;
Oconto Board of Supervisors, R2017-08-04;
City of Marinette, Resolution 18-2017;
Town of Amberg, Resolution 2017-2;
Town of Porterfield, Resolution 2017-2;
University of Wisconsin Waukesha, Student Government Association, Resolution 1.

The WRD received public written comments during the public comment and public hearing periods. Of the 3418 comments that were received, 3381 comments stated opposition of the project and 37 comments stated support of the project. The supporting comments cited economic development as the primary public interest of the project. Of the comments in opposition, 3303 comments expressed general opposition due to potential adverse impacts to the environment and/or aquatic resource and potential impacts to cultural resources. An additional 78 comments were received in opposition to the project based upon the technical merits of the application and impacts to the regulated resource.

It is assumed that the private need for the proposed project is the return on investment. The application states that the typical net present value expected for a mining project similar to the Back Forty Project would be on the order of $250 million. This has been inferred to relate that the current project is economically beneficial to the applicant.

(b) The availability of feasible and prudent alternative locations and methods to accomplish the expected benefits from the activity.

Finding: The feasible and prudent alternative analysis demonstrates various site configuration layouts but does not provide alternative locations and methods that may accomplish the benefits of the activity.

(c) The extent and permanence of the beneficial or detrimental effects which the proposed activity may have on the public and private uses to which the area is suited, including the benefits the wetland provides.

Finding: The extent and permanence of the beneficial effects of the proposed activity are not well defined by the applicant. The application proposes a 7-year life of mine; although some conversation has been given to an extended underground mining component that may extend the life of mine to 16 years. Based upon the 7-year life of mine schedule included with the application, site construction and buildout will take up to two years, followed by seven years of operation and three years of closure reclamation (8 R-Wetland Permit Application Nov 2017, Table 1-1, Reclamation Sequence). There will be a period of revegetation and monitoring and the final closure of the waste water treatment plant will occur in mine year 16 to 17 (life of mine year 18 to 19). It is assumed that during the construction phase, life of mine, and closure reclamation, the project will provide employment for a labor force.

During production, it is also assumed that public revenue will be generated through state and local taxes.

The extent of the detrimental effects of the project are not completely defined by the application. The scope and extent of impacts to regulated wetlands are underestimated. The wetland watershed budgets provide incorrect assumptions of the watershed input and output parameters and the infiltration and runoff rates. The wetland watershed budgets do not include applicable groundwater flux data necessary to determine the mass balance of the model. (Refer to Attachment B for details on the WRD review and determination of the wetland watershed budgets.) The groundwater model fails to adequately demonstrate the spatial extent of the proposed drawdown and the impacts to the land and surface water interface. The model also fails to address information on existing seasonal groundwater parameters that may demonstrate the groundwater flux during the growing season and support the groundwater inputs for the wetland watershed model. Without a reasonable and site specific measurement of groundwater values in the wetland watershed budgets, the extent of the impacts to wetlands cannot be determined.

The project does not demonstrate that the activities will be protective of water quality in perpetuity. The management and onsite disposal of waste material has not demonstrated that constituents from the material will be contained on the site, in the manner in which they are disposed. The methodology in which the application demonstrates the modeling and the mobility of these materials is inappropriate and with the limited information available to the WRD it is determined that these materials will be transported through groundwater and discharge at the land and water interface, resulting in an adverse impact to the resource. With the data available to the WRD, this impact is foreseeable and will result in a long-term degradation of the aquatic resources on and off the project site. The extent and permanence of this impact cannot be determined by the information that has been made available to the WRD.

The application does not demonstrate the extent and permanence of the impacts from the proposed activity. It is known that 11.2 acres of wetland will be impacted due to direct dredge and fill of the resource. The application proposes impact or impairment to an additional 17.2 acres of wetland and the WRD believes this number to be underestimated. The impacted wetlands on the project site and off the project site will have a loss or impairment of the benefits as described in Section 30302. Further, the groundwater drawdown model demonstrates that groundwater will be reduced to an extent that it will impact that hydrology of wetlands on private properties that are not under the control of the applicant.

Constituent mobility into groundwater will impact water quality on and near the project site. The scope and extent are unknown but have a high likelihood to impact the water quality of the onsite wetlands, streams, and the Menominee River, which will result in a direct impact to the habitat, function and value of the wetlands and river and likely result in a reduced benefit the the public and private uses of these resources. The extent and permanence of this impact is not defined by the information available to the WRD and the extent of the detrimental effects cannot be determined.

(d) The probable effects of each proposal in relation to the cumulative effect created by other or existing and anticipated activities in the watershed.

Finding: There is limited development or new land use in the watershed. There are no known or anticipated activities within the watershed that would contribute to the cumulative effects of this project.

(e) The probable effects on recognized historic, cultural, scenic, ecological, or recreational values and on the public health or fish or wildlife.

Finding: The Menomonee Tribe of Indians maintains that a comprehensive cultural landscape including ancestral burial sites, ceremonial and village sites, cultural and other funerary objects are located within the footprint of the proposed site and will be impacted by the project.

The project is within the view shed of the Menominee River and will subjectively impact the scenic value of the reach of river within the proximity of the mine view shed.

The project proposes direct and potentially indirect impacts to state listed threatened and endangered plant species. DNR Wildlife Division has determined that a T&E permit will be necessary that involves the take or potential take of any state endangered or threatened plant species. This permit would also include the known location of Vasey's Rush located within the cone of depression from pit drawdown that extends into the Shakey Lake Pine Barrens Environmental Area.

The project has a significant probable effect on ecological value. The direct loss of wetland and streams will be contained to the project site and a loss of habitat function and value will be realized in 11.2 acres of directly impacted wetland. Additional wetland impacts will be realized

through pit dewatering activities that will increase infiltration values and drain surface water from wetlands. The application states that an additional 17.2 acres of wetland will be impacted; however, the WRD has determined that this acreage is underestimated and the total probable effects are unknown.

Long-term constituent mobility will impact the ecological value of wetlands and aquatic resources on and near the project site. Constituent loading into groundwater and discharge to the land and water interface has a high probability of adversely impacting fish and wildlife. Juvenile game and baitfish species typically rely on wetland areas at the land and water interface for habitat and food/ nutrient availability. Mobilized constituents may precipitate at the land and water interface, potentially concentrating in those areas, impacting fish and wildlife species that utilize wetlands for their lifecycles and bioaccumulating in trophic levels of the food chain. Constituents in solution may discharge from ground to surface waters and be transported downstream. With the limited modeling information available for WRD review, the extent of the probable effects to the fish and wildlife is unknown.

Numerous residential wells in the study area get their water supply from the fractured bedrock, including deeper portions. This indicates that the fractured bedrock is permeable and able to transport significant quantities of water. Given that the proposed mine is located up gradient from these wells, there is risk of impact to the residential wells as well as potential discharge to the Menominee River at GSI locations that will be difficult to determine.

(f) The size of the wetland being considered.

Finding: The project proposes impacts to five wetland complexes. All of the wetland complexes that are proposed to be impacted except for 14/14a/15b extend off the project area and have not been delineated or classified on adjacent properties. The size and type of resource offsite and the impacts to those resources is not described in the application.

The direct loss of wetland and streams will be contained to the project site and a loss of habitat function and value will be realized in 11.2 acres of directly impacted wetland. Additional wetland impacts will be realized through pit dewatering activities that will increase infiltration values and drain surface water from wetlands. The application states that an additional 17.2 acres of wetland will be impacted; however, the WRD has determined that this acreage is underestimated and the total probable effects are unknown.

(g) The amount of remaining wetland in the general area.

Finding: A review of the Huc 8 watershed (id 04030108) estimates an existing 217,101 acres of wetland within the 715,334 acre watershed. The watershed has an estimated loss of 8% since settlement.

(h) Proximity to any waterbody.

Finding: The 84 acre open pit is proposed to be located approximately 150 feet from the Menominee River. The project proposes to directly impact an unnamed stream with the placement of the Tailings and Waste Rock Management Facility (TWRMF) over the headwater of the stream and adjacent wetland (Wetland B1). The TWRMF will be situated in close proximity to three wetland complexes. In addition to the stream in Wetland B1, the TWRMF is adjacent to wetland C1 where there is a separate stream that lies approximately 300 feet from the facility. The contact water basins are situated over Wetlands 4A and 2C, contagious with Wetland 2b, which supports a stream that flows southerly to the Shakey Lakes. The Mine Waste Storage Area is proposed for placement over WL 6, which supports an observed ephemeral stream that dips underground near the sandstone pinch out.

(i) Economic value, both public and private, of the proposed land change to the general area.

Finding: The application does not provide an assessment of the public economic value of the proposed land change. The private economic value of the land change is assumed to include a net valuation of the mine to the owner and local and state taxes paid accordingly. There is also the assumed creation of jobs and economic development directly and indirectly related to the project.

The land where the project is proposed is partially under the ownership of Aquila and partially under the ownership of the State of Michigan, managed by DNR Escanaba Forest Management Unit. The applicant has proposed a land exchange with the State of Michigan for the proposed publically owned parcels; however, the land exchange application has been rescinded by the applicant and the applicant states they are looking for a new parcel for the proposed exchange. The state owned project parcel is currently managed for timber and recreation and the values of any proposed land exchange is undetermined.

(3) In considering a permit application, the department shall give serious consideration to findings of necessity for the proposed activity which have been made by other state agencies.

Finding: No findings of necessity were provided by other state agencies.

(4) A permit shall not be issued unless it is shown that an unacceptable disruption will not result to the aquatic resources. In determining whether a disruption to the aquatic resources is unacceptable, the criteria set forth in section 30302 and subsection (2) shall be considered. A permit shall not be issued unless the applicant shows either of the following:

(a) The proposed activity is primarily dependent upon being located in the wetland.

Finding: The purpose of this project is to develop a polymetallic zinc, copper, and gold mine. The project will include an open-pit mine, surface infrastructure facilities, beneficiation plant, and overburden and tailings/waste rock stockpiles. The purpose of the project is not wetland dependent. In consideration of 30302(1)(d), some consideration may be made to the use of wetlands in relation to access to the ore body if it is determined that no alternative is feasible and prudent and the project meets the criteria of Section 30311. However, surface infrastructure,

beneficiation facilities and waste rock storage are not activities that are dependent on being performed in a wetland as they can all be undertaken in uplands and do not necessitate wetland conditions to achieve their purpose.

(b) A feasible and prudent alternative does not exist.

Finding: The application has provided a feasible and prudent alternative analysis in their Least Environmental Damaging Practicable Alternative Analysis (LEDPA) report. The report outlines the conceptual alternatives that include onsite layout configurations and the requirements of offsite conceptual location. The application does not demonstrate and support the conclusions that no feasible and prudent alternative exists.

(5) If it is otherwise a feasible and prudent alternative, a property not presently owned by the applicant which could reasonably be obtained, utilized, expanded, or managed in order to fulfill the basic purpose of the proposed activity may be considered. If all of the following requirements are met, there is a rebuttable presumption that alternatives located on property not presently owned by the applicant are not feasible and prudent:

(a) The activity is described in section 30304(a) or (b).

Finding: The activity is described in 30304(a) and 30304(b).

(b) The activity will affect not more than 2 acres of wetland.

Finding: The activity will affect more than two acres of wetland.

(c) The activity is undertaken for the construction or expansion of a single-family home and attendant features, the construction or expansion of a barn or other farm building, or the expansion of a small business facility.

Finding: The activity does not include the construction of a single-family residence or attendant features, the construction of expansion of farm buildings or the expansion of a small business facility.

(d) The activity is not covered by a general permit.

Finding: The activity is not covered by a general permit under Part 303.

(6) Consideration of feasible and prudent alternatives regarding the size of a proposed structure shall be based on the footprint of the structure and not the square footage of the structure.

Finding: The application details several required structures and facilities to meet the project purpose and within the alternatives analysis provides some modification to the footprint of the facilities. These footprints have been considered as feasible and prudent alternatives. An exception to this is with the TWRMF in which the application notes their preferred criteria for an

area and design, but does not include the required acreage or layout for footprint for the facility. The design specifications of this facility footprint include modification to the footprint to directly avoid placement of the facility within regulated wetlands. All considerations specified by the application have been taken into consideration.

(7) The choice of and extent of the proposed activity within a proposed structure shall not be considered in determining feasible and prudent alternatives.

Finding: The choice and extent of the activity within the proposed structures have not been taken into consideration.

(8) An alternative that entails higher costs, as described in R 281.922a(11) of the Michigan administrative code, is not feasible and prudent if those higher costs are unreasonable. In determining whether such costs are unreasonable, the department shall consider both of the following:

(a) The relation of the increased cost to the overall scope and cost of the project.

Finding: The application does not provide a cost analysis for the project or alternatives.

(b) Whether the projected cost is substantially greater than the costs normally associated with the particular type of project.

Finding: The application does not provide any cost analysis on the preferred alternative or as part of the LEDPA. The nature of the project is mining and it is reasonable to assume that cost associate with mining projects may be relevant to this project. When additional information was requested regarding the LEDPA, the applicant provided a rebuttal to the suggestion of a feasible and prudent alternative of investigating the State of Michigan land to the east of the project site. (Please see Attachment D for notes on the economic analysis provided by the applicant and further investigation of cost associated with transportation of onsite ore.) The information provided in the rebuttal was speculative (based upon information that was provided in the application). Further investigation of the State of Michigan parcel to the east of the project site shows that the costs of this alternative would not be substantially greater than the cost normally associated with this particular type of project.

R281.922a

R 281.922a Permit application review criteria.

(1) The department shall review a permit application to undertake an activity listed in section 30304 of the act according to the criteria in section 30311 of the act.

Finding: A permit is required.

(2) As required by subsection 30311(4) of the act, a permit applicant shall bear the burden of demonstrating that an unacceptable disruption to aquatic resources will not occur as a result of the proposed activity and demonstrating either of the following:

(a) The proposed activity is primarily dependent upon being located in the wetland.

Finding: The activity is not wetland dependent.

(b) There are no feasible and prudent alternatives to the proposed activity.

Finding: The application does not demonstrate the extent of the impacts that will be realized by the project. The application does not demonstrate that a feasible and prudent alternative for the full extent of the impacts does not exist.

(3) A permit applicant shall provide adequate information, including documentation as required by the department, to support the demonstrations required by section 30311 of the act. The department shall independently evaluate the information provided by the applicant to determine if the applicant has made the required demonstrations.

Finding: The applicant has not provided sufficient information to document the extent of impacts of the project, to demonstrate that the benefits of the project outweigh the detriments, to demonstrate that the project is within the public interest, and to demonstrate that no feasible and prudent alternative exists.

(4) A permit applicant shall completely define the purpose for which the permit is sought, including all associated activities. An applicant shall not so narrowly define the purpose as to limit a complete analysis of whether an activity is primarily dependent upon being located in the wetland and of feasible and prudent alternatives. The department shall independently evaluate and determine if the project purpose has been appropriately and adequately defined by the applicant, and shall process the application based on that determination.

Finding: As defined by the applicant, the Project purpose is to develop and mine a polymetallic resource containing zinc, gold, silver, and copper in the Back Forty deposit. This purpose is consistent with the project and activities described in the application.

(5) The department shall consider a proposed activity as primarily dependent upon being located in the wetland only if the activity is the type that requires a location within the wetland and wetland conditions to fulfill its basic purpose; that is, it is wetland dependent. Any activity that can be undertaken in a non-wetland location is not primarily dependent upon being located in the wetland.

Finding: The activities proposed can be undertaken in a non-wetland location and are not considered wetland dependent.

(6) An alternative is feasible and prudent if both of the following provisions apply:

(a) The alternative is available and capable of being done after taking into consideration cost, existing technology, and logistics.

Finding: The feasible and prudent alternatives analysis detailed in the application does not address the cost, existing technology or logistics of the alternatives.

(b) The alternative would have less adverse impact on aquatic resources. A feasible and prudent alternative may include any or all of the following:

(i) Use of a location other than the proposed location.

Finding: It is presumed that a non-wetland alternative exists.

(ii) A different configuration.

Finding: Project plans and alternatives identify that different configurations of facilities were considered and it is feasible to reconfigure certain facility layouts and design to accommodate onsite aquatic resources.

(iii) Size.

Finding: Alternative pit size was considered but determined to be not economical. The size and configuration of the TWRMF has increased form the site plan that was originally included with the application but the required size (acreage) has not been specified.

(iv) Method that will accomplish the basic project purpose.

Findings: The method for mineral extraction is proposed as open pit mining. Underground mining is described in the LEDPA as feasible but not economical. Further demonstration should be given to this alternative if it is demonstrated that underground mining will avoid and minimize impacts to aquatic resources.

The applicant shall demonstrate that, given all pertinent information, there are no feasible and prudent alternatives that have less impact on aquatic resources. In making this demonstration, the applicant may provide information regarding factors such as alternative construction technologies; alternative project layout and design; local land use regulations and infrastructure; and pertinent environmental and resource issues. This list of factors is not exhaustive and no particular factor will necessarily be dispositive in any given case.

(7) If an activity is not primarily dependent upon being located in the wetland, it is presumed that a feasible and prudent alternative exists unless an applicant clearly demonstrates that a feasible and prudent alternative does not exist.

Finding: The activity is not wetland dependent and the applicant has not demonstrated that a feasible and prudent alternative does not exist. Therefore, it is assumed that a feasible and prudent alternative exists.

(8) Unless an applicant clearly demonstrates otherwise, it is presumed that a feasible and prudent alternative involving a non-wetland location will have less adverse impact on aquatic resources than an alternative involving a wetland location.

Finding: It is presumed that a non-wetland location will have less adverse impact on aquatic resources than an alternative involving a wetland location.

(9) An area not presently owned by the permit applicant that could reasonably be obtained, utilized, expanded, or managed in order to fulfill the basic purpose of the proposed activity is a feasible and prudent alternative location.

Finding: Areas not presently owned or under control of the applicant were not included in the feasible and prudent alternative analysis. Alternative locations were not identified or examined by the applicant. Land under State of Michigan ownership to the east of the project area was discussed with the applicant (see 11).

(10) An alternative may be considered feasible and prudent even if it does not accommodate components of a proposed activity that are incidental to or severable from the basic purpose of the proposed activity.

Finding: It is determined that the basic purpose of the project is the development and mining of the Back Forty mineral resource. This project purpose includes the development of the project for the purpose of extracting the mineral resource.

(11) An alternative may be considered feasible and prudent even if it entails higher costs or reduced profit. However, the department shall consider the reasonableness of the higher costs or reduced profit in making its determination.

Findings: The applicant has not provided any economic considerations to demonstrate feasible and prudent alternatives.

(12) The department may offer a permit for a modification of an activity proposed in an application if the proposed activity cannot be permitted under the criteria listed in section 30311 of the act and if the modification makes that activity consistent with the criteria listed in section 30311 of the act.

Finding: The applicant has not demonstrated the extent of impacts to aquatic resources and has not demonstrated that a feasible and prudent alternative does not exist. Further consideration of a modified permit may only be considered when the scope of impacts has been identified and a thorough feasible and prudent alternatives analysis has been presented.

(a) The applicant may accept the permit for the modification of the proposed activity by signing it and returning it to the department within 30 days of the date of the offer. The permit shall be considered issued upon countersignature by the department.

(b) The permit application is considered denied if the applicant does not sign and return the permit for the modification of the proposed activity to the department within thirty days of the date of the offer. The permit applicant may then appeal the denial pursuant to sections 30307(2) and 30319(2) of the act.

(c) The date on which the modification is offered shall be considered the date of the department's approval or disapproval of the application pursuant to section 30307(2) of the act.

Conclusion of Law: The project is not consistent with the permitting requirements of Part 303, Wetlands Protection, and a permit may not be issued under this Part.

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Attachment A: WRD Comments on Groundwater Model

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Introduction

A groundwater model was developed by Foth Infrastructure & Environment, LLC (Foth) for the purpose of estimating groundwater inflow to an open pit mine during mining operations and to provide an estimate of the drawdown associated with the open mine pit dewatering as presented in a report titled Groundwater Modeling, Back Forty Project prepared by Foth Infrastructure & Environment, LLC (Foth), October 2015. This groundwater model was submitted as part of 632 Nonferrous Metallic Mineral Mining Permit Application in Menominee County with the associated figures being submitted to WRD as part of the wetlands, lakes, and streams application for the purpose of supporting the indirect wetland impact report.

Based on the WRD review of the subject groundwater model files (that included a review of the model boundary conditions, model assumptions, grid, and model calibration), the existing Foth groundwater model as constructed is considered to be able to provide an estimate of the influx of water into the mining pit and related drawdown but with a high degree of uncertainty. Following a review of the groundwater model files, WRD identified several issues (as noted in the following sections) that indicate that the existing Foth groundwater model is insufficient for use in assessing potential impacts to the site wetlands as a result of the proposed mining operations.

Groundwater Model Calibration Target Data Issues

According to Foth, the model as initially constructed was not achieving an acceptable mass balance error which indicates there is a problem with the conceptual model (how the site hydrogeology and flows are represented). Therefore, Foth modified the conceptual model to add River Boundary cells (river cells) to define the wetlands likely identified in the National Wetland Inventory in areas outside of the mine site as a guide for river cell placement. Only select wetlands and portions of wetlands identified onsite were defined using river cells. However all off-site and onsite wetlands were defined using the same arbitrary thickness (1 ft.), width (cell grid thickness at the wetland location), and hydraulic conductivity (K) value (1 m/day). These parameters are used to define how "fast" water will infiltrate into the aquifer and when. The select wetlands defined in the site area using the river cells helped to achieve an acceptable mass balance error in the model. However, there are no flow or stream flow measurements collected at the same time as the water levels measurements in the site wetlands so an assessment on the amount of water that is available in a particular wetland stream was not possible. Adding stream flow measurements in a groundwater model calibration is typically one means of reducing the uncertainty and "non-uniqueness" in the model calibration. Because onsite wetland and stream data is not used to define the parameters of the model, the current calibration is "non-unique" (only calibrated with limited water level data) which gives the model calibration a higher degree

of uncertainty meaning there are several combinations of parameters, some of which don't match site conditions, that will give the same answer.

Foth created a steady-state model that was calibrated to the mid-point between the maximum water level and minimum water level (median) recorded at each location based on the groundwater elevation targets listed in the Foth Groundwater Report Table 4-1. However, it is not clear from the Foth groundwater modeling report which years of data were used in the calibration. A map of water levels collected in May 2012 is included in the groundwater October 2015 modeling report. Elsewhere in the application, water level data is presented from collection dates of February 2010, October 2011, December 2011, and early May 2012. At best, the steady-state model represents average annual conditions as it was calibrated based on a constant average annual recharge rate and median water level data. However, the water level target data used in the groundwater model calibration appears to be missing measurements during the wetland growing season which in this area is approximately between mid-May through the end of September. If the mine operations reduce the normal high water levels that data suggests exist in the site wetlands during the growing season (mid-May through end of September) then there could be significant impacts to these wetlands. Unfortunately, the existing groundwater model is not sufficient to evaluate the likely drawdown in the site wetlands during the period when the wetland is biologically active and the dewatering impacts to wetland function and value is not represented by the model.

Graphs of quarterly groundwater elevations recorded in the Quaternary sediments between July 2007 and September 2009 were presented in A Hydrogeology Report: Environmental Baseline Studies for the Aquila site by Environmental Resources Management, Inc. (ERM) dated September 2011. These graphs consistently show the gradual rise in water levels from mid-March, peaking in June, as a result of spring snowmelt and precipitation. It was noted in the ERM report that due to the rapid snowmelt and precipitation water tends to mound or pond in site areas in June. This was also observed during site visits in May and June of 2017 conducted by WRD and King and MacGregor environmental staff. The ERM graphs show groundwater levels gradually decrease from June through November with occasional small increases observed in December.

According to information in the ERM 2011 Hydrogeology Report flow data and seasonal water level trends were documented in 2007 to 2009. For example, the report states that the wetlands along the northern and western project area boundaries drain to the Menominee River via several small, intermittent streams with flow rates ranging from 1.8 cfs and 2.3 cfs. On page 35 of the ERM Hydrogeology Report it states that "…In most cases, wetland water elevation trends are very similar to those observed in the Quaternary aquifer wells, indicating that wetlands are a surface expression of water level changes in the Quaternary aquifer…". While there is a need for updated data, this type of information is missing from the existing groundwater conceptual model which, therefore, does not reflect the site wetland hydrology

The Foth groundwater modeling report notes that the initial model appeared to have a large mass balance error and water levels were calculated to be too high based on measured data resulting in the revision in the model to reduce these calculated high water levels. However, the initial

groundwater model may have been correctly capturing the higher water levels/mounding but since no June water level targets were collected, this was not incorporated correctly in the groundwater model. Foth addressed this high water level discrepancy in the model by using the river cells to define the wetlands, thereby removing the mounding. The existing model now removes water that should be mounding at the surface. Where the water levels fall below the base of the wetlands, water is now being discharged into the aquifer through the river cells. This additional inflow of water would then tend to reduce the predicted drawdown in the model. The median target water levels used in the model calibration also combine seasonal data from various years (2010, 2011, 2012) and do not represent a consistent annual median value for any month or quarter (January – December of any one year).

Groundwater Model Calibration and Target Residual Issues

A plot lf the observed target values (water level measurements) versus the water level values calculated by the groundwater model is typically used to assess the quality of a groundwater model calibration. This type of calibration plot indicates how closely the measured water level data matches the water levels calculated by the groundwater model. Ideally, all the points will fall on or close to a straight line with a 45 degree slope (showing that the computed values equal the measured values). The degree of scatter about this theoretical line is a measure of the overall calibration quality. The plot of the observed water levels versus the model computed water levels from the calibrated steady-state model files shows a significant scatter around a 45 degree line indicating that the model is not that well calibrated. Attached Figure 1 is a graph of the Quaternary (model Layer 1) observed water level targets versus the model calculated water level targets from the Foth calibrated steady-state model.

In addition, a plot of the residuals from the steady-state model file indicates that there are large residuals between the measured water levels and the model calculated water levels (up to a maximum residual of 10.7 ft). These residuals also exhibit a spatial pattern of high and low values which suggests that there is likely a problem with the conceptual model or calibration. Attached Figure 2a is a map of the water level residuals with the negative (red) or positive (blue) residual level posted. The same information is presented in Figure 2b with circles added based on the relative numerical level of the residual. Figure 2b provides a better indication of the spatial bias as clusters of blue or red residuals are observed. Some of the large residuals may be the result of using a mixed year and season dataset during model calibration to represent consistent annual median calibration targets. The large residuals may also be the result of not defining the river boundary cells in the site area based on actual site data and conditions. In any case, the current use of river cells to define the wetlands onsite is not appropriate. The transient model was not correctly defined, calibrated and run to simulate conditions on a monthly basis so the flux information from the model is not available for use in the wetland water budget calculations. An appropriately designed groundwater model can be used to estimate the flux associated with each wetland and that information can supply the inflow and outflow in a wetland budget analyses.

Lack of Seasonal Variation for Inputs to Wetland Budgets

The transient groundwater model did not include simulations to evaluate seasonal changes in recharge. The recharge from November through February is often considered zero as surface soils are typically frozen. (The Foth groundwater model includes recharge for all months since the data is not scaled to represent actual site conditions.) The annual average recharge, for example, then is typically scaled to represent recharge likely to be observed in an area for the remaining months (March through September). For evaluation of wetland budgets, a groundwater model then would be used to estimate the monthly inflow or outflow from a wetland for an "average year" using the monthly transient model simulations with the scaled recharge. The "average year" rates would then be reduced by 30% to represent a "dry year" and increased by 30% to represent a "wet year". This information is missing from the Foth groundwater model and therefore not available as input to the wetland water budget analyses.

If just the seasonal changes in water levels are considered, then under existing conditions (before mining operations) if a wetland is saturated to the soil surface (or ponded) in May, June and July (as observed at this site) there isn't any infiltration that occurs. However, if the drawdown model shows that water table will be lowered by 2 feet for example during May, June, or July, induced infiltration will occur and water levels in the wetland will be lowered under operating conditions. This has the potential to turn wetland areas into non-wetland areas depending on the infiltration rate of wetland based on soil types. As noted above, there has been no data related to infiltration rates collected in the wetlands or used in this existing groundwater model.

Therefore, if the mine operations reduce the normal high water levels that data suggests exists in the site wetlands and that sustain the wetlands during the growing season (mid-May through end of September) then there could be significant impacts to these wetlands. Unfortunately, the existing groundwater model is not sufficient to provide inputs to a wetland budget analyses or evaluate the likely drawdown and potential impact to site wetlands and streams based on the current groundwater models conceptual design.

Problems Using the MODFLOW River Boundary Cells Used to Define All Model Wetlands

In addition to the lack of seasonal calibration, the wetlands identified in the entire model domain were defined using River Boundary Cells (river cells). Foth indicates that this was done as a means of achieving a better water balance. It is noted that only select sections of a limited number of wetlands identified onsite were defined using the river cells without any justification for the random placement which is only consistent with the river cell use as a means of balancing water budget. There can be a problem with using river cells to define wetlands if the water level in the aquifer falls below the defined "river cell bottom" then flow of water into the aquifer remains constant. Since there are no adjustments for river flow and stage when using the river boundary cells, the supply of water to the aquifer from a "loosing stream" (stream discharging to the aquifer) in the wetland area can be more than the flow in the stream. Since there are no flow measurements, there is no means of assessing this effect and it is seen as a problem.

The definition of the river cells were not based on any site specific geological or hydrological data from site soil boring, piezometers, or wells. Therefore, the parameters used to define the river cells for the wetlands in the site area do not reflect the actual sediments or conditions of the

wetlands. All river cells were defined using an assumed conductivity of 1 meter/day and a thickness of 1 meter. There are no onsite measurements of the vertical conductivity/infiltration rates through each wetland base. The ERM Hydrogeology Report does list limited aquifer and slug testing done in the site area in the fall of 2009 but none of the locations tested the Quaternary in any of the wetlands. Therefore, the singular river cell definition does not take into account any presence of silt, clay, or organics in the wetlands that may in reality impede the flow of water into the aquifer. In addition, the existing groundwater model no longer predicts the mounding or high water levels that are actually observed onsite in June due to spring snowmelt and precipitation. As a result, more water will likely be added to the existing groundwater model through the river cells than is actually present and that process will tend to lessen the predicted drawdown effect in the wetlands.

Based on the Foth groundwater model files, the recharge in the model over the wetlands in the site area was set to zero so that when the water levels drop below the river cell bottom, the flow into the model was intended to equal the same constant rate as the model recharge of 6 inches per year which was intended to be close to the model recharge rate of 7 inches/year (0.00048679 meters/day). However, this also has the potential of adding more water to the model than is actually available. Since there are no current stream flow or any flow measurements available in the wetland streams, the amount of water actually available cannot be assessed which adds an additional degree of uncertainty to the model predictions.

Drawdown Impacts May be Greater than Indicated in the Current Groundwater Model
As noted above, the result of the target data used in the steady-state calibration (for example, lack of consistent and complete seasonal water level targets) and the use of river cells to represent the site wetlands without the use of site specific data or conditions the drawdown impacts predicted by this groundwater model will likely be greater in most wetlands than has been presented in the Foth groundwater modeling report.

In addition, as Figure 3 (a screen shot of the drawdown contours directly from the groundwater model files) illustrates that, the existing groundwater model predicts drawdown between at least 0.5 ft to 1 ft that extends offsite to the north, west, and south of the site area. The offsite extension of drawdown is not acknowledged in the Foth groundwater report. While Foth considers this groundwater model in general to be conservative, however, the conceptual model of the wetlands are not conservative and the WRD expects that the drawdown impacts will be greater than what has been modeled by the applicant.

Drawdown Impacts Should the Life of the Mine Extend to 16 Years Instead of 7 Years

While there are recognized problems with using the simulations from the existing Foth groundwater model to predict drawdown impacts, WRD ran a test simulation that extended the current transient model from the 7 years mine operation time listed in the Part 632 mining permit to 16 years based on discussions that included the possibility of Aquila extending the mining operations. The 16 year extended transient model indicates that drawdown impacts could extend more significantly offsite in the Quaternary and into Wisconsin at the weathered bedrock level in the model.

Conclusion

The existing Foth groundwater model was reviewed by WRD and determined to not be sufficient to adequately predict the potential drawdown in the site wetlands or provide useful information for wetland water budget analyses based on:

- Inappropriate target levels used for the steady-state calibration that ignores wetland growing season water levels;
- Incorrect assumptions used in the groundwater model conceptual design for wetland impact determination that ignores actual site conditions in the wetlands (for example, groundwater mounding observed in June);
- Lack of monthly seasonal variations in the transient simulations with appropriate recharge rates;
- Lack of infiltration rate information in the site wetlands;
- The use of River Boundary Cells with generic values not representative of site wetlands;
- Not all wetlands and only portions of some wetlands identified onsite are explicitly modeled using river cells. Therefore, there is no direct connection with the definitions of the river cells to the actual wetland resource other than the information presented in the Foth groundwater modeling report that the river cells were used to help lower the mass balance error;
- The use of River Boundary Cells that are not, or cannot, be defined to correctly represent actual site wetland conditions;

Because of these identified issues, the impact to the site wetlands are expected to be greater than what has been modeled by the applicant

WRD Comments on Groundwater Model

Eric Chatterson
Geology Specialist
Water Resources Division

<u>The MODFLOW (groundwater) model:</u>

- Provide comment on how the model has been constructed.
    - Due to the way the model was constructed, it provides little to no use in assessing impacts to nearby wetlands.
        - The MODFLOW model was designed with the wetlands set as predetermined recharge areas that are allowed to provide an infinite amount of water to the underlying aquifer. The way the model is designed provided little to no information regarding impacts to the wetlands from the mining activities.

- No constituent generation/particle tracking. A constituent generator based on humidity cell testing coupled with a particle/concentration tracking routine would provide a more accurate estimation of contaminant loading to the nearby surface water bodies. The use of Fick's law, in this manner, for estimating GSI concentrations is a fundamentally flawed approach.

- How does this construction represent conditions of groundwater drawdown and wetland hydrology on and near the project site?
    - Wetland connectivity was predetermined in the conceptual model to not be influenced by aquifer drawdown. Therefore, model results indicating the lack of impact to the nearby wetlands are merely a function of how the model was built and not a revelation from the modeling study.

- Provide brief recommendations on how this form of modeling could be designed to represent onsite conditions.
    - Transient simulations (time steps) should be utilized in a reconstructed model. The wetlands should be modelled based on data from nested piezometers surrounding and within each wetland. A water budget approach should be taken when assessing impacts to the wetland. For example, mass flux of water into and out of each wetland complex should be assessed for before, during, and after mining activities have taken place.

- What type of data collected onsite would best support a revised model that realistically addresses impacts to wetlands and streams?
    - Nested piezometers and continuous soil cores would be necessary in and around each wetland complex where these data don't already exist. To account for complex local geology, certain wetland complexes and the interactions with the water table should be evaluated with specific smaller scale numeric models.

- Is it possible to assess the extent of groundwater drawdown during operations conditions, and therefore the changes to the mass balance of each wetland watershed, based upon the information presented in the existing model?
    - Yes, once the degree of connectivity to the underlying aquifer is determined, a water budget approach should be taken in assessing both temporal and spatial impacts to wetlands.

Attachment B: WRD Comments on Wetland Watershed Budgets

Michael Pennington
Wetland Mitigation Specialist
Wetlands, Lakes and Streams Unit
Water Resources Division

Review of Wetland Water Budgets for Aquila

March 2018 Submittal

In March 2018, WRD staff reviewed Aquila's response to the WRD January 19, 2018 correction request. The response document entitled "Response to Michigan Department of Environmental Quality Comments dated January 19, 2018 on the Back Forty Project Wetland Permit Application" was prepared to respond to WRD concerns over the accuracy of groundwater drawdown model and wetland water budgets. WRD staff (primarily Mike Pennington and Kristi Wilson) reviewed the water budgets and concluded that the water budgets were prepared incorrectly and they did not provide sufficient information to determine how construction of the project would affect the remaining wetlands and how many acres of impact there would be. The water budgets that were prepared greatly overestimated runoff into the site and underestimated infiltration rates. The water budgets used a runoff coefficient of .90 that was applied to total monthly rainfall. The formula assumed that 90% of the precipitation that fell on the watershed contributed to the wetland hydrology. Using this coefficient is not appropriate due to the types of soils (sandy) and vegetation that were present in the area. With regards to infiltration rates, the water budgets used a rate of .9 inches that was applied to each month. The notes associated with the water budgets state that this rate was determined from slug tests on site. The applicant did not provide results of slug tests and it is highly unlikely that every wetland would have the same "tested" infiltration rate. In addition, the presence of sandy soils on site would result in a rate that was much higher. Lastly, the formulas they are using to determine infiltration using a constant are not appropriate. For example, in the winter the ground is frozen so there is no infiltration that occurs. However, in the summer months when the water table is likely below the soil surface much greater infiltration would occur. This is especially true in circumstances where the water level is drawn down. The use of a constant, low infiltration rate for each month does not accurately represent the infiltration that the wetland is likely to experience throughout the growing season.

March 21, 2018 Meeting with Aquila

Results of WRD's review of the wetland water budgets were discussed at a meeting in Lansing on March 21, 2018. There were several discussions about the items listed above, the accuracy of the groundwater model and the conclusion of the amount of wetland impact under operating conditions. At that meeting Michael Pennington,WRD's Wetland Mitigation Specialist, identified issues related to infiltration rates and watershed contribution and suggested the use of the Pierce 2013 model to predict water level fluctuations in the wetland. This is the model recommended by WRD staff to design wetland mitigation projects. Michael Pennington provided two versions of the model to Aquila's consultants in a March 21, 2018 email to Jeff King. Included in that email were initial assumptions that were to be used for infiltration rates,

watershed calculations (using TR-55) and natural weir heights based on monitoring well data. Aquila agreed to prepare modified water budgets for future discussion using these models.

March 27, 2018 Revised Water Budget for Wetland A-1

Jeff King submitted a revised wetland water budget on March 27, 2018 for review for wetland A1-A3. The intent of the submittal was to have WRD review the model to gain approval prior to moving forward with revising other wetland water budgets. WRD reviewed the model and determined that a new approach was fairly consistent with the Pierce Model. Runoff was greatly reduced using TR-55 method of calculating runoff and infiltration rates were fairly consistent with a rate of -6.0 inches per month. Mike Pennington (WRD) and Aquila's consultants discussed the model in a conference call the following day. Mike Pennington recommended modifying the model slightly to allow water table values to drop below the soil surface. This recommendation was to determine what affect the drawdown would have during operating conditions. Jeff and company agreed to make this modification and prepare the models for the remaining wetlands.

April 6, 2018 Submission of Revised Water Budgets for WL-40-41 and WL-C-1 Lobe

On April 6, 2018 Jeff King submitted revised water budgets for wetlands WL-40-41 and WL-C-1. Several changes were made to the model that were not discussed with WRD. The biggest change was with respect to runoff contribution to the wetlands. Aquila's consultants abandoned the use of TR-55 and inserted a new method of calculating runoff using a runoff calculation in accordance with the USGS Oakes & Hamilton reference for the Menominee River watershed. Mike Pennington reviewed this change and thought it was not appropriate for use in a wetland water budget model. Runoff into wetlands should be determined by the watershed surrounding the wetland and not a stream runoff model. Using this method the runoff contribution to the wetland was greatly exaggerated. The method for calculating infiltration was also modified although values were similar to what WRD suggested. The model was modified as requested to allow water levels to be shown below the soil surface.

April 11, 2018 Submittal of Water Budgets from Mike Pennington to Mike Nimmer

To help clarify what WRD was asking for Mike Pennington prepared revised water budgets using the Pierce model for WL-40-41. The water budgets were prepared using TR-55 for surface water runoff, infiltration rates of approximately 6 inches per month and water table data from piezometer readings provided by Mike Nimmer. Water budgets were prepared for the wetland at the location of the piezometers as well as at the wetland fringe. The water budgets prepared by Mike Pennington showed that infiltration rates and presence/absence of groundwater were the driving factors affecting the level of water in the wetland when comparing existing and operating conditions. Mike also noted that the way the monitoring wells were installed was probably resulting in higher water table readings. Mike Pennington and Aquila's consultants (Jeff King, Don Tilton and Mike Nimmer) had a lengthy discussion on April 12, 2018 about surface water runoff and it was apparent that Aquila didn't agree that TR-55 was appropriate even with a low runoff curve number. They also didn't understand how groundwater levels affected infiltration rates in the model. Regardless, they agreed to run the rest of the models using the assumptions provided by Mike Pennington in accordance with this model. They also agreed to put existing and operating water levels on the same hydrograph to allow for easy visual comparison.

April 20, 2018 Submittal of Revised Water Budgets

On April 20, 2018 Jeff King submitted revised water budgets for all wetlands. Water budgets were to be submitted with assumptions used in Mike Pennington's previous submittal to Mike Nimmer. However, Aquila's consultants once again changed several factors/assumptions in the revised water budgets. Specifically, infiltration rates were reduced from 6 inches per month to 3 inches with no data to justify the reduction and the influence of groundwater on infiltration rate was completely removed from the model. As a result, all of the models that were prepared showed no change between existing and operating water levels with the exception of a small runoff event in November. On Monday, April 23 2018 Jeff King emailed Mike Pennington with another justification for increasing infiltration rates based on a stream study of Pike River in Wisconsin. The reason for that submittal is unknown since it wasn't requested and wasn't part of the models previously provided on April 20, 2018. The new information was discussed in a follow-up conference call that afternoon with Jeff King, Don Tilton, Mike Nimmer and Kristi Wilson. Mike Pennington explained that the new information was not appropriate for inclusion in a wetland water budget. There was lengthy discussion pertaining to all of the information that had been submitted to date. Kristi Wilson documented the call in a note to the file.

April 27, 2018 Submittal of Revised Water Budgets

On April 27, 2018 Jeff King submitted revised water budgets for wetlands 2b, 6, 40/41, A1East, A1West, B1 and C1 Lobe using assumptions requested by Mike Pennington in his April 11 email to Mike Nimmer. Specifically, the assumptions used were (1) no surface runoff contribution to the wetlands other than snowmelt and one November rain event of 2.5 inches, and (2) an infiltration rate of 6 inches per month. Based on the email from Jeff King, the outputs from the revised water budgets resulted in an increase in indirect impacts to wetlands from approximately 17 acres to approximately 31 acres. These estimates include the estimated loss of 6.15 acres of wetland at WL14/14a/15 (as suggested in the original permit application), an estimated loss of 12.48 acres (as compared to the 1.93 acres in the original permit application, so 10.55 acres more) in the western lobe of Wetland A1, and an estimated loss of 3.60 acres (as compared to the 0.10 acres in the original permit application, so 3.50 acres more) along with approximately 231 linear feet of intermittent stream in Wetland 6. Jeff King also stated that in the email that they did not think that there were offsite impacts to wetlands. Mike Pennington reviewed the water budgets and agreed that they were generally prepared per WRD recommendations and that they more accurately represent conditions in the field based on available data. However, no maps were provided that showed exactly where the increased indirect impacts were likely to occur. In addition, no justification was provided for why some wetlands had increased impacts and others did not and why the conclusion was reached that there would be no offsite wetland impacts.

General Conclusion with Regards to Wetland Water Budgets

WRD staff have considerable time over the last month or so reviewing several versions of wetland water budgets prepared by Aquila's consultants. None of the water budget revisions that have been prepared to date have appropriate based on site conditions. Therefore, WRD staff are unable to use the water budgets to determine the amount of indirect impact to wetlands. After several lengthy discussions, Mike Pennington prepared an example water budget on April 11, 2018 to help detail the information that he felt was necessary to document potential impacts to

wetlands. There seems to be a lack of understanding by Aquila's consultants on how wetland water budgets work. On numerous occasions they have submitted revisions to water budgets that are inappropriate and use incorrect assumptions. In addition, WRD's water withdraw staff have reviewed the groundwater drawdown model and concluded that the model is not well calibrated and may underestimate the amount drawdown that is likely to occur under operating conditions of the mine. Since the groundwater drawdown model is used to prepare the wetland water budgets, an accurate, well calibrated drawdown model is necessary to determine the extent of wetland impacts caused by the project.

Attachment C: Comments on Water Quality

Eric Chatterson
Geology Specialist
Water Resources Division

- The likelihood of constituent mobility within ground and surface waters on and near the project site. Is there a possible effect on the water that flows into wetlands and streams on or near the proposed project site? If so, is it possible to categorize or anticipate the scope or effect the proposed action will have on these waters?

Most all of the materials that will be removed during mining operations contain sulfides. Exposing this material to oxygen and water is expected to mobilize constituents from the mined/backfilled material at concentrations exceeding GSI criteria. Table 5-1 of the Foth modeling report estimates the projected pore water concentrations for several constituents of concern. These values exceed generic DEQ GSI criteria. The modeling report (Foth) attempts to demonstrate that these constituents will not be an issue by using a diffusion calculation (Fick's law) to show that the final concentrations will be below GSI criteria. However, using Fick's law in this way is both inappropriate (Fick's law is for one dimensional situations) and based on incorrect assumptions (i.e, the groundwater concentration gradient is calculated with a zero constituent background) and does not accurately reflect the constituent loading to the groundwater. The concentration of constituents in groundwater should be based on pilot tests that reflect the three dimensional impact of the waste rock. If concentrations are to be modeled,

they should be modeled numerically with the entire volume of sulfide deposits, capable of mobilizing constituents, modeled as a whole.
Based on my review of the available data, the proposed mining activities will mobilize constituents and ultimately impact nearby groundwater and surface waters at the site. The use of carbonate to mitigate the effects of the ARD has been proposed for when the pit is backfilled. However, the amount of carbonate required would be enormous and the logistics/reliability of such a proposal would require a detailed plan with confirmatory pilot tests. Such a plan/report has not been provided in either the modeling report or the Mining application.

- Is there a possible discharge to the Menominee River on or near the project site? If so, is it possible to categorize or anticipate the effect the proposed actions will have on these waters?

There is a high likelihood that elevated constituent concentrations will be observed in the groundwater that discharges to the Menominee River and the Shakey River. Hydraulic conductivities indicate that flow into and through the surrounding material will occur at all depths of the excavated area. However, groundwater flows/hydraulic conductivities are expected to be much higher in the shallower zones and decrease with depth. Significant flow through the host rock (crystalline Precambrian) is evidenced by several residential wells in the area that extract their water solely from these crystalline Precambrian units. Given the hydrogeologic setting, impacted groundwater from the backfilled pit is expected to migrate to local surface water sources. Assessing these impacts would require an in depth analysis using three dimensional methods. Such an analysis is not available in the documents currently available to me.

- If there is a potential for constituent loading and discharge to ground and surface waters, would the action be otherwise lawful under NREPA. Specifically, would this activity as currently proposed required a permit to discharge under other applicable Parts (i.e. Pt 22, 31, NPDES) of NREPA?

It is the WRD's opinion that this activity would either require a Part 22 groundwater discharge permit or demonstrate that no discharge from the proposed mine area into the groundwater aquifer would occur. To demonstrate that no discharge occurs would require the pit to be lined per Part 22 Rule 2237 liner requirements, or the applicant would have to demonstrate equivalency of such.

<u>Part 22/ Part 31:</u>

- Provide comment on known residential wells within the bedrock near the project site. How is this information useful for assessment of potential groundwater conditions and flows. Is there potential risk to these wells that is proposed by the project?
    - Numerous residential wells in the study area get their water supply from the fractured bedrock, including deeper portions. This indicates that the fractured bedrock is permeable and able to transport significant quantities of water. Given that the proposed mine is located up gradient from these wells, there is risk of

impact to the residential wells as well as potential discharge to the Menominee River at GSI locations that will be difficult to determine.

- Provide any additional comments or recommendations on the methodology of assessment for mobilization of constituents into groundwater.
    - I would recommend that the model utilize a mass loading approach that incorporates quantitative results such as the humidity cells testing. A mass loading per unit time could then be incorporated into a transient numeric model that would allow for a loading rate to be released per time interval. This would provide an accurate estimate (a baseline) for untreated material being backfilled into the pit. Proposed treatment options (limestone/carbonate) could then be incorporated into the model to estimate their effectiveness.

Attachment D: Comments on LEDPA and Economic Feasibility

Kristi Wilson
Environmental Quality Specialist
Water Resources Division

The WRD requested that the applicant further detail the Least Environmental Damaging and Practicable Alternatives (LEDPA) by addressing the property directly to the east of the proposed project site. This question was first addressed with the applicant in the January 17, 2017 Correction Request, and again in the March 2, 2018, letter to the applicant to address public comment. Additional requests for information to fully characterize the feasible and prudent alternatives were contained in the March 8 EPA letter of objection and the WRD March 19 letter for additional information to address the federal objection. The WRD has specifically asked the applicant to further address potential upland alternatives for non-wetland dependent activities.

From the March 19, 2018 letter:
Additional supporting documentation demonstrating that the preferred-alternative is the least environmentally damaging practicable alternative (LEDPA), e.g. documenting off-site alternatives for waste rock storage including cost analysis. The LEDPA shall demonstrate that the applicant's alternative avoids and minimizes impacts to wetlands and aquatic resources.

- Provide a final site plan. Final site plan should include the location of storm water management facilities, waste management features, collection liners, ditching, and site infrastructure development including proposed power substation and road construction, realignments or widening.
- Address future underground mining.
- Further detail the LEDPA analysis to include the economic considerations and asserted costs.
    - Alternatives should address the specific site(s) and locations that were considered for the analysis.
    - Documentation should support why the alternative is considered not economically feasible, which should include a detailed cost analysis.
- Provide description of what considerations were given to alternative upland areas near the project site, e.g., state land to the east of the site, or other nearby properties.
- Provide further analysis on how the preferred alternative avoids and minimizes impacts to aquatic resources.

Applicant response to public comment:
"The preferred site alternative maximizes use of the upland acreages in the vicinity of the mine pit to the extent possible, as described in some of the responses above. As shown in the LEDPA analysis, several other alternatives were evaluated and were considered economically infeasibly and/or not prudent with respect to wetland impacts (refer to LEDPA Table 4-1).

"Off-site ore processing was evaluated as Alternative Site Plan B in the LEDPA, and was deemed not economically viable due primarily to increased ore transport costs. As described in comments above, there is a high sensitivity of the Project to material transport costs since ore, waste rock, tailings, and water transport costs make up a significant portion of the Project's operating costs. Any significant expansion of the Project Area (whether in the vicinity of the site or off-site) renders the Project economically unviable simply as a result of the transportation costs combined with the lack of any existing facility to handle any of these mine products or by-products in the region."

The applicant provided further response to the suggestion of the state owned land to the east of the project site:

WRD Comments: There is some upland acreages within the project area that have not been included in the alternatives analysis. These areas are not significant in size, but may be able to support ancillary facility development that will otherwise directly impact wetlands and aquatic resources.

There is no information about offsite ore processing contained in the LEDPA. The project has been compared to the Flambeau mine, in which the ore was transported to Ontario for processing. The project has also compare itself to Polymet, in which the ore will be transported by rail offsite to a refurbished taconite processing facility. There is also the standard that Eagle Mine has demonstrated for offsite ore processing at the Humbolt mill.

The applicant has not sufficiently demonstrated that the project is not capable of alternative logistics, technologies and sites that may minimize impacts to wetlands. The applicant also has not demonstrated the offsite alternatives that were considered for processing ore or the stockpile

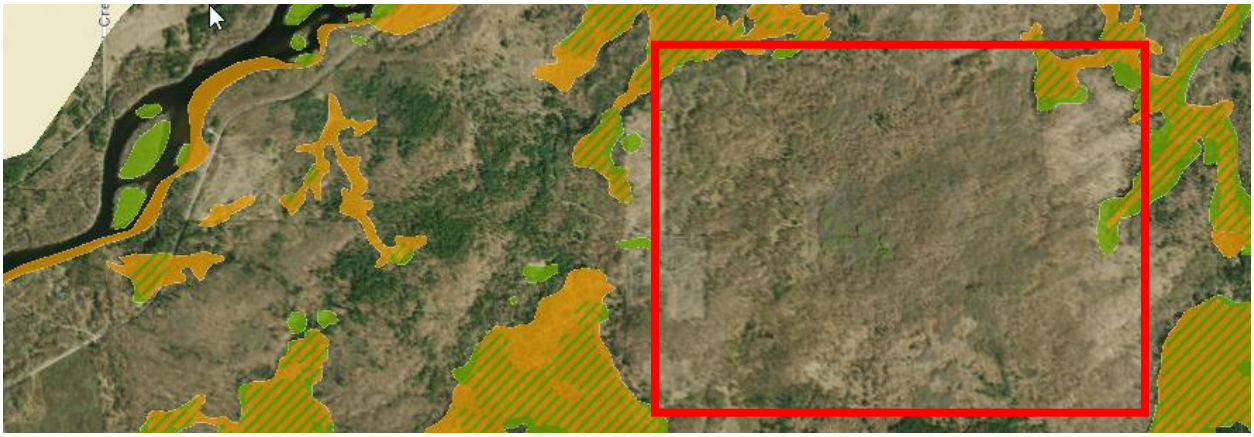
or disposal of materials. The WRD has requested that the applicant demonstrate the alternatives by identifies the sites that were considered and provide a detailed cost analysis. The applicant has not provided this information to support their assertion that offsite processing or material storage and disposal is not feasible or prudent.

The WRD further inquired about the opportunity to utilize upland areas that lie to the east of the project site for material storage. The applicant provided the following response (Response from applicant #6.4):

"The State-owned land east of the Project Boundary was considered for siting of Project facilities such as mine waste storage, contact water storage, and ore processing; but was rejected because the longer transport distances for waste rock, ore, and water would render that alternative economically infeasible and not optimal from an environmental and worker health and safety perspective, for the reasons described above. Also, as shown in the NWI wetland map on the DEQ website, the State-owned land also contains wetland acreage that would need to be avoided in any site plan to use that area and would be subject to the same kind of "indirect impact analysis" that we have evaluated on the existing Project site. While Aquila may have mineral rights in the land to the east, those mineral rights do not give them any control over the surface use.
WRD Comments: This parcel was not included in the LEDPA. No analysis regarding costs and economic viability have been included in the LEDPA. No information about transportation costs were included in the LEDPA.

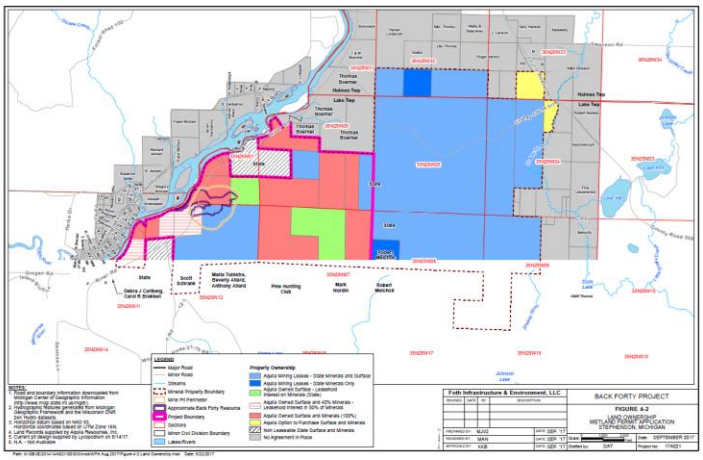
I contacted the Manager of DNR Real Estate Services and asked if Aquila has inquired after the availability to develop this property. DNR responded: "Aquila has never proposed that lands in these Sections be part of the exchange. The only have indicated that there will be likely future easement applications for utilities and roads, but to date, no applications have been submitted."

Wetlands Map Viewer does not show any wetland complexes on the State of Michigan land adjacent to the project area. Using Wetlands Map Viewer, I was able to measure 900 acres of upland adjacent to the project site and proposed development.



State land to east of project area

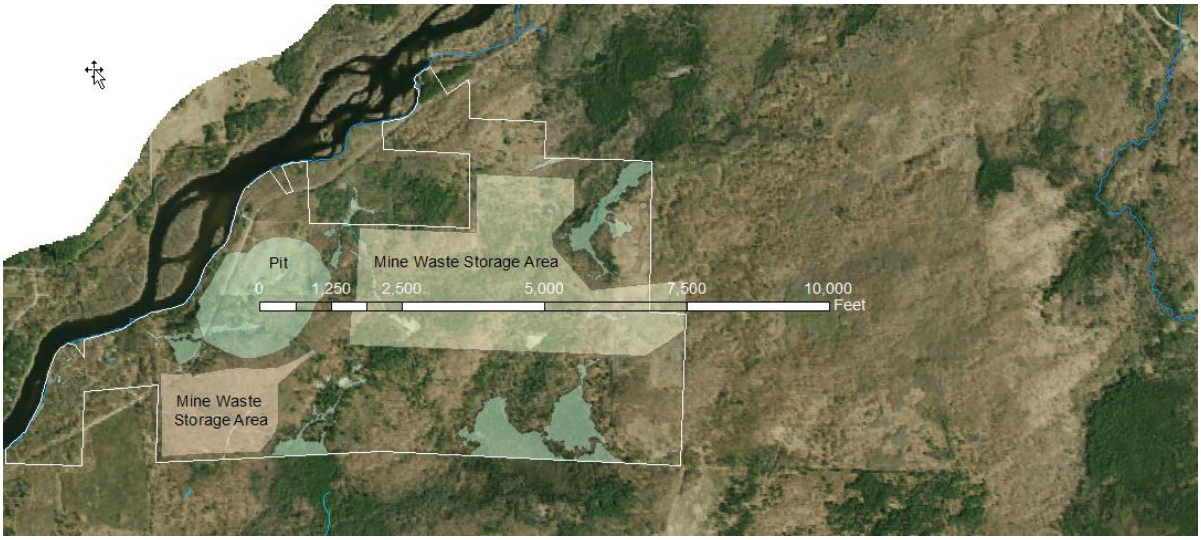
Aquila's application map shows that Aquila has both minerals and surface leases in the area of interest (SOM property).



In response the EPA objection letter, the applicant states: "The straight-line hauling distance from the center of the mine pit to the general vicinity of the proposed process plant and mine waste storage area as currently proposed is approximately 3,000 feet; whereas the straight-line hauling distance to the State-owned land to the east is approximately 10,000 feet. A typical hauling cost for ore and waste rock is assumed to be approximately $0.50 per ton per 1,000 feet…"

For the approximate total quantity of ore and waste rock expected for the Back Forty Project (totaling approximately 60 million tons), the total transport cost as currently proposed will be approximately $90 million. If the mine waste storage area and contact water basin were located on the State-owned land to the east with the resultant hauling distance thereby increased to 10,000 feet, the hauling costs would increase to approximately $300 million. The costs to relocate the waste rock back to the mine pit at closure would be similar, so effectively increasing the total costs for transportation costs on the Project from approximately $180 million to $600 million. And if the contact water basins were also to be located on the State-owned land, pumping costs would also increase significantly.

WRD Comment: This information is not consistent with information in the application. The wetlands application LEDPA states that this distance from the pit to the TWRMF is 3,900 feet. That measurement is made from the center of the pit to the center of the TWRMF. From the center of the pit to the east property line is 7,800 feet.



As measured on GIS:

Approximate center of the mine pit to the proposed processing plant: ~3,800 feet
Processing Plant to center of Mine Waste Storage Area (TWRMF): ~2,600 feet
Processing plant to east property line (direct): ~4,800 feet
Center of pit to east property line: ~7,800 feet

The financial assurance estimate for the 632 application states that it will cost $1.15/ton to relocate waster rock from the TWRMF to the pit, an estimated 3,900 feet. This would mean that it is approximately $0.29/ton per 1,000 feet, not the $0.50/ ton that the applicant provided as an "assumed" transportation cost.

From the 632 Closure Financial Estimate – relocation of material from TWRMF to pit is $1.15/ ton. This information is also based upon the previous site plan in which some portions of the TWRMF are closer and some are further away from the pit.

Reclamation and Monitoring Cost Estimate

Foth

Client:	Aquila	Scope ID.:	14A012
Project:	Final Reclamation Cost Estimate		
Prepared by:	JPH	Date:	10/14/15
Checked by:	JOS	Date:	10/30/15

Reclamation and Monitoring Cost Estimate		*Life of Mine Estimate*			
				Item	
Item	**Units**	**Unit Cost**	**Quantity**	**Total**	**Comments**
Open Pt Restoration					
1) Rock & Tailings Relocation					
Rock relocation to Mine Pit	tonne	$1.15	44,000,000	$50,600,000	Open Pit Data
2) Pit Improvements					
Place and compact soil cover	cu.m	$4.00	1,582,000	$6,328,000	Open Pit Data
Place and grade topsoil	cu.m	$6.00	35,625	$213,750	Open Pit Data
Hydro-Seeding	sq.m	$0.35	237,500	$83,125	Open Pit Data
			Subtotal	**$57,224,875**	
Buildings and Structures					

ROCK MOVING	SCOPE	RATE	UNIT	DETAILS
TWRMF Rock Relocation	Load/Haul/Dump by Contractor	$1.15	tonne	From TWRMF to Open Pit Using Mine Fleet
TWRMF Tailings Relocation	Load/Haul/Dump by Contractor	$1.25	tonne	From TWRMF to Open Pit Using Mine Fleet
Overburden from Stockpiles	Load/Haul/Dump by Contractor	$4.00	cu.m	From Stockpile to Open Pit Using Mine Fleet
Topsoil from Stockpiles	Load/Haul/Dump by Contractor	$6.00	cu.m	From Stockpile to Open Pit Using Mine Fleet

The applicant further states:

"A typical net present value expected for a mining project similar to the Back Forty Project would be on the order of $250 million. Therefore, the additional operational transport costs for ore, waste rock, and water of over $200 million would certainly result in a negative net present value, and therefore result in an economically infeasible project. It may be correct that the net present value of the project is more highly sensitive to metal prices and ore grades than operating costs, but this would certainly not be the case if average hauling distanced were more than tripled. From an overall "environmental footprint" perspective, to spread out the mine operation (as compared to consolidating it as currently proposed) by building a haul road to a site at least 4,000 feet further east would result in both direct additional landscape impacts as well as secondary or indirect impacts to otherwise relatively undisturbed parcels."

WRD Comment: This response assumes that the WRD is requesting an alternative of moving the facilities and waste rock storage to only the SOM property to the east of the current project site. What we have requested is that area be included in the LEDPA for inclusion of a feasible and prudent alternatives analysis.

Moving facilities to the east parcel would impact uplands and potentially result in the avoidance of direct impacts to regulated wetlands within the project site. Reconfiguration of the project may result in the avoidance of direct impacts to WL-6, B1/B2/B1c, 4A, 2c which would minimize the project's overall wetland impacts. The applicant has claimed that these wetland complexes are not connected to groundwater and would not be subject to impacts from groundwater reductions/ pit dewatering. The claims that these wetlands are not connected to or influenced by groundwater is unsubstantiated and these wetlands may be impacted by groundwater reductions even if they are avoided by direct dredge and discharge impacts.

From
LEDPA

Economic Viability Criteria

As mentioned, tailings and waste rock storage areas require a liner system as required by 632 R425.409 (a)(i)(A). A liner system is a significant portion of the Project capital cost. As shown in Table 4-1, alternatives F, G, and H have combined tailings/waste rock storage footprints of 17.6, 17.0, and 15.9 million square feet (MSF), respectively, compared to 14.3 MSF for the preferred alternative. Hauling distances (measured in a straight-line) for waste rock are approximately 2,000 feet, 3,000 feet, and 4,100 feet for the three alternatives, respectively, compared to 3,900 feet for the preferred alternatives, as shown in Table 4-1. Also, Alternatives F and G rely on wet slurry tailings which can be costly to cap at closure. All aspects considered, Alternatives F, G, and H were all deemed not economically viable since their capital

Based upon the distance identified in the LEDPA and the costs identified in the Part 632 cost closure analysis ($1.15/ton from TWRMF to backfill pit), the cost to haul one ton of ore 1,000 feet is $0.2948. This may not be a direct comparison to indicate that the transportation costs of hauling an extra 1,000 linear feet is the same as the initial 1,000 feet and it is unclear if the cost includes loading, deposition and placement, which would involve other equipment/ operators.

	60Mt to TWRMF			44Mt from TWRMF to Pit		
Cost per 1000 feet	$0.29/ton	$0.38/ton	$0.50/ ton	$0.29/ ton	$0.38/ton	$0.50/ ton
2000	34800000	45600000	60000000	25520000	33440000	44000000
3000	52200000	68400000	90000000	38280000	50160000	66000000
3800	66120000	86640000	114000000	48488000	63536000	83600000
3900	67860000	88920000	117000000	49764000	65208000	85800000
4000	69600000	91200000	120000000	51040000	66880000	88000000
7800	135720000	177840000	234000000	99528000	130416000	171600000
10000	174000000	228000000	300000000	127600000	167200000	220000000

Total Cost			
	$0.29/ ton	$0.38/ton	$0.50/ ton
2000	60320000	79040000	104000000
3000	90480000	118560000	156000000
3800	114608000	150176000	197600000
3900	117624000	154128000	202800000
4000	120640000	158080000	208000000
7800	235248000	308256000	405600000
10000	301600000	395200000	520000000

Response #6.2

“As mentioned, transport costs for mined materials and water typically drive the economics of mining projects, as is the case with this Project. As noted above, transport distances are also a significant driver of environmental impacts associated with mine projects as well as the health and safety of mine workers. Over the operating life of mine, transport of ore and mine wastes over even modest distances can result in costs substantially greater than similar mines, since the

mining industry typically strives to optimize projects by reducing transport distances to the greatest extent possible. Therefore, it is imperative that mine waste storage areas and basins be located immediately adjacent to the mine development for this Project to be economically viable/feasible and optimized environmentally. And, as described in other portions of the permit application documents, since an off-site process plant is not feasible or prudent for this Project, a process plant must also be located on-site. Therefore, in this case, direct impacts to (removal of) portions of wetlands immediately surrounding the mine pit (WL-6, WL-4a, WL-2c, WL-B2, WL-B1, and WL-52) are unavoidable. Since the liner is required beneath the mine waste storage area under Part 632, construction of mine waste storage area liners are also unavoidable."

WRD Comment: I spoke with the production manager of another mining operation in the Upper Peninsula that works with hauling ore. This mining company has a long history of wetland permitting with WRD and is experienced with Michigan's mitigation criteria. I contacted this mining company to discuss transportation and materials cost. This company asked not to be recognized as the source for some of this information as it is proprietary and spoke with some degree of confidentiality.

I asked the production manager about how much it would cost to transport ore an additional 1,000 feet and they said additional distance is "negligible". The manager explained that the costs of transporting ore include equipment (loader and haul truck), labor costs, fuel, and tires (as a separate maintenance cost). They stated that the haul trucks they use consume about 20 gallons of fuel per hour while in operation. Their labor costs (hourly plus benefits) are approximately $50/ hour per operator. For their class of trucks, the cost of tires is about $10/ hour per machine (8,000 hour service life). Once the haul truck is moving, it travels up to 40 mph. It was explained that the cost of transporting ore is the loading and unloading; once the truck is loaded the only real cost of transportation is the additional operating time.

This company also brought up the costs associated with wetland permitting and mitigation. For their operation, the costs associated with mitigation approximate at $1 per ton; which is twice what the applicant is claiming the extra transportation costs of the east parcel alternative will cost.

Conclusion: The applicant has not provided any substantial information to determine that offsite alternatives are not feasible and prudent. Information would need to include the location of the sites that are included in the alternatives analysis and a detailed cost assessment for each alternative. This assessment should include the costs associated with the entire project and include the cost of the proposed mitigation. If this project is as sensitive to the costs as the application asserts, the applicant should demonstrate that the requirements of a permit can be carried out including mitigation, monitoring and adaptive management.