NORTHMET PROJECT – DAM SAFETY PERMITS

FINDINGS OF FACT, CONCLUSIONS, AND ORDER OF COMMISSIONER

November 1, 2018

Minnesota Law, in order to receive a dam safety permit. If permit applicants demonstrate that their application and supporting materials satisfy those standards, DNR must issue a dam safety permit to the applicant. Minn. Stat. § 103G.315, subd. 3. Thus, DNR may not dictate design choices among alternatives that otherwise satisfy legal requirements.

202. For this Project, wet closure and dry closure each could provide benefits and could present engineering, environmental, or other challenges. DNR has evaluated various closure options, including both wet and dry closure. A wet closure scenario will reduce the sulfate load and sulfate concentrations and will be the most protective of wild rice. Wet closure options also provide an acceptable Factor of Safety. Once the chemical oxidation of the PolyMet tailings has ceased, the wet cap will no longer be required and the associated water pond can be drained. *See* FEIS at 3-156.

203. The dam safety regulations expressly anticipate "perpetual maintenance" of dams, providing that "the owner shall perpetually maintain the dam and appurtenances so as to ensure the integrity of the structure." Minn. R. 6115.0390, subp. 1.

204. DNR has evaluated PolyMet's FTB Application, including its proposed design for wet closure, against the applicable dam safety legal requirements (i.e. factors of safety, inspections, maintenance, and financial assurance) and has concluded that it meets those requirements.

205. The Geotechnical Data Package includes an analysis of the long-term stability of the FTB Dam. That analysis shows that the FTB Dam will remain stable so long as the required monitoring and maintenance is performed, and in fact, the Factors of Safety for the dam will increase over time, as materials in the dam are subject to secondary compression and dewatering. *See* Geotechnical Data Package at 89 to 91.

206. Numerous additional regulations and permit conditions provide for ongoing maintenance, monitoring, inspections, financial assurances, and other requirements aimed at assuring that the FTB Dam remains structurally sound.

207. The FTB Permit also includes a condition that requires PolyMet to investigate "Future Closure Considerations … such as a dry cap or other technologies that may provide additional benefits such as a shorter post-closure monitoring and maintenance period while ensuring no loss of dam safety." *See* FTB Permit Condition 45.

208. Thus, the DNR finds that the FTB Permit, taking into consideration the anticipated "wet closure" of the FTB, satisfies the permitting standards and other requirements of the applicable dam safety regulations. *See* Minn. R. 6115.0410.

xi. Concerns that the FTB Dam Safety Permit Should Require Dry Stacking

209. Commenters suggest that PolyMet should use "dry stacking" to dispose of tailings instead of placing them in the FTB. "Dry stacking," also referred to as "dry cake" or "filtered tailings," would involve using a filter press to remove water from the tailings while the tailings are still at the beneficiation plant. These tailings with reduced water content would then be transported to a tailings basin.

210. Some commenters appear to confuse "dry stacking" and "dry closure," which are different. Dry closure in this instance would involve dewatering the tailings basin, either by intentionally breaching the dam or by pumping the water from the basin after operations were completed, leaving the tailings in place. The basin would be revegetated. Dry closure will be further evaluated as a condition of the FTB Permit.

211. Dry Stacking is a newer technology designed to allow mining companies to develop mineral deposit in areas where there are insufficient water supplies to sustain the processing of mined ore. By removing and returning the water from the tailings at the plant, the mine operator is essentially able to reuse that processing water, though some make-up water is necessary due to losses in the tailings and plant processing. In an arid climate, a conventional slurry and tailings pond can result in a 50% water loss, making plant operations unsustainable. Dry stack tailings are generally in very remote arid or artic environments.

212. In a dry climate, dry stacking has significant environmental benefits. Among those benefits are reduced seepage of contaminated waters, reduced foot print of the storage facility, and potentially easier closure requirements. A perimeter seepage collection ditch and lined storage pond is usually associated with a dry stack, but a large perimeter dam would be unnecessary in most applications. Therefore, there is little risk of a dam failure.

213. By contrast, however, in wetter regions, dry stacking may not be appropriate. In a wet climate, dry stacking has major environmental disadvantages. Maintaining dry stacked tailings as "dry" in areas with substantial precipitation and/or a high water-table is difficult. Once exposed to rain or snow, the dry stack becomes wet, so most of the benefits of dry stacking are lost. Dry stacked tailings that become wet again (but are not submerged) are subject to oxidization and leaching of heavy metals. As precipitation then intermittently washes through the tailings, those heavy metals and other constituents may be washed into surrounding soils and nearby water bodies. Seepage water will also flow into the underlying groundwater, potentially contaminating local water supplies. To prevent seepage from this wet stack carrying pollutants into surrounding areas, seepage collection and water treatment systems would be required. In addition, stacks in a wet climate will be more subject to fluvial erosion. A perimeter dam may be required to prevent the movement of contaminated sediments and waters off-site. Construction of a perimeter dam reintroduces issues associated with maintenance of a dam for long-term storage of tailings, including the possibility of dam failure.

214. Another potential environmental challenge for dry stacking of tailings is the generation of fugitive dust. If tailings are dry, they are easily entrained in the air and carried by the wind, given their small particle-size. While wet tailings can be transported in slurry form through a pipeline, dry stack tailings must be transported by other means – generally by truck or conveyer belt. These transportation processes are likely to result in emissions of airborne fugitive dust. This dust may contain reactive materials, such as sulfur, or heavy metals leached from the "dry" tailings. Trucks and other heavy equipment required for other phases of dry stacking would also create additional air emissions.

215. Further fugitive dust emissions from dry tailings are likely to occur from storage or disposal areas. In wet climates, fugitive dust containing reactive minerals could pose a

significant risk to the surrounding environment. Fugitive dust released into the forests, lakes and communities of northeast Minnesota would pose environmental risks.

216. Commenters cite to statements by Michael Davies to support their contentions that dry stacking should be used for the NorthMet Project. As Mr. Davies makes clear, however, "dry stacking" of tailings is not appropriate for all circumstances. Dry stacking may provide distinct advantages in arid regions, where water conservation is essential for project operations. For similar reasons, in arctic regions, where water handling becomes highly problematic in winter, dry stacking may be preferable. Dry stacking may also provide advantages in areas of high seismicity. *See, e.g.*, Davies, Michael P., Lighthall, Peter C., Rice, Steve, Martin, Todd E., 2002. Design of Tailings Dams and Impoundments, Presented at the Annual General Meeting of the Society for Mining, Metallurgy, and Exploration: Tailings and Mine Waste Practices (Keynote Address), Phoenix, 2002 at pp. 10-11.

217. The DNR has considered the facts and circumstances of the Proposed NorthMet Project and has evaluated the feasibility, as well as the potential advantages and disadvantages of dry stacking and has concluded that dry stacking would not be appropriate at this location and for this Project. Dry stacking presents a particular disadvantage for the proposed NorthMet Project because it would undermine the ability to address existing contamination and repurpose a former disposal site and would require the use of a "greenfield" site at a new location for tailings handling and disposal.

218. Dry Stacking would require the development of a new green field site for the tailings basin because it would not be feasible to construct a dry stack disposal area at the location of the existing LTVSMC tailings basin. The use of dry stack technology would require a different location for deposition of the PolyMet tailings. This would increase the footprint effects of the proposed project. In addition, use of a separate dry stack tailings basin would not address LTVSMC tailings basin legacy issues. Given this fact, at the scoping stage of the environmental review process, DNR determined that it would not evaluate alternative sites for the for a dry stack tailings basin because it had not identified an alternative site that would likely have significant environmental benefits over the proposed site and an alternative site might not be feasible or achievable in the time frame of the project. *See* FEIS at A-315

219. Implementing dry stacking for the PolyMet tailings would involve logistical and environmental challenges even beyond the greenfield site requirement discussed above. Because the NorthMet facility would not be in an arid climate, dry stacking the PolyMet tailings would present the challenges associated with storing dry stacked tailings in a wet climate. The PolyMet tailings would not be submerged, and would be exposed to the air, so would be likely to oxidize, and to create reactive materials, including sulfuric acid. This, in turn, would be likely to lead to leaching out of heavy metals. Heavy rains, snow melt, or wind could then mobilize these constituents, transporting them into nearby soils, surface waters, or other areas.

220. Dry stacking is also management-, equipment-, and energy-intensive. Dry Stacking requires specialized filter presses and pumps that can remove sufficient water to leave a tailings product with about 18% water. These presses are slow to operate, so companies often need multiple presses. Once the tailings have left the presses, the tailings must be transported by conveyer or truck. Truck transport also can be difficult in a wet and/or snowy climate, where

roads may become unusable. Conveyers pose their own reliability issues in a cold wet climate. Once the tailings have been placed at the new site, they are subject to further management. They must be leveled, compacted, and then treated for dust suppression. These additional equipment and management requirements, as well as the increase in energy consumption associated with implementing dry stack in these circumstances would also substantially increase costs.

Concerns Regarding HRF

i. Concerns Regarding HRF Dam[6] Breach

221. Commenters raised concerns regarding the potential consequences of a breach of the HRF Dam, including the effects on the environment and public health, and suggested that such consequences had not been disclosed. Some commented that the DNR should have performed a dam breach analysis. Some commenters contended that the HRF should be classified as a Class I hazard dam.

222. The DNR has considered the potential for a breach of the HRF Dam. Such a breach is highly unlikely in view of the location, design, planned construction, use and other conditions and circumstances pertaining to the HRF Dam. *See, e.g.*, FEIS at § 5-628; A-370 to 381. PolyMet will construct the HRF using a geo-membrane and geo-synthetic liner. PolyMet will also use well-compacted, well-defined, construction materials. The DNR will require monitoring during construction to assure adherence to the approved plans and specifications. The HRF Dam will be founded on existing silty sand, glacial till, gravel, and Giants Range granite, so that it will have a stable foundation. *See* FEIS at A 5.2.14.2.3 (summary of geotechnical stability themes); FEIS A-370 to 381; HRF Geotechnical Data package at 28;

223. The potential for a breach of the HRF Dam would be so remote, particularly in view of the ongoing review, monitoring, and management obligations associated with the facility, that the FEIS declined to examine the potential environmental impacts of such a breach. FEIS at FEIS at § 5-628.

224. Barr Engineering completed a dam break analysis for the HRF Dam. Barr examined how the HRF dam could fail, and found "no plausible HRF Dam failure scenarios." *See, e.g,* HRF Management Plan, Attachment L (HRF Dam Break Analysis) at 4.

225. In addition, in reviewing the HRF Application, and in view of comments on a potential breach of the HRF Dam, DNR's dam safety experts considered the potential consequences of such a breach, taking into consideration the topography of the site, the capacity of the HRF, the materials involved, the character of the surrounding areas and how those areas could be affected, and other relevant factors. DNR personnel concluded that, in light of all of

[6] Like the FTB, the HRF is governed by a variety of regulatory permits and requirements. The HRF Permit addresses dam safety statutory and regulatory requirements. Requirements under other regulatory schemes are addressed by other permitting regimes and are addressed in documentation supporting other permits. Where issues overlap or are related, these Findings may refer or incorporate information or findings from these other permitting processes.