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Memorandum

To: Stuart Arkley

From: Mark Jacobson; Cheryl Feigum

Subject: Wetland Impacts – Tailings Basin Mitigation Alternative

Date: May 28, 2008

Project: 23/69/-862-006-001

c: John Borovsky, Jim Scott, ERM

The purpose of this memorandum is to respond to information needs identified in the Reasonable Alternatives Screening Table dated 4/21/08 for the mitigation to use LTVSMC taconite tailings for construction of the NorthMet tailings dams. The information need is to characterize the wetland impacts that will result with the implementation of the mitigation. Figure 1 shows the evaluation area around Tailings Basin Cells 2E/1E. Table 1 identifies the wetlands within the evaluation area. The potential wetland impacts were evaluated for:

1) the 300-ft wide Buttress Area located along the length of the north side of Tailings Basin Cell 2E, to provide space to construct the buttress required to implement the mitigation; and

2) the East Basin Expansion Area in order to reduce the requirement for LTVSMC coarse tailings required for dam construction (natural terrain used as dam) and provide an additional source (existing dams in this area) for LTVSMC coarse tailings required to implement the mitigation.

Table 1. Wetlands in the Evaluation Area

Wetland Type	**Buttress Area (acres)**	**East Basin Expansion Area (acres)**
Type 2 (PEMB)	0.003	1.77
Type 3 (PEMC)	---	3.01
Type 4 (PEMF)	32.01	10.65
Type 5 (PUBF)	---	2.44
Type 5 (PUBFx)	---	1.07
Type 6 (PSSB)	2.41	0.07
Type 7 (PFO4B)	2.22	---
TOTAL	***36.63***	***19.01***

Past disturbances that have affected the hydrology and vegetative characteristics of the wetlands include beaver dams, culverts, road construction, parking areas, railroad embankments, diversion of flowages, and the development of the Tailings Basin Cells 2E/1E. Wetlands in the evaluation area generally have low vegetative quality and significant hydrological impacts (Table 2).

There are 36.63 acres of wetlands identified within the Buttress Area (Table 1). Nearly 90 percent of the wetlands are classified as deep marsh (Circular 39 Type 4; Cowardin Type - PEMF). These wetlands are generally inundated with dead black spruce trees observed throughout the area. Other wetland types present in the area included wet meadow (Circular 39 Type 2; Cowardin Type - PEMB), shrub carr (Circular 39 Type 6; Cowardin Type - PSSB), and coniferous swamp (Circular 39 Type 7; Cowardin Type – PFO4B).

The wetlands in the Buttress Area are low quality wetlands with the dominant vegetation including cattails and phragmites. This area has been historically impacted by seepage from the Tailings Basin. Black spruce is present throughout the area, however, the wetlands are generally inundated and most of the black spruce trees within the wetlands are dead.

There are about 19 acres of wetlands identified within the East Basin Expansion Area (Table 1). Approximately 56 percent of the wetlands in this area are classified as deep marsh (Circular 39 Type 4; Cowardin Type - PEMF) and there are generally no trees present within these wetlands. Another 40 percent of the wetlands are classified as wet meadow (Circular 39 Type 2; Cowardin Type - PEMB), shallow marsh (Circular 39 Type 3; Cowardin Type - PEMC), and open water (Circular 39 Type 5; Cowardin Type - PUBF). The remaining 4 percent of wetlands include shrub carr (Circular 39 Type 6; Cowardin Type – PSSB) and excavated open water (Circular 39 Type 5; Cowardin Type - PUBFx). The wetlands in the East Basin Expansion Area are generally low quality wetlands with the vegetation dominated by cattails located within inundated areas.

T26
PSSB
T24
PFO4B
T23
PFO4B
T23
PFO4B
T19
PEMF
T22
PSSB
T20
PFO4B
T18
PEMF
T17
PFO4B
T16
PEMF
T29
PEMB
T31
PFO4B
T15
PEMC
T14
PEMF
T31
PFO4B
T13
PEMF
T12
PEMC
T11
PUBF
T10
PUBF
T9
PEMB
T8
PEMB
T7
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PSSB
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T5
PEMB
T3
PEMB
T2
PUBFx
T1
PUBFx

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Evaluation Area

Wetland

Impacted Wetland

N

0 500 1,000 2,000 Feet

Figure 1

IMPACTED WETLANDS
Tailings Basin Area
PolyMet Mining
Hoyt Lakes, Minnesota

Table 2
Projected Wetland Impact Detail
Revised May 28, 2008
NorthMet Mine/PolyMet Mining Co.

Project Area	Wetland ID	Dominant Circular 39 Type	Total Wetland Area (acres)	Projected Total Wetland Impacts (acres)	Projected Indirect Wetland Impacts (acres)	Dominant Eggers & Reed Community Type	Vegetative Diversity/ Integrity	Overall Wetland Quality	Disturbance Level	Disturbance Type	Wetland Origin	Field Delineated	Impact Type (Direct/Indirect)
TB Mitigation Alternative - Buttress Area	T1	5		0.17	0.00	open water	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - Buttress Area	T2	5		0.90	0.00	open water	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - Buttress Area	T3	2		0.09	0.00	wet meadow	Low	Low	High	Ditch	Created	Y	Direct
TB Mitigation Alternative - Buttress Area	T4	2		1.02	0.00	wet meadow	Low	Low	High	Road Fill	Created	Y	Direct
TB Mitigation Alternative - Buttress Area	T5	2		0.24	0.00	wet meadow	Low	Low	High	Road Fill	Created	Y	Direct
TB Mitigation Alternative - Buttress Area	T6	6		0.07	0.00	shrub carr	Low	Low	High	Road Fill	Created	Y	Direct
TB Mitigation Alternative - Buttress Area	T7	3		0.92	0.00	shallow marsh	Low	Low	High	Impounded	Created	Y	Direct
TB Mitigation Alternative - Buttress Area	T8	2		0.04	0.00	wet meadow	Low	Low	High	Seepage	Created	Y	Direct
TB Mitigation Alternative - Buttress Area	T9	2		0.38	0.00	wet meadow	Low	Low	High	Seepage	Created	Y	Direct
TB Mitigation Alternative - Buttress Area	T10	5		1.48	0.00	open water	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - Buttress Area	T11	5		0.96	0.00	open water	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - Buttress Area	T12	3		0.39	0.00	shallow marsh	Low	Low	High	Impounded	Created	Y	Direct
TB Mitigation Alternative - Buttress Area	T13	4		0.60	0.00	deep marsh	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - Buttress Area	T14	4		10.06	0.00	deep marsh	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - Buttress Area	T15	3		1.70	0.00	shallow marsh	Low	Low	High	Impounded	Created	Y	Direct
TB Mitigation Alternative - Buttress Area	T31	7		0.03	0.00	coniferous swamp	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - Buttress Area				**19.1**	**0.0**								
TB Mitigation Alternative - East Basin Expansion Area	T16	4		9.03	0.00	deep marsh	Low	Low	High	Ditch	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T17	7		1.18	0.00	coniferous swamp	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T18	4		4.07	0.00	deep marsh	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T19	4		18.91	0.00	deep marsh	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T20	7		0.45	0.00	coniferous swamp	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T21	6		0.48	0.00	shrub carr	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T22	6		0.48	0.00	shrub carr	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T23	7		0.22	0.00	coniferous swamp	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T24	7		0.33	0.00	coniferous swamp	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T25	6		0.01	0.00	shrub carr	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T26	6		1.38	0.00	shrub carr	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T27	7		0.03	0.00	coniferous swamp	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T28	6		0.05	0.00	shrub carr	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T29	2		0.00	0.00	wet meadow	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area	T30	6		0.02	0.00	shrub carr	Low	Low	High	Impounded	Natural	Y	Direct
TB Mitigation Alternative - East Basin Expansion Area				**36.6**	**0.0**								