Response to Public Comments
Part 632 Nonferrous Metallic Mineral Mine Permit
Orvana Resources US Corp.
Proposed Copperwood Mine
Michigan Department of Environmental Quality

The following is a summary of comments collected during the public hearing held on March 6, 2012, and received by the Michigan Department of Environmental Quality (DEQ) in writing, regarding the DEQ's proposed decision to grant a Part 632 Nonferrous Metallic Mineral Mining Permit to Orvana Resources US Corp (Orvana) for the Copperwood Mine.

1. **Comment:** Section F(5) of the General Permit Conditions requires that "records upon which the mining and reclamation reports are based shall be preserved by the permittee for 3 years and made available to the Department upon request." These records should be preserved until it is determined that all financial assurance may be released.
   Response: *General permit condition F(5) is taken directly from Part 632 Sec. 63213 (3).*

2. **Comment:** The details of the Tailings Disposal Facility (TDF) should be provided now, prior to approval.
   Response: *Rule 203 (Mining Plan) states in part, the plan shall include information that demonstrates that all methods, materials, and techniques proposed to be utilized are capable of accomplishing their stated objectives in protecting the environment and public health,* ***except that such information may not be required for methods, materials, and techniques that are widely used in mining or other industries and are generally accepted as effective.*** *The Department has concluded that even though storage and disposal facilities may vary, they are widely used in the mining industry and generally accepted as effective. However, the Department included a permit condition F(1), which dictates construction of the TDF shall not begin until the Department agrees the design will meet the requirements of R 425.409 of Part 632. Furthermore, any supplemental information submitted to the Department will be promptly posted on the DEQ website at http://www.michigan.gov/deq/0,4561,7-135-3311_4111_18442-262826--,00.html .*

3. **Comment:** Perpetual care has not been adequately addressed in the application or the draft permit.
   Response: *The term "perpetual care" appears in Part 632 in R 425.409 (b) and is linked to water quality. Orvana's conceptual design of the TDF does not contemplate the need for perpetual water treatment, however, the Department included a permit condition F(1), which dictates construction of the TDF shall not begin until the Department agrees the design will meet the requirements of R 425.409 of Part 632.*

4. **Comment:** Very little detail is provided about the fault zone, its impacts to mine safety and stability and to its conductivity.
   Response: *In a letter to Orvana dated December 14, 2011, the Department requested additional analysis of how the fault shown in the middle of the proposed mine workings will influence water movement. Orvana's response indicated based on cross-sections and drill core observations, there is no definitive evidence that the fault intersects the top of bedrock surface. To evaluate the potential for variation in groundwater movement, the presence of a fault was simulated in the groundwater model and the results showed little potential influence on the overall water balance. However, Orvana included in their response a standard operating procedure and plan to test for any potential for water inflow due to either faulting or other sources. The Department is satisfied with this approach and has included a permit condition. Areas within a mine that pertain to mine safety are strictly regulated by the Mine Safety and Health Administration (MSHA).*

5. **Comment:** In Special permit condition K(5), Orvana has 180 days to provide an undefined plan of action and revised models if the fault zone is more conductive than originally modeled. This is simply too long to allow impacts to continue with no knowledge of their impacts on the nearby rivers, Lake Superior, other surface water bodies, and private water supply wells.
   Response: *While the presence of the fault zone was included in the site predictive model, it is still a feature that may react differently than predicted when encountered. Underground mining proceeds very slowly, and the bedrock has an extremely low hydraulic conductivity. Therefore, DEQ believes 180 days is a reasonable period to gather necessary data, revise the predictive model, and prepare a report for submittal, and at the same time not jeopardize natural resources. Regardless, if mining operations do encounter a feature that can lead to a catastrophic event, Part 632 and the proposed permit requires an immediate report of the event to the Department.*

6. **Comment:** Section K(5) provides Orvana with an extreme, 180 days in which to recalibrate its models and predictions should subsidence or ground water impacts outside of the expected range be detected. The 180 days is simply far too long for the company to spend recalibrating and modeling when unanticipated subsidence or ground water impacts are known to be occurring.
   Response: *The Section K(5) condition does not require action due to subsidence issues. Rather, it is a condition requiring action if mine dewatering affects the upper aquifer layers at a further distance from the mine workings than what the groundwater model predicts. Due to the very*

low hydraulic conductivity of the bedrock units, the lack of consistent connectivity between the bedrock unit aquifer layers and the unconsolidated unit aquifer layers, and the fact that mining operations proceed quite slowly, the DEQ does not believe possible impacts to surface water bodies and private wells will occur quickly. Thus, the DEQ believes 180 days is a reasonable length of time to gather data, revise the predictive model, and prepare a report for submittal, and still protect the two major rivers and private wells bordering the site.

7. **Comment:** At Section K(4), the draft permit requires only 4 (four) pairs of nested monitoring wells; this is an inadequate amount to representatively monitor impacts and potential impacts at a site of this size.
   Response: *The four nested well pairs required in special permit condition K(4) are intended to assess regional impacts to groundwater and major surface water features specifically from mine dewatering and post-closure re-flooding. Permit conditions that require additional monitoring are F(6) to assess potential impacts to groundwater quality around the tailings disposal facility and F(7) to assess impacts to groundwater quality around the entire surface facility area. Some of the other monitoring requirements under the permit include surface water monitoring, water quality and quantity from the mine workings, regional hydrologic monitoring, flow of water from the Wastewater Treatment Plant (WWTP), and aquatics monitoring.*

8. **Comment:** Under Section I(4), additional information about the Waste Water Treatment Plant's sludge and its requisite appropriate disposal methods must be required.
   Response: *Waste water treatment plant sludge must be disposed of off site in a licensed land fill or other state or federally approved facility.*

9. **Comment:** Section P(9) states that leachate shall be pumped from the TDF to the WWTP for five years, "or until the volume of water coming out of the TDF reduces to a rate that is determined can be contained within the TDF indefinitely without an excessive buildup of water on the liner system." This permit condition is too vague to meet Part 632's ban on perpetual care. Orvana must be able to, at the time of permitting, demonstrate that the ban will not be violated; the permit application and this permit condition do not satisfy that requirement.
   Response: *Permit condition F(1) dictates construction of the TDF shall not begin until the Department agrees the design will meet the requirements of R 425.409 of Part 632.*

10. **Comment:** The described leachate collection system is inadequate; to meet the requirements of Part 632's Rule 425.409(a), the leachate collection system must underlie the entire TDF.
Response: *The applicant has provided a Pre-Feasibility Study Report on the Tailings Disposal Facility (TDF) with three possible design options. The Report recommends a design that utilizes a natural soil barrier and includes a leachate collection system extending across the entire floor of the TDF, The report also contains several recommendations for follow-up engineering studies and analyses that must be completed and reviewed by the DEQ before a final decision can be made as to the suitability of the design. The final design will be reviewed for consistency with the requirements of R 425.409 of Part 632 and with Part 315, Dam Safety, of Act 451.*

11. **Comment:** The proposed liner system is inadequately described and does not comply with Part 632, R425.409. The DEQ has repeatedly stated that further design evaluation will occur and a final design selected, however, such statements do not provide the public or governmental agencies anything to evaluate. Delay of liner selection and design to a future time is inappropriate.
Response: *The applicant has provided a Pre-Feasibility Study Report on the Tailings Disposal Facility (TDF) with three possible design options. The Report recommends a design that includes decant towers to drain the majority of water collected in the TDF pond and routing it to the Water Treatment Plant prior to discharge. The design also includes a drainage blanket (leachate collection system) extending across the entire floor of the TDF. The drainage blanket would act to reduce the hydraulic head on the till during operations. Layers of filter fabric would be used to separate the drainage material from the underlying till and overlying tailings.*

At closure, the design utilizes a sloped soil cap over the final tailings surface consisting of a filter fabric and geogrid for material separation and tensile strength at the tailings surface, a capillary break layer to limit the upward migration of salts or other constituents from the tailings, an initial soil grading layer, a low-permeability rainfall shedding layer, and an upper topsoil layer that will be vegetated.

Rule 203 (Mining Plan) states in part, the plan shall include information that demonstrates that all methods, materials, and techniques proposed to be utilized are capable of accomplishing their stated objectives in protecting the environment and public health, except ***that such information may not be required for methods, materials, and techniques that are widely used in mining or other industries and are generally accepted as effective****. The Department has concluded that even though storage and disposal facilities may vary, they are widely used*

in the mining industry and generally accepted as effective. However, the Department included a permit condition F (1), which dictates construction of the TDF shall not begin until the Department agrees the design will meet the requirements of R 425.409 of Part 632.

12. **Comment:** Given the design proposed by Orvana, with an underdrain draining to the north-west corner, the highest pressure on the liner and likely point of seepage discharge from the base of the TDF would be at the northwest corner. Because of the high hydrostatic head at that NW point, the tailings seepage would eventually penetrate the TDF berm, and likely daylight to surface at the toe of the tailings basin. The impacts of long-term seepage from the TDF need to be accounted for in the EIA and the permit conditions.
Response: *There is no evidence of a point of high hydrostatic head at the NW corner of the TDF in the proposed design. However, the Department included a permit condition F(1), which dictates construction of the TDF shall not begin until the Department agrees the design will meet the requirements of R 425.409 of Part 632. Seepage estimates will need to be fully evaluated in the final design including an evaluation whether other water discharge permits will be required.*

13. **Comment:** Surface and ground water standards are exceeded by predicted Tailings Disposal Facility (TDF) leachate. While the leachate would be treated during operations and for 5 years after mine closure, in the long-term the poor quality leachate would discharge to ground and surface waters near the TDF. Table's 203.3.5-4a and 4b of the Mine Permit Application predicts that at least 15 constituents would violate Lake Superior surface water standards, Environmental Protection Agency (EPA) Maximum Contaminant Levels, EPA Secondary Maximum Contaminant Levels, and/or MI Part 201 standards.
Response: *Tables 203.3.5-4a and 203.3.5-4b of the Copperwood Application predicts what the theoretical untreated leachate contaminant concentrations in the TDF might be through the year 2035. However, at the bottom of the same tables, the permittee indicates what the end of pipe values will be after treatment has occurred. These values are far lower and more in line with expected discharge values. The permittee indicates that treatment of water from the TDF will occur for years after the mine suspends mining operations before permanent capping occurs. Furthermore, the Department included a permit condition F(1), which dictates construction of the TDF shall not begin until the Department agrees the design will meet the requirements of R 425.409 of Part 632. Seepage estimates will need to be fully evaluated in the final design including an evaluation whether other water discharge permits will be required.*

14. **Comment:** The TDF stability must be fully evaluated before a final permit decision.
    Response: *Prior to commissioning the TDF, Orvana will need to obtain a Part 315, Dam Safety permit.*

15. **Comment:** The cap, drains and slopes of the TDF would require perpetual care to prevent erosion and slope failure. Knight Piesold states: "A maintenance bond will be established for periodic repair of the closure cap and spillway extending beyond at least the primary portion of the tailings consolidation process" (AP_B_text_1.pdf, end of section 5.10.1, page 5-15)."
    Response: *The proposal provided by Knight Piesold recognizes the possible need for maintenance of certain aspects of the TDF beyond mine closure. However, the proposal does not contemplate the need for perpetual water treatment.*

    The Department included a permit condition F(1), which dictates construction of the TDF shall not begin until the Department agrees the design will meet the requirements of R 425.409 of Part 632. In addition, R425.407 of Part 632 requires the post closure monitoring period to be 20 years following completion and approval of reclamation. However, the Department shall extend the post closure monitoring period increments of up to 20 years after the end of the initial 20 year monitoring period unless the Department determines that there is no significant potential for water contamination resulting from the mining operation. The Department may extend or shorten the post closure monitoring period only after public notice and opportunity for a public hearing.

16. **Comment:** Orvana recognizes that surface hydrology may be substantially altered by subsidence and that there may be "Changes in surface topography resulting in new wetland creation" (MPA section 205.1.11.1), yet does not analyze those impacts. A thorough analysis should be conducted on the eventual steady state hydrologic condition within the subsidence area.
    Response: *A permit application for Part 303, Wetland Protection, and Part 301, Inland Lakes and Streams, for the Copperwood Project has been submitted to Water Resources Division (WRD) and is currently under review. A Part 632 permit would not be effective until all other permits required under the Natural Resources and Environmental Protection Act (NREPA) for the Copperwood Project are obtained.*

17. **Comment:** Drawdown of the water table in the upper glacial till is predicted to be 4 to 12 feet under a large portion of the wetlands and streams at the proposed mine site. Figures R-18.A, B & C and R-25.B & C of Orvana's January 6th response to the DEQ request for information

show the extent and magnitude of the drawdown under the streams and across the site. Figure R-25.C (attached) shows all the streams, except East Gipsy, and the majority of site wetlands will experience at least 1 foot and as much as 12 feet of drawdown, even post-mining. Such extensive drawdown of the water table across the entire area to be mined will have profound impact on the surface hydrology of the site. The use of grouting and cemented backfill to reduce mine groundwater inflow and to minimize long-term disruption of the water table should be required in detail prior to a final permit decision.
Response: *A permit application for Part 303, Wetland Protection, and Part 301, Inland Lakes and Streams, for the Copperwood Project has been submitted to WRD and is currently under review. A Part 632 permit would not be effective until all other permits required under the Natural Resources and Environmental Protection Act (NREPA) for the Copperwood Project are obtained.*

Underground disposal of tailings as a paste or cemented backfill is considered in the permit application and the Department understands Orvana will continue to evaluate the option. The Department encourages backfilling of mined out areas. However, the Department understands that this may not be feasible or effective for all mine projects.

18. **Comment:** It is predicted that developing the TDF would fill approximately 60 acres of wetland. This means that 90 percent of the total wetland fill of this project is due to the TDF. Backfilling the underground mine during mining would result in a smaller TDF and could substantially reduce the acreage of wetland fill. Backfilling the mine is consistent with the goal of reducing or avoiding wetland fill in the Lake Superior basin. Although Orvana recognizes the possibility of damage to existing wetlands (section 205.1.11.1), the 60 acres of wetland loss does not include any consideration of the wetlands that may be drained or otherwise damaged by subsidence or groundwater drawdown. Drawdown of the water table is predicted to be more than 1 foot across the majority of wetlands (Figure R-25.C). Given that almost all the wetlands at the site are shallow, a drawdown of 1 foot or more will have profound impact on those wetlands. This impact must be fully articulated in a revised Environmental Impact Assessment (EIA) and methods for minimizing impacts proposed in the mine plan prior to a final permit decision.
Response: *A permit application for Part 303, Wetland Protection, and Part 301, Inland Lakes and Streams, for the Copperwood Project has been submitted to WRD and is currently under review. A Part 632 permit would not be effective until all other permits required under the Natural Resources and Environmental Protection Act (NREPA) for the Copperwood Project are obtained.*

19. **Comment:** Streams will be impacted by direct discharge, subsidence and drawdown of the water table. Although the discharge of treated wastewater will be regulated by a NPDES permit, the long-term seepage from the TDF and upwelling from the mined-out ore zone through old boreholes or subsidence induced channels is unarticulated in the application or proposed permit. Such discharges of poor quality water must be anticipated, described and planned for in the mine permit. Subsidence of up to 7 feet is predicted under some of the site streams. This would have substantial impact on stream hydrology. Drawdown of the water table is predicted to be more than 12 feet in the middle stretches of Namebinag and West Namebinag Creeks (Figures R-18.B and R-25.C, attached). Although Orvana predicts that base flow to Namebinag Creek would be reduced to 1/3 of normal, it is unclear how these streams would be able to maintain any base flow under these severe drawdown conditions. These impacts to streams must be fully articulated in a revised EIA and methods for minimizing impacts proposed in the mine plan.
Response: *In their response to the Departments request for additional information, Orvana provided a standard operating procedure (SOP) for evaluating zones of higher than predicted water flow. In addition, a permit application for Part 303, Wetland Protection, and Part 301, Inland Lakes and Streams, for the Copperwood Project has been submitted to WRD and is currently under review. A Part 632 permit would not be effective until all other permits required under the Natural Resources and Environmental Protection Act (NREPA) for the Copperwood Project are obtained.*

20. **Comment:** This project will not be accomplished without large sums of public dollars (transportation, electrical power, water source, waste water discharge). It would be wiser and more cost effective to mine at the existing ore body, but mill the ore off site, such as in Thomaston. If tax dollars are not involved, my comments are totally unwarranted and should be disregarded.
Response: *The DEQ is not aware that any public funds would be used to develop infrastructure for the Copperwood Project; in any event, that issue is outside of the scope of the DEQ's regulatory authority.*

21. **Comment:** It is not clear how many showy orchid (Galearis spectablilis) plants would be destroyed or if any would remain protected and in an undisturbed part of the project area. Orvana's assumption that any of these plants is expendable is disturbing and we urge the DEQ/DNR reviewers to ask for more information on numbers that would be destroyed and that might remain, to determine if the population can be sustained and if mitigating measures are needed. The TDF should not be placed over the orchids. Orvana's assumption that these orchids could be

transplanted and established elsewhere is not backed up by any evidence that this would work.
Response: *A permit application for Part 303, Wetland Protection, and Part 301, Inland Lakes and Streams, for the Copperwood Project has been submitted to WRD and is currently under review. A Part 632 permit would not be effective until all other permits required under the Natural Resources and Environmental Protection Act (NREPA) for the Copperwood Project are obtained. As part of the review of the application submitted under Part 301 and 303, DEQ Water Resources Division will coordinate with DNR Wildlife Division to address the potential impact to Galearis Spectabillis.*

22. **Comment:** Specific descriptions are given for the Galearis plants. Given the strong sentiments for and against mining in the western Upper Peninsula, publicizing this information seems a poor way to protect the only population cluster in the county. Why was this specific information not redacted?
Response: *The information contained within documents regarding a mine permit application is open to public review and subject to the Freedom of Information Act.*

23. **Comment:** The mining permit requested would authorize Orvana to mine within 200 feet of Lake Superior and would allow collapse of the mined openings and subsidence of the land surface which together with an upward groundwater gradient, would displace a freshwater cap bringing brine and dissolved metals into Lake Superior.
Response: *The DEQ believes brine water will not affect Lake Superior upon mine closing. The mining permit application documents, the permit conditions, and the subsequent revised predictive model provide acceptable plans, procedures, and evidence to ensure containment of brine water in the lower mine workings during operations and after mine closure. The anticipated subsidence is a very small fraction of the vertical distance between the bottom of Lake Superior elevation and the highest elevation of the mine workings in the area within 200 feet of Lake Superior. As such, the DEQ does not believe subsidence will increase the potential for brine water intrusion into Lake Superior.*

24. **Comment:** The tailings dump (TDF) fills in 8,000 feet of existing streams, over 59 acres of wetlands, and destroys at least two local watersheds.
Response: *A permit application for Part 303, Wetland Protection, and Part 301, Inland Lakes and Streams, for the Copperwood Project has been submitted to WRD and is currently under review. A Part 632 permit would not be effective until all other permits required under the Natural Resources and Environmental Protection Act (NREPA) for the Copperwood Project are obtained.*

25. **Comment:** The TDF has the distinct possibility of requiring perpetual care due to cap maintenance and contaminated tailings leachate after mining ceases and WWTP decommissioning. The process of degeneration of the TDF cap and a corresponding increase in seepage through the tailings may not take place until after the 20 year monitoring period, after the WWTP is long gone.
Response: *R425.407 of Part 632 requires the post closure monitoring period to be 20 years following completion and approval of reclamation. However, the Department shall extend the post closure monitoring period increments of up to 20 years after the end of the initial 20 year monitoring period unless the Department determines that there is no significant potential for water contamination resulting from the mining operation. The Department may extend or shorten the post closure monitoring period only after public notice and opportunity for a public hearing.*

As per Special Permit Condition F(1), construction of the TDF shall not begin until the permittee has demonstrated that the design of the TDF is consistent with the requirements of R 425.409 of Part 632, which includes the requirement of not requiring perpetual care following closure. Additionally, the permittee must received approval of the plans and specifications from the DEQ.

26. **Comment:** Both the major impacts of subsidence and the large tailings basin could be minimized by backfilling the mine with tailings and/or redesigning the pillars.
Response: *Underground disposal of tailings as a pasted or cemented backfill is considered in the permit application. The Department encourages backfilling of mined out areas, and agrees that backfilling with tailings at the Copperwood Project may minimize impact. However, the Department understands that this may not be feasible or effective for all mining projects. Orvana has indicated that they will continue to evaluate the feasibility of tailings back fill. In addition, Orvana has included in there Part 301 and 303 permit applications a revised pillar design that substantially reduces subsidence.*

27. **Comment:** Critical studies and required Orvana decisions are missing from the Mine Permit Application (MPA) prohibiting the state agencies or the public to fully assess the adverse impacts.
Response: *The mine permit application and supplemental information submitted by Orvana to the DEQ in response to the DEQ's December 14, 2011, request for additional information has provided sufficient information to identify potential impacts and develop permit conditions to address those impacts.*

28. **Comment:** The contingency plans contained in the MPA for the post-closure period are inadequate.
    Response: *The contingency plan submitted in the MPA includes the minimum requirements as listed in R 425.205 in Part 632. In addition, the post closure monitoring plan will allow for advance notice of potential for water contamination and whether there is impact from subsidence.*

29. **Comment:** There have not been any amendments to the Mining Permit Application filed with the MDEQ since Orvana's initial permit application on September 23, 2011, so then we must assume that all anticipated problems spelled out by previous comments filed with the MDEQ in December still apply.
    Response: *During the mine permit application technical review, the DEQ may ask for additional information from the applicant per Sec. 63205 (9) of Part 632. The DEQ sent a request for additional information on December 14, 2011. Orvana submitted responses to the DEQ's request on December 28, 2011, and January 6, 2012. These responses and related documents have been posted on the DEQ website at http://www.michigan.gov/deq/0,4561,7-135-3311_4111_18442-262826--,00.html .*

    In addition, Orvana has included in there Part 301 and 303 permit applications a revised pillar design that substantially reduces subsidence.

30. **Comment:** The MDEQ must take into account agreements that the State of Michigan has agreed to that would be compromised by the Copperwood Project including: (1) the Lake Superior Binational Program's Zero Discharge Demonstration Program, (2) the Great Lakes Water Quality Agreement, and (3) the Great Lakes Restoration Initiative.
    Response: *The DEQ WRD will develop effluent limits based on the proposed discharge location, which will take into account the goals of national and international agreements. The permittee will be responsible for meeting those limits.*

31. **Comment:** Comments were received in support of the project for reasons of economic impact.
    Response: *While the DEQ takes note of these supportive statements, economic impacts are not a direct consideration in review of a mining permit application.*