Summary Response to Comments
Copperwood Mine Mining Permit Amendment Request March 2018 – MP 01 2012
Michigan Department of Environmental Quality

The Michigan Department of Environmental Quality (MDEQ) received an application from Copperwood Resources, Inc. (CRI) on March 22, 2018 requesting approval to amend Mining Permit MP 01 2012, issued under Part 632 Nonferrous Metallic Mineral Mining Regulations (Part 632), Natural Resources and Environmental Protection Act (NREPA), 451 of P.A. of 1994, as amended. On July 17, 2018, the MDEQ held a public meeting regarding the amendment request application. After the public meeting, MDEQ accepted written comments until August 14, 2018.

The following is a summary of comments received by MDEQ, Oil, Gas, and Minerals Division, during the public meeting through the end of written comment period, and responses to those comments.

1. **Comment:** Inconsistent proposed size of Tailings Disposal Facility (TDF) in various permits.

   Response: As explained in response to MDEQ request for additional information, the area of the grading limits for the TDF, which includes the perimeter road, soil borrow area, and areas of excavation around the TDF are approximately 348 US Acres, which is consistent with the previous approved design. The total area of the TDF within the outer toe of the dam is approximately 316 US Acres.

2. **Comment:** The MPAA should not be approved without an adequate description of where the power for the project is coming from. There have been descriptions of both on-site power generation through natural gas turbines with a gas pipeline as well as an overhead transmission line delivering power to the site.

   Response: According to CRI, a feasibility study update conducted by GMining Services for CRI indicated that an on-site natural gas power plant was the preferred power supply alternative for the project compared to the 2012 feasibility study plan for utility supplied power that required construction of a 25-mile transmission line. During the course of initial discussions with the local utility provider, they indicated the timeline for a transmission line would be at least 48 months which was a bad fit with the preferred project timeline. The same utility provider also offered to provide natural gas service to the Copperwood Mine site that, in addition to fueling the on-site power plant, would have provided a fuel source for the updated mine ventilation system air heaters and space heating requirements for plant site buildings. After further consideration, the cost estimates for purchase and installation of the on-site natural gas power plant plus installation of the natural gas service pipeline had a very adverse effect on the economics of the project. As a result, CRI re-initiated transmission line discussions with the utility company and reached agreement on an accelerated completion date that falls in line with the current project schedule. Project economics are also significantly improved by a large reduction in pre-production capital costs for the project with the utility company offer to recover the capital costs of the transmission line in their power rates over the life on the project. Therefore, CRI submitted an addendum to MDEQ on June 26, 2018 to

revise the amendment request application to return to the previously permitted power supply by a public utility via a grid-connected transmission line

CRI will not be applying for the permits associated with the power supply of the mine site, as a third-party energy provider will submit the necessary permit applications. Any potential environmental impacts from power supply installation will be addressed under the appropriate environmental statutes and regulations. In addition, the MDEQ has proposed to add a condition to Mining Permit MP 01 2012 that requires power supply infrastructure to be removed from the mining area once no longer necessary unless the permittee enters into an agreement with another party in which a property end use is established that includes beneficial use of the electrical service.

3. **Comment:** The Alternatives Report for the TDF on pg. 45 it states that the TDF will be a cost increase of $3.6 million, and on pg. 67 it states the cost increase will be $2.8 million.

   Response: The commenter is referring to the Copperwood Project Alternatives Analysis Update, June 7, 2018, that was submitted to the MDEQ as part of the Part 301, 303, and 325, Inland Lakes and Streams, Wetlands, and Great Lakes Bottomlands permit application, and was also submitted in response to MDEQ request for additional information regarding the amendment request. The $3.6 million is a 2018 update of the cost increase of the preferred TDF Alternative 4B vs. Alternative 4. The inconsistency is an oversight on CRI's part of not updating the Alternative 4B cost increase ($2.8 million in the 2012 application) in both places where it is found in the Alternatives Analysis report.

4. **Comment:** The MPAA should be using terms like "preliminary analysis" or "preliminary plan designs"-as the applicant does in the aforementioned section-is especially disconcerting when it comes to reviewing and understanding the environmental impacts of the proposed project. In a water-rich landscape like where the proposed project is centered, changes to design could greatly change the impacts on not only wetland dredge and fill, but on streams and Lake Superior itself. Until the design plans have been finalized and analysis completed, the concern of possible irreversible impacts to wetlands, streams, and Lake Superior is a very real and valid possibility. The applicant should be required to collect five consecutive years of baseline data on the water resources, finalize design and analysis, and resubmit an application.

   Response: The difference between preliminary and final design plans is expected to be minor and will not represent scope changes to mining area impact nor increase the affected area. The permittee may submit to the MDEQ a request to amend the mining permit to address changes to the mining, reclamation, and environmental protection plan, and environmental impact assessment, or the MDEQ may require a mining permit to be amended if the terms and conditions are not providing the intended reasonable protection of the environment, natural resources, or public health and safety. In addition, Mining Permit MP 01 2012 requires all design certifications of liners, covers, and leachate collection systems be submitted to the

MDEQ, and placement of the ore, waste rock, overburden, or tailings cannot begin in the storage facility until approved by MDEQ.

Part 632 requires of a minimum of two years of on-site monitoring data for groundwater and surface water occurrence and quality, and meteorological data. The Environmental Impact Assessment (EIA) submitted as part of the Mining Permit Application includes data and information that meet this requirement, as concluded by the team that reviewed the original application. In consideration of CRI's request to amend the mining permit, this information remains valid in satisfying the requirement. However, the MDEQ is proposing to add a permit condition to Mining Permit MP 01 2012 to conduct confirmation baseline sampling prior to the start of mining operations under a plan to be approved by MDEQ. In addition, CRI is currently in discussions with the Water Resources Division (WRD) of the MDEQ to determine what additional baseline data should be collected given the comments received by CRI from the Environmental Protection Agency (EPA).

5. **Comment:** Biological communities change during drought periods and existing data may not account for the full diversity of species found at the site. The DEQ must require additional data collection that fully captures variability of environmental conditions.

   Response: CRI is currently in discussions with the WRD of the MDEQ to determine what additional baseline data should be collected given the comments received by CRI from the EPA. In addition, the MDEQ is proposing to add a permit condition to Mining Permit MP 01 2012 to conduct confirmation baseline sampling prior to the start of mining operations under a plan to be approved by MDEQ. In addition, Mining Permit MP 01 2012 requires monitoring for flora, fauna, fish and wildlife habitats, and biodiversity as specified in the approved monitoring plan.

6. **Comment:** The application doesn't thoroughly address potential impacts to aquatic organisms and riparian habitat along the streams impacted by the TDF. The biological monitoring referenced in the Stream Impact and Mitigation summary document (Page 4, Figure 4) was collected only along three creeks (Unnamed, Namebinag, and Lehigh Creeks) adjacent to or within the mine site-there was no biological monitoring sites along Gipsy Creek which will also be filled and redirected based on the new proposed TDF. Until this is done on Gipsy Creek, we find it irresponsible to issue any permits allowing impacts to this stream.

   Response: The MDEQ is required to take into account the extent to which other permit determinations afford protection to natural resources when making Part 632 permit decisions, and a mining permit is not effective until all other permits required under NREPA are obtained. The WRD of the MDEQ is reviewing the Part 301, 303, and 325, Inland Lakes and Streams, Wetlands, and Great Lakes Bottomlands permit application, which includes impact to streams impacted by the TDF.

7. **Comment:** The Stream Impact and Mitigation document show there were no surface water monitoring sites downstream of the East Branch of Gipsy Creek. This is a gap in data and should

remedied before any decisions are made related to permitting impacts related of the creek, relating to the TDF or any actions that would result in impacts to water quality or quantity to Gipsy Creek.

Response: Surface water monitoring is required under MP 01 2012 during mining operations and postclosure. The approved plan includes downstream monitoring of the east stream relocation.

In addition, the department is required to take into account the extent to which other permit determinations afford protection to natural resources when making Part 632 permit decisions, and a mining permit is not effective until all other permits required under NREPA are obtained. The WRD of the MDEQ is reviewing the Part 301, 303, and 325, Inland Lakes and Streams, Wetlands, and Great Lakes Bottomlands permit application, which includes impact to streams impacted by the TDF.

8. **Comment:** The field data used in the 2018-EA and 2018-MPAA were collected prior to 2012. During that time, the southern shore of Lake Superior experienced below average precipitation with drought conditions occurring during the spring and summer of 2010. Since that time, the Lake Superior region has experienced dramatic fluctuations in rainfall patterns with two 500-year precipitation events (2012 and 2016) as well and one 1000-year precipitation event (2018). It is likely that the hydrologic information collected by the mining company is not representative of the entire range of precipitation events.

   Response: Part 632 requires of a minimum of two years of on-site monitoring data for groundwater and surface water occurrence and quality, and meteorological data. The EIA submitted as part of the Mining Permit Application includes data and information that meet this requirement, as concluded by the team that reviewed the original application. In consideration of CRI's request to amend the mining permit, this information is remains valid in satisfying the requirement. However, the MDEQ is proposing to add a permit condition to Mining Permit MP 01 2012 to require the permittee to conduct confirmation baseline sampling prior to the start of mining operations under a plan to be approved by MDEQ. In addition, CRI is currently in discussions with the WRD of the MDEQ to determine what additional baseline data should be collected given the comments received by CRI from the EPA.

9. **Comment:** In the 2009 biological monitoring report, populations of Redside Dace were found in both Namebinag and Unnamed Creek, they are an Endangered Species in Michigan and the Fishbeck, Carr, and Thompson report clearly states "Populations of Redside Dace within the Copperwood site should be protected from human-related impacts. The Namebinag and Unnamed Creeks watersheds should be delineated and project activities within these watersheds, especially those that could alter hydrology, water temperature, or turbidity should be avoided or minimized to the extent possible." The surface facilities including the mill site, ore stockpile, box cut, sewage lagoons, and additional small infrastructures are all located in those streams' watersheds.
   The stream monitoring sites in Namebinag and Unnamed Creeks should be shown on a map and the monitoring stations should be described in respect to setup, deployment, and procedures

used for sampling. The monitoring stations should include more parameters pertinent to potential impacts to the Redside Dace. On top of this, monitoring points should be added upstream of the project site to allow for adequate assessment of the facilities impacts to surface water. This should include samples of the wastewater discharges from the sewage lagoons and the water treatment plant. These issues should be remedied with a comprehensive monitoring plan attached as an addendum to the Environmental Assessment and a new public comment period held on this monitoring plan prior to any permit being renewed or amended by MDEQ.

Response: Mining Permit MP 01 2012 requires monitoring for flora, fauna, fish and wildlife habitats, and biodiversity, including threatened and endangered species, as specified in the approved monitoring plan. The specified streams are also required to be monitored throughout the life of the mine to assess whether adverse impacts are occurring, and corrections made as necessary.

The MDEQ is required to take into account the extent to which other permit determinations afford protection to natural resources when making Part 632 permit decisions, and a mining permit is not effective until all other permits required under NREPA are obtained. The WRD of the MDEQ is reviewing the Part 301, 303, and 325, Inland Lakes and Streams, Wetlands, and Great Lakes Bottomlands permit application, which includes impact to streams impacted by the TDF. The discharges into streams are regulated by the WRD of the MDEQ under a NPDES permit. There will be monitoring of the water treatment plant discharge and sewage lagoon discharges covered under a NPDES permit through the WRD of the MDEQ. The monitoring plan submitted and approved under the Part 632 application is not required to include monitoring required by other permits.

10. **Comment**: Information provided in the permit application does not describe the full range of possible impacts to treaty rights or treaty-guaranteed harvests of fish that could be caused by the construction and operation of the water intake, the pipeline that would be built to transport water to the mine, the mine facility, or the long-term reclamation and perpetual care of the site. Nor does it fully explore alternatives for the proposed environmental impacts (e.g., backfilling tailings instead of surface storage) or the possible contamination that will be all but impossible to avoid due to the guaranteed leakage and failure of liners associated with the ore stockpile and TDF. The Environmental Assessment and other permit documents should honestly and accurately describe the possible impacts and the perpetual care requirements of the proposed mine.

Response: This question was addressed in CRI responses to the United States Army Corps of Engineers' (USACE) request for information under the Section 10 permit application. There will be a small 0.5-mile-long by 100-foot-wide corridor that will have a limited temporal impact of fisheries being unavailable for tribal harvests of fish. This will be close to shore and multiple miles from the closest known spawning reefs, near the Black and Presque Isle Rivers.

The closure plan for the TDF with its low permeability cap and geosynthetic liner that, coupled with the very low hydraulic conductivity and natural attenuation capability of the native soil

underlying the TDF, is predicted to not result in a situation requiring a perpetual care treatment plan. The term "perpetual care" appears in Part 632, R 425.409(b) which is linked to groundwater and surface water quality.

The proposed design of the liner and water management for the ore stockpile meets Part 632 requirements for treatment and containment to reasonably minimize actual and potential adverse impacts on groundwater and surface water. Further detail of the stockpile design was provided in the MDEQ response to additional information. The ore stockpile pad uses a combination of low permeability surfaces and designed slopes to direct and capture any contact water on the pad. The base is constructed using a minimum fill layer of 1 foot of very low permeability clayey material, compacted at 95% modified Proctor, produced from the excavation of the box cut and an incorporated 60 mil HDPE geomembrane layer to prevent seepage. An extra layer of 1 foot of uncompacted material will be placed over the liner in order to protect the liner. At closure, the ore stockpile area is required to be reclaimed. The MDEQ is proposing this additional permit condition to MP 01 2012 to clarify this requirement: The outdoor ore stockpile area shall be reclaimed and area regraded to conform to the reclamation grading plan in accordance with the approved Reclamation Plan and Special Permit Conditions O-1, 2, 7, 11, and 13. The geomembrane liner shall be removed and disposed of at a local landfill in accordance with applicable solid waste regulations.

In addition to the protective measures in the design, groundwater and surface water quantity and quality are required to be monitored throughout the life of mine in accordance with MP 01 2012. This includes monitoring wells located as close as physically practicable to storage and disposal activities, regional hydrologic monitoring, and ongoing geochemical characterization. Corrective action is required if a change in water quality is determined to be caused by a release associated with a mining activity that is the responsibility of the permitee.

11. **Comment:** Environmental data used in the Environmental Assessment and the MPAA was collected over 7 years ago. At that time, the Western Upper Peninsula was experiencing drought conditions with below average precipitation. Since then the area has recovered from the drought conditions and has had several large rainfall events. Wetland area and streamflow data may be very different today. Additional studies should be conducted to show more accurate environmental and biological data.

Response: Part 632 requires of a minimum of two years of on-site monitoring data for groundwater and surface water occurrence and quality, and meteorological data. The Environmental Impact Assessment submitted as part of the Mining Permit Application includes data and information that meet this requirement, as concluded by the team that reviewed the original application. In consideration of CRI's request to amend the mining permit, this information is remains valid in satisfying the requirement. However, the MDEQ is proposing to add a permit condition to Mining Permit MP 01 2012 to require the permittee to conduct confirmation baseline sampling prior to the start of mining operations under a plan to be approved by MDEQ. In addition, CRI is currently in discussions with the WRD of the MDEQ to determine what additional baseline data should be collected given the comments received by CRI from the EPA.

12. **Comment:** In addition to changing rainfall patterns, the project footprint has changed with the addition of an ore stockpile and changes to the location and footprint of the tailings facility compared to 2012. Baseline data collection and biological surveys of these new impact areas must be conducted prior to the issuance of any permit and included in the environmental review information for Copperwood.

    Response: The area of study delineated in the original EIA to identity and define the baseline conditions in the area is inclusive of the modified site layout proposed in the amendment request application, and therefore remains valid. Follow up field surveys were conducted in areas not previously assessed for cultural, historical, and archaeological resources, and results were submitted to MDEQ in response to a request for additional information. However, the MDEQ is proposing to add a permit condition to Mining Permit MP 01 2012 to require the permittee to conduct confirmation baseline sampling prior to the start of mining operations under a plan to be approved by MDEQ. In addition, CRI is currently in discussions with the WRD of the MDEQ to determine what additional baseline data should be collected given the comments received by CRI from the EPA.

13. **Comment:** With increase in precipitation over the 30-year average, there is the reasonable assumption that the groundwater table would not be the same as it was during years of drought conditions. Not only was the data collection for the original modeling inadequate due to the timeframe over which monitoring was collected, to use the same data more than five years later when there has been documented changes to the climate is negligent. The changes in climate modeled for the south shore of Lake Superior include increases in precipitation and more severe, flashier storm events. The applicant should be required to collect new data and rerun their models with the more recent data collected and the projection that precipitation will continue to increase.

    Response: The permittee is required to conduct regional hydrologic monitoring to evaluate local and regional stream flow and quality and local and regional groundwater elevations in accordance with the requirements of Rule 425.203(g) and Rule 425.406 of Part 632. In addition, the MDEQ is proposing to add a permit condition to Mining Permit MP 01 2012 to require the permittee to conduct confirmation baseline sampling prior to the start of mining operations under a plan to be approved by MDEQ. CRI is currently in discussions with the WRD of the MDEQ to determine what additional baseline data should be collected given the comments received by CRI from the EPA.

14. **Comments regarding tailings disposal alternatives:**
    - The DEQ must require backfill for this project in the mine permit.
    - The MDEQ must require that the backfill alternative be adequately considered.
    - Consideration of offsite tailings disposal, including at White Pine Mine as an alternative.
    - Why has the company not further explored the option of backfilling the mine with tailings to decrease the size of the TDF and possibly alleviate some of the environmental concerns that arise when storing tailings on the surface?

Response: The MDEQ requested additional information regarding tailings disposal alternatives. In May of 2018, CRI submitted a Part 301, Part 303 and Part 325 permit application to the MDEQ for stream, wetland and Great Lakes bottomland impacts related to development of its proposed Copperwood Project (Submission Reference Number: HND-EQMB-E27HX). An updated Alternatives Analysis report with appendices was included as part of this application and subsequently revised in June 2018 in response to correction requests received from the MDEQ on the Copperwood application, which included evaluation of tailings disposal alternatives. This report was submitted to OGMD as part of the response to the request for additional information to include as an update to the alternatives analysis. The on-site TDF alternative for deposition of 100% of the tailings produced during the life of mine was selected as the most feasible and prudent (practicable) alternative for the proposed TDF. The conclusion of Golder Associates for the underground tailings disposal options studied (Raw Tailings, Hydraulic Sand and Paste) is that they are all technically possible but that none are prudent for either safety or economic reasons. While the MDEQ encourages backfilling of mined out areas, this may not be applicable to all mine projects.

15. **Comment:** The tailings facility cover, drains and slopes would require perpetual care to prevent erosion, infiltration of water into the tailings, and slope failure. Lack of maintenance would ultimately result in the failure of containment and impacts to streams, wetlands and Lake Superior. The 2018 EA states several times that no long-term impacts to surface water quality would be present because the site would be reclaimed into a natural, self-sustaining ecosystem. The tailings facility is a constructed facility that relies on the perpetual operation of stormwater controls to maintain the stability of the embankments. It is not accurate to say that a natural, self-sustaining ecosystem is possible after mine closure.

    Response: The term "perpetual care" appears in Part 632 in R 425.409 (b) and is linked to water quality. The TDF conceptual design does not contemplate the need for perpetual water treatment. Postclosure monitoring and maintenance of the TDF is required to continue for a minimum of 20 years. Postclosure monitoring may only be terminated upon MDEQ determination that there is no significant potential for water contamination resulting from the mining operation.

16. **Comment:** As at the White Pine mine, historical boreholes provide conduits for discharge of mine waters and brines post-mining. Copperwood proposes to prevent brines from filling the underground mine and discharging to the surface by pumping Lake Superior water into the mine to form a fresh water cap. Because of head pressures at depth the brines will slowly displace the freshwater cap as is happening at White Pine. Maintaining a freshwater cap would be a perpetual mitigation activity.

    Response: As provided in Appendix 202.5.2-2b of the Mine Permit Application, the post-mining head conditions in the far southeastern corner of the mine are predicted to be just under 850 ft msl. This location is the furthest upgradient location in terms of groundwater elevation in the proposed mine workings. However, head levels at this point are predicted to be maintained below ground surface. From this location, predicted heads slope gently

towards Lake Superior - generally following the ground surface topography. In some areas, piezometric heads may be higher than the ground surface, but these occurrences will be limited to the deeper stream channels (as what is currently observed). In between streams, groundwater modeling for the Part 632 EIA of 2011 predicts heads will be well below ground surface. The assumption that a head of 850 ft msl will be maintained throughout the underground mining extent is inaccurate as the head elevations will vary throughout the mine. At most, there may be a few feet of piezometric head that is above ground surface in the stream bottoms, but the water in the underground mine will typically be separated from surface water by several hundred feet - separated by low conductivity bedrock and overburden materials. In the area of the boxcut, groundwater will equilibrate above the bottom of the boxcut, but are predicted to be about 10 feet below ground surface. Seepage out of the boxcut is not likely.

The final predicted head conditions are similar to what currently exists, except for the decrease in the head elevations predicted for areas within the footprint of the underground mine workings. Overall drawdown actually decreases the probability that the head in the underground mine will ever lead to discharge at the ground surface.

As historic boreholes are encountered during active underground mining, they are required to be grouted to prevent water inflow to the active workings and outflow during the post-mining period. Boreholes completed by Orvana and CRI have all been grouted shut from the surface as required by Part 625 Mineral Wells Regulations. Similarly, as naturally occurring fractures and/or faults are encountered with more than a brief duration of water inflow, they will be grouted shut.

The updated mine plan for the Copperwood Mine is designed to have no subsidence. Closure plans for the Copperwood Mine include filling the mine workings with a fresh water cap to suppress inflow of brines, construction of an engineered bulkhead to seal the boxcut entry portal and sealing of the mine ventilation raises. The much smaller extent of the Copperwood Mine, limited large openings for possible post-closure water inflow or outflow, an active program to grout historic boreholes, fractures and faults during mining, and planning for mine closure before and during mining are unlikely to lead to the White Pine mine situation described in the comment.

For reference, pumping of water from the White Pine mine is currently being done to hold the "brine level" at a specific elevation to allow for underground growth chamber operations being conducted by SubTerra LLC under an agreement with the Copper Range Co. The one million gallons per day pumping rate is an annual daily average that varies seasonally. During the annual snow melt, water level in the mine usually rises even with continuous pump operation. During the dryer months of July and August there are periods when no pumping is needed. This pumping to maintain a water level allowing SubTerra's operations to continue is thought to be required mostly due to uncontrolled inflow of surface water from uncapped historic mine workings, mine utility and service boreholes and, to a lesser extent, from unplugged exploration boreholes rather than the upwelling of deep brines. Copper Range

never completed its closure plan to fill the mine with fresh water that would act as a cap to suppress the deep brines. Previous numerical modeling by Copper Range in 1998 and recent modeling coordinated by MDEQ staff in 2016 does, however, result in the eventual need to pump and treat the White Pine mine water to prevent contamination of near surface groundwater and surface water. Unlike the White Pine Mine, the Copperwood Mine is regulated under the authority of Part 632, and as such the requirements for closure and the mine design does not allow for this situation to occur.

17. **Comment:** The Tailings Disposal Facility (TDF) liner and drainage system appear to be substantially different than that proposed by Orvana in their 2012 application and approved by the DEQ. As Highland Copper points out in section 5.2 of the MPAA " The proposed TDF design uses a geomembrane liner rather than the previously permitted basin drainage blanket. "In addition, the construction of the embankments differs substantially from the design approved by the DEQ in 2012. We were unable to find evaluation of seepage rates or expected seepage water quality with the new design. Such evaluation must be completed prior to permitting.

    Response: Construction of the tailings dam facility is subject to permitting under Part 315 Dam Safety regulations. The rationale behind the change to a geomembrane liner was provided by GMining Services and communicated to MDEQ as follows: The previous decision to use a drainage blanket is the usual way of preventing horizontal water pressure on dams. In the case of the Copperwood Mine, the ore beneficiation process requires to grind the ore at P80, 45 µm and down to 20 µm with the regrind circuit. CRI believes that over a relatively short period of time, the blanket would plug and ultimately result in increased water pressure on the earth structure being created without having any way to repair or remediate the drainage system.

    Using the liner may induce, for a short period, some water pressure on the dams while the initial tailings discharges create the protecting beaches. While CRI believes that the water pressure will not structurally damage the dams, this evaluation would fall under the Part 315 Dam Safety permit. The TDF designer increased the safety factor by decreasing the outside slopes of the dams, from 2.5H: 1V to 3H: 1V.

    The updated TDF design of 2018 will have a liner system that will have a lower amount of seepage occurring compared to the previously approved non-lined TDF design, of which conservative groundwater postclosure modeling predicted minimal leakage. The results of modeling the 2012 TDF design indicate, after 250 years of the worst-case flux out of the TDF and assuming no retardation of material in the TDF, make it evident that groundwater movement at the facility is very slow. For example, modeling predictions out to 1000 years show that most particles would still be within the footprint of the TDF or within 500 feet of the embankment. Considering that the liner system will have a 60-mil thick HDPE liner in addition to in situ and engineered low permeability soils, impacts from seepage are not expected to occur. However, groundwater water monitoring in proximity to the TDF is required during operations and postclosure, as specified in the mining permit and required under Rule 406 of Part 632. In addition, while MDEQ has determined that the liner system design appears to

meet the requirements under Part 632, the permittee is required to submit final designs of the TDF for approval prior to construction, conduct a Quality Assurance and Quality Control program during installation of the liner system in conformance with the Construction Quality Assurance procedures under Michigan's Solid Waste Management Rules, and develop an operations plan that addresses all components of the final design. The chemical composition of contact water will be used to monitor geochemical characterization during mining operations to calibrate and adjust model predictions.

18. **Comment:** In section 5.2.2 of the MPAA the applicant claims that water collected in drains in the TDF will be treated as non-contact water and discharged to a perimeter channel: "Excess port water collected in the drains will be released to a perimeter channel near the downstream toe of the embankment adjacent to the perimeter access road and handled as non-contact storm water." That perimeter channel reports to surface waters such as Gipsy Creek. As with all liner systems, there will be seepage through the liner which will report to the drains, particularly the Chimney Drain and the Foundation Drainage Blanket (MPAA Figure 5-10). Water in the TDF drains cannot be considered non-contact water. It must be collected and treated, or at least frequently tested for suitability for direct discharge.

    Response: Part 632 requires plans for monitoring, containment, and treatment of surface runoff that has that has contacted, or may contact, ore waste rock, overburden, or tailings determined to be reactive. The water the commenter is referring to is not expected to come in contact with the tailings, and therefore may be handled as non-contact water. The MDEQ is required to take into account the extent to which other permit determinations afford protection to natural resources when making Part 632 permit decisions, and a mining permit is not effective until all other permits required under NREPA are obtained. The National Pollution Discharge Elimination System (NPDES) permit for the Copperwood Mine is for industrial storm water discharge with required monitoring including characterization sampling of individual water flows contributing to runoff water leaving the Copperwood Mine. This will include water discharging from the TDF drains.

19. **Comment:** Updated precipitation information must also be incorporated into the design of the tailings facility. Because the applicant is using 100-year flood and precipitation data, it's likely that the facility will not be engineered to withstand these extreme precipitation events.

    Response: Predicted seasonal and long-term variations of the meteorology were identified for the affected area. This is sufficient to make assumptions regarding the climate for the predicted life of the mine. Part 632 allows for amendments to be made to a mining permit to address changes in natural conditions. In the case of such an event the Emergency Response and Contingency Plans (which are updated yearly) will outline plans to mitigate potential water management issues.

20. **Comment:** The mining method proposed by Copperwood Resources Inc. for the Copperwood Project does not meet industry standard much less attempt to apply new innovations to the room and pillar mining method, most room and pillar operations have a secondary recovery

program wherein remaining pillars are removed after all other ore is safely excavated. One way many mine operators safely achieve secondary pillar removal is through the use of backfill. Researchers have shown that various additives will bind-up tailings enough to make a paste and be load bearing (even Copperwood's fine grained tailings) especially in the confinement of the underground setting.

Response: Underground room-and-pillar mining utilizing conventional drill-and-blast extraction is the method that will initially be used as stated in the application. Copperwood Resources is also contemplating use of a continuous miner (CM) mining method if it is shown to be practicable. Both options are presented in the permit application. Room-and-pillar is a widely used mining method for underground mines and is generally accepted as effective. While a secondary pillar recovery program would result in an increase in recoverable ore from the Copperwood Project, to achieve this would require: a) Removal of the remaining pillars using a retreat mining program followed by caving of the mine roof and surface subsidence, or b) Placing of structural backfill to support the mine roof followed by removal of the ore-containing support pillars.

When Orvana submitted a Part 632 Mine Permit Application (MPA) to MDEQ in September of 2011, their mine plan included a retreat mining program that was anticipated to result in surface subsidence in areas where mining occurred. The plan included removal of the roof support pillars allowing for cave-in of the roof and predicted subsidence of the ground surface. A Subsidence Plan was included as part of the Part 632 MPA to describe monitoring and mitigation of the possible effects of subsidence on the environment. This mining and subsidence plan became, by reference, part of the issued MP 01 2012 for the Copperwood Mine.

Subsequent to issuance of the Part 632 permit, and during the review process for Orvana's Part 301 and Part 303 permit application, objections were raised to the planned surface subsidence program and its potential for adverse environmental effects on streams and wetlands. The mine plan was revised by Orvana to include a partial pillar recovery program with enough roof support pillars left in place so that pillar failure and surface subsidence was not anticipated. This, no-subsidence mine plan, was submitted to MDEQ as an amendment application for the Part 632 MP 01 2012 that was approved in February of 2013.
Objections were also made to the Copperwood Alternatives Analysis submitted with Orvana's Part 301 and Part 303 application, in particular that a more thorough review was needed of alternatives to the proposed tailings disposal facility (TDF) that was accounting for most of the stream and wetland impacts in the application. One of the TDF alternatives noted as requiring more thorough analysis is underground disposal of tailings that Orvana addressed by commissioning Golder Associates to complete engineering and laboratory studies to determine the suitability of backfilling the underground mine with tailings. Golder's report is dated September 14, 2012 and was submitted with a revised Part 301 and 303 application package dated October 20, 2012.

The conclusion of Golder Associates for the three underground disposal options they studied (Raw Tailings, Hydraulic Sand and Paste) is that they are all technically possible but that none are prudent for either safety or economic reasons.

21. **Comment:** One variation that should be considered for Copperwood is the main drift could be advanced north down-dip from the box cut all the way to the Lake Superior 200-foot boundary where cross drifts would be driven in both directions across the orebody. Then mining could advance up-dip (preferably with a continuous miner {CM)) while backfilling goes on down-dip behind the CM. Strategic placement of the remnant pillars would control backfill placement while setting up designated pillars for secondary recovery. The slope of the mining horizon (the CBS) would allow the tailings water to drain to a down-dip sump where it could be pumped to surface and reused in the mill. Mining methods can be adapted to allow mining of high-grade ore first. Learning to manage and control pillar failure while maintaining safe and stable openings by transferring load to the backfill are the key to ore recovery and economic viability. Modern underground mining methods utilize some form of backfilling for ground support and/ or to eliminate surface tailings impoundments as environmental headaches for decades to come. While underground placement of tailings would cost in engineering and infrastructure, elimination or reduction of the TDF could substantially reduce the tens of millions of dollars in costs associated with the TDF.

    Response: While it might be technically feasible to do so with the very fine Copperwood tailings (80% passing 20 microns) this is not a practicable solution for the Copperwood Mine project. Large amounts of aggregate and/or cement binder would be required to achieve acceptable and timely structural strength in backfill for ground support and a large surface facility would still be required for tailings disposal. Also see #20 response.

22. **Comment**: Also, a Factor of Safety (FOS) of 1.2 is low considering the discontinuities and lateral low rock mass strength. Pillar sizes presented in Table 3 of Golder's report are small. The Golder geotechnical report discusses the predictions of the 3D modeling of 0.1 ft. convergence from back to floor. This, they conclude “is consistent with surface disturbance experienced above the stable mining areas at White Pine". The problem with this statement is that besides the stable areas, there were also unstable areas at White Pine where there was noticeable and documented surface subsidence.

    Response: As noted in their geotechnical report, Golder has accounted for the effect of the basal gouge layer on the ability of pillars to maintain lateral stresses. Pillar dimensions selected for design are those determined to have a 1.2 FOS in spite of the basal gouge layer being present.

    For better control and productivity, the updated mine plan for the Copperwood mine calls for a single pass approach such that the pillars will immediately have their final dimensions. The revised mine plan of Orvana’s 2012 feasibility study that was developed with a prediction of no measurable surface subsidence included a partial pillar recovery program where the remaining pillars would also have had a 1.2 FOS. This is noted in the Call & Nicholas Inc.

Geomechanical report of March 2012 that was submitted with the original Part 632 permit amendment application (January 2013) and subsequently approved by MDEQ in February of 2013.

The areas at White Pine with noticeable and documented surface subsidence were typically associated with pillar recovery programs leading to planned roof failures in the mine (pillar recovery anecdotally reported to remove 50% of remaining pillars), a longwall mining test in the 1960's and a large unplanned cave-in event that occurred in January of 1988 that was attributed to a number of factors including sandstone floor recovery mining that resulted in mine opening heights up to 28 feet and not following planned room and pillar design sizes.

23. **Comment:** Copperwood Alternatives Analysis, May 15, 2012, 5.1, Alternative 1: Underground Tailings Disposal ... page 13 - The additives, cement or fly ash, are not needed particularly in a 1:1 ratio (...double the volume of the tailings??). While breaking rock always creates more volume due to creation of pore space between fragments, the statement on page 13 "... only about 25% of the tailings removed from the mine could physically fit back into the mine workings" would appear to be very low. If it was decided that cement would help solidify the tailings or increase the strength of the backfilled tailings to support the back after placement, then a few percent cement could be used (e.g. 4%). Copperwood need only look at the Eagle Mine in Marquette County and see examples of lightly cemented backfill holding as high stope walls.

    Response: Golder Associates completed a study on underground tailings disposal. Results of the paste backfill option demonstrated that a 5% addition of cement binder to the tailings was not enough to produce a paste backfill that would develop sufficient Unconfined Compressive Strength (UCS) at 28 days of curing time to avoid liquefaction (28-day sample UCS of 17 psi vs. the liquefaction benchmark of 25 psi as reported by Golder). Extending the curing time to 56 days for a tailings sample with 5% cement addition resulted in a UCS of 34 psi that exceeds the liquefaction benchmark but would still be considered unacceptable for use as structural backfill to facilitate a pillar recovery program.

    While a 1:1 addition ratio of cement binder to tailings might very well not be needed as this comment suggests, the Engineering and Mining Journal (EMJ) technical article referenced by the commenter provides an example of sand and gravel aggregate addition required to produce acceptable backfill at an Ontario gold mining operation with tailings that are 70% passing 20 microns. The Ontario mine is only able to mix 20% of their tailings stream with sand and gravel for use as backfill. A tailings disposal facility is required for 80% of the tailings produced. Note that Copperwood metallurgical testing required a similar very fine grind of 80% passing 20 microns to achieve economic copper recovery.

24. **Comments regarding transportation:**
    - A list of possible destinations for the trucks hauling concentrate is missing.
    - Accidents along mine haul routes have the potential of spilling concentrate and causing contamination.

- This document should specifically include information on standard operating procedures to reduce contamination on the exterior of trucks (truck wash facilities) and an analysis on the potential for contamination along the transportation corridors that might be used.
- An analysis of the possibility of spills of copper concentrate along the route should be performed using all available truck accident rate information.
- What steps are being taken by the applicant to monitor and address possible contamination along haul routes? What steps are being taken to reduce the maintenance burden on the municipalities and entities responsible for maintaining the road these trucks will be using once they leave the mine site?
- For example, truck accidents along the Eagle mine to Humboldt mill route have occurred.

Response: Haul roads on the mine site will have containment ditches to mitigate any potential contaminations on-site and vehicles are required to be washed prior to leaving the contact area. Concentrate loads are required to be covered before leaving the concentrate loadout facility. Truck transportation routes beyond that of the proposed mine area are subject to other state and/or federal transportation regulations

25. **Comment:** Eliminating ground subsidence is a great improvement, however, there is no information on how Copperwood would ensure that the recommended thickness of gray laminated rock be maintained or to what extent the decrease in the amount of material that would be mined might affect the economic viability of the project. There are also no indications of maintenance or inspection requirements for this mitigation post closure. Furthermore, the costs of the mesh and pattern bolting must be assessed. The retention of the 12 inches of gray laminar rock should be made a permit condition. Finally, given the importance of this engineered mitigation, Golder's new geotechnical report should be reviewed and confirmed by an independent expert.

Response: The mining plan of the 2018 updated feasibility study completed by GMining Services for the Copperwood Mine acknowledges Golder's detailed geotechnical evaluation of the Copperwood deposit that established many of the mine design criteria, in particular the pillar design. To control the pillar ribs, 6 ft. long bolts on a 5 ft. x 5 ft. pattern with mesh is recommended. For roof (or back) control of the red laminated unit of the Nonesuch formation, controlled blasting practices with 6 ft. (rooms) and 8 ft. (intersections) resin-grouted or inflatable bolts on a 4 ft. pattern are recommended. Where possible, stability is expected to be enhanced if a 1 ft. "beam" of the grey laminated unit is left in place. Mesh can also be used to enhance stability of the roof. As mining begins, ground control will begin under an initial plan required for approval by the Mine Safety and Health Administration (MSHA) that will be revised as actual underground conditions dictate.

Documentation by credible independent testing and certification organizations are accepted by MDEQ. At this time, MDEQ does not find it necessary to require additional review of the Golder geotechnical report.

26. Comment: There is virtually no detail about mine closure. The terms closure and post-closure are used almost interchangeably throughout the 2018 EA with no information about when closure ends and post closure begins. There is no detail on the types of activities that are included in closure or postclosure to prevent contamination to the surrounding environment. Closure and post-closure activities may be the most important set of management and mitigation activities at a metallic mine site.

Response: While the comment is referencing the 2018 EA from the Part 301, 303, and 325, Inland Lakes and Streams, Wetlands, and Great Lakes Bottomlands permit application, (1) the Mining Permit Application includes detailed plans that were approved for closure and postclosure; (2) the Mining Permit MP 01 2012 include permit conditions that further explain requirements for closure and postclosure; and (3) Part 632 statute and rules include requirements for closure and postclosure.

27. Comment: Section 6.2.2 Proposed measures to reduce or mitigate potential impacts - This section states that the underground mine workings would be grouted. We are unable to find any information that explains how the grouting would be performed, how much grout would be needed, how that material would be transported, etc. Based on our review of other mine projects, we are aware that the effectiveness of grout curtains is highly variable and depends on the ability of the mining operator to locate a majority of rock fractures. This is complicated in underground mining operations by blasting which increases the number of fractures in the rock. Because the water budget assumptions depend in part of the effectiveness of the grout curtain, a full characterization of this mitigation method is needed in the 2018 EA.

Response: Part 632, R425.203(c)(x), requires a description the types and uses of grouting. In the 2011 Part 632 Mining Permit Application, grouting is described in Section 203.3.10 - Types and Uses of Grouting. During MDEQ's review of the application, the following issue was raised for response in a December 14, 2011 memorandum: 13. There seems to be no real analysis of how the fault shown in the middle of the proposed mine workings will influence water movement. Provide a plan for evaluating the fault and a contingency for unplanned inflow from the fault. Orvana's response to this review item included a detailed description of a contingency plan to handle water inflow to the mine which, with grouting, also prevent water outflow after closure. Below is the grouting part of the response:

During the development of the mine, as the workings are advanced there will be a standard operating procedure and plan to test for any potential for water inflow due to either faulting or other sources, such as historical borings that may or may not be grouted. A contingency plan would provide for written procedures in the event of an unplanned inflow from a fault or un-grouted legacy hole or water source. The following sections provide a general summary of the standard procedures that will be followed during development of the mine.
In areas where a known fault exists a heading will be advanced to within a safe distance of the fault or water source. The heading will serve as a drill platform to test from. All necessary

equipment and supplies will be staged at a convenient accessible location to support testing and grouting of the heading.

During the development of the mine, as the workings are advanced there will be a standard operating procedure and plan to test for any potential for water inflow due to either faulting or other sources, such as historical borings that may or may not be grouted. A contingency plan would provide for written procedures in the event of an unplanned inflow from a fault or un-grouted legacy hole or water source.

In areas where a known fault exists a heading will be advanced to within a safe distance of the fault or water source. The heading will serve as a drill platform to test from. All necessary equipment and supplies will be staged at a convenient accessible location to support testing.

28. **Comment:** Copperwood's consultant analysis suggests that the low permeability of the tills at the site will prevent substantial impacts to surface waters. However, drawdown of groundwater of several feet would occur over a large portion of the project area which is likely to manifest itself in surface waters.

    Response: The MDEQ is required to take into account the extent to which other permit determinations afford protection to natural resources when making Part 632 permit decisions, and a mining permit is not effective until all other permits required under NREPA are obtained. As discussed in the supporting AECOM appendix submitted with the Environmental Assessment (Potential Impacts of Mine Dewatering on Wetlands) for the Part 301,303,325 permit application, mine dewatering impact on groundwater; in the worst-case estimated changes to riparian wetlands are less than 2.4% of the average stream flows and less than 0.1% of estimated annual average stream flow based on water budget analysis. This amount would be less than natural variations and could probably not be measured in the field and is considered insignificant. On top of this, the hydrostratigraphic units of the Copperwood Mine area do not yield much water which is why the mine cannot feasibly operate using the groundwater on site as a water supply. In addition, environmental monitoring at the surface and ongoing regional hydrogeological monitoring are required by Part 632.

29. **Comment:** GLIFWC analysis and field observations, and Copperwood's surface water quality data all indicate that many of the streams at the proposed mine site already have a connection to the underlying bedrock aquifer, contrary to the applicants claim that "no evidence of groundwater discharge to surface water has been observed at the site." (2018 EA page 75). While stream flows may be "flashy" connection between the deeper aquifer and the site surface waters is important in that it indicates that conduits for the movement of deeper brines already exist. Those conduits will likely be augmented by mining activity, subsidence induced cracking, and the increased upward head pressures generated by flooding the mine at closure.

    Response: During mining, water within the bedrock will be removed to keep the workings accessible. Upon closure of the mine, the underground workings will begin to fill with water. Some of this water will be naturally-occurring brine within the formational rocks surrounding

the mine openings. The mine workings will also be flooded with water from Lake Superior to act as a cap to the heavier saline waters. The underground opening portals will be closed with engineered bulkheads and the inclined ramp backfilled, or otherwise closed in place, to prevent collapse and effectively close the mine opening.

Historic boreholes (1950s and 1960s) were likely not closed and grouted to the standards present in the current laws. During mining, it is likely that many of these boreholes will be encountered and that they could provide a conduit for groundwater from elevations above the underground workings. As these are encountered during mining, the historic boreholes are required to be grouted and closed from within the mine. This grouting will limit the infiltration of excess water to the mining area during the mine life and prevent upward migration of water after mining has ceased and closed with the freshwater cap. Grouting of these historic boreholes from the surface is not considered to be practical since it would very difficult to find, intersect, and grout the bedrock portion of the boreholes with the original overburden collar casings no longer in place.

Other groundwater pathways encountered during mining, such as faults and fractures, are also required to be sealed by grouting to limit groundwater inflow during the mine life and outflow of water after closure of the mine.

Boreholes advanced by Orvana (2008 through 2013) and Highland Copper (2017 and 2018) have been properly grouted and abandoned per Part 625 Mineral Wells Regulations.

The original mining plan was updated in 2013 to include no planned subsidence. The 2018 updated plan also incorporates design plans for no subsidence.

30. **Comment:** Monitoring for subsidence should be part of the project should it move forward.

    Response: The MDEQ proposes to add the following permit condition to MP 01 2012: A subsidence monitoring plan that is a revision of the plan referenced in Special Permit condition K30 shall be submitted to the MDEQ for approval prior to the start of mining operations. The revised plan shall take into account changes in the mine development plan as specified in the Mining Permit Application Amendment, March 2018.

31. **Comment:** Collapsed and caved ground will be accompanied by a notable increase in hydraulic conductivity in the bedrock and by local changes to surface drainage. The MPA describes reactive sulfide minerals in the rock of the broken and fractured zones above the mining horizon. This means that upwelling ground water moving through the collapsed mine workings and rubble zone could bring oxidized sulfide minerals to within 100 feet or into Lake Superior. This presents the possibility that the collapsed and fractured area above the extraction zone would generate acid rock drainage which would flow directly into Lake Superior after mining operations cease. While the MPA cites the buffering capabilities of natural calcium, this will only affect groundwater acid neutralization for a short time due to calcium's high solubility and the

calcium will not remove the metals from the groundwater. The MPA must properly evaluate subsidence impacts and potential drainage into Lake Superior.

Response: The updated mine plans for both Orvana in 2012 and the 2018 feasibility study update indicate no pillar failures with subsequent back caving and no surface subsidence to occur.

32. **Comment:** Please explain how Golder can expect the 3D numerical models to accurately predict pillar stability and subsidence particularly with basal gouge.

Response: There are no available empirical or analytical methods that incorporate the influence of a layer of gouge at the base of the pillars. The basal gouge is a discrete layer and does not affect the intrinsic strength of the surrounding rock mass. However, sliding along that layer does result in a reduction in the load carrying capacity of the pillar. This complex behavior can only be evaluated using a numerical model; a methodology that is widely used for design of complex geological/geotechnical conditions that are not amenable to simple analytical approaches. Development of the 3D model was therefore necessary in order to account for the weak layer, rather than to avoid accounting for it. To the extent possible, the method was benchmarked with empirical methods to increase confidence in the results of the 3D modeling. The model was first constructed without the basal gouge and the results were compared with empirical design methods. Once the relationship between the 3D model and the empirical methods was established (and it was confirmed that the model was predicting conditions consistent with known case studies), the model was used to simulate the pillars with the layer of basal gouge.

33. **Comment:** MPAA, 4.6 "Anticipated surface subsidence as a result of mining will be on the order of 0 to 3 centimeters over the LOM." How about long after the Life of Mine? 0 to 3 cm isn't much initially but it usually takes years after mining ends for subsidence to fully express itself. The pillars are small and sized to be close to failure with a FOS of only 1.2. One pillar failure could cause two and result in an increase of surface subsidence (domino effect).

Response: The MDEQ proposes to add a permit condition to MP 01 2012 requiring an update of the subsidence monitoring plan, which will include postclosure subsidence monitoring. In addition, to maintain long term stability of the pillar ribs, Golder has recommended pattern bolting with mesh to avoid issues with sloughing and reduction of pillar strength over time as has been experienced at White Pine. To control the propensity of the red laminated sub-unit forming the back (roof) of the mine to delaminate, controlled blasting practices and pattern bolting with either resin-grouted or inflatable bolts will be required. Mesh may also be used to enhance stability as can leaving, where possible, a 1-foot thick grey laminated sub-unit beam in the back.

34. **Comment:** With disturbance of the Nonesuch shale cap over an artesian aquifer comes the flow of brines. Boreholes and any subsidence will create flow paths to surface. Calculations performed by GLIFWC (Copperwood Mine discharge from workings due to high head pressure,

John Coleman 4/24/2012) were re-submitted with GLIFWC-EA comments on 7/26/18 which documents the significant hydraulic head above ground surface in the area of the Copperwood Mine. This is no surprise since deep upwelling brine has been an aspect of the White Pine Mine for decades. At the time of the last Copper Range NPDES permit renewal at White Pine, the brine level in the mine workings was being kept at a specific elevation by pumping approximately 1 million gallons per day out from the underground. This has all the makings of a Perpetual Care situation. The old borings from the 1950s and any subsidence at the proposed Copperwood Mine will result in pathways for brine flow and creation of another Perpetual Care situation which is forbidden in the Part 632 regulations.

Response: See response to Comment #16.

35. **Comment:** The TDF will also be visible from the Porcupine Mountain State Wilderness Area, Copper Peak, and the North Country National Scenic Trail, areas that people visit to enjoy the pristine wilderness. Also, the TDF will be located between two federally designated Wild and Scenic Rivers, the Black River and the Presque Isle River, and within 1.5 miles of Lake Superior.

Response: The project area is set back from public roadways (more than 2,000 feet at closest point to CR 519) in heavily forested land. It is located over a mile from the nearest receptor (Porcupine Mountain Wilderness State Park). It is unlikely that development and operation of the mine will result in significant impacts to the view sheds from use areas of the Park. Long-term operation of the mine with subsequent increase in height of tailings disposal piles may eventually change the view shed in the immediate area of the mining operation. However, the view shed within the forested campground and picnic areas of the Park will remain unchanged.

The Lake of the Clouds overlook in the Porcupine Mountains Wilderness State Park is at an elevation of approximately 1,320 feet, and provides scenic views to the south, east, and west. From this overlook, it is possible on certain days to see the Copper Peak Ski Jump, located 20 miles to the west-southwest. This line of sight passes over the Copperwood project. For the most part, the facility will not be visible from this overlook due to the low profile of the buildings and the tree cover. A small clearing, however, may be visible from this overlook, and the tops of the TDF dikes may be visible above the tops of trees. Because the dikes will be vegetated, however, the impact to the view will be minimal.

Portions of the operation will be visible from the segment of the North Country National Scenic Trail (NCNST) that is near the mine site. Hikers on the NCNST may be able to see traffic, top of the TDF and berms for the TDF, mine-related structures, fencing, and lights. These may be visible through a cover of trees and may be more visible during periods when leaves are not on the trees. These limited views will not adversely impact the aesthetics of the hiking trail. Nonetheless, relocation of the NCNST about 2,500 feet to the south is currently being negotiated and would minimize any perceived adverse impacts.

Views of the area from the surface of Lake Superior should remain unchanged. The project is set more than one mile from the lakeshore and is within forested land. Aerial views will reveal the presence of a small industrial facility surrounded by forest. The project will not be visible from any private residences or seasonal camps except for one seasonal camp located on a ridge top in Section 19, south of the project area.

While the project is indeed located between the Black and Presque Isle Rivers, it is not visible from either watercourse nor is any of its mining affected area located within the drainage watershed of either river.

36. **Comment:** The proposed ore stockpile is also unacceptable. There is a very large difference in the new project plans, increasing the capacity from 75,000 tons to 620,000 tons. There isn't much of an explanation given for this very large increase except for stating that it was originally miscalculated. We request more information regarding this large increase of the ore stockpile.

    Response: According to CRI, during the process of updating the Copperwood feasibility study, GMining Services determined that Orvana's pre-production mine development plan was overly optimistic in planning the daily rate of ore production that could be delivered to the process plant after building a small initial stockpile of approximately 75,000 tons in the TDF. While the Stage 2 area of the TDF planned for use as the initial stockpile was capable of holding up to 400,000 tons of ore, Orvana did not desire to have anywhere near this amount of ore stockpiled before commissioning production in the process plant due to the one-mile haulage distance to and from the stockpile. The updated pre-production mine plan is considered to have a more realistic, and longer, ramp-up schedule for ore production to reach a rate that will sustain continuous operation of the process plant. Ore stored on the stockpile will increase over the course of 18 months to the 620,000 ton capacity and be essentially consumed by the mill over the following 18 months. For the remaining life of mine, the stockpile will serve as surge capacity between the mine and the mill that would not have been available under Orvana's plan for a temporary ore stockpile in the TDF. Tonnage of ore in the stockpile after the initial 3 year period discussed above is forecast to average 134,000 tons with a minimum of 26 tons and a maximum of 373,000 tons. Figure 5-2 of the Part 632 Mining Permit Application Amendment depicts this information graphically.

37. **Comment:** The MPA must properly evaluate subsidence impacts and potential drainage into Lake Superior.

    Response: The Mine Plan does not include planned subsidence. However, subsidence monitoring is required during operations and postclosure. See response to comments #20, 22, 30, 32, and 33 regarding subsidence.

38. **Comment:** Subsidence is a large concern because any downward shift of the land due to mining activities could profoundly affect surface drainage patterns.

Response: The Mine Plan does not include planned subsidence. Surface water and subsidence monitoring is required during operations and postclosure. See response to comments #20, 22, 30, 32, and 33 regarding subsidence.

39. Comment: In 2012, staff from Great Lakes Indian Fish & Wildlife Commission (GLIFWC) conducted a site visit to the shore of Lake Superior where streams found on the Copperwood site discharge into the lake. According to GLIFWC staff, water chemistry data from the mine site indicate a hydraulic link between site streams and groundwater below the surface. Streams discharging into Lake Superior had Specific Conductance readings between 150 and 225 uS/cm indicating significant groundwater inputs. GLIFWC staff have found that in the Lake Superior basin, typically any stream with a specific conductance above 100 uS/c has significant groundwater inputs or is impacted by human activity…These field observations and corresponding analyses by GLIFWC indicate that many of the streams at the mine site have a hydraulic connection to the underlying bedrock aquifer, contrary to what is claimed by Copperwood. Any ground-to-surface water conduits that already exist will be exacerbated by mining activity. Therefore, any brines that exist in the bedrock aquifer (which are high in chloride and are known to occur in this bedrock aquifer) will have an increased access via these conduits to the surface and discharge waters. This hydraulic link must be properly characterized so an accurate water balance can be defined and substantial impacts to surface waters can be avoided.

Response: Data from the mine site does not support classification as perennial (groundwater-fed) streams. Data within the Mine Permit Application includes:

• Stream flow data – widely variable flow in streams and changes seasonally. No consistent base flow to streams. Many sampling locations are dry during certain seasons, while others consist only of small pools of water.

• Correlation to precipitation – The plots of water elevation and precipitation vs. date (Figures 202.2.5-3A through 202.2.5-3D) indicate a correlation of stream flow and precipitation and snow melt. No significant portion of the stream flow can be attributed to base flow (contribution from groundwater).

• Temperature data – The temperature of the water in the streams, even the downstream portions, ranges between from 32°F in the winter to as high as 77°F in the summer. Streams with significant base flow have a more consistent temperature profile, due to the contribution of groundwater, which is of near-constant temperature.

• Aquatic communities – The streams at the site are not trout streams. Trout (and other cold-water fish) require a constant supply of cold water to survive. The aquatic studies found that the physical habitat was "good to excellent in the streams", but "unreliable water input and associated intermittent nature of streams is severely limiting the potential for fish and macroinvertebrates to inhabit the Copperwood site." The primary stressor was found to be "lack of seasonal flow" in the streams. The majority of the fish and macroinvertebrate species found are "known to be tolerant of degraded conditions."

• The streams freeze over or are covered by thick snowpack during the winter. A constant supply of groundwater to the streams would keep the streams open, due to the consistent temperature (warmer than ambient winter temperature) of the groundwater entering the streams.

• The ground does not generally freeze beneath the snowpack in the winter months, and the snowpack melts from the bottom during the winter. This contributes small amounts of surface runoff to the streams throughout the winter.

• Throughout multiple surface water sampling events, sediment sampling, wetland delineation, aquatic studies and other site activities for more than 3 years, no evidence for springs, seeps or other groundwater issuances have been observed at the site.

• During groundwater modeling, a groundwater discharge to the surface water was included so that the model would calibrate to observed site conditions. This discharge was set at approximately 54 gallons per minute, or approximately 1 gallon per minute per mile of stream. Therefore, while some groundwater contribution to the surface water system is likely present (making the streams intermittent by definition), the contribution appears to be very, very small.

• Groundwater chemistry is different than surface water chemistry. Groundwater samples from wells MW-09-57G, MW-09-66G, and MW-09-71G (wells closest to the mouth of Namebinag Creek, the unnamed creek and Gijik Creek) are sodium chloride or calcium chloride type groundwater. Water in the surface water samples at SW-M and SW-N are calcium bicarbonate type waters. The water from these wells and surface water samples plot in different fields on Piper diagrams (Piper Diagram Attachment). Groundwater in these wells contains elevated chloride (up to 1,100 mg/l) and even higher concentrations in the bedrock wells at these locations. Even though water elevations in these wells are above the elevation of the adjacent streams, the water chemistry indicates that no or minimal groundwater is entering the surface water.

40. **Comment:** Tables 9-1 and 9-2 grossly underestimate that amount of time that post closure activities would need to be conducted.

    Response: Postclosure monitoring is required to continue for a minimum of 20 years. Postclosure monitoring may only be terminated upon MDEQ determination that there is no significant potential for water contamination resulting from the mining operation.

41. **Comment:** The table does not list reclamation costs for the following proposed mine components: The costs of reclaiming the proposed Lake Superior water intake; the costs of reclaiming the area of the proposed ore stockpile; the costs of wetland mitigation and wetland monitoring; the costs of reclaiming the power line corridor and pipeline corridors; the costs and methods of reclaiming the sewage lagoons are not included; if a freshwater cap is needed for the reflooded mine to prevent brines from reaching the surface (similar to White Pine) that potential cost is not included.

Response: The Mining Permit is not effective until financial assurance is established to cover the cost to administer, and to hire a third party to implement the reclamation, remediation, and postclosure monitoring required under Part 632. The reclamation plan, mining permit, and additional proposed permit conditions shall be taken into account in the cost estimates. Stream and wetland mitigation costs, with financial assurance posting requirements before beginning permitted activity, will be covered in an issued Part 301 and 303 permit that will also require establishment of a non-depleting endowment for perpetual monitoring of the wetland preservation areas.

42. **Comment:** The appropriate amount of financial assurance must be calculated after the applicant has developed a complete set of costs.

    Response: The Mining Permit is not effective until financial assurance is established to cover the cost to administer, and to hire a third party to implement the reclamation, remediation, and postclosure monitoring required under Part 632. The reclamation plan, mining permit, and additional proposed permit conditions shall be taken into account in the cost estimates.

43. **Comment:** The MDEQ must assure no future mining activity occurs beneath Lake Superior.

    Response: Mining Permit MP 01 2012 does not authorize mining activity beneath Lake Superior, and any requests to do so will be met with extreme scrutiny. CRI's request to amend the Mining Permit does not include a plan to mine beneath Lake Superior.

44. **Comment**: Copperwood proposes to dispose of mine tailings in a surface facility (known as the tailings disposal facility, or TDF, in the permit documents) that would cover approximately 350 acres of upland, 57 acres of wetland, and 16,557 feet of streams. Since the footprint of the TDF has increased by approximately 50 acres since the original mine proposal in 2012 (page 86, Section 6.9.1, Environmental Assessment) the increase doubles the linear feet of streams that would be filled with mine tailings. Where does this extra 50 acres come from and why are the stream impacts doubled with no reflected change in the wetlands being impacted by the TDF? This information being spread across the original MPA, the addendum to the MPAA, the original NPDES permit, and the applications for the 301, 303, and 325 permits have made review difficult and inconsistencies are present. We request a packet that contains all finalized plan designs and numbers, with updated surface water and environmental data collected within the past five years to eliminate the inconsistencies.

    Response: In response to the MDEQ request for additional information, two maps were submitted to show the differences between the 2012 site layout and the 2018 site layout. The TDF hasn't been increased in size by 50 acres which is why the wetland impacts do not show an increase. The only difference is that the updated LIDAR from May of 2014 data meant that the impacts could be calculated more accurately and slightly increased the impacts from the last permit application. The stream impacts haven't doubled since the 2012 application, in the initial application there was a doubling of the stream impacts due to taking into consideration the sinuosity of the streams rather than straight-line distance.

The MDEQ is proposing to add a permit condition to Mining Permit MP 01 2012 to conduct confirmation baseline sampling prior to the start of mining operations under a plan to be approved by MDEQ. In addition, CRI is currently in discussions with the WRD of the MDEQ to determine what additional baseline data should be collected given the comments received by CRI from the EPA.

45. **Comment**: It has been difficult to find some of the referenced information from the original mine permit application that was included in the amendment documents. Throughout all of the documents, there were inconsistencies in figures as discussed above. Also, some of the information had to be viewed in Gaylord, requested from the Gaylord office, or was difficult to locate online after comment periods closed. All of the information should be gathered into one final document for more accurate review.

    Response: The original Mine Permit Application and amendment documents have been made available on the MDEQ website. There are typically multiple permits required to be obtained for a complex project such as mine, and therefore it would not be practical to include all in one document. The MDEQ strives in the review of the applications to identify and clarify inconsistencies.

46. **Comment:** Additional concerns related to the understanding of site conditions and the impacts of the TDF on natural resources were also raised by the Tribe's NRD in a December 7, 2011 to Mr. Harold Fitch at MDEQ4. As far as we can ascertain from this section and others submitted regarding the permit amendment, our original concerns were not addressed in any of the changes proposed by the company, nor were they addressed in any actions taken by MDEQ.

    Response: Response to public comments documents that were posted on the MDEQ website included responses to comments received during posted public comment periods. Comments received were taken into consideration in the final decision to issue Mining Permit MP 01 2012.

47. **Comment:** In Figure 4-5 it shows that untreated "non-contact" stormwater runoff from the processing plant and other areas will be allowed to flow overland into Namebinag Creek and other surface waters onsite.

    Response: Part 632 requires plans for monitoring, containment, and treatment of surface runoff that has that has contacted, or may contact, ore waste rock, overburden, or tailings determined to be reactive. Runoff from non-contact areas such as administrative building areas and parking lots, as shown on Figure 4-5, is not expected to come in contact with those materials.

48. **Comment:** Storm water management is not adequate, proposed plans call for using the 100-year, 24-hour rainfall event and the 50-year combined rainfall and snowmelt in their design. However, like we noted in our earlier comments, recent, larger, more frequent precipitation events have occurred in the region, providing evidence that climate change is already impacting the area. Thus, the design precipitation and combined precipitation and snowmelt events

should be raised to the 500-year, 24-hour rainfall event and 100-year combined rainfall and snowmelt events for a more realistic storm water management approach.

Response: Predicted seasonal and long-term variations of the meteorology were identified for the affected area. This is sufficient to make assumptions regarding the climate for the predicted life of the mine. Part 632, R425.203(xx)requires that plans and schedules ensure that 24-hour 100-year precipitation events do not cause releases of water that are not in compliance with the conditions of the mining permit. Corrective action is required if a change in water quality is determined to be caused by a release associated with a mining activity that is the responsibility of the permitee. The MDEQ has the authority under Part 632 to require a mining permit to be amended after determining that the terms and conditions of the mining permit are not providing the intended reasonable protection of the environment, natural resources, or public health and safety. Contingencies will be in place to address outlier events, and the Emergency Response and Contingency Plan will be updated as necessary as required by Part 632.

49. **Comment:** There isn't enough information to fully assess the proposed plan for treated water discharge. There should be information on the length of time that the water treatment plant would need to operate after closure, a detailed post-mining water budget for the tailings disposal facility that includes information to evaluate the potential for long term generation of seepage through the facility, and details about how mercury will be addressed to result in a zero discharge compliant with the Zero Discharge Demonstration Program established by the State and Provincial governments that border Lake Superior.

    Response: The MDEQ is required to take into account the extent to which other permit determinations afford protection to natural resources when making Part 632 permit decisions, and a mining permit is not effective until all other permits required under NREPA are obtained. Discharges will be covered under a NPDES Permit applied for through the Water Resources Division of the MDEQ that addresses mercury discharge limits. Post closure de-watering of the TDF and treatment of contact stormwater during site closure activities is anticipated to be completed within five years of the end mine life. The updated TDF design of 2018 will have a liner system that will have a lower amount of seepage occurring compared to the previously approved non-lined TDF design, of which conservative groundwater postclosure modeling predicted minimal leakage. The results of modeling the 2012 TDF design indicate, after 250 years of the worst-case flux out of the TDF and assuming no retardation of material in the TDF, make it evident that groundwater movement at the facility is very slow. Modeling predictions out to 1000 years show that most particles would still be within the footprint of the TDF or within 500 feet of the embankment. Considering that the liner system will have a 60-mil thick HDPE liner in addition to in situ and engineered low permeability soils, impacts from seepage are not expected to occur.

50. **Comment:** Additive impacts need to be more fully addressed. This analysis is needed in multiple areas to understand the additive effect of air emissions, stream fill, and dust deposition on wetland water quality.

Response: The MDEQ is required to take into account the extent to which other permit determinations afford protection to natural resources when making Part 632 permit decisions, and a mining permit is not effective until all other permits required under NREPA are obtained. Additive impacts were addressed based on a sitewide viewpoint and any other close operating facilities. Impacts of predicted air emissions are evaluated by the Air Quality Division in review of the Permit to Install.

51. **Comment:** Why is the applicant not expected to turn in the same supporting information needed for other permits (e.g., Part 301, Part 303, NPDES, etc.) as part of the overall mine permit application when all the information is pertinent to the overall review and permitting of the proposed mine?

    Response: The MDEQ is required to take into account the extent to which other permit determinations afford protection to natural resources when making Part 632 permit decisions, and a mining permit is not effective until all other permits required under NREPA are obtained. The permits referenced will cover the impacts outside of the scope of 632 requirements. This includes the information described in the question and are reviewed by other agencies both on the State and Federal level.

52. **Comment:** Has the sewage lagoon size increased to a size that will be able to handle 1-in-500 and 1-in-1000 year storm events without failing? Has other water treatment and conveyance infrastructure also taken the increased size of storm events into consideration in their design?

    Response: The infrastructures in question have been designed to facilitate a 100-year storm event and a 50-year combined rainfall and snowmelt event. This was done based on the 13-year mine life. Infrastructures designed on more extreme criteria would enlarge the footprint of the project and are not found to be justified. Emergency Response and Contingency Plans will be in place to manage impacts associated with events of this size. On top of this, predicted seasonal and long-term variations of the meteorology were identified for the affected area. This is sufficient to make assumptions regarding the climate for the predicted life of the mine. Part 632, R425.203(xx)requires that plans and schedules ensure that 24-hour 100-year precipitation events do not cause releases of water that are not in compliance with the conditions of the mining permit. Corrective action is required if a change in water quality is determined to be caused by a release associated with a mining activity that is the responsibility of the permitee. The MDEQ has the authority under Part 632 to require a mining permit to be amended after determining that the terms and conditions of the mining permit are not providing the intended reasonable protection of the environment, natural resources, or public health and safety.

53. **Comment:** The Environmental Assessment says the site will be restored, or that natural conditions will return. However, there is no details about how that would happen or what the applicant will need to do to make those claims a reality. Closure and post-closure activities must be described in detail in order to have an adequate Environmental Assessment.

    Response: The reclamation plan submitted with the Part 632 application of September 2011 and approved by MDEQ as part of the issued MP 01 2012 addresses each of the required sections of Part 632, R425.204 Reclamation Plan. The Part 632 amendment application of 2018

addresses reclamation of the ore stockpile that was not part of the previously approved reclamation plan.

54. Comment: Historical and Cultural Resource Investigations must be completed for both the landward and lakeward impact areas under a Section 106 requirement, as they were not included in the application.

Response: The Historical and Cultural Resource Investigations have been submitted to the USACE and the MDEQ for their use in the review process. Both lakeward and landward studies were submitted.

55. Comments regarding surface discharge of treated waste water; Lake Superior water intake structure and water withdrawal; wetland delineation, impact, and mitigation; inland lakes and streams impacts.

Response: The MDEQ is required to take into account the extent to which other permit determinations afford protection to natural resources when making Part 632 permit decisions, and a mining permit is not effective until all other permits required under NREPA are obtained.

56. Comment: Permitting for construction of the· water intake structure will be by the U. S. Army Corps of Engineers under Section 10 of the Rivers and Harbors Appropriation Act of 1899 and Section 404 of the Clean Water Act for any fill or dredging below the ordinary high water mark (OHWM) associated with the water intake structure and pipeline. It is clear that the water intake structure is for the sole purpose of supplying the Copperwood Project. Considering the proposed extensive filling of wetlands, the filling of stream channels in multiple sub-watersheds and the rerouting of streams, it is also clear that the proposed water intake structure is a "connected action" to the entire Copperwood Project for the purpose of applying the National Environmental Policy Act (NEPA) to all aspects of the project.

Response: This designation would be a decision of the USACE and not related to the MDEQ's review and decision process on a Part 632 Mine Permit Amendment. This is under the jurisdiction of the USACE and their determination of a connected action. This isn't pertinent to the request to amend Mining Permit MP 01 2012.

57. Comment: In as much.as the State of Michigan is a principle party to national and international Great Lakes and Lake Superior water quality ecosystem goals, the MDEQ must take into account agreements that would be compromised by the Copperwood Project. These agreements include: (1) The Lake Superior Binational Program's Zero Discharge Demonstration Program, particularly targeting mercury (which is recognized as a Contaminant of Potential Concern, (see MPA Appendix C, p.6), (2) the Great Lakes Water Quality Agreement goal to "restore and maintain the chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystems," and (3) the Great Lakes Restoration Initiative which seeks to clean up existing Areas of Concern and avoid creating more, ensure that near shore aquatic, wetland and upland habitats will sustain the health and function of natural communities, and plan and implement development activities in ways that are sensitive to environmental considerations and compatible with fish and wildlife and their habitats, with particular emphasis on wetlands.

Response: The MDEQ is required to take into account the extent to which other permit determinations afford protection to natural resources when making Part 632 permit decisions, and a mining permit is not effective until all other permits required under NREPA are obtained. The WRD through the NPDES permit application review process develops effluent limits based on the proposed discharge location, which takes into account the goals of national and international agreements.

58. Comments in approval of issuing the mining permit amendment request to improve the economy of the area and provide jobs.

Response: The MDEQ shall make decisions regarding the amendment of the mining permit based on the requirements of Part 632.