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Thank you for your timely resubmittal of the Follow-up report required by Permit #2015-01.

Our review has found that this resubmittal meets many, but not all, of the conditions of Permit #2015-01.

This letter of review has been prepared to document the extent of conformance with the stated requirements.

For ease of understanding this letter of review contains text from two earlier documents:

1. The benchmark report requirements from Permit #2015-01. These requirements are depicted in grey underlined text.
2. The comments regarding adequacy of the benchmark report contained in the March 13, 2018 letter from the LCFM to Northern Sands WI. These comments are depicted in grey bulleted text.

To convey the extent of compliance with Permit #2015-01 and the March 13, 2018 LCFM letter, bulleted comments shown in black indicate acceptance of the Follow-up report resubmittal.

Bulleted comments shown in red indicate deficiencies in meeting Permit #2015-01 and the March 13, 2018 LCFM letter, and therefore require additional information and resubmittal by Northern Sands Wisconsin.

To be compliant with the requirements of the permit, all required resubmittals must be submitted to the LCFM prior to the start of mining, and no later than May 31, 2019.

3. Size & Scope

d. An assessment of the existing biological resources at the mine site shall be conducted for each spatial phase of the mine development as depicted in Figure 1 of the reclamation plan.

(i) These assessments shall be conducted during the appropriate growing season and a written report of findings shall be filed with the Department before beginning the planned mining activities under each phase of the mine development.

- The assessment of biological resources was conducted for Phase 1 during the appropriate growing season (June 2018 and September 2018). The Follow-up report meeting all requirements was submitted on September 28, 2018.

Additional biological assessments will be required for each subsequent phase of mining. These assessments must be completed and filed with the LCFM, then reviewed and approved prior to beginning mining in each phase.

(ii) These assessments shall be conducted using the "Wisconsin Forest Habitat Type Classification System" or an alternative system as approved the Department.

- Written report of findings is included in B. Biological Assessment (existing) – Phase 1 and Appendix A.
- Site was classified using the Wisconsin Forestry Classification System (WFCS). Areas identified include Dry, Dry-Mesic, & Mesic to Wet-Mesic.
 - The assessment shall include documentation of existing trees and assemblages of understory plants using the Wisconsin Forest Habitat Type Classification System/KOTAR Method. See the attached documents for reference.
 - The biological assessment included documentation of existing trees and assemblages of understory plants. This assessment was conducted using the "Wisconsin Forest Habitat System Classification System" and the "WDNR Ecological Landscape Detailed Community Descriptions".
 - The assessment shall document the methods used for field verification, including when & where the site investigations were conducted and data was collected. Site investigations shall be performed to record the plant species present.
 - The assessment that was conducted documented the methods used for field verification.

(iii) The biological assessment and field work for Phase 1 of the mine shall commence by October 15, 2016, with a written report of findings to be completed and submitted to the Department by December 31, 2017.

- Report submitted on December 20, 2017.
- The Follow-up report was submitted on September 28, 2018. This Follow-up report documents the findings of the biological assessment and field work for Phase 1.

4. Stream, Stream Corridor & Wetland Protection

a. A baseline hydrologic inventory shall be conducted to define the location of seeps, springs, wetlands, and surface waters located within the permitted mine boundary, and those located on adjacent properties.

(i) This inventory shall be based upon an examination of available resource maps and shall be verified through a general field assessment of the mine site, and adjacent properties if access to the adjacent properties is allowed.

- Inventory was conducted in November, 2017 within Phase 1. 10 seeps and 18 surface water drainages were identified within Phase 1.
 - As part of the inventory, "Surficial Drainage", as identified in C.1 and shown in Appendix C, shall be clarified and mapped using flow lines to depict the areas of concentrated flow and drainageways. Areas of concentrated flow shall be depicted separately than surface waters with stream channel characteristics (continuous bed & banks) for the purpose of establishing riparian buffers (Permit Condition 4.d)
 - The Follow-up report clarified that "Surficial Drainage", as depicted on the map in Appendix B, depicts areas of concentrated flow identified in the field that do not have bed and bank channel characteristics. Flow lines were added to the map to show the general direction of overland flow from these areas. Streams with

continuous bed and bank channel characteristics are identified separately on the map for the purpose of establishing riparian buffers.

- As a basis for this hydrologic inventory, include the methodology that was used to determine the existing hydrologic features. Operator may propose that the full baseline hydrologic inventory be conducted in conjunction with other inventories and assessments for individual mining phases, to be conducted in the future, prior to mining a given phase.
- The Follow-up report describes the methodology used to determine the existing hydrologic features, including seeps, spring, wetlands, and surface waters.

The methodology included a review of existing maps and supporting data, which was then verified in the field using a 50 meter grid to identify site specific hydrologic features.

- A baseline inventory was not conducted on neighboring parcels adjacent to Phase 1. This inventory shall be completed and submitted with the Follow-up Report. If the operator does not see value in conducting an inventory of seeps, springs, wetlands, and surface waters on certain parcels adjacent to Phase 1, provide justification utilizing the site specific hydrologic analysis (Permit Condition 4.b).
- **The Follow-up report proposed that a full inventory of seeps, springs, wetlands, and surface waters on adjacent properties was not necessary because the hydrologic features would likely not be hydrologically impacted as a result of mining.**

This rationale used by Northern Sands WI for not doing the full inventory was that hydrologic features would be upgradient of the mine and that surface flow to these features would not be disrupted as a result to mining.

The rationale does not account for infiltration and associated subsurface lateral flow that may be contributing to these features.

- **The Wetland Delineation Report, submitted by Northern Sands Wisconsin dated July 22, 2018, identifies multiple wetlands at an elevation of approximately 1100 ft MSL. Because these wetlands appear at a consistent elevation, it is reasonable to assume that there are one or more restrictive layers that occur at or near the interface of the Tunnel City and Wonewoc sandstone formations, which is mapped at approximately 1100 ft MSL.**

These restrictive layers may cause infiltration permeating through the Tunnel City sandstone formation to be intercepted and conveyed as preferential lateral flow along bedding planes, before being discharged to the surface. This surface discharge likely contributes to the hydrology of the identified wetlands.

The Northern Sands Reclamation Plan identifies one area in Phase 1, located near the west property boundary, where mining will partially remove the Tunnel City formation. This mining activity, which is planned to occur at approximately 1120 ft MSL, may intercept a bedding plane and modify the route of subsurface lateral flow. Altering the route of

subsurface lateral flow may impact hydrologic features in the landscape, even though surface flow to the features may not be disrupted.

Because of this possibility, it is necessary for Northern Sands WI to conduct the full hydrologic inventory to determine the location of all seeps, springs, wetlands, and surface waters on all properties adjacent to the areas that will be excavated in Phase 1. The properties to be evaluated for Phase 1 are shown in Attachment 1.

This full inventory will allow Northern Sands WI to work directly with the appropriate regulatory authorities to mitigate impacts through established permitting processes.

(ii) This baseline hydrologic inventory shall commence by October 15, 2016, with a written report of findings to be completed and submitted to the Department by December 31, 2017.

- Report submitted on December 20, 2017.

b. A site specific hydrologic analysis shall be conducted by a Professional Hydrologist or Professional Geologist to evaluate and assess the potential for mining operations and reclamation activities to affect naturally occurring seeps, springs, wetlands, and surface waters as documented through the hydrologic inventory required under condition 4.a.

(i) This assessment shall be conducted for each phase of the mine site prior to beginning any mining activities in that mine phase.

(ii) This assessment shall document and describe the source of the water creating the hydrologic condition and shall assess the extent to which these features may be impacted by mining operations and reclamation activities. It shall also specify mitigation measures that can be used to reduce any potential impacts to seeps, springs, wetlands, and surface waters.

- Assessment indicates that the identified seeps will not be directly impacted by proposed mining activities. A monitoring well has been installed up gradient of the seeps near the proposed rail area.
- Assessment indicates that subsurface hydrology will be effected both during and post-mining. Restored slopes will generally be less steep than the original slopes.
- Assessment claims that post-mining surface will have similar infiltration to pre-mining surface.
 - Field studies have shown that the post-mining land surface does not regain its infiltration capacity for forested areas.
- Assessment includes multiple mitigation techniques for increasing infiltration post-construction and preserving surface drainage divides.
 - The assessment shall include a sub-watershed delineation of each hydrologic feature (or set of features) in order to determine the water source and the approximate percent contribution from each water source to the feature. The delineation shall be used to assess the extent to which each feature may be impacted by mining operations.
 - **The report did not include a sub-watershed delineation of each hydrologic feature or set of features to determine the water source and the approximate percent contribution from each water source to the feature.**

To address this shortfall, Northern Sands WI must conduct the sub-watershed delineation as required.

- Upon completing the updated hydrologic inventory and sub-watershed delineation, Northern Sands WI must reevaluate the potential for mining operations to affect seeps, springs, wetlands, and surface waters, including the following:
 - Hydrologic features located at or near elevation 1100 ft MSL, as they may be affected by removing material above that elevation.
 - Hydrologic features located at or near the elevation of the regional water table, mapped at approximately 1000 ft MSL, as they may be affected by the disruption of surface water flow during mining operations.
- The Permit requires a Professional Hydrologist or Professional Geologist to conduct the Site Specific Hydrologic Analysis. Identify the person who has conducted the assessment and their credentials.
- The site specific hydrologic analysis was conducted by a Professional Geologist, identified as Brian Mahoney.
- If certain wetlands will be impacted (filled or hydrologically altered), explain how these activities will be managed to limit the impact to hydrologic features (avoid, minimize, or mitigate).
- The report states that wetland impacts will be avoided or minimized by optimizing the site layout, including modifying the footprint, slopes, and staging considerations.

(iii) The site specific hydrologic assessment and field work for Phase 1 of the mine shall commence by October 15, 2016, with a written report of findings to be completed and submitted to the Department by December 31, 2017.

- Report submitted on December 20, 2017.

d. A continuous riparian corridor and vegetative buffer shall be established to prevent environmental pollution and meet standards for surface water and wetland protection, as established in NR 135.07. The buffer shall be established to be 100 feet from the boundary of wetlands and centerline of watercourses with defined bed and banks. No mining or mine-related activities are permitted within this buffer. Pre-existing agricultural uses including cultivated cropland fields and agricultural pastures shall be allowed within the buffer. The wetland buffer shall be monumented with markers for the life of the mine.

A map of the riparian corridor and vegetative buffers will be prepared to prevent environmental pollution during the life of the mine. Field work shall commence by October 15, 2016, with maps and a report of findings to be completed and submitted to the Department by December 31, 2017.

- A map of the corridors and buffers was produced and included in the report, submitted on December 20, 2017.
 - The mapped buffer does not extend into railyard. Identify how Northern Sands intends to avoid, minimize, or mitigate the impacts to the USGS mapped intermittent stream.
 - The report states that the final design of the railyard will be conducted prior to mining. This final design will consider methods to reduce impacts, including staging considerations, modifications of the footprint, and slope adjustments.

- The mapped riparian corridors were based on the location of intermittent streams, as shown on the USGS 7.5 minute quad maps, and were not field verified. Watercourses with defined bed & banks must be field verified and submitted to the Department. Riparian corridors and vegetative buffers shall be redrawn based on field verified watercourses with defined bed & banks and wetlands.
- The report includes an updated map of on-site delineated wetlands and bed & bank streams including 100 foot buffers.

f. The Operator shall determine the location of all wetlands within a mine phase using a recognized wetland delineator following procedures established in the 1987 edition of the USACOE Wetlands Delineation Manual.

g. Wetland delineations may be performed over time (in stages), to coincide with the planned phases of mining and reclamation.

h. All wetland delineations shall be completed and a written report submitted to the Department for review prior to beginning mining activities in any phase. The report shall include a map that shows the delineated boundary of the wetlands. The wetland delineation field work for Phase 1 of the mine shall commence by October 15, 2016, with a written report of findings to be completed and submitted to the Department by December 31, 2017.

- A partial wetland delineation was completed in late fall of 2016. This partial delineation identified thirteen wetlands within Phase 1.
 - The partial wetland delineation completed for this report was not conducted during the appropriate growing season. To meet the conditions of Permit Conditions 4.f. through 4.h., the operator shall initiate a state recognized wetland delineation for the entirety of Phase 1 no later than May 1, 2018. This report shall be completed and submitted to the Department no later than August 1, 2018.
 - **An updated wetland delineation was conducted during the appropriate growing season for the parcels within Phase 1 of the permitted mine boundary.**

Northern Sands WI must perform additional delineations on adjacent properties for Phase 1, as described under 4.a.(i).

Additional wetland delineations will be required for each subsequent phase of mining. These delineations must be completed and filed with the LCFM, then reviewed and approved prior to beginning mining in each phase.

11. Site Reclamation & Post-Mining Land Use

e. A freestanding Site Restoration & Vegetative Management Plan shall be developed for each plant community as specified in the reclamation plan. This plan will be implemented by the Operator to guide ongoing efforts to systematically manage, restore, and monitor the property as a management unit. This plan will define management options and recommendations that can be used to enhance the site's ecological and economic value.

(i) This plan shall include a description of the methods that will be used to manage areas disturbed by mining, the methods that will be used to establish and maintain a native prairie and woodlands plantings, and the methods that will be used to control noxious weeds and invasive species.

- Plan includes methodology for installing plantings and controlling noxious weeds/invasive species.

(ii) This plan shall include a minimum of two seed mixes for each plant community that account for varying soil textures and physical site conditions that may range from dry to mesic.

- Plan includes multiple seed mixes for each plant community.

(iii) This plan shall include best management practices for managing prairie and woodland plantings, a timeline showing recommended seeding windows and deadlines, and a multi-year maintenance program.

- Plan includes best management practices, timelines, and an annual maintenance plan.

(iv) The field work required for the development of this plan shall commence by October 15, 2016, and a written plan shall be completed and submitted to the Department by December 31, 2017.

- Report submitted on December 20, 2017.

ATTACHMENT 1

