



WETLANDS AND RIPARIAN RESOURCES VOL 2 IMPACT INDICATORS AND METHODS

TWIN METALS MINNESOTA PROJECT

Environmental Review Support Document

Prepared for Twin Metals Minnesota, LLC
Prepared by

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REVISION RECORD

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REVISION NARRATIVE

DISCLAIMER

This document is a working document. This document may change over time because of new information, or further analysis or deliberation.



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LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

TMM

Twin Metals Minnesota, LLC

1.0 INTRODUCTION

The Twin Metals Minnesota, LLC (TMM) Project (Project) is focused on designing, permitting, constructing, and operating an underground copper, nickel, cobalt, platinum, palladium, gold, and silver mining project. Located approximately nine miles (14 kilometers [km]) southeast of Ely, Minnesota, and 11 miles (18 km) northeast of Babbitt, Minnesota, the Project targets valuable state, federal, and private minerals within the Maturi deposit, which is a part of the Duluth Complex geologic formation.

All potential Project infrastructure locations presented herein are considered preliminary and are undergoing further design and engineering evaluations which will dictate final design and locations. Further information about TMM and the Project is located at <http://www.twin-metals.com/>.

The purpose of this document is to provide necessary information for the environmental review and permitting process. TMM retained [insert Consultant name] (insert abbreviated Consultant name) to complete [insert text].

2.0 SUMMARY

This report will describe impact assessment by:

- Describing the methodology used to assess the impacts;
- Defining the area of effects of the impacts;
- Establishing the indicators of effects to the baseline conditions; and
- Referencing relevant sections of the FSDD, SEAW, and / or federal documents to remind the reader there is a defined scope that is being followed.

The impact assessment will be used to assess impacts from the proposed action and alternatives on the baseline conditions described in the other volumes of the *Wetlands and Riparian Resources Data Package* results of which will be presented in a subsequent volume of the *Wetlands and Riparian Resources Data Package*.

3.0 IMPACT ASSESSMENT CRITERIA

3.1 Area of Analysis

Describe this based on features and / or of the proposed action or alternatives that would cause effect. The discussion here needs to match the discussion in the other volumes of the *Wetlands and Riparian Resources Data Package*. Baseline conditions should be assessed for anywhere that the proposed action or alternative could have effects on wetlands or riparian resources.

3.1.1 Areas of Analysis for Direct Impacts

- Direct impacts would result from mining-related activities such as filling or excavation of wetlands or physical changes to riparian resources, and therefore, these wetlands or riparian resources would be permanently lost.

3.1.2 Areas of Analysis for Indirect Effects

- Wetlands or riparian resources that are not filled, excavated, or physically altered but have a reduced function or value, :
 - wetland fragmentation;
 - changes in wetland or riparian hydrology resulting from changes in watershed area;
 - changes in wetland or riparian hydrology due to groundwater drawdown resulting from construction and operations of the underground mine;
 - changes in wetland or riparian hydrology from water management from the operation of the plant site and tailings management site, including groundwater seepage containment;
 - changes in stream flow near the plant site and tailings management site due to water management features, as well as associated effects on wetlands abutting the streams; and
 - changes in wetland water quality related to atmospheric deposition of dust from the dry stack facility and groundwater seepage.

3.2 Indicators

This section will discuss how indicators were selected and what the indicators are.

- Changes in wetland hydrology resulting from changes in watershed area;
- Changes in wetland hydrology due to groundwater drawdown resulting from underground mine dewatering;
- Changes in wetland hydrology from groundwater drawdown, including groundwater seepage containment;
- Changes in stream flow, as well as associated effects on wetlands abutting the streams;
- Changes in wetland water quality related to atmospheric deposition; and
- Changes to riparian characteristics.

3.3 Methodology and Evaluation Criteria

- Discussion of wetland effects for the proposed action which include direct and indirect effects to wetland and riparian resources.

3.3.1 Areas of Direct Impacts

- Determined based on project features, activities and phases.
- Describe rationale for selection of areas based on drainage, dredge, or fill activities in wetlands.
- Describe rationale for selection of riparian areas of assessment.

3.3.2 Areas of Indirect Effects

- Describe methodology and evaluating criteria for wetland impacts due to wetland fragmentation.
 - EIS analysis may include:
 - Size of remaining wetland
 - Wetland type
 - Source of hydrology
 - Direction of flow in the area
 - Determination of the wetland's current watershed
 - Location of the Minerotrophic bog and non-bog wetland Fragment in the wetland's future watershed
 - Connectivity to other wetlands
- Methodology and evaluating criteria for wetland impacts due to a change in watershed area.
 - An estimate of the change in watershed area (acreage and percent gain or loss) was calculated for the following conditions: proposed action, during operation when the maximum amount of watershed has been removed, and at closure and long-term maintenance
- Methodology and evaluating criteria for wetland impacts due to a change in hydrology due to water table changes due to groundwater drawdown resulting from construction and operations of the underground mine.
 - The applicability of utilizing a modeling approach should be considered in consultation with the water team.
- Methodology and evaluating criteria for wetland impacts due to a change in hydrology due to water table drawdown and the potential for hydrologic effects on overlying wetlands.
- Methodology and evaluating criteria for wetland impacts due to a change in stream flow.
 - Keeley Creek during operation and post-closure should be estimated using mass balance techniques.
- Methodology and evaluating criteria for wetland impacts due to a change in water quality.
 - Including groundwater seepage.
- Describe indirect effects anticipated (if appropriate) for riparian areas.
- Describe riparian areas of analysis for indirect effects.

3.3.3 Quality Control

- Discussion of QA/QC or QAPP.

4.0 REFERENCES



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FIGURES



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APPENDICES



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APPENDIX [#A, B, C, D]

[APPENDIX TITLE]



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APPENDIX [#A, B, C, D]

[APPENDIX TITLE]

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