Foth

Memorandum

2121 Innovation Court, Suite 100
P.O. Box 5095
De Pere, WI 54115-5095
(920) 497-2500
foth.com

May 2, 2022

Report for 401(a)(2) Public Hearing

TO: U.S. Army Corps of Engineers, St. Paul District
File No. MVP-1999-05528-TJH

FROM: Steve Donohue, PH, Foth Infrastructure & Environment, LLC[1]

RE: 401(a)(2) Public Hearing on PolyMet's NorthMet Project Section 404 Permit:
Review of Fond du Lac Band of Lake Superior Chippewa Claims that the NorthMet Mine Project Will Affect Water Quality on the Fond du Lac Reservation

1. Summary

In this report, we document our review of claims by the Fond du Lac Band of Lake Superior Chippewa (Band) that the NorthMet Project (Project) by Poly Met Mining, Inc. (PolyMet) will affect the Band's water quality on its Reservation located 116 miles downstream from the Project. The following summary items demonstrate that the Band's claims are speculative and not supported by the very conservative environmental evaluations conducted by PolyMet and the Minnesota Pollution Control Agency (MPCA):

- The Project will reduce the loading of sulfate and mercury to the St. Louis River: sulfate loading will be reduced by 1,380,000 kilograms per year (kg/yr); mercury loading will be reduced by 5.2 grams per year (g/yr).
- The loading and concentration changes for sulfate, mercury, and methylmercury will not cause or contribute to any violations of water quality standards in Minnesota or Fond du Lac waters, nor will they cause adverse health effects relating to mercury concentrations in fish, either in the vicinity of the Project or downstream.
- The Project will not cause or contribute to any violations of water quality standards with respect to arsenic, copper, or cobalt in any downstream waters.
- The Project will not cause an exceedance of the Band's water quality standard for specific conductance (Foth, 2022).
- The documentation provided by PolyMet and reviewed by the MPCA and U.S. Army Corps of Engineers (USACE) is exhaustive and thoroughly quantitative compared to the speculation provided by the Band.

[1] Resume of author is provided in Attachment 1.

2. Scope of Review

On December 20, 2018, the USACE and the U.S. Environmental Protection Agency (USEPA) received notice of Section 401 Water Quality Certification from the MPCA relating to the USACE's Clean Water Act (CWA) Section 404 permit for the Project in St. Louis County, Minnesota. On June 4, 2021, the USEPA notified the Band and the state of Wisconsin under Section 401(a)(2) of the CWA that discharges associated with the 404 permit may affect water quality in waters of the Band and Wisconsin. The Band is located 116 miles downstream of the Project. Waters of Wisconsin are located further downstream beyond the FDL Reservation. On August 2, 2021, the Wisconsin Department of Natural Resources (WDNR) notified the USEPA and USACE that "the department does not object to issuance of the federal 404 permit for the subject project." On August 3, 2021, the Band provided to the USEPA documentation that the Band "has determined the discharges related to the Project will affect the quality of the Band's waters so as to violate the Band's water quality requirements." The focus of the Band's claim is that the Project's operation will lead to an increase in the concentration of mercury, methylmercury, sulfate, and specific conductance in waters of the Band.

Relating to the Band's claim, Foth Infrastructure & Environment, LLC (Foth) was requested by PolyMet to review pertinent documents related to PolyMet's analyses of cumulative water quality effects, MPCA's review of potential water quality effects from the Project, and the Band's claim that the Project will affect water quality in waters of the Band. An evaluation of the water quality effect analyses and substance of the Band's claims are provided herein.

2.1 The Band's Claims are in Conflict with the Final Environmental Impact Statement and Environmental Permit Outcomes

The Band's claim that the Project will violate water quality standards at the FDL Reservation was evaluated by PolyMet and the MPCA throughout the Environmental Impact Statement (EIS), National Pollutant Discharge Elimination System (NPDES), and 401 Water Quality Certification processes. The entire scope of that evaluation was comprehensive in nature, examining the cumulative potential effects from the Project as they relate to increasing mercury concentrations in waters near the Project and 116 miles downstream at the FDL Reservation. The assessment of cumulative effects on sulfate, mercury, and methylmercury (Barr, 2017 and MPCA, 2018) in regulated waters considered the following:

- Treated wastewater discharges from the Project.
- Air emissions from the Project.
- Watershed changes affecting runoff to streams surrounding the Project.
- Water withdrawals.
- Deposition of sulfur particulates resulting in the geochemical release of sulfate in wetland environments leading to the generation of methylmercury and migration of methylmercury into streams flowing into the St. Louis River.
- The impact of generated methylmercury on the concentration of methylmercury in fish tissue within the St. Louis River.

- Very conservative assumptions, with respect to emissions of metal and sulfur bearing particulates, discharges, and generation of methylmercury.

2.1.1 The MPCA and PolyMet's Cumulative Evaluations Were Cutting Edge

The assessment of cumulative effects on sulfate, mercury, and methylmercury in waters surrounding and downstream of the Project as completed by PolyMet, reviewed by the MPCA, and reviewed by the Band was exhaustive in nature. The PolyMet assessment of potential impacts to water greatly exceeds analyses that have been completed for other mining projects in the region. Additional analysis was completed by Foth (2022) to assess water quality impacts related to the Band's recently enacted water quality standard for specific conductance.

2.1.2 Findings Show Project's Reductions of Sulfate and Mercury in St. Louis River

- The Project will reduce the loading of sulfate and mercury to the St. Louis River. Specifically, sulfate loading will be reduced by 1,380,000 kg/yr and mercury loading will be reduced by 5.2 g/yr.

- Specifically, when mercury and sulfate loadings from air emissions are added to mercury and sulfate loading changes from the Project's wastewater discharge and other Project actions, the cumulative effect was shown to be:
  - A decrease in sulfate loading to the St. Louis River,
  - A decrease in sulfate concentration in the Embarrass River,
  - No change in sulfate concentrations in the lower Partridge or St. Louis Rivers,
  - A decrease in mercury loading to the St. Louis River watershed,
  - No change in mercury or methylmercury concentration in the Partridge, Embarrass, or St. Louis Rivers, and
  - No change in fish tissue mercury concentrations at any downstream locations on the Partridge, Embarrass, or St. Louis Rivers.

- The loading and concentration changes for sulfate, mercury, and methylmercury will not cause or contribute to any violations of water quality standards in Minnesota or Fond du Lac waters, nor will they cause adverse health effects relating to mercury concentrations in fish, either in the vicinity of the Project or downstream.

- The Project will not cause or contribute to any violations of water quality standards with respect to arsenic, copper, or cobalt in any downstream waters.

- The Project will not cause an exceedance of the Band's water quality standard for specific conductance (Foth, 2022).

MPCA reviewed PolyMet's analyses and in summary concluded the following:

- The analyses developed a reasonable and protective scenario (worst-case assumptions) that showed no changes in mercury in water or from fish from Project-related deposition of sulfur.

- There will be no exceedances of copper, cobalt, and arsenic to Class 2D water quality standards or to any other water quality criteria from Project-related air emissions or the cumulative impact Project-related air emissions.

- The Project will not result in any measurable changes in downstream water quality of the Project in the St. Louis River, including downstream locations at Forbes (located 50 miles downstream from PolyMet and 66 miles upstream of the FDL Reservation).

2.2 Comprehensive Permit Monitoring, Adaptive Management, and Mitigation Action Plans Are Already in Place

In deciding to issue the 401 Water Quality Certification for the Project, the MPCA evaluated the considerable documentation and analyses that was provided by PolyMet for the EIS, the NDPES Permit and associated Antidegradation Assessment, and the Cross Media Analysis (Barr, 2017). The Cross Media Analysis in particular evaluated in great detail specific concerns raised again by the Band in their August 3, 2021, determination that the Project "will affect" mercury levels in waters of the Band. The exhaustive worst-case assessment of the Band's concerns completed by PolyMet, in consultation with the MPCA, Minnesota Department of Natural Resources, and MPCA's third party consultant weighs heavily against the Band's claims of water quality impairment with respect to mercury and demonstrates that the Project will protect water quality standards of the state and the Band.

To add yet another level of protection to the Project, MPCA is requiring PolyMet to implement a comprehensive wetland and water quality monitoring program to assess indirect impacts to wetlands, including water quality changes in the wetlands that could affect mercury levels in water around the Project and further downstream in the St. Louis River. The collected data will be reported to MPCA on a routine basis. If changes are detected attributable to the Project, PolyMet is required to take actions ranging from additional monitoring to implementation of mitigation measures to address water quality impacts. It is noted that the enforcement mechanism spelled out in the MPCA's Water Quality Certification is not open ended but contains specific timelines for action. This timeline for monitoring, assessment, and action makes the claim by the Band that mercury levels in waters of the Band will be affected by the Project even less supportable.

2.3 Statement of Claims by Fond du Lac are Speculative in Nature

The Band states in their August 3, 2021 letter that they have made a **determination** that the Project will affect the quality of the Bands' water. Specifically, the Band is claiming that the Project will violate water quality standards for sulfate, mercury, methylmercury, and specific conductance in waters of the FDL Reservation.

As part of our work scope, we have reviewed the exhaustive analyses on this issue that has been completed by PolyMet, and reviewed by the MPCA and USACE, as part of the regulatory review process. As stated above, this analysis is exhaustive and comprehensive in its nature. We have also reviewed the Band's documentation on this matter including documentation submitted by Dr. Brian Branfireun (Band, 2021, Branfireun, 2015, 2019, 2021) in which the Band and Branfireun claim that the Project will affect mercury levels in waters of the Band.

Based on our review, it is evident that the Band's concerns were rigorously evaluated by PolyMet and reviewed extensively by the MPCA and USACE. We will not recite here the extensive documentation and history of that review as it is already well reflected in the administrative record. Rather we will note the following:

- Throughout the EIS, NDPES, and 401 Water Quality Certification processes, the record clearly shows that the Band's concerns related to mercury were thoroughly considered.
  - The Cross Media Analysis completed by PolyMet (Barr, 2017) was directly on point and tailored to the Band's concerns.

- The Band's claims of future water quality impairment of their waters due to the Project do not represent anything close to a "determination."

- The Band's claims and those by Branfireun represent speculation at best and lack quantitative analysis.

- There is nothing in the Band's August 3, 2021 submittal or in any of the documentation submitted by Branfireun (2015, 2019, 2021), that provides quantitative analysis based on the Project's design and site-specific data that show the Project contributing to impairment of the Band's water with respect to mercury.

- Claims by the Band of impairment are made but are not supported by quantitative analysis.

- The documentation provided by PolyMet and reviewed by the MPCA and USACE is exhaustive and thoroughly quantitative compared to the speculation provided by the Band.

- With respect to specific conductance, analysis shows that the discharge of treated waters from the Project will not cause an exceedance of the Band's recently promulgated water quality standard (Foth, 2022).

2.4 Conclusions

After completing a review of the material related to the Band's claim pursuant to this matter, we have concluded that PolyMet provided substantive documentation based on quantifiable analysis that the cumulative effect of the Project will not cause an increase in sulfate, mercury, or methylmercury in the St. Louis River. In fact, the opposite is true, the Project will reduce the loading of sulfate and mercury to the St. Louis River. The PolyMet documentation is exhaustive in its analyses. The MPCA thoroughly reviewed the documentation as part of the EIS, NPDES, and 401 Water Quality Certification processes. The Cross Media Analysis (Barr, 2017) was based on very conservative assumptions, and thus overestimates potential impacts from the Project. The analysis shows that the Project will not violate state of Minnesota or the Band's water quality standards with respect to sulfate, mercury, or methylmercury, even with these very conservative assumptions. In comparison, the Band's claim that the Project will violate the Band's water quality standards is based on unsubstantiated speculation lacking quantifiable analysis. As such, the Band's claim lacks foundation for a *determination* that the Project *"will affect"* the Band's water quality standards. The Band's claims of water quality impairment from

the Project are in direct conflict with the Final Environmental Impact Statement and the NorthMet Project's permit documentation and have not held up in judicial proceedings.

References

Barr Engineering, 2017. *Cross-Media Analysis to Assess Potential Effects on Water Quality from Project-Related Deposition of Sulfur and Metal Air Emissions*. October 31, 2017.

Branfireun, B.A., 2015. *Expert Review of the NorthMet Mining Project and Land Exchange Final Environmental Impact Statement.* December 2, 2015.

Branfireun, B.A., 2019. *Expert Review of the Minnesota Pollution control Agency Clean Water Act Section 401 Certification for the NorthMet Project.* January 20, 2019.

Branfireun, B.A., 2021. *PolyMet NorthMet 401(a)(2) Certification Remand.* April 28, 2021.

Foth Infrastructure & Environment, LLC., 2022. *Project-Related Effects on Specific Conductance and Salinity in the St. Louis River at the Fond Du Lac Reservation*. May 2, 2022.

Minnesota Pollution Control Agency, 2018. *MPCA Conclusions and Recommendations Related to Poly Met Mining, Inc.'s NorthMet Project "Cross-Media Analysis to Assess Potential Effects on Water Quality from Project-Related Deposition of Sulfur and Metal Air Emissions."* January 5, 2018.

The Fond du Lac Band Lake Superior Chippewa, 2021. *Letter from Kevin Dupuis Sr. RE: Notification of Objection to NorthMet Project, U.S. Army Corps Proposed Permit MVP-1999-05528-TJH*. August 3, 2021.

Attachment 1
Resume for Stephen V. Donohue

Stephen V. Donohue, P.H.

Vice President - Mining

Education
M.S. University of Wisconsin-Madison
B.S. Natural Science, University of Wisconsin-Madison

Professional Registrations/Certifications
- Professional Hydrologist - WI
- Professional Soils Scientist - WI

Litigation Highlights
- 2007 – Contested Case Hearing: Flambeau Mine (Rio Tinto) Certificate of Completion for Reclamation.
- 2008 – Contested Case Hearing: Eagle Mine (Rio Tinto) Mining Permit/ Environmental Impact Assessment and Groundwater Discharge Permit.
- 2012 – Clean Water Act Citizens Lawsuit: Plaintiff Action in Federal Court Against Flambeau Mining Company (Rio Tinto) alleging water quality impairment of Flambeau River
- 2018 – Contested Case Hearing: Back Forty Mine (Aquila Resources) Mining Permit/Environmental Impact Assessment.
- 2019 – Contested Case Hearing: Back Forty Mine (Aquila Resources) Wetlands Permit. Case Pending.

Key Expertise
- 30 years of professional experience, much of it focused on permitting complex mining projects in the Great Lakes region

Steve Donohue, P.H., has over 30 years of experience with expertise in permitting complex metallic mining projects. Mr. Donohue has led project teams on high-profile projects integrating feasibility studies, environmental permitting, mine closure, compliance and environmental impact analyses. He has worked with his clients to develop mine development, regulatory, and permitting strategies that incorporate the technical, legal, and public relations needs of the project. Mr. Donohue has provided litigation support to his clients. Mr. Donohue served as Rio Tinto's Lead Witness for the Eagle Project Contested Case Hearing and served as Aquila Resources' lead witness in the Contested Case Hearing for the Back Forty Project. Part of his responsibilities to his clients includes significant public involvement through multiparty meetings with public interest groups and regulatory agencies. He is routinely involved in educating state and federal legislators on behalf of his clients. Mr. Donohue's expertise in his profession has been recognized through his appointment to the Board of Trustees for the American Exploration and Mining Association and through his three appointments by Wisconsin Governors Thompson, McCallum, and Doyle to the Wisconsin Examining Board of Professional Geologists, Hydrologists, and Soil Scientists. Mr. Donohue is a past Chairperson of the Hydrology Section and the Joint Board.

Relevant Experience

Rio Tinto/Kennecott Exploration Company, Tamarack Project. In 2017, Foth was retained to assist Rio Tinto in the completion of the Conceptual Study for the potential development of the Tamarack copper-nickel resource in northeastern Minnesota. Steve led the Foth team's work effort on this project which included an assessment of all regulatory requirements, critical data needs including hydrologic studies for subsequent stage-gated study phases, costing and a risk assessment related to water resources, regulatory, social, and developmental risks.

Highland Copper Company, Copperwood Project. In 2017, Foth was retained as a Lead Environmental Consultant to lead the effort to secure permit amendments for the Copperwood Project in the Upper Peninsula of Michigan. In 2018, Foth secured the Amended Mining Permit and Air Permit for the reconfigured/ optimized project.

Aquila Resources Inc., Back Forty Project. In 2015, Aquila Resources acquired ownership of the Back Forty Project and financing to support permitting and feasibility studies for the development of the project. Foth was awarded the prime contract to lead the engineering and science-based work for the permitting and environmental review effort. Steve is the principal in charge of this effort. Tasks completed under Steve's direction included completion of the Environmental Impact Assessment including all baseline reports, geochemical characterization of mine waste materials, completion of the tailings and waste rock storage facility design, completion of mine water management plan including process level engineering of the wastewater treatment plant, completion of hydrologic modeling, completion of the Mine Permit Application, Air Permit Application, NPDES Permit Application, and Wetlands Permit Application. Steve worked as a strategic business partner with Aquila on the planning of the project to aid in the securing of finance agreements to fund the project. Steve recently served as the lead expert witness for the contested case hearing challenging the Mine Permit. In this capacity, Steve provides testimony related to the Mine Permit and Environmental Impact Assessment and in particular testimony related to the adequacy of hydrologic baseline studies and groundwater modeling studies.

Stephen V. Donohue, cont.

Professional Affiliations & Organizations

- Past Chair of the Wisconsin Examining Board of Professional Geologists, Hydrologists, and Soil Scientists - Past Chair of the Hydrology Section
- Society for Mining, Metallurgy and Exploration
- Prospectors & Developers Association of Canada
- American Exploration & Mining Association – Great Lakes Mining Committee
- Board of Directors - Mining Minnesota
- Board of Trustees for the American Exploration and Mining Association

Publications/Presentations

- Donohue, S.V., 2018. Prospects for Renewal of the Mining Industry in Wisconsin. Society for Mining, Metallurgy & Exploration. Annual Conference & Expo. February 25 -28, 2018. Minneapolis, Minnesota.
- Donohue, S.V. and F. Ongaro, 2017. Policies, Politics, and Projects: Are the Midwest States Inviting Investment? American Exploration & Mining Association. 123rd Annual Conference. December 4 -8, 2017. Reno, Nevada.
- Eykholt, G.R., J.B. Manchester, S.V. Donohue & J.C. Cherry (2009), "Heat and Mass Balance Modeling of a Subaqueous Tailings Disposal Facility," Tailings and Mine Waste '08, Taylor & Francis Group, London, pp. 35-48.
- Manchester, J.B., G.R. Eykholt, S.V. Donohue & J.C. Cherry (2009), "Water Chemistry and Metal Cycling in a Subaqueous Tailings Disposal Facility," Tailings and Mine Waste '08, Taylor & Francis Group, London. Pp. 49-62.
- Council, G.W., P.F. Anderson, S.V. Donohue. Crandon Mine Permit Application: A Modeling Odyssey. Modflow 2001 and other Modeling Odysseys Conference September 11-14, 2001.
- Donohue, S.V. May 5, 2000. Development of a Surface Water Mitigation Strategy for the Proposed Crandon Mine in Forest County, Wisconsin. Upper Peninsula Section SME Meeting.

Twin Metals Minnesota (Antofagasta). Twin Metals Minnesota is seeking to develop a large underground copper-nickel mine near the Boundary Waters Canoe Area Wilderness in northern Minnesota. The regulatory process will involve oversite by numerous state and federal agencies including the MDNR, MPCA, USACE, BLM, USFS, and USEPA. In 2015 Foth was awarded the contract as the Lead Environmental Consultant and was also selected to lead the hydrogeologic and water resources studies. In these roles, Foth will serve as one of the primary consultants to TMM for NEPA, MEPA, and permitting efforts. Steve is the principal in charge of Foth's contract obligations and serves in an advisory capacity to TMM for project activities including hydrologic studies.

Flambeau Mining Company. Principal-in-Charge for the project to engineer and construct an improved stormwater management system for runoff from the Industrial Outlot including the construction of a passive treatment wetland for attenuation of copper.

Flambeau Mining Company Lawsuit. In January 2011, the Wisconsin Resources Protection Council and others filed a federal lawsuit against Flambeau Mining Company alleging violations of the Clean Water Act. Having worked with Flambeau Mining Company for more than 25 years, Foth was retained to provide expert witness testimony on behalf of Flambeau Mining Company. Steve served as a lead witness on behalf of Flambeau Mining Company on issues related to site hydrology, hydrogeology, and water chemistry. The federal judge's ruling found that the Flambeau Mine was an exemplary operation and had not impaired water in the Flambeau River as alleged by the plaintiffs.

PolyMet Mining, Inc. For the better part of a decade, PolyMet Mining Inc. has been working on securing a positive EIS and permitting decision on the proposed NorthMet Project in northern Minnesota. Adjacent to the iron range, the NorthMet Project represents the first copper-nickel development in the state of Minnesota. In January 2012, Foth was retained to provide input to the consulting team working to address agency concerns about the project. Foth has also been tasked with providing peer review of hydrologic modeling studies and assisting in the preparation of the Permit to Mine Application, analysis of Financial Assurance and other critical documents leading to a permissibility decision by the regulatory agencies. Steve serves as principal-in-charge of this effort.

Kennecott Eagle Project. Principal-in-Charge and project manager for the permitting effort for the Kennecott Eagle Project in Marquette County, Michigan. Tasks included the development of a permitting plan for the project and development of permitting documents including the Mine Permit Application, Environmental Impact Assessment, Groundwater Discharge Permit Application, Air Permit Application, State Surface Use Lease Application, Soil Erosion, and Sediment Control Permit, Storm Water Permits, Septic Permit, Potable Well Permit, and Local Permit Application. Permit applications included design of the development rock storage area, facility plan, stormwater management plan, contact water storage basins, wastewater treatment plant, treated water infiltration system, reclamation plan, and financial assurance requirements. Project permits were issued in December 2007. Worked as a consultant with Kennecott's legal team on the preparation of litigation strategy, and preparation of expert witness testimony in support of environmental permits issued by the state of Michigan. All environmental permits and the impact analysis were successfully defended in court.

Stephen V. Donohue, cont.

- Donohue, S.V., G.W. Sevick, G.J. Berg, G. Reid. 1999. "Development of a Surface Water Mitigation Strategy for the Proposed Crandon Mine in Forest County, Wisconsin." Sudburg '99 Mining and the Environmental II Conference.
- Anderson, P.F., G.W. Council, R.T. Hagemeyer, S.V. Donohue. 1998. "Numerical Simulation of the Effect on Groundwater and Surface Water of the Proposed Crandon Mine." Presented at the American Water Resources Association Wisconsin Section 22nd Annual Meeting, Green Lake, Wisconsin. March 5-6, 1998.
- Donohue, S.V., P.F. Anderson, G. W. Council. 1998. "Project Overview of Groundwater Studies for the Proposed Crandon Mine." Presented at the American Water Resources Association Wisconsin Section 22nd Annual Meeting, Green Lake, Wisconsin. March 5-6, 1998.
- Donohue, S.V. 1997. "Geographical Information Systems (GIS): Emergence of a Cost-effective Management Tool." Presented at the New World of Environmental Regulation...Challenges for the Future Conference sponsored by DeWitt, Ross & Stevens, S.C. and Foth & Van Dyke, De Pere, Wisconsin. April 9, 1997.
- Donohue, S.V., P.F. Anderson, G.W. Sevick. 1997. "Crandon Mining Groundwater Studies." Presented at the Society of Environmental Toxicology and Chemistry-Midwest Chapter 5th Annual Meeting, Green Bay, Wisconsin. April 2-4, 1997.
- Donohue, S.V., G.W. Sevick. 1997. "Studies on Groundwater Lake Interactions near the Proposed Crandon Mine Site in Forest County, Wisconsin." Presented at the Society of Environmental Toxicology and Chemistry-Midwest Chapter 5th Annual Meeting, Green Bay, Wisconsin. April 2-4, 1997.
- Cheng, X.X., S.V. Donohue, S.J. Laszewski, S.G. Lehrke. 1993. Temporal and Spatial Non-Uniformity of Recharge in Northern Illinois. American Geophysical Union Spring Meeting.

Kennecott Humboldt Project. Principal-in-Charge for the permitting effort for the Kennecott Humboldt Project in Marquette County, Michigan. Tasks included the development of a permitting plan for the project, baseline studies, and development of permitting documents including the Mine Permit Application, Environmental Impact Assessment, National Pollution and Discharge Elimination System Permit Application, Air Permit Application, Soil Erosion, and Sediment Control Permit, Stormwater Permits, Septic Permit, Potable Well Permit, and Local Permit Application. Mine Permit Application included evaluation of historic mine impacts, reclamation plan, and financial assurance requirements.

HudBay/Aquila Resources, Back Forty Project. Principal-in-Charge for the permitting and environmental impact analysis for the Back Forty Project in Stephenson County, Michigan. This work commenced in 2009 when Foth was retained as the Prime Consultant to lead the permitting process. Foth was tasked with developing permitting strategy in consultation with HudBay's outside legal counsel and participating in community education programs. Other tasks include subsurface geotechnical investigations for tailings facility design, bedrock hydrogeologic studies, reviewing commissioned baseline environmental reports, geochemical characterization of waste rock and tailings, preparation of mining permit application, preparation of environmental impact assessment, design of water treatment system, design of waste rock and tailings storage facilities, preparation of water discharge permit application, preparation of air permit application and coordination with regulatory agencies.

Twin Metals, Minnesota. Principal-in-Charge of Foth team that completed scoping study on the use of open-pit mine site for tailings management. Project effort evaluated environmental liabilities associated with various options for using the open pit for tailings disposal. Both subaqueous and dry stack placement methods were evaluated. Conceptual level cost estimates for construction, operation, and closure were prepared.

Confidential Client. Principal-in-Charge of Foth team that completed scoping study on the use of open-pit mine site for tailings management. Project effort evaluated environmental liabilities associated with various options for using the open pit for tailings disposal. Both subaqueous and dry stack placement methods were evaluated. Conceptual level cost estimates for construction, operation, and closure were prepared.

Centerra Gold (Mongolia). Principal-in-Charge for Foth team completing various tasks for Centerra Gold's mining operations in northern Mongolia. Tasks have included completion of a Detailed Environmental Impact Assessment for the proposed Gatsuurt mine and a Detailed Environmental Impact Assessment for modifications of the mill facility at the existing Boroo Mine. Other studies at Gatsuurt include geochemical characterization, hydrogeologic investigations, waste rock storage facility design, and reclamation and water treatment planning.

Confidential Client Legislative Assistance. Work for the confidential client to assist with drafting a new state mining law regulating metallic mining.

- Donohue, S.V., S.J. Laszewski, F.J. Doran. 1992. Risk of Increased Contamination of a Dolomite Aquifer from Pumping Induced Drawdown, Fifth International Solving Groundwater Problems with Models Conference, Association of Groundwater Scientists and Engineers, Dallas, Texas. February 11-13, 1992.
- Kung, K-J.S., and S.V. Donohue. 1991. Improved Solute Sampling Protocol in a Sandy Vadose Zone Using Ground-Penetrating Radar, Soil Science Society of America, J. 55: 1543-1545.
- Donohue, S.V., X.X. Cheng, K-J.S. Kung. 1990. Improving Solute Sampling Protocols in Sandy Soils by Using Ground-Penetrating Radar, Third International Conference on Ground-Penetrating Radar, U.S. Geological Survey, Denver, Colorado. May 14-18, 1990.

Kennecott Tamarack Project. Principal-in-Charge of the baseline studies for the Kennecott Tamarack Project in Aitkin County, Minnesota. The Tamarack Project is high-grade nickel and copper peridotite intrusion west of Duluth, Minnesota. In 2006, Foth was commissioned to begin environmental studies on the project in anticipation of future environmental review and permitting requirements. To date, Foth has initiated studies on surface water hydrology, groundwater hydrology, hydraulic characterization of the Quaternary deposits and bedrock system at the potential mine site, geochemical characterization of potential development rock and regulatory coordination.

Crandon Mine Project. Project Manager for the formerly proposed Crandon Mine Project in northeast Wisconsin. Responsible for management of the permitting budget and activities of Foth Infrastructure & Environment professional staff and numerous sub-consultants, and overall coordination and integration of technical studies into permitting documents. Key project elements included preparation of an environmental impact report, development of mitigation plan for mine dewatering impacts on lakes and streams, groundwater quality performance assessment for proposed tailings facility, development of management plan for reflooded underground mine, feasibility studies for tailings and development of rock storage areas, socioeconomic analysis and addressing complex regulatory issues for a project that experienced significant public opposition. Attended and participated in numerous meetings with the Wisconsin Department of Natural Resources, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Geological Survey, Native American Tribes, legislative officials, concerned environmental organizations, and the Governor's Science Advisory Council on Metallic Mining.

Kennecott Flambeau Mine Project. Principal-in-Charge for ongoing environmental monitoring of the closed and reclaimed Flambeau Mine in Ladysmith, Wisconsin. The project received in 2007 a Certificate-of-Completion for reclamation of the main mine site. Recent work includes support for ongoing litigation.

Groundwater Quality Assessment for Mine Closure. Lead Groundwater Hydrologist for a project to evaluate future groundwater quality compliance after backfilling and reclamation of a copper mine operated by Flambeau Mining Company in Ladysmith, Wisconsin.

Renard Island Closure Plan. Project Manager for the development of a closure plan for a confined disposal facility in the Bay of Green Bay. The CDF is contaminated with heavy metals and PCBs. The closure plan assessed capping options and the contaminant flux from the island under different closure scenarios.

Cedar Creek. Principal-in-Charge for the Amcast Industrial Corporation Cedarburg Superfund Project in Cedarburg, Wisconsin. The project included site characterization of PCB-contaminated environmental media and feasibility study on remedial alternatives including dredging and capping of contaminated sediments.

RCRA Closure Plan. Project Manager for preparation of an RCRA closure plan for Modern Plating Corporation in Freeport, Illinois. The feasibility study included conceptual design plans for the disposal of metal plating sludge and contaminated soils in a double-lined and capped landfill referred to as a Corrective Action Management Unit or CAMU. The closure plan also addressed the development of site-specific soil and groundwater cleanup objectives.

North American Exploration Projects. Principal-in-Charge of hydrologic monitoring programs for clients conducting exploration projects in North America in support of Order-of-Magnitude studies at potential mine sites.