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Mine Development Assessment Process

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MOUNT POLLEY COPPER/GOLD PROJECT

*A report summarizing the technical review and
outlining commitments, and permit, licence and
approval information requirements*

June 1992



Province of British Columbia
Ministry of Energy, Mines and
Petroleum Resources
Ministry of Environment, Lands
and Parks

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1.0 PURPOSE OF REPORT

An application by Imperial Metals Corporation to develop the Mt. Polley copper project has been reviewed under the Mine Development Assessment Process. On the basis of this review, the Mine Development Management Committee has concluded that the Mt. Polley Project is technically and environmentally acceptable.

The purpose of this report is to outline the reasons for this conclusion. It also identifies the environmental commitments made by, or agreed to by Imperial Metals Corp. with respect to project design and operation, and outlines information related to various permits, licences and approvals that will be required for project development should the Minister of Energy, Mines and Petroleum Resources, with the concurrence of the Minister of Environment, Lands and Parks, issue a Mine Development Certificate for this project.

2.0 PROJECT DESCRIPTION AND REVIEW

2.1 Summary of Project Proposal

The Mount Polley project, located 56 km northeast of Williams Lake (Figure 1), is owned by the Imperial Metals Corporation Group (formerly owned by a joint venture between the Imperial Metals Corporation Group and Corona Corporation). The Mount Polley deposit contains 51,402,000 tonnes of ore grading 0.38 percent Copper and 0.55 g/tonne gold. Production of the proposed mine is targeted at an average rate of 13,700 tonnes per day or 5,000,000 tonnes per year over the life of the mine. The ore processing plant located onsite will produce a copper/gold concentrate by standard froth flotation at an average rate of 160 tonnes per day. The ore will be mined year-round by open pit mining methods using electric shovel and mechanical drive haulage trucks. The tailings pond will operate with a negative water balance and no effluent will be discharged into the environment.

Tailings will be deposited by gravity flow behind an impervious till dam constructed initially by the centerline method, and later by an upstream configuration. Surface runoff from waste dumps, mill site, as well as pit water, will be collected in sediment ponds, and recycled. Water not meeting water quality guidelines will be sent to the tailings pond, or treated before release to the environment.

Power will be obtained by a 3-phase 69 KV transmission line that will tap the Gibraltar Mine line at McLeese Lake, approximately 25 km north of Williams Lake. Freshwater for the mine and mill will be pumped from approximately 1.0 m of water storage to be created by raising the level of Polley Lake. Access to the project from the Likely Highway will be via the existing 14 km forestry road that will be upgraded to meet the transport requirements of the project.

Project capital cost of \$131,400,000 and an average operating cost of approximately \$32,595,000 per year are projected over the life of the mine based on Imperial Metal's 1990 feasibility study conducted by Flour Daniel Wright consultants. The construction workforce will peak at

MOUNT POLLEY PROJECT

CARIBOO MINING DIVISION, B.C.

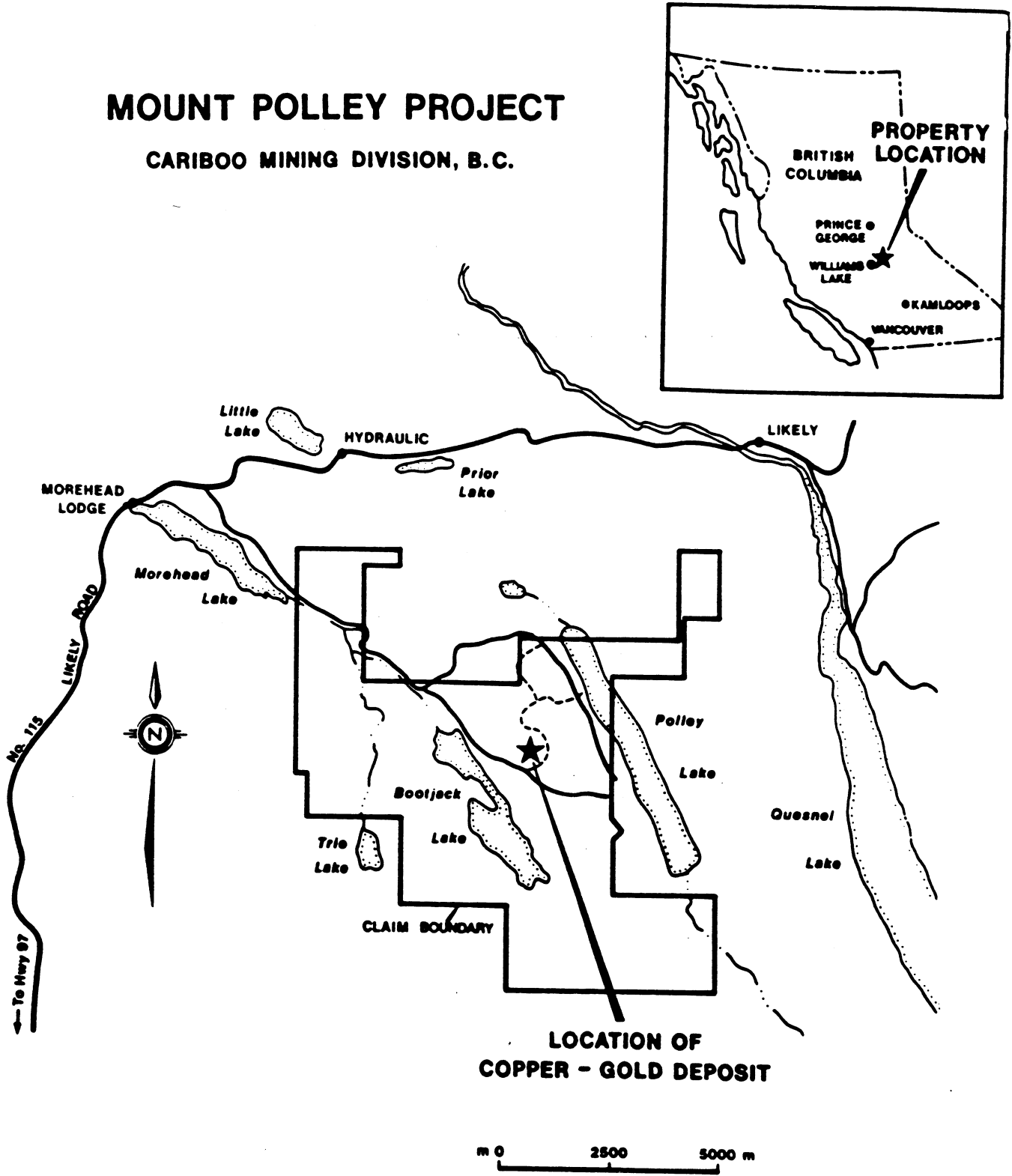


Figure 1. Map identifying the location of the Mount Polley project (Imperial Metals Corp., 1990, Mount Polley Project, Stage I Environmental and Socio-economic Impact Assessment, Vol. I.)

200 persons. The Mount Polley project employment estimates for the operational phase include 162 positions in Year 1, increasing to 229 positions by Year 7. The average earnings, including benefits, will be approximately \$50,000 per person per year for a total annual wages and salaries of \$8,100,000. The current under utilization of existing social infrastructure in the region indicates that the project will not require significant enlargement of public facilities.

Much of the project area has been subject to recent logging operations. However, the proposed development will result in a temporary loss of the regenerating vegetation cover and will consequently have a temporary impact on wildlife, hunting, trapping and cattle grazing. A three-stage reclamation plan, to be initiated in the first year of operation, has been developed with the objective of returning all mine-affected lands to their original use and capability.

2.2 Project Review Documentation

Imperial Metals Corporation's application for a Mine Development Certificate consisted of the following:

- o Stage I Environmental and Socio-economic Impact Assessment Report, Volumes I and II (July 1990), Imperial Metals Corporation;
- o Stage I Environmental and Socio-economic Impact Assessment Report, Supplementary Submission (October 1990), Imperial Metals Corporation;
- o Stage I Environmental and Socio-economic Impact Assessment Report, Responses to Comments by Agencies (January 1991), Imperial Metals Corporation;
- o Mount Polley Project, An Evaluation of Runoff Estimates for the Mount Polley Project and Allocation of Fisheries and Mine Process Water Requirements (July 1991), Hallam Knight Piesold Ltd.;
- o Letter from R. Pesalj (Project Manager) to N. Ringstad (Chair, Mine Development Steering Committee), 1990-01-05, outlining a strategy for the impoundment of Bootjack Lake, including preliminary downstream water and fisheries impact management proposals;
- o Letter from R. Pesalj to N. Ringstad, 1990-01-25, outlining a strategy for Polley Lake as an alternative to Bootjack Lake;
- o Letter and attachment from R. Pesalj to D.B. Letvak (Water Management Branch, Ministry of Environment), 1991-01-10, outlining the hydrological report from PWS Engineering;
- o Letter from R. Pesalj to N. Ringstad, 1991-02-19, outlining the cost comparison between Polley Lake and Quesnel Lake water supply alternatives;

- o Letter from R. Pesalj to D.B. Letvak, 1991-03-04, outlining Imperial Metals position on the average annual lake flow rates provided by PWS Engineering;
- o Letter from R. Pesalj to D.B. Letvak, 1991-04-02, detailing Imperial Metals proposal to conduct further hydrological monitoring program;
- o Letter from R. Pesalj to N. Ringstad, 1991-04-08, responding to final issues raised at February 14 and March 26, 1991 meetings;
- o Letter and attachment from R. Pesalj to N. Ringstad, 1991-04-24, detailing the revised layout of the concentrate rail loading and storage facility and revised text of Section 8 of the Stage I Environmental and Socioeconomic Impact Assessment-Response to Comments by Agencies (Jan. 1991);
- o Mount Polley Project, Analysis of acid mine drainage potential. From R. Pesalj to N. Ringstad, December 14, 1990; and
- o Letter from Z. Nikic to N. Ringstad, 1992-04-16, outlining agreements reached at the April 10, 1992 meeting.

2.3 Public Consultation

Imperial Metals Corporation held a series of public meetings regarding the Mount Polley project at the prospectus stage of the review process. The meetings were advertised in local newspapers, posted throughout the communities and announced through the local radio stations. Meetings were held on November 22, 1989 at Williams Lake and Likely, June 19 and 20, 1990, at Williams Lake (two meetings) and Likely, and June 21 at 150 Mile House. The purposes of the meetings were to introduce the company to the public, and to allow the public an opportunity to review and comment on the project. The various concerns raised included impacts to cattle grazing along the access road, commuting time for employees, impacts on Polley and Bootjack Lakes, construction scheduling, employment opportunities, and the nature of chemicals to be used in the flotation process.

Additional meetings were held by Imperial Metals as part of the Stage I consultation process in Williams Lake and Likely on August 27, 1990. The meetings provided the company with further opportunities to present and discuss the most recent mine plan with the public and gather additional feedback.

2.4 Aboriginal Consultation

A copy of the Prospectus for Mt. Polley was sent to the Cariboo Tribal Council for review and comment. Imperial Metals first contacted the Cariboo Tribal Council in a letter on October 13, 1989, expressing Imperial's commitment to protecting the environment and its willingness to

address social issues with respect to the project. Imperial also gave its assurance that the operations would meet or exceed all existing government regulations. Imperial invited the Council to provide comments on the project and on the Stage I report which was submitted to the Council the following year.

On February 1, 1991, Imperial Metals met in Williams Lake with the Council and representatives of the Williams Lake and Soda Creek Bands. The Council and Band members were informed of the project's status, environmental management and financial plans for project development. Local aboriginal involvement and on-the-job training were discussed, as was the company's proposed employment policy.

The Bands were also informed that the Mount Polley project would not have any mill effluent discharge and that all tailings pond supernatant would be recycled. The company agreed to provide additional information to the Council regarding the water supply analysis for Polley Lake and reagent toxicity associated with the tailings. It was also agreed that a committee to identify aboriginal employment opportunities during the construction and operation of the project would be formed prior to the project proceeding. Other items discussed were project investment opportunities for the Cariboo Tribal Council, and linkage opportunities for the proposed trailer park development north of 150 Mile House.

3.0 RESOLUTION OF KEY ISSUES

Pursuant to section 2 of the *Mine Development Assessment Act*, Imperial Metals Corp.'s application for a Mine Development Certificate has been reviewed by government agencies, local governments, aboriginal groups and the public.

The review has focussed on the following key issues: socio-economic impacts, Aboriginal groups, water supply, management of fisheries and aquatic resources, wildlife management, mitigation of acid mine drainage, management of groundwater, tailings pond management, and the design and location of the load out facility.

3.1 Proposal for Further Public Consultation

To facilitate ongoing opportunities for public consultation if and when the project proceeds, the Mine Development Management Committee recommends that a public liaison committee be established. The purpose of this committee would be to:

- o provide for ongoing liaison between Imperial Metals, provincial and federal agencies, Aboriginal people, local governments and the general public; and
- o review and discuss the monitoring information collected by Imperial Metals and regulatory agencies.

Representatives of local governments, environmental and resource use groups, and also the Cariboo Tribal Council, would be invited to participate, in addition to Imperial Metals Corporation and provincial and federal regulatory agencies.

The public liaison committee should be set up expeditiously if and when the project is certified by the Ministers, especially if the company decides to proceed quickly with detailed permitting. Terms of reference for the committee would be developed by the committee and approved by the Mine Development Management Committee.

The Committee will review and advise on issues of public interest and concern, such as: ongoing Polley Lake water supply monitoring; fishway operation and effectiveness; effects of the mine on angling use; groundwater quality, quantity and flow (e.g. hydrogeological relationships between Bootjack Lake and the West Pit); spill prevention and emergency response planning; and wildlife impacts and mitigation, and impacts on trapping and recreational use.

To facilitate the work of the committee, Imperial Metals will be required to prepare an annual environmental report. Annual reporting will address pertinent matters such as: monitoring results for the past year; the effectiveness of impact mitigation measures; regulatory compliance issues; and future project planning and monitoring.

The public liaison committee will be expected to liaise with the general public using a communication strategy developed by the committee and agreed to by the Mine Development Management Committee.

3.2 Management of Socio-economic Impacts

The Province recommends that Imperial Metals Corporation develop a comprehensive and detailed human resource plan, including hiring and training requirements for mine and mill personnel, to enable local communities to gain access to employment and training opportunities. Imperial Metals has agreed to work with Aboriginal groups in the area to provide employment opportunities for Aboriginal peoples during construction and operation of the project.

3.3 Addressing Aboriginal Groups' Concerns

In a February 1, 1991 meeting with the Cariboo Tribal Council, Imperial Metals agreed to work with the Council to provide employment opportunities for Aboriginal peoples during construction and operation of the project.

In a letter of March 14, 1991, the Cariboo Tribal Council provided general support for the project. However, the Council raised two outstanding areas of concern: (1) the potential for a water deficit in Polley Lake and the adequacy of inflow for both mining activities and the fisheries resource, and (2) the environmental impacts of mill reagents. In March, 1991, the company provided the Council with a report which provided data indicating that mill reagents would not be harmful to fish and life in and around the streams in the vicinity of the mine. A report prepared for Imperial Metals

indicating that there would be sufficient inflow to Polley Lake to satisfy both the mine and the fisheries resource was also provided.

The Province requested an overview assessment of the heritage resources of the Mount Polley project area. This assessment was conducted by Points West Heritage Consulting Ltd. and the results were presented in the company's Stage I submission. The purpose of the study was to determine the heritage resource potential or sensitivity of the proposed development area. The major post-contact historic events of this region related to mining. Research indicated that prehistoric sites of the Fraser River division of the Shuswap Band could also be encountered. Field investigations however, indicated that large portions of the study area have been impacted by recent logging activities. Consequently, the majority of the development area is typified by low heritage resource potential.

Bootjack Lake was considered by the consultant as the only site which is both relatively undisturbed and of moderate heritage resource potential. Imperial Metals Corporation agreed that if the Bootjack Lake watershed became the location of the tailings pond, as proposed, or if the tailings pond was located in an area of moderate or greater potential, additional heritage resource potential investigation would be conducted before construction activities take place. If neither of the above becomes the case, then no further investigations would be necessary.

3.4 Water Supply

The location of the water supply for the mine was the key technical issue raised during the review of this project. In its prospectus, Imperial Metals proposed the use of Bootjack Lake as the water supply for the mine project. Bootjack Lake and adjacent Polley Lake, support a significant sport fishery. As a result of the need to protect the local fishery, the company subsequently proposed Polley Lake in its Stage I submission because of its greater watershed and runoff capability.

As part of the Stage I review, the Province requested that the company consider Quesnel Lake as the water supply for the mine. The benefits of the Quesnel Lake option were deemed to include the following:

- o Quesnel Lake would be a more reliable water supply because of its size and catchment area.
- o The requirements for most of the ongoing assessment and monitoring of fisheries resources in and downstream of Polley Lake would be reduced.
- o Although the initial capital costs would be higher, the long-term operational, monitoring and abandonment costs might be lower than for Polley Lake, since there would be no requirement for a dam, fishway or any of the mitigation measures required for Polley Lake or Hazeltine Creek.

Imperial contracted Wright Engineers Ltd to conduct a preliminary assessment of the Quesnel Lake option. The cost comparison revealed that over the life of the mine, Quesnel Lake water supply capital and operating costs, including monitoring costs, would be \$4.2 million greater than the costs of the Polley Lake water supply. The Province accepted the cost comparison and supported Imperial's request to continue further planning and assessment of the Polley Lake option on the understanding that an adequate water supply to satisfy both the mine and fishery requirements would have to be demonstrated prior to project approval.

Following the company's decision to continue to seek approval for Polley Lake, Ministry of Environment, Lands and Parks staff carried out an extensive analysis to determine whether sufficient water would be available to maintain the fishery, and meet the operational requirements of the mine. This analysis was conducted independently from an earlier water supply analysis carried out by consultants for Imperial Metals. The Ministry analysis using two methods estimated the annual runoff for the Polley Lake watershed using data collected on Hazeltine Creek for the 1991 freshet period, and a comparison with data from comparable hydrometric stations with a longer record of measurement. The estimated runoff was then compared to fisheries flow requirements determined by the Ministry of Environment, Lands and Parks, and mine water needs, under a variety of drought flow sequences to determine whether the estimated supply would be adequate under a range of low flow conditions. The following results were shown:

- o Based on a comparison with other hydrometric stations in the area, mean annual runoff was estimated to be 6 litres per second per square kilometre (L/s/km²). This was also the runoff amount estimated by the company in its analysis.
- o Based on the 1991 monitoring data for Hazeltine Creek and hydrological analysis, which incorporated a longer period of measurements from other stations in the region, the mean annual runoff was estimated to be 7.5 L/s/km².

The lower, more conservative estimate was adopted for further analysis. The analysis demonstrated that with the reservoir at average carryover going into a drought, the storage could meet mine and fishery requirements for the following drought conditions:

- o a single year drought of 28 percent of mean annual runoff;
- o two consecutive drought years each 60 percent of mean annual runoff; and
- o three consecutive drought years each 71 percent of mean annual runoff.

The analysis demonstrates that there is a negligible chance of a single-year drought depleting the reservoir to the point where problems would develop. If a water shortage were to develop, it would likely occur during a sequence of at least two consecutive drought years that exceeded the design conditions.

In the event that a water supply shortage occurs over the life of the project, Imperial has committed either to find an alternative source of water acceptable to the Province or to suspend or reduce production at the mine during the shortage to maintain fishery flows. The Ministry of Environment, Lands and Parks will estimate the duration and extent of the emergency on the basis of prediction of runoff, lake level, and additional hydrometric information available at that time. The Ministry will consult with Imperial Metals on the preferred course of action. Since the greatest likelihood of a water shortage would occur during a multiple-year drought, the company will likely have advance warning of the potential for a water shortage and could schedule a shutdown, or develop an alternative source of supply early enough to reduce the financial impact to the mine.

The Ministry of Environment, Lands and Parks will have priority for fish flow requirements over mine requirements in the licencing of flows out of Polley Lake under the *Water Act*. During a multi-year drought, it may be possible to modify water management operations to conserve storage and still allow the mine to operate while protecting fish.

In addition, there are a number of ongoing measures to which Imperial Metals has committed that will use the water efficiently:

- o construction of a properly designed fishway around the dam on Polley Lake;
- o removal of beaver dams and control of beaver dams under Ministry of Environment, Lands and Parks direction in Hazeltine Creek to improve access to spawning areas;
- o monitoring of fish flows in Hazeltine Creek in conjunction with the monitoring of the use of the fishway at the outlet of Polley Lake, to refine fish flow requirements.
- o construction of the dam at the outlet of Polley Lake in a manner that will allow some of the "dead storage" to be released into Hazeltine Creek when required to meet fish flow needs. The amount of dead storage available will be determined in consultation with the Ministry to avoid undue drawdown of Polley Lake and resulting impacts to lake biota and recreational opportunities.

Drought conditions during the period of reservoir filling could delay or even cause storage to be emptied. It is estimated that it would take four years of average runoff to fill the reservoir created from Polley Lake, and at the same time meet the needs of the fishery and the mine at full production. However, according to Imperial Metal's development schedule, the outlet dam will be constructed by October of the first year of project development. Full production would not begin until April or May of the third year. During the time between dam construction and processing of ore, only fishery flows will be released as the mine process requirements will be minimal, thus it is expected that the reservoir could be filled in 2-3 years of average runoff.

With low reservoir levels, the amount of lead time available to Imperial Metals to prepare for the possibility of an extreme water shortage requiring emergency measures is reduced. To conserve

water during the startup period, Imperial Metals has committed to implement maximum collection and reuse of runoff from the waste dumps and mill site, in addition to recycling from the pits and tailings. In addition, Imperial Metals will benefit from continuing hydrometric monitoring on Hazeltine Creek and Polley Lake to improve the runoff estimates for the watershed. This will assist the company in planning for contingencies needed to deal with a possible water shortage.

Although the possibility of climate change and its effects on precipitation and temperature was of concern in the above water supply analysis, the Province cannot determine the effects of climate change on this project with any accuracy because of the lack of scientific understanding of the magnitude, direction and location of possible changes in climate. Because of the uncertainty regarding climate change, the Province has taken the conservative approach of adopting the lower estimate of runoff for the Polley Lake watershed. The conservative approach in analyzing the water supply, and Imperial Metal's commitment to implement the measures described above to reduce mine water supply requirements in a drought situation, provide sufficient assurances to deal with the uncertainty of climate change for the projected twenty-year life of the project.

3.5 Management of Fisheries and Aquatic Resources

Bootjack and Polley Lakes are popular locations for anglers. The presence of an active mine in close proximity to Bootjack and Polley Lakes may diminish the quality of the fishing experience. To offset possible impacts on recreational use, the company will undertake measures to minimize the aesthetic impacts of the project (e.g. dust suppression, control of noise from blasting, progressive reclamation). Measures to enhance the fishing and recreational experience, such as improvements to recreation sites on the lakes, will be developed in consultation with the proposed Mt Polley public liaison committee and the Ministry of Environment, Lands and Parks.

The fish flow requirements for Hazeltine Creek used in the water supply analysis were based on an assessment of desirable flows for all life stages of rainbow trout, using results of on-site studies conducted by consultants for the Ministry of Environment, Lands and Parks and Imperial Metals. Flow requirements include migration, spawning, egg incubation and rearing of trout, and the provision of "flushing" flows every second year of up to 500 percent of the mean annual discharge, to maintain channel integrity and spawning and rearing capability. In addition, a fishway, designed by the company in consultation with the Ministry, will be constructed and operated by Imperial Metals to ensure adequate passage through the water storage dam for all sizes of fish.

Regulation of flows from Polley Lake may provide benefits to fisheries production, particularly during the rearing period in late summer and early fall, when present unregulated flows are naturally reduced to near-zero. In order to provide the opportunity for the Ministry of Environment, Lands and Parks to manage flows at the completion of mining, Imperial Metals has committed to transfer the water licence for the dam and storage to the Ministry of Environment, Lands and Parks, upon mine closure, or remove it if requested by the Ministry of Environment, Lands and Parks.

The tailings disposal site is to be located within the upper catchment of the Edney Creek tributary, approximately five kilometres southeast of the mill site. The tailings will inundate a small wetlands area in the upper watershed of Edney tributary and possibly impact flows and water quality in the tributary. Rainbow trout occur in Edney tributary. The company will further sample Edney Creek tributaries and water courses that could potentially be impacted by the tailings pond, to determine the extent of fish values and the potential impact of the tailings pond on fish and waterfowl values in the area. Compensation for fish and waterfowl habitat lost will be required if further studies confirm the presence of resource values.

Finally, the company will undertake a monitoring program to assess the continued viability of the fishery in the project area during the operation of the mine. This program is intended to monitor the impacts of the mine on Bootjack and Polley Lakes and to provide data on the effectiveness of the fishway and the regulated flows in Hazeltine Creek. The assessment and monitoring programs must collect at least one, and preferably two years, of background monitoring before significant disturbance from the mine. Monitoring will continue during the operational phase until such time as any effects of the construction and operation of the mine have been assessed.

3.6 Wildlife Management

The principal ungulates in the area are moose and mule deer. The area of the mine is used primarily as summer range by mule deer with some use by moose. Excessive snow depths and availability of winter forage limit the habitat for ungulates in the area. Black bear, coyote and wolf also occur in the project area, along with a variety of other smaller mammals.

There were no threatened or endangered species, or unique or critical habitat, found in the vicinity of the minesite. Imperial Metals has agreed to reclaim the area following development to its original use and capability.

The area around the Mt Polley site has been extensively logged. As a result, vehicle access is afforded to both Polley and Bootjack Lakes. Furthermore, these existing access roads connect with major north-south and east-west forestry roads providing a broad road network. For the mining project, the forestry road into the mine will be upgraded to handle 40-tonne trucks. The company will undertake measures to reduce the number of wildlife-vehicle collisions, such as speed restrictions, on the road from the Likely Highway into the minesite. Because of the extensive road network that already exists in the area, development of the Mt. Polley project is not expected to result in increased access.

Both guide/outfitters that utilize the area have been contacted by the company and have indicated that the project area forms only a minor part in their annual hunting and guiding activity. As in other mining projects, there will be a no-shooting-area imposed around the mine for the safety of workers. This may disrupt the established hunting patterns to some degree.

There is one registered trapper in the project area. Imperial Metals should continue discussions with this trapper regarding management strategies to address any impacts on trapline species.

3.7 Mitigation of Acid Mine Drainage

Acid generating potential of the Mount Polley orebody and waste rock was evaluated by static and kinetic tests to design the waste management plan presented in the company's Stage I Submission. Static methods consisted of acid-base accounting tests to detail acid-producing and acid-consuming components of each sample, while kinetic testing consisted of humidity cells. Samples used were ore, low grade material and waste from drill cores, while tailings samples were taken from metallurgical bench scale tests.

The average pyrite content within the Mount Polley orebody is less than 1 percent and acid generation is not expected to be a concern. Test results have shown that if localized AMD develops, the majority of rock samples contain adequate buffering materials to neutralize acid.

The following strategies for mitigating or neutralizing any potential AMD will be implemented by Imperial Metals:

- o collection and recycle of waste rock drainage and mill site drainage, and implementation of other waste conservation steps to prevent discharges from these sources, or collection and treatment of all site runoff and wastewater discharges to a level that will not cause the B.C. Water Quality Criteria to be exceeded;
- o confining all surface drainage inside the development area by a series of drainage ditches in and around the waste dumps, and other disturbed areas to direct runoff into the sediment pond or tailings pond for recycle; avoiding discharge of water from the mine area unless it can meet B.C. Water Quality guidelines; and planned drainage collection to keep contamination away from surface waters if localized seeps of acid occur; and
- o direct recycling of all water from the pits or discharge to the tailings pond for later recycling.

3.8 Management of Groundwater

The mine plan for Mt Polley consists of the excavation of North, South and West pits on the property. The maximum depth of the West Pit at completion will be 36 m below the elevation of the Bootjack Lake surface. The distance separating the pit wall from Bootjack Lake is approximately 450 metres. Polley Lake and 6K Creek, the nearest water bodies to the North and Central pits, are separated by a greater distance.

Permeability data and investigative work in the area of the pits has indicated that the rock structure provides a natural barrier to flow from Bootjack Lake into the pit. The reversal of flow from the pit to Bootjack Lake is not expected. However, as a safeguard, the following measures have been committed to by Imperial Metals:

- o Imperial Metals will implement a groundwater monitoring program acceptable to the Province at least one year prior to the start of pit development. This program will include the installation of a number of wells for monitoring groundwater quality between the pit perimeters and 6K Creek, Bootjack and Polley Lakes, to monitor background water quality and direction/volume of flow.
- o During the operation of the pits, Imperial Metals will continue to evaluate the pit geology and measure the rate of seepage into and out of the pits to determine the potential for inflow/outflow.
- o In addition to the above commitments, Imperial Metals, as a condition of permitting, could be required to continue to monitor groundwater following mine closure for a period to be specified by the Ministry of Environment, Lands and Parks (such requirements will be determined during the final stages of planning for mine closure and site abandonment).
- o Imperial Metals will provide a contingency plan outlining measures, such as grouting or drilling, to relieve hydrostatic pressure to deal with the potential for inflow into the West Pit from Bootjack Lake.

3.9 Tailings Pond Management

Imperial Metal's original proposed location for a tailings pond to the north of Mount Polley was later changed to the location proposed in the Stage I Submission in the Edney Creek watershed because of problems in acquiring tenure on the original site. Federal agencies and the Ministry of Environment, Lands and Parks identified concerns with this new location because of the trout and salmon resources that exist in Edney Creek and its tributaries. In order to protect this sensitive watershed, the company has agreed to significant water conservation measures within the mine and mill to reduce flows to the tailings pond. The company has agreed to recycle as much of the pit water and tailings as possible to the mill. In addition, the company has demonstrated that measures, such as the use of water for dust suppression combined with evaporative techniques, will allow it to maintain a negative balance in the tailings pond.

Most of the tailings basin is covered with low permeability till that will provide an impervious layer beneath the tailings. However, to control any seepage that does occur from the tailings pond, the company will install underdrains and pump collected seepage back into the tailings pond.

To prevent damage to sensitive fish stocks in Bootjack Creek and Edney Creek tributary from a spill from the tailings line, the Waste Management Permit will include specific details and a contingency plan for spill control and monitoring measures (e.g. spill basin location, tailings line crossing of Bootjack Creek, alarm systems, etc.). One of the measures is the siting of a catchment basin up-grade from Bootjack Creek with sufficient capacity to hold the volume of tailings in the tailings pipeline.

3.10 Loadout Facility Location

The copper/gold concentrate will be transported in covered 40-tonne trucks to a site to be selected on the British Columbia Rail line. Environmental concerns include fugitive dust and possible runoff of contaminants from the site and during transportation to the site.

B.C. Rail is working with Imperial Metals to find an acceptable site. The site originally proposed by Imperial Metals at Enterprise was unacceptable to the Ministry of Environment, Lands and Parks, based on environmental grounds, and another proposed site investigated by the company at Lac La Hache has since been withdrawn due to public opposition.

Prior to construction of the load out facility, and as a condition of the Mine Development Certificate, the company must submit detailed load out facility plans for government approval. These plans need to demonstrate that the facility can be operated in a manner that is acceptable to the public and will prevent the escape to the receiving environment, of copper concentrate or any hazardous materials used, or transported to and from the site.

3.11 Conclusions of the Review Process

The Management Committee of the Mine Development Assessment Process has determined, based on a full technical review and public consultation program, that the potential adverse environmental impacts that may be caused by the project can be managed through existing legislation and programs. The project will provide socio-economic benefits to the region through employment and business opportunities during construction and operation of the mine. The aesthetic enjoyment of anglers using Polley or Bootjack Lakes may, however, be decreased due to the presence of the mine.

Provincial and federal agencies have consulted extensively during the review of this project. The federal government is completing its screening of the project in accordance with the *Environmental Assessment and Review Process Guidelines Order* (EARP).

4.0 COMMITMENTS AND INFORMATION REQUIREMENTS FOR PERMITS, LICENCES AND APPROVALS

Imperial Metal Corp.'s proposal, discussed in Section 3.0 above, was agreed to by agencies at the conclusion of the review of the application, and it was decided that any remaining issues could be resolved during permitting and licencing. If a Mine Development Certificate is issued to Imperial, the following requirements, agreed to by Imperial, would guide the finalization of permits, approvals, licences, orders or directions issued under various statutory authorities. Nothing in the summary of commitments and requirements inhibits the parties in continuing to negotiate and refine the conditions of permits. Other as-yet-undefined regulatory requirements may also emerge during the permitting phase or after project development has begun.

4.1 Pre-development (Construction of camp water supply, road upgrading and site preparation)

Prior to commencement of any project development or mine construction, Imperial Metals shall apply for and obtain a reclamation permit from the Chief Inspector of Mines in accordance with Section 10(1) of the *Mines Act*. The application shall consist of a program for the protection and reclamation of the surface of the land and watercourses affected by the proposed mine, and should be based upon the terms of reference and table of contents described in the *Reclamation Permit Requirements* dated April 1991.

In addition to the above information requirements, the following issues are to be addressed in the reclamation permit application:

- o A commitment to initiate environmental monitoring and surveillance programs during mine construction is required to ensure that surface erosion impacts on water quality are minimized and that design criteria for tailings dams, runoff diversions, collection ditches and other water management structures are strictly adhered to.
- o Proposed environmental monitoring programs to confirm the absence of acid mine drainage are required. These programs shall address questions regarding the identification and segregation of possible small pockets and lenses of pyritic rock in the pit, and shall include proposed blast hole sampling methods and frequencies, turnaround times for sample analyses and contingency plans for prevention of acid drainage from pyritic waste rock. Specific sampling and analyses requirements will be subject to permits issued under the *Waste Management Act*.
- o Research programs into the methods of achieving specific land use objectives shall include a program for evaluation of copper/molybdenum ratios in plants, as well as metal toxicity levels in tailings supernatant and seepage ponds where livestock or wildlife may be exposed to them.
- o Research programs to evaluate the cumulative effects of mine site fertilization on total nutrient loading impacts to receiving waters are required.
- o Due to the heavy recreational use of Bootjack and Polley Lakes, visual impacts and aesthetic values should be given high priority in reclamation planning. Methods of reducing visual impacts and of restoring aesthetic values following mine closure are therefore required.
- o Detailed waste dump reclamation plans are required, including proposed cross-sections of final dump configurations, proposals for dump revegetation, strategies for improving visual quality, and contingencies for resloping and covering, if necessary.

- o Design plans are required for any proposed rock drains to be constructed in overburden or waste rock dumps, to determine if a detailed technical assessment is required.
- o A projection of reclamation and mine closure and decommissioning costs is required and shall include the costs of surface reclamation, habitat compensation, post-closure environmental monitoring and long term impact mitigation strategies.

A reclamation permit issued under the *Mines Act* will include conditions consistent with reclamation standards contained in Part 10 of the *Health, Safety and Reclamation Code for Mines in British Columbia*. In addition the permit will contain special conditions including the following:

- o A monitoring program approved by the Regional Manager, Fish and Wildlife, Ministry of Environment, Lands and Parks shall be designed and implemented by Imperial Metals to identify impacts on the fisheries resource due to changes in the productivity of Polley and Bootjack Lakes, operation of the fishway at the outlet of Polley Lake, and changes in stream morphology and juvenile fish production due to regulated stream flows in Hazeltine Creek.
- o A plan for mitigation and/or off-site compensation approved by the Regional Manager, Fish and Wildlife, Ministry of Environment, Lands and Parks shall be submitted if fish habitat is lost as a result of tailings pond location, impact of the dam on Polley Lake or failure of the fishway.
- o A creel survey approved by the Regional Manager, Fish and Wildlife, Ministry of Environment, Lands and Parks shall be designed and implemented by Imperial Metals to monitor angler effort and catch in the sport fishery. This monitoring program shall be implemented prior to mine construction and continue for a minimum of four years.
- o Programs satisfactory to the Regional Manager, Fish and Wildlife, Ministry of Environment, Lands and Parks to monitor gravel quality in lower Hazeltine and Edney Creeks and salmon populations in creeks affected by the regulation of Polley Lake shall be designed and implemented by Imperial Metals.
- o A plan for mitigation of, and/or compensation for, wildlife habitat impacts due to the tailings pond shall be submitted if significant values are identified.
- o Post-closure monitoring and maintenance of the site shall be provided as required by the Chief Inspector of Mines and the Regional Manager, Environmental Protection, Ministry of Environment, Lands and Parks to demonstrate that reclamation objectives including land use, productivity, water quality and stability of structures have been achieved.
- o In the event that acid mine drainage occurs, or effluent streams are identified which carry unacceptably high metal levels, all contaminated drainage shall be collected and treated to a level that assures long term protection of environmental quality.

- o Borrow material from within the tailings impoundment and sediment pond areas shall be used to maximum practical advantage to reduce the visual impacts of mining.
- o Imperial Metals shall deposit reclamation securities in an amount based upon an assessment of the actual projected costs of mine reclamation and closure, including the costs of long term monitoring and maintenance, as described in the reclamation plan and permit.

Prior to issuance of permits and approvals under the *Waste Management Act*, Imperial Metals shall, to the satisfaction of the Regional Manager, Environmental Protection, Ministry of Environment, Lands and Parks, Prince George:

- o submit a plan to contain runoff/seepage from the ANFO storage site, powder magazine and explosives plant to minimize ammonia toxicity and nitrate fertilization of the aquatic environment;
- o submit a plan to minimize the use and release of phosphorous from sources, such as truck wash facilities, showers, laundry, kitchen, etc., to minimize discharge and seepage of nutrients to receiving waters; and
- o provide an environmental protection plan to minimize the impact of road upgrading, and any site preparation for the tailings pond, pit and waste dumps.

Prior to the issuance of approvals or licences under the *Water Act*, Imperial Metals shall, to the satisfaction of the Regional Manager, Water Management, Ministry of Environment, Lands and Parks, Prince George:

- o in consultation with the Regional Manager, Fish and Wildlife, Ministry of Environment, Lands and Parks, Prince George, develop plans for construction activities at stream crossings during the upgrade of the road and the construction of the tailings line, and submit an application for approval under the Act; and
- o submit plans showing the amount and location of source of the short-term use of water to supply the construction camp, and submit an application for approval under the Act.

Prior to the issuance of permits and approvals for the mine workings under the *Mines Act*, the company shall, to the satisfaction of the District Inspector and Resident Engineer, Environmental Impact Management Group, Ministry of Energy, Mines and Petroleum Resources, Prince George:

- o provide at least one NS and one EW section for each pit, showing a fence of holes and assay data similar to Figures 2-5, 2-6 and 2-7 in the Stage I Report (1990). This requires, as a minimum, providing an EW section for the Central Pit, and NS sections for both the West and North Pits;

- o provide information on grades, tonnages and strip ratios for each individual pit. Grade information should be provided for both copper and gold, and not for a gold or copper equivalent; and
- o complete all details of mine planning, as outlined in the Health, Safety and Reclamation Code, issued pursuant to the *Mines Act*.

Prior to the issuance of a Special Use Permit under the *Forest Act*, the company shall:

- o submit plans for the access road upgrading to the District Manager, Cariboo Forest Region, Ministry of Forests.

The following *Health Act* approvals will be required by the company prior to mine start-up:

- o Any domestic sewage flows under 5,000 gallons per day will require Health Unit approval in accordance with the B.C. Disposal Regulations. Approval of the Environmental Protection Branch, Ministry of Environment, Lands and Parks, will be required if daily volumes exceed 5,000 gallons.
- o Details of the source and systems for drinking and domestic water use are to be supplied to the local Medical Health Officer for approval.
- o Living and eating accommodation must comply with the Industrial Camp Regulations and the Regulations Governing the Sanitation and Operation of Food Premises.

4.2 Mine Construction

Prior to the issuance of approvals and licences under the *Water Act*, Imperial Metals shall, to the satisfaction of the Regional Manager, Water Management, Ministry of Environment, Lands and Parks, Prince George:

- o as part of any licence application, provide a minesite drainage plan including runoff collection and diversion structures around the millsite and rock dumps to direct runoff to sediment ponds for reuse in the mill process;
- o commit to construct the necessary clean water collection and diversion ditching, with appropriate flow dissipating structures for sediment control; and
- o submit plans for the design and location for the Polley Lake outlet structure to incorporate discharge flows up to the highest flushing flows (0.88 m³/s) even at low reservoir levels. The dam must incorporate a spillway to handle peak flows and a fishway as per the Stage I report design.

The water licence for water supply to the mill will require construction and operation of hydrometric stations on Hazeltine Creek and Polley Lake to facilitate flow regulation and future assessment of mean annual runoff, in addition to metering of the quantity withdrawn from Polley Lake for the mine. This should be carried out either as part of the outlet design or alternative means. Flow regulation for the Hazeltine Creek station would be monitored immediately below the confluence with Bootjack Creek.

In addition, there may be a requirement for Imperial Metals to measure precipitation in the vicinity of the minesite to assist in runoff forecasting.

Prior to the issuance of permits under the *Waste Management Act*, Imperial Metals shall, to the satisfaction of the Regional Manager, Environmental Protection, Ministry of Environment, Lands and Parks, Prince George:

- o obtain approval for and complete the baseline receiving environmental monitoring program before significant disturbance occurs on site;
- o commit to conduct water quality and other environmental monitoring programs when mine operations are suspended;
- o provide a contingency plan for treating and discharging, or containing for later recycling, sediment pond runoff during extreme storm events to ensure the protection of water quality at receiving sites;
- o submit a data quality assurance plan for the collection and analysis of any seepage, effluent and receiving water, sediment, benthic macroinvertebrates and fish samples, including methods to achieve acceptable data precision and accuracy, to adequately control sample contamination and to reliably detect background concentrations of relevant parameters, where required; and
- o submit for review an environmental protection plan covering the construction phase of the mine;

Prior to the issuance of permits and approvals under the *Mines Act* and to meet the requirements of the Health, Safety and Reclamation Code, the company shall to the satisfaction of the District Inspector and Resident Engineer, Ministry of Energy, Mines and Petroleum Resources, Prince George:

- o provide a copy of the geotechnical report on which the wall slopes and berm widths were based;
- o provide detailed tailing dams and settling pond dam designs completed by a geotechnical engineer;

- o provide plans of machinery layout, conveyors, bins, etc., showing all safety requirements of the mining code;
- o provide plans of the ventilation layout to be built for the maintenance shop;
- o provide suitable guards along the portions of access road near the west pit during blasting in the top benches of the pit; and
- o indicate the specific types and models of haulage trucks to be used during mine operation.

4.3 Permit Conditions and Operational Requirements

Permits issued under the *Waste Management Act* or *Water Act* shall include the following conditions and expectations:

- o The Waste Management Permit will not authorize a discharge from the tailings pond or pits to the receiving environment. Imperial Metals has committed to maximum recycle of tailings and pit water, evaporation enhancing techniques and, if necessary, raising the tailings pond berm height to maintain an allowable freeboard to achieve a negative balance in the tailings pond.
- o If recycle and other water conservation efforts are not successful, Imperial Metals will be required to apply for an amendment to its permit. The Ministry of Environment, Lands and Parks will at that time decide whether to authorize a discharge and assign the terms and conditions of the discharge.
- o Imperial Metals will have to submit for review an environmental protection plan covering the operational phase of the mine in the Waste Management permit application.
- o Imperial Metals will have to submit a plan, acceptable to the Regional Manager, Environmental Protection, Ministry of Environment, Lands and Parks, Prince George, to identify, segregate and monitor potentially reactive wastes during operation. This should include the isolation of waste rock with adequate acid-neutralizing capability from waste rock with inadequate neutralizing capability to facilitate blending and control of acid generation.
- o Imperial Metals will have to identify strategies to reduce acid generation during operation.

Imperial Metals will be expected to:

- o neutralize and treat acidic runoff, and further reduce acid generation from occurring to a level acceptable to the Regional Manager, Environmental Protection, Ministry of Environment, Lands and Parks, Prince George, if the results of waste rock runoff

monitoring or testing of waste rock indicates that acid generation or production is occurring, or is predicted to occur;

- o collect and divert runoff from the waste rock dumps and mill site runoff to the sediment ponds;
- o provide a contingency plan, acceptable to the Regional Manager, Environmental Protection, Ministry of Environment, Lands and Parks, Prince George, that identifies measures to be taken if the quantity of effluent in the sediment pond exceeds, or is predicted to exceed the quantity that can be reused or discharged without exceeding B.C. Water Quality Criteria;
- o monitor the tailings seepage collection system to ensure that there is no contamination of Edney Creek or tributaries;
- o provide an annual report of the operation of the tailings pond to include the following:
 - assessment of seepage conditions;
 - trends in the water balance over the previous year;
 - possible impact of tailings pond seepage on downstream water quality; and
- o submit for Ministry of Environment, Lands and Parks' approval a monitoring program for waste discharges and the receiving environment to assess the impacts of mine operation.

The following is required in support of an application for a Special Use Permit issued under the *Forest Act*:

- o Construction reclamation plans for the road improvement and power line right-of-way.

June 15, 1992