APPENDIX D3
Water Resources

INTENTIONALLY LEFT BLANK

Cumulative Water Resources Effect Assessment

Prepared for Excelsior Energy

Mesaba Energy Project

SEH No. EXENR0502.03

November 2006, Revised by Excelsior Energy, February 2009

Cumulative Water Resources Effect Assessment
Mesaba Energy Project

SEH No. EXENR0502.03

Prepared for:
Excelsior Energy Inc.

November 2006, Revised by Excelsior Energy, February 2009

Short Elliott Hendrickson Inc.
3535 Vadnais Center Drive
St. Paul, MN 55110-5196
651.490.2000

West Range

I. Introduction

The definition of terms commonly used throughout the Final EIS shall be maintained in this document.

II. Identification and description of affected watershed: Swan River.

The Swan River Watershed is located in Itasca and St. Louis Counties in Northern Minnesota and is part of the Upper Mississippi River Watershed Basin. Figure 1 shows the Swan River Watershed to a point immediately upstream of the confluence with Trout Creek, the location of the IGCC Power Station, and the location of the proposed Minnesota Steel project.

Human influences related to logging, mining, ditch construction, agriculture, dam construction, flow diversion/withdrawal, development of transportation systems, and community development have impacted streams in the Swan River Watershed, including the Swan River.

The watershed area has been altered primarily through past mining actions. The land use/cover type was modified significantly through the construction of mining related facilities and, in turn, this alteration has modified the quantity and timing of surficial runoff to the Swan River.

Impacts resulting from the Minnesota Steel Industries ("MSI") project are hydrologically upstream on the Swan River from the IGCC Power Station. The Swan River watershed study area was selected at a point sufficiently downstream of the Mesaba's impacts in order to encompass the cumulative impacts within the Swan River Watershed with respect to both the MSI project and Mesaba.

NOTE: *The Mesaba West Range Site will have an enhanced Zero Liquid Discharge (ZLD) system and would not contribute to any cumulative impact on water quality in the Swan River resulting from the discharge of wastewater from the project. There is no further discussion of water quality needed.*

III. Identify existing usage:

Existing Water Appropriation permits from surface waters in the Swan River watershed are shown in **Table 1**.

Table 1 - Existing Water Appropriation Permits for Surface Waters Near the West Range Site within the Swan River Watershed

		Permitted		Reported Pumping (Million Gallons)				
Permittee	**Resource**	**GPM**	**MG/Y**	**2000**	**2001**	**2002**	**2003**	**2004**
MDNR	Hill-Annex Tailing Basin	4500	500	ND	ND	ND	ND	70.3
MDNR	Hill-Annex Mine	7000	3416	ND	ND	621.1	1550.3	1374
Swan Lake Country Club	Oxhide Creek	540	10	4.6	8.5	9.2	8.4	5.8
City of Coleraine	Trout Lake	400	41	37	19.7	19.7	12.1	11.9

IV. Effects from new sources/appropriations

a. Quantity:

i. Mesaba One and Mesaba Two:

The Swan River is affected to the degree that Mesaba One and Mesaba Two will pump water out of the Hill-Annex Mine Pit ("HAMP") complex to the CMP instead of the DNR's current practice of pumping water from the HAMP complex to Upper Panasa Lake, which discharges to Lower Panasa Lake and ultimately the Swan River. The DNR's current NPDES permit allows for annual transfers of water from the HAMP complex at an average pumping rate of 6,500 gpm. However, because of the costs associated with pumping such volumes, seasonal freeze-ups, and pump capacity, the HAMP complex is generally dewatered for 6 months per year at a rate of 6,200 gpm (which is the pump capacity). Therefore, loss of such flow would represent the maximum possible loss of flow to the Swan River resulting from the IGCC Power Station's operations (or Minnesota Steel's operations, as discussed below). Although, the DNR has indicated its preference for maintaining some flow from the HAMP Complex to Upper Panasa Lake, such preference appears to be premised on the benefits of reducing algal blooms in Upper and Lower Panasa Lakes, not on augmenting flow in the Swan River.

The maximum water loss specified above would only occur during peak process water demand periods with both Mesaba One and Mesaba Two in operation. Smaller quantities of water are likely to be diverted from the HAMP complex for Mesaba One if the Canisteo Mine Pit yields more water than estimated and/or if above normal precipitation occurs. Excelsior's regulatory documents (the Joint Application, Environmental Supplement, NPDES Permit Application, and the Water Appropriation Permit Application) contain detailed descriptions of Mesaba One and Mesaba Two water uses and the timing of their appropriation.

As the Canisteo Mine Pit does not directly discharge to any surrounding surface waters and Excelsior has announced its intention to maintain water levels therein within a relatively narrow band (i.e., ± 2 feet), water appropriated from it will not affect the Swan River. Excelsior, via its application to the MDNR for Water Appropriation Permits, has requested to withdraw water from the Prairie River (at a point beyond MP's hydroelectric dam) and the Lind Mine Pit for use by the IGCC Power Station. Although such appropriation will reduce flows in the Prairie River downstream of the point of withdrawal, there will not be any cumulative impacts on the resource since MSI's use of water will not reduce flows to the Prairie River watershed. Furthermore, no

other reasonably foreseeable projects would negatively impact flow in the Prairie River, so no further analysis of cumulative impacts on that resource is necessary.[1]

ii. Minnesota Steel Industries (MSI)

While the annual consumptive use of water from the MSI project averages 4,910 gpm[2], its impact on the Swan River would be less due to the use of groundwater inflows from existing and new mining pits. Studies done for MSI's Environmental Impact Statement concluded that the net reduction in water flows in the Swan River due to MSI would average 1,660 gpm and would rise to 2,110 gpm in dry years. While higher short-term reductions were predicted, they coincide with periods of high flow in the Swan River, and are therefore not considered to be problematic.

MSI's EIS also states that approximately 1,200 gpm of stream flow augmentation would be required during latter years of operation. The Hill Annex Mine Pit would be the preferred source, although no water appropriation permit application has yet been filed. As discussed above, the maximum impacts are still limited by the existing pumping by DNR. However, to the extent that MSI uses the water for stream augmentations, less impact is attributable to Mesaba.

iii. Nashwauk WWTF

Sanitary wastewater flows to the Nashwauk WWTF from the MSI project could be as high as 21 gpm *(Question 18.b. – MSI EAW).* The effluent would be slightly less that the influent to the WWTF.

iv. Coleraine-Bovey-Taconite WWTF

Mesaba would connect to the wastewater treatment facility for disposal and treatment of domestic wastewater. The maximum estimated increase in 24 hr-averaged flow to the treatment facility during construction would be 31 gpm during construction and 5 gpm during the operational phase of Mesaba Phase I and II. The effluent from the WWTF would be slightly less than the influent.

Due to inflow and infiltration in the existing collection system, sewage bypasses and excess flows relative to the design limit of the treatment plant sometimes occur during times of heavy precipitation or thaw. Excelsior will seek to rehabilitate the collection system or enlarge the pumps to mitigate this situation.

v. Total: Compare to flow of Swan River.

From the above analysis, the maximum short-term cumulative reduction in flow is approximately 8,300 gpm. This is primarily based on MSI's dry-year reductions and the elimination of DNR's pumping from Hill Annex at maximum summer rates. For annual average flows, the maximum cumulative reduction would be approximately 4,800 gpm. This is primarily based on MSI's normal-year reductions and the elimination of DNR's highest annual pumping from Hill Annex.

---

[1] The MDNR has proposed to keep levels in the Canisteo Mine Pit from rising above 1,313 ft msl by creating an overflow that would ultimately divert pit waters to the Prairie River, augmenting flows therein until the IGCC Power Station commences commercial operations and begins to reduce surface water levels in the Pit below 1,313 ft.

[2] Minnesota DNR and US Army Corps of Engineers. "Minnesota Steel Final Environmental Impact Statement." June 2007. Available: http://www.dnr.state.mn.us/input/environmentalreview/minnsteel/index.html.

The historic mean flow of the Swan River is 29,000 gpm (USGS gage data for the period 1965-1990). However, significant mining has taken place within the watershed during the period of record, which could commensurately cause unnaturally high or low flows to be measured in the river as a result of dewatering and stream augmentation practices conducted.

East Range

I. Identification and description of affected watershed: Partridge River.

The Partridge River Watershed is located in St. Louis County in Northern Minnesota. The Partridge River watershed is part of the St. Louis River and Lake Superior Watershed Basin. Figure 2 shows the Partridge River Watershed to a point approximately 5 miles downstream of the confluence with First Creek. The Mesaba Energy Project, Mesabi-Nugget, and PolyMet Projects are located within the watershed study area.

Human influences related to logging, mining, ditch construction, agricultural activity, dam construction, flow diversion / withdrawal, development of transportation systems, and community development activities have impacted streams in the area, including the Partridge River.

The contributing watershed area of the Partridge River has been primarily altered through several past mining actions. The land use / cover type was modified significantly through the construction of mining related facilities and, in turn, this alteration has modified the quantity and timing of surficial runoff to the stream.

Lake levels in Colby Lake are augmented with water from Whitewater Reservoir, which also has impacts on the natural flow regime within the Partridge River.

Impacts resulting from the PolyMet project are hydrologically upstream of the Partridge River from Mesaba. The Mesabi-Nugget project is relatively close to the Mesaba Energy Project and shares some of the same sub watersheds. The Partridge River watershed study area was selected at a point downstream of Mesaba's impacts in order to encompass the cumulative impacts within the Partridge River Watershed with respect to the Mesaba Energy Project, Mesabi-Nugget, and PolyMet.

NOTE: *The Mesaba East Range Site will have an enhanced Zero Liquid Discharge (ZLD) system and would not contribute to any cumulative impact on water quality in the Partridge River resulting from the discharge of wastewater from the project. There is no further discussion of water quality needed.*

II. Identify existing usage:

Existing Water Appropriation permits for surface waters in the Partridge River Watershed are shown in **Table 2**.

Table 2 - Existing Water Appropriation Permits for Surface Waters Around East Range Site within the Partridge River Watershed[3]

		Permitted		Reported Pumping (Million Gallons)				
Permittee	**Resource**	**GPM**	**MG/Y**	**2000**	**2001**	**2002**	**2003**	**2004**
MP & Cliffs Erie LLC	Colby Lake	12000	6307	2945.7	69.2	ND	ND	ND
MP	Colby Lake	100500	50000	71.4	60.4	63.4	96.1	117.2
MP	Colby Lake	100500	50000	23851.7	24061.7	24261.9	24132.9	22458.9
MP	Colby Lake	100500	50000	21734.0	24133.9	24185.4	24132.9	23541.8
MP	Colby Lake	105000	50000	51.1	4.0	3.4	0.0	21.1
MP	Colby Lake	105000	50000	4.3	41.6	28.8	0.1	0.4
MP	Colby Lake	100500	50000	17.3	0.1	ND	ND	ND
MP	Colby Lake	105000	50000	474.0	516.4	523.6	525.5	525.1
City of Hoyt Lakes	Colby Lake	1050	160	123.1	116.4	120.4	122.8	120.4
City of Hoyt Lakes	Partridge River		4	2.4	1.8	1.7	2.2	1.5
Cliffs Erie LLC		3600	1155	1055.4	ND	ND	ND	ND
Cliffs Erie LLC		3600	1155	ND	ND	ND	ND	ND
Cliffs Erie LLC		3600	1155	ND	ND	ND	ND	ND
Cliffs Erie LLC		1500	551	ND	ND	ND	ND	ND
Cliffs Erie LLC		20000	10512	ND	ND	ND	ND	ND
Cliffs Erie LLC		20000	10512	ND	ND	ND	ND	ND
Cliffs Erie LLC		20000	10512	1860.2	ND	ND	ND	ND
Cliffs Erie LLC		20000	10512	ND	ND	ND	ND	ND
City of Aurora		1020	160	73.7	74.7	81.8	106.5	93.4
Cliffs Erie LLC		5000	788	ND	ND	ND	ND	ND
Cliffs Erie LLC		12000	3049	316.9	ND	ND	ND	ND
Cliffs Erie LLC		12000	3049	ND	ND	ND	ND	ND
Cliffs Erie LLC		12000	3049	ND	ND	ND	ND	ND
Cliffs Erie LLC		3000	1050	ND	ND	ND	ND	ND
Cliffs Erie LLC		3000	1050	1807.2	ND	ND	ND	ND

[3] Minnesota DNR. Permit Information Report, created August 25, 2008. See : http://files.dnr.state.mn.us/waters/watermgmt_section/appropriations/index.zip

III. Effects from new sources/appropriations

a. Quantity:

i. Mesaba:

Pits 3 and 5N discharge water to small streams, which flow to the Upper Partridge River, and the Stephens and Knox pits discharge water to small streams that flow to the Lower Partridge River. The Upper Partridge River is defined as the portion of the river upstream of Colby Lake and the Lower Partridge River is the stream reach downstream of the lake.

Pits 3 and 5N currently contribute an estimated mean flow to the Upper Partridge River of 1,100 gpm, which would potentially be eliminated if the water is used by Mesaba.

The Stephens and Knox pits contribute an estimated mean flow of 435 gpm to the Lower Partridge River, which would potentially be eliminated if the water is used by Mesaba.
The water sources that would be used for Mesaba are shown in **Table 3**.

Table 3 - Water Source Supply Capability

Water Source (Pits)	**Est. Range of Flow (gpm)**	**Currently Discharging (yes/no)**	**Assumed Sustainable Flow for Water Balance Modeling (gpm)**
2E	ND	N	112
2W	ND	N	898
2WX	ND	N	673
6	ND	N	1,795
Source: MDNR East Range Hydrology Report	Sub-Total		**3,478**
3	150–450	Y	300
5N	800[1]	Y	800[1]
9 / Donora	130–380	N	260
9S	90–270	N	180
Stephens	190–590	Y	390
Knox	20–70	Y	45
Source: Surface Water Modeling[2]	Sub-Total		**1,975**
Mesabi Nugget Discharge	1000	N	**1,000**
Source: MPCA NPDES Discharge Permit			

[1]Personal communication Jim Scott, representing PolyMet, to Robert Evans, July 3, 2008.
[2]Excelsior estimated the range of flow based only on the surface drainage area to the pit and average yearly rates of runoff. This represents a first order approximation and the actual flow rates are likely much more dependent on groundwater components. The groundwater inflow/outflow component in this area can be highly variable as a result of fractures in the bedrock and/or highly pervious tailings dikes. Due to the complexity associated with the groundwater component, groundwater inflow/outflow has not been evaluated.

ii. PolyMet

PolyMet will not appropriate water directly from the Partridge River, but it may appropriate water from Colby Lake. Since PolyMet would not directly appropriate water from the Partridge River, there would be no direct impacts on stream flow in the river. PolyMet may have some indirect impacts on the stream flow in the Partridge River by cutting off a portion of the runoff to the river and dewatering of the mine pit which could cause a localized drop in the groundwater levels. This impact has not been quantified.

According to the MDNR, PolyMet may need to appropriate as much as 4-8,000 gpm from Colby Lake, but this is a moving target at this time. PolyMet will reportedly employ a Zero Liquid Discharge system, so it would not contribute any new discharges of water to the system.

iii. Mesabi-Nugget

A water appropriation permit has been issued to Mesabi-Nugget. The permit from the MDNR allows Mesabi-Nugget to pump up to 5,000 gpm from Pit 1 and Pit 2WX would be used as a standby source with a permitted appropriation of 5,000 gpm. However, actual average required use is much lower. Pit 2WX does not currently discharge to surface waters. According to water flow records, Pit No. 1 has a base discharge of approximately 3,300 gpm[4] to Second Creek, which subsequently flows to the Lower Partridge River. This would be reduced or eliminated by Mesabi Nugget's use and by Mesaba's potential use of dewatering and wastewater flows from Mesabi Nugget.

Mesabi Nugget is planning a mining project that would use additional water, but specific consumption information is not available at this time.

iv. Hoyt Lakes POTW

At this time, there are no reasonably foreseeable expansions to the Hoyt Lakes POTW. However, Mesaba would connect to the Hoyt Lake wastewater collection and treatment system. The current system discharges to Colby Lake, and additional effluent from the treatment facility would have negligible effects on the Partridge River flows.

The maximum estimated increase in flow to the treatment facility during construction would be 31 gpm during construction and 5 gpm during the operational phase of Mesaba Phase I and II. The effluent would be slightly less than the influent.

v. Total: Compare to low-flow of Partridge River.

Low, average, and high flow estimates for the Upper Partridge River are shown in Table 17-1 of the PolyMet EAW. Low flows are estimated to be in the range of 320-835 gpm, average flow is estimated at 17,500 gpm, and high flows are estimated at 156,000-161,000 gpm. The total maximum flow that Mesaba could remove from the Upper Partridge River could be up to 1,100 gpm.

The total maximum flow that Mesaba and Mesabi Nugget could remove from the Lower Partridge River during low flow conditions could be as much as 3,735 gpm downstream of Second Creek. This is not cumulative with removals from the Upper Partridge River during low

[4] Email communication from Bill Johnson, Minnesota DNR, Feb 20, 2009.

flow conditions, because the water level (and hence outflow) of Colby Lake, which separates the two rivers, is controlled according to existing permits. Currently, a number of different entities appropriate water from Colby Lake. Minnesota Power is required to augment lake levels in Colby Lake by pumping from Whitewater Reservoir and a minimum allowable lake level has been established. When the lake level is at its minimum, flow out of the lake to Lower Partridge River (upstream of Second Creek) is also at its minimum, which is approximately 13 cfs. This means that flows on the Lower Partridge River should never fall below 13 cfs or 5,835 gpm.

The maximum total estimated amount of water that PolyMet and Mesaba could appropriate from Partridge River (Colby Lake) would be determined by the MDNR, and determining precise appropriations and cumulative impacts of all potential projects is difficult at this time, due to the uncertainty of the status and design of each project. The Colby Lake water levels would still be expected to be augmented from Whitewater Reservoir. As discussed in the EIS, Mesaba may use an average of 1,300 gpm from Colby Lake, and peak use could reach 4,300 gpm. Combined with PolyMet's potential use and Mesaba's potential appropriation from Upper Partridge River, total potential short-term use could reach 13,400 gpm, although this would represent a worst case scenario where mine pit storage is unable to reduce short-term appropriation rates. This rate is lower than the historical short-term permit limit of 15,000 gpm for the LTV mine. Minnesota Power has historically appropriated approximately 90,000 gpm from Colby Lake for once-through cooling of its Laskin Energy Center, which is not expected to contribute significantly to water consumption.

If Colby Lake levels are maintained above minimum levels, fluctuation could occur in Whitewater Reservoir. During historical periods when maximum appropriations from Colby Lake occurred, transfers of water from the reservoir caused short term water level fluctuations therein of up to 5-10 feet. Such water fluctuations could have adverse effects on fish populations, however, fish populations and sizes have generally increased since stocking began, and LTVSMC operated during most of that period of time.[5] Boat access and property values may also be affected.

Reportedly, water losses through leaky dikes in Whitewater Reservoir are estimated to be on the order of 9,000 gpm when water in the reservoir is at high levels.[6] An option for mitigating such fluctuations would be to repair its leaky dikes allowing for water in the reservoir system be more effectively stored. This would allow both Colby Lake and Whitewater Reservoir to be maintained at higher levels, and may allow for Whitewater Reservoir levels to be controlled through the overflow outlet to the St. Louis River, rather than leaving the lake through leakage and required pumping into Colby Lake. Any credit ultimately ascribed to recovering waters leaking from Whitewater Reservoir would be required to be supported by in-depth studies conducted in conjunction with input from the MDNR.

References

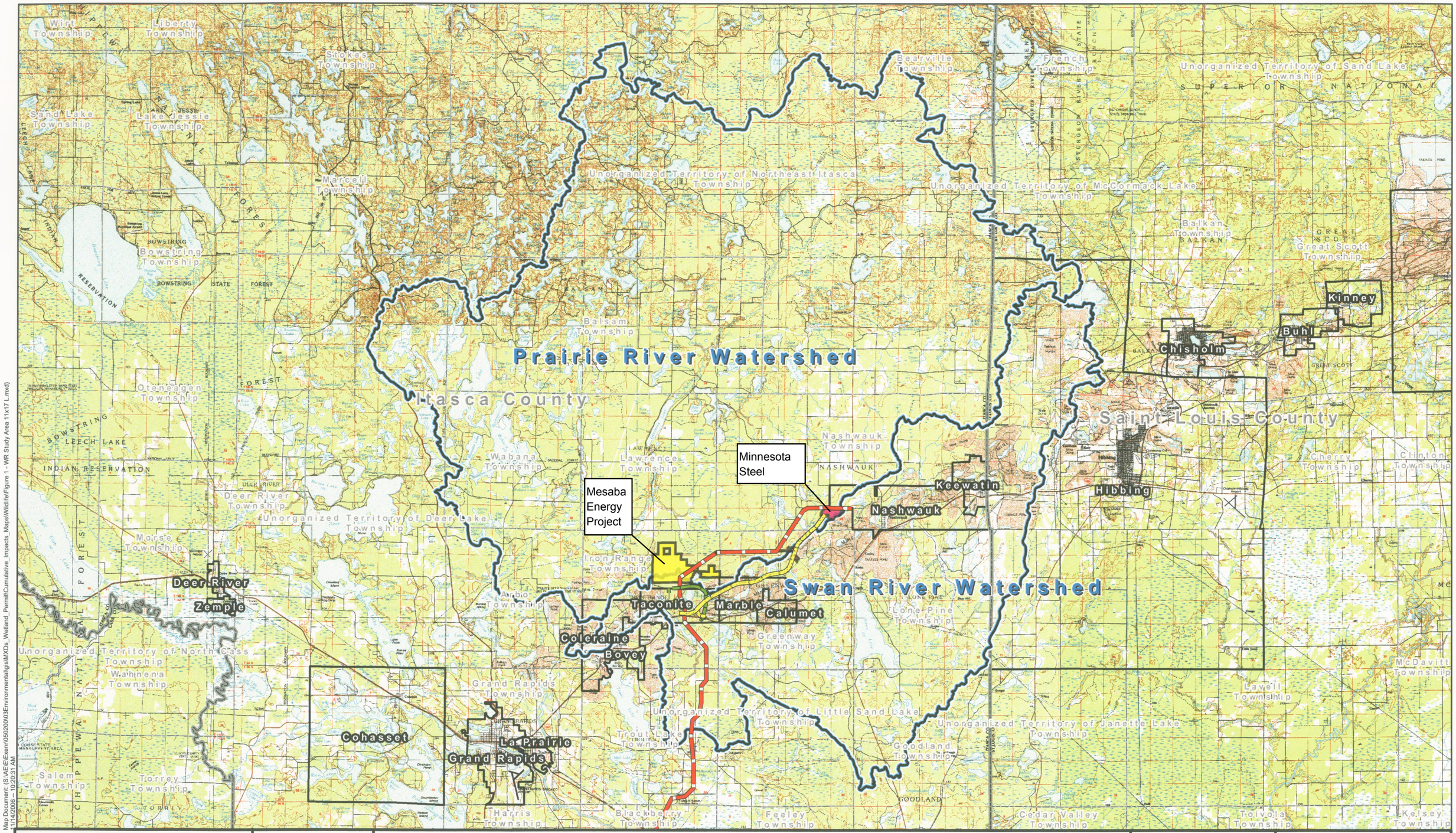
Minnesota Department of Natural Resources. "Water Appropriation Permit Index." 2001-2005. Available: http://files.dnr.state.mn.us/waters/watermgmt_section/appropriations/idxloc.pdf.

Attachments

Figure 1: Swan River Watershed
Figure 2: Partridge River Watershed
Table 17-1 – PolyMet EAW

---

[5] Personal communication with Joe Geiss of the MDNR, May 15, 2008.
[6] Id.



Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2380 Fax 952.847.2373

West Range

November 2006

Legend

- Swan River Watershed
- Prairie River Watershed
- Excelsior Energy West Range Site
- MN Steel DRI Plant Site

Reasonable and Foreseeable Actions

- Nashwauk Gas Pipeline
- Itasca County Road 7 Realignment
- Itasca County Rail Alignment
- Municipal Boundaries
- Civil Township Boundaries
- County Boundary

Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, MN Steel, City of Nashwauk and SEH.
© 2006 SEH

Figure 1

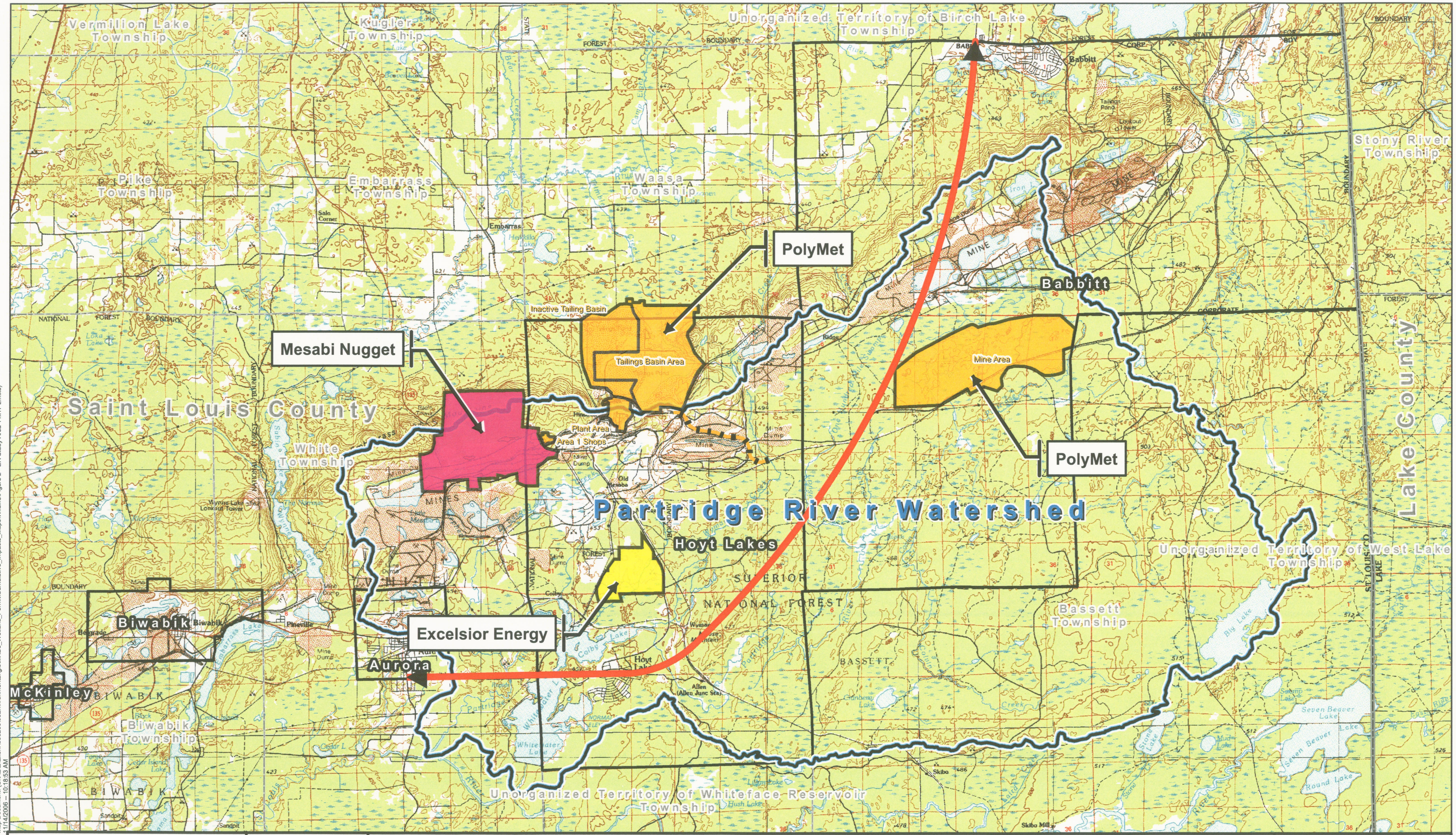
West Range Study Area

UTM, Zone 15, Meters
NAD83

N W E S

0 5 Miles

Map Document: (S:\AE\E\Exenr\050200\03Environmental\gis\MXDs_Wetland_Permit\Cumulative_Impacts_Maps\Wildlife\Figure 1 - WR Study Area 11x17 L.mxd)
11/14/2006 -- 10:20:31 AM



Map Document: (S:\AE\E\Exenr\050200\03Environmental\gis\MXDs_Wetland_Permit\Cumulative_Impacts_Maps\Wildlife\Figure 2 - ER Study Area 11x17 L.mxd)
11/14/2006 -- 10:18:53 AM

Excelsior Energy Inc.

Mesaba Energy Project

Energy, Innovation, and Economic Development for Minnesota

11100 Wayzata Boulevard Suite 305 Minnetonka, MN 55305
Phone 952.847.2360 Fax 952.847.2373

East Range

November 2006

Legend

Partridge River Watershed

Reasonable and Foreseeable Actions

Excelsior Energy East Range Site
Mesabi Nugget Plant Site
PolyMet Sites
PolyMet Rail Construction
St. Louis County New Hoyt Lakes to Babbitt Connection
Municipal Boundaries
Civil Township Boundaries
County Boundary

Source: USGS, USFWS, MNDNR, Mn/DOT, Excelsior Energy, and SEH.
© 2006 SEH

Figure 2

East Range Study Area

UTM, Zone 15, Meters
NAD83

N W E S

0 2 Miles

Table 17-1 (of PolyMet EAW) – Calculated Low, High, and Average Flow Statistics for Ungauged Portions of the Partridge River

Location	Drainage Area (mi^2)	Low Flow – 7Q10 (cfs)		High Flow – Q2 (cfs)		Average Flow
		Brooks and White	Siegel and Ericson	Siegel and Ericson	This study	Siegel and Ericson
PU-1 without Pit B Area	10.8	0.23	0.05	90	57	6
PU-1 with Pit B Area	14.4	0.33	0.08	114	78	9
PU-2 without Pit B Area	20	0.49	0.13	149	111	13
PU-2 with Pit B Area	23.6	0.61	0.17	171	132	15
PU-3 without Pit B Area	54.4	1.71	0.65	340	325	37
PU-3 with Pit B Area	58	1.86	0.72	358	348	39