Watershed, Fisheries and Other Concerns with Respect to the Burmis Magnetite Mine Proposal

Submission to Alberta Environment
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by

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Introduction

International Metallurgical and Environmental Inc. (IME) of Kelowna, British Columbia, proposes to conduct open-pit mining for magnetite north of Burmis, Alberta (IME 2003). The present application is for a single pit with a production volume of less than 45,000 tonnes, apparently to avoid the requirement to prepare a formal environmental impact assessment. Nevertheless, the proponent has made it clear at a public meeting on 10 December 2003 that much or all of the 12+ km long ore-rich formation will likely be mined in future. For this reason I consider the entire ore-bearing formation and its surroundings that could be affected by surface mining and its related activities, to be the project area. In particular, for my purposes here the project area includes the entire drainage basins of Connelly and Rock creeks to their confluences with the Crowsnest River.

Existing Conditions

Rock Creek

Rock Creek drains an area of 47.5 km^2, has a mainstem length of 10.3 km, and at low flow averages 2.7 m wide and 13.2 cm deep (Fitch 1978). The extent of watercourse within the drainage basin, however, is much more extensive than just the mainstem. Within the project area alone, the basin area is 36.6 km^2 and the total watercourse network extends for 93.6 km (Sawyer et al. 1997:Table 3.2), consisting mostly of ephemeral and intermittent channels. Roads, trails and other linear disturbances within the project area, at 91.7 km (Mayhood, unpublished data), almost equals in extent the drainage network. As a result of this very high road density, which exceeds 5 km/km^2 over part of the basin (Sawyer et al. 1997:Figure 2.9), the number of stream crossings in the project area (128) is likewise very high (Mayhood, unpublished data).

Largely as a consequence of this dense stream network overlain and intersected by a dense road network, Rock Creek and its tributaries in the project area are already at very high risk of channel damage from the combined effects of surface erosion and changes in peak flow (Sawyer et al. 1997:Figure 3.7). This is true even though the analysis of Sawyer et al. (1997) does not consider the impacts from existing cattle grazing, the primary human influence on the stream (Fitch 1978).

Fish populations in the Rock Creek basin consist of native westslope cutthroat trout (*Oncorhynchus clarki lewisi*), introduced non-native rainbow trout (*O. mykiss*), and their apparent hybrids (Fitch 1978, and unpublished data). There are no reports of bull trout (*Salvelinus confluentus*) being native to Rock Creek (Fitch 1978, 1997). Bull trout are now extinct in the Crowsnest drainage (Fitch 1978, 1997), but when they were present in the Crowsnest River, they probably used at least the lower reaches of Rock Creek during some part of the year, as would other species still existing today, such as mountain whitefish (*Prosopium williamsoni*) and suckers (*Catostomus* spp.).

Connelly Creek

The mainstem of Connelly Creek flows approximately 18 km from the project area to the Crowsnest River. The basin in the immediate project area (in Range 3 west of the 5th Meridian) is 15.1 km^2, with a watercourse network of 52.7 km of mostly ephemeral or intermittent streams (Sawyer et al. 1997:Table 3.2). The road network in this part of the basin is 34.7 km in extent, with 66 stream crossings (Mayhood unpublished data). The

density of roads, trails and other linear disturbances in some parts of the basin exceeds 5 km/km^2 (Sawyer 1997:Figure 2.9). These characteristics contributed most to the assessment by Sawyer et al. (1997:Figure 3.7) that streams in the Connelly Creek basin were at very high risk of channel damage from the combined effects of surface erosion and peak flow changes.

I have not found any fish survey data for Connelly Creek, but cutthroat trout reportedly occur in it (Vic Bergman, The Crowsnest Angler, Bellevue, personal communication).

Selected Issues

Surface Disturbance

The existing condition of the Rock Creek and Connelly Creek drainage basins already seriously threatens both the integrity of stream channels in these basins, and the quality of trout habitat within and downstream from the project area. Even at the present level of human use, these basins need restoration. Road densities are very high in some places, and are still high averaged over the entire catchment of both creeks within the project area. Expected consequences for the stream channels are channel infilling and shallowing from sediment deposition, bank erosion, debris jams (in areas within and downstream of riparian shrubs and trees), and burial of gravels by silt and sand. While individual trout are capable of surviving in such extremely poor habitat as these processes may produce, the carrying capacity of the stream for trout typically is reduced severely. The need for restoration is even greater when the problems commonly arising from cattle grazing are considered, which I did not do here.

Strip mining by definition disturbs the land surface. The area affected by the IME proposed mine and ancillary facilities is not at all clear from the applicant's documents, but ultimately it could exceed very roughly 140 m in width by over 12 km in length, or 168 ha, plus substantially more road development, plus the process facilities covering approximately 140 X 140 m (2 ha), plus a tailings storage lake which may eventually measure 700 m long by 25 m deep. Width of the tailings lake would appear to be about 150 m (IME 2003:Appendix 5), so the area affected could be in the order of 10 ha or more. This is only the immediate footprint. Relative to the size of these small headwater basins, that amount of additional surface disturbance is large.

Fish Populations

Trout populations,specifically including those of westslope cutthroat trout, are sensitive to the degree of road development in basins (e.g., Eaglin and Hubert 1993, Huntington 1998, McCarthy et al. 1998). Negative population effects have been noted at road densities and stream crossing densities within the range of, or less than, those in Rock and Connelly creeks. For example, Eaglin and Hubert (1993) detected a negative effect on trout population size from stream crossing densities over the range 0-5.1 km^{-2} (cf. 3.5 km^{-2} for Rock Creek and 4.4 km^{-2} for Connelly Creek). Baxter et al. (1999) working in the Swan River drainage of Montana detected a strong negative correlation between bull trout redd counts and road densities over the range of 0~1.2 $km \bullet km^{-2}$(cf. 2.5 $km \bullet km^{-2}$ for Rock Creek and 2.3 $km \bullet km^{-2}$ for Connelly Creek). Similarly, Rieman et al. (1997) observed that bull trout populations in the Columbia and Klamath basins were reported to be strong nearly 7 times more frequently in drainage basins with road densities less than 1.5 $km \bullet km^{-2}$. These data suggest that roads and similar linear disturbances in the project area are already likely having substantial negative consequences for trout populations in the Rock and Connelly creek basins.

Rock and probably Connelly creeks support populations of cutthroat and rainbow trout. Westslope cutthroats have been extirpated from most of their native streams in Canada by a combination of habitat damage and loss, overfishing, and hybridization with introduced *Oncorhynchus* (Mayhood 2000). Pure westslope cutthroat trout in their native habitats should provisionally be treated as endangered in Canada due to their limited and highly-fragmented distribution, continued exposure to introgression from introduced *Oncorhynchus*, continuing habitat damage and loss, inadequate legislation and enforcement, and continued overfishing of some small remnant populations (Mayhood 2000). Hybridized native populations are more common, but should be provisionally treated as threatened for the same reasons (Mayhood 2000). The population in Rock Creek requires DNA or biochemical genetic studies to establish its genetic status, and to determine if there are remnant pure native populations using the headwaters within or below the project area. New population surveys are also required in these creeks.

Regardless of their genetic or conservation status, the trout in Rock and Connelly creeks must be protected from further damage that would likely arise from additional human development in their basins. IME has been dismissive of concerns for fish in these creeks; in fact it seems to think there aren't any.

Other Water-related Issues

In addition to these problems, there is the matter of water use, contamination and potential catastrophic loss of tailings water and sediments into natural watercourses in the event of a tailings dam failure.

While IME proposes to re-use its process water and retain all of it within the tailings lake, there will be losses through adsorption to the shipped product and tailings, evaporation, and possibly through loss to groundwater. Water is to be initially extracted and continually made up from local springbrooks. Springbrook flow is critical to trout overwintering in streams, and during other seasonal low-flow periods. A flow loss in winter can destroy whole trout populations in minutes to hours by dessication or freezing as they are congregated in the few remaining pools. Mainstem Rock Creek has a recorded discharge of just 0.14 $m^3 \bullet s^{-1}$ at low summer flow near the mouth (Fitch 1978), and probably experiences much lower flows at times. Upstream flows, tributary flows and winter minimum flows must be considerably less as well. These data suggest that there is little surplus water available for operating a mine processing plant.

Mining exposes extensive areas of freshly-broken rock to weathering, leading to high levels of contaminants in ground and surface water. IME has noted that acid drainage will not be a problem; however we need data on this and other potential contaminants. For example is selenium going to be a problem? Selenium has been found to be an important contaminant from some strip mines in the Canadian Rockies, where in at least one case it is teratogenic in trout eggs and larvae (Holm et al. 2003).

IME claims that its tailings lake will have zero discharge, that the water and tailings will be non-toxic, and that all the water will be recycled for use in the processing plant. Canadian mining companies have experienced numerous tailings pond failures, with often catastrophic effects on downstream inhabitants and habitats, the victims including humans, wildlife and fish. While some of these catastrophes have been made worse by high toxicity of the tailings water, the sheer volume of water and tailings can cause tremendous damage as well. Simply put, a tailings lake breach at this location cannot be risked. The public deserves a thorough, transparent examination of the IME proposal if only for this reason.

Conclusion

It is not supportable to permit further extensive land disturbance in the form of strip mining in the Rock Creek and Connelly Creek basins. Watercourses in these catchments are already seriously at risk, and cannot tolerate a threat of any more damage. Their basins need to be restored to something closer to their natural condition, not damaged further. Existing native cutthroat trout populations -- in Rock Creek, at least -- appear already to be stressed by the effects of hybridization. It is likely that trout habitats in both creeks and their tributaries already have been degraded as a result of surface disturbance in their drainage basins. Additional land disturbance from strip mining will make this worse, particularly if significant water withdrawal, contamination and tailings dam failures occur.

Existing documentation for the mine project does not attempt seriously to deal with these problems. The application should be dismissed on present evidence. If IME or Alberta Environment nevertheless decides to proceed further in the application process, a public hearing should be held jointly with the Canadian Environmental Assessment Agency to ensure that the significant fish and fish habitat issues are thoroughly addressed by the applicant and the regulatory agencies.

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