Comprehensive Study Report

PAMOUR PIT EXPANSION

FEBRUARY 2005

EXECUTIVE SUMMARY

1.0 INTRODUCTION

The Porcupine Joint Venture (PJV) was formed in July 2002 to combine the assets of Placer Dome (CLA) Limited (51%) (Placer), and Kinross Gold Corporation (49%) (Kinross). As majority partner, Placer represents the legal proponent of the pit expansion project. The assets of the PJV include the Dome underground and open pit mine and mill, the Hoyle Pond mine, the Bell Creek mill, the Pamour Mine and a large land package in the Timmins camp. The PJV was formed to maximize the value of resources of both partners, and now intends to undertake a major expansion of the existing Pamour Pit. The PJV, through its members, is the proponent of the proposed Pamour Pit Expansion and bear financial responsibility for the planning, design and construction of the project. The Pamour Pit Expansion is the most significant PJV resource.

The proposed Project (see Project Overview) is subject to federal legislation including the *Fisheries Act* and the *Navigable Waters Protection Act*. With the requirement for *Fisheries Act* and *Navigable Waters Protection Act* Authorizations, the *Canadian Environmental Assessment Act* (CEAA) process is triggered. Consistent with the CEAA Comprehensive Study List, a Comprehensive Study is required. This study is scoped to include aspects of the works and activities (the "Project") associated with pit expansion, and key works and activities required to facilitate the pit expansion. The Responsible Authorities (RAs) for the Project are the Department of Fisheries and Oceans (DFO) and Transport Canada (TC), with DFO representing the lead RA.

PJV assembled their baseline information and effects assessment in a draft Comprehensive Study Report (DCSR) that was submitted to federal authorities in July 2004. The federal authorities reviewed the document and provided technical comments and recommendations. The PJV provided technical and process responses in October 2004, and additional meetings with federal authorities were undertaken to discuss and clarify project details and outstanding issues. Upon completion of this consultation and issue resolution process, the final Comprehensive Study Report was submitted for review by the RAs and CEA Agency. This review has resulted in this CSR being made available for public review.

2.0 PROJECT DESCRIPTION

The proposed Pamour Pit Expansion project is located along Highway 101, 5 km east of Porcupine, Ontario, in Whitney Township. The pit expansion will combine the previously mined No. 3 Pit and West Pit of the Pamour Mine site, as well as the adjacent Hoyle Pit, into one large open pit. Pit expansion will extend across the current alignment of Highway 101 into Three Nations Lake and through a section of Three Nations Creek. To access the ore reserves through pit expansion, it is proposed to build a dam across Three Nations Lake to isolate and remove approximately 14 ha of the lake's north basin. This will also result in the indirect alteration of approximately 2.5 km of the headwaters of Three Nations Creek due to diversion of flows. The construction of the dam on Three Nations Lake will require approval from Transport Canada under Section 5 (1) of the Navigable Waters Protection Act. The proposed shoreline

alteration, isolation of the north basin and alteration of 2.5 km of Three Nations Creek will require authorization from DFO under Section 35 of the *Fisheries Act*, in which no **H**armful **A**lteration, **D**isruption or **D**estruction (HADD) to fish habitat can proceed without this authorization. The Fisheries and Oceans Canada Habitat Management Policy requires "no net loss" of fish habitat and as such, any alterations to Three Nations Lake and Three Nations Creek habitat will require compensation. In keeping with Fisheries and Oceans Canada's Policy for the Management of Fish Habitat (1986), an authorization will be issued where the HADD is considered acceptable and provided that acceptable measure to compensate for the habitat loss are developed and implemented.

To accommodate the recognized HADD and *Fisheries Act* requirements, excavation of a new lake replacement basin is proposed to occur adjacent to the southeastern side of Three Nations Lake in order to compensate for the habitat loss of the lake. A new Three Nations Creek realignment will drain this lake replacement basin and reinstate lake outlet flows to tie into the existing Three Nations Creek system at a point 4.6 km downstream.

The major works and activities required to undertake the expansion of the Pamour Pit involve both the works that are directly related to open pit mining, as well as the activities that must be applied to facilitate the pit expansion. The scope of the project being assessed in the CSR is::

The Pamour Pit Expansion, which consists of the following undertakings:

- Pit overburden stripping including existing Pamour tailings;
- Ore and waste rock mining; and,
- Waste rock management and disposal.

And the following works and activities to facilitate the proposed pit expansion:

- Construction of an isolation dam across Three Nations Lake (Lake Infill);
- Partial dewatering of Three Nations Lake;
- Relocation of a portion of Three Nations Creek;
- Alteration of Three Nations Lake shoreline; and,
- Extension of Three Nations Lake.

PROJECT PURPOSE AND NEED

The purpose of the Project is to undertake several works and activities including pit expansion, isolation of Three Nations Lake from the pit, and associated local habitat and watershed drainage replacement such that gold bearing ore, of sufficient tonnage and throughput, can be mined.

This Project is critical to the sustainability of the PJV, as it will provide a continuous source of mining for the next 11 years after the closure of the existing PJV open pit operation at the Dome Mine. This Project will not only sustain the 270 employee workforce for this 11-year period, but

will also allow the proper time to explore the rest of the Timmins mining camp to find future resources. Mining is an important cornerstone in the Timmins and area economy.

3.0 PROJECT ALTERNATIVES ASSESSMENT

Alternatives to the Project

The Pamour and adjacent Hoyle Mines, which collectively represent the area of the proposed Pamour Pit Expansion, have been mined since the early 1900s. Over this period of time, ore extraction efforts were initiated with narrow vein mining through underground techniques and ended with open pit development. The underground mining was continued until the higher-grade ores were exhausted. Pit development represented the application of mining techniques to access lower grade ore and reserves closer to surface.

Through consolidation of mining resources, the PJV can feasibly access the remaining low-grade ore that persists between the Pamour and Hoyle Pits, and below the old mine/milling facility infrastructure of the Pamour Mine. As this represents the final phase of feasibly accessing the remaining ore reserves, it is considered that there is no reasonably feasible alternative to this Project. Consequently, the alternatives are represented by either No Mine development, or expansion of the Pamour Pit.

An evaluation of performance objectives including: cost-effectiveness, technical applicability and/or system integrity and reliability, effects (adverse) to the natural environment, effects (negative) to the socio-economic environment, and amenability to reclamation was applied and it was determined that the No Mine scenario was not acceptable. The expansion of the Pamour Pit would permit the extraction of the remaining low grade ore reserves found between the existing old workings with minimization of adverse effects on the environment through mitigation. This alternative would meet the objectives of maintaining an ore supply to the Dome Mill on completion of mining activities at the Dome Mine, and permit ongoing exploration to establish future reserves in the Timmins mining camp, a recognized benefit to the socio-economic environment of Timmins.

Alternative Means of Carrying Out the Pamour Pit Expansion Mining

Alternative means of carrying out the PJV Pamour Pit Expansion, with specific reference to the mining aspects of the Project, were represented by two alternative mine scenarios that included:

- Phase 1 and Partial Phase 2; and,
- Mining Phases 1,2 & 3 – Complete Pamour Pit Expansion.

The Phase 1 and partial Phase 2 Alternative involve a pit expansion that would be restricted to the north side of Highway 101 and Three Nations Lake. This scenario would involve expansion of the No. 3 pit in a westerly direction to connect the adjacent West pit, and recover the shaft, crown pillar and additional reserves located under the previous Pamour Mine site and tailings area.

With no encroachment into Three Nations Lake, there would be no requirement for an isolation dam, a loss of fish habitat in the north lake basin, an alteration of the shoreline, or the construction of a replacement lake basin. Three Nations Creek would also be maintained in its existing location. Although this would afford the least effect on the environment, it is not cost effective, does not meet the socioeconomic objectives of sustaining the overall PJV operations that contribute to the economy of Timmins, and site closure implementation would require considerable capital expenditure with only minimal potential to generated suitable revenue from the available ore resource. This alternative means was considered unacceptable.

The complete Pamour Pit Expansion scenario involving the mining of Phases 1 through 3 would involve mining under Highway 101 and into Three Nations Lake. Although environmental effects would be associated with this alternative, adverse effects could be mitigated. With appropriate mitigation measures applied, the alternative would provide a cost effective return, meet the socio-economic benefits of maintaining a skilled workforce to mine and process ore supplies and will allow the PJV to continue its long mining tradition in the Timmins area for the next 11 years and into the future. A long mine life will allow time for the PJV Exploration Group to find the next underground and open pit mines that will continue to provide Timmins with 500 to 600 full time jobs and three times this in spin-off jobs. With access to available ore resources and associated capital, and with a mine infrastructure framework in place that would support progressive reclamation activities and enhanced application of engineering solutions to address stability and hazard issues, this Project alternative permits effective closure and abandonment of the project site.

Alternative Means of Carrying Out the Pit Facilitation Works and Activities

The five works and activities required to support pit expansion were organized collectively into specific alternative Project Packages that could logically be reviewed from the perspective of infrastructure implementation, as well as from environmental and economic perspectives. These Project Packages represent the alternative means of carrying out the facilitation components. With respect to the overall pit expansion project, these five works and activities were considered to represent “walk away’ development related scenarios that would not require further abandonment consideration for the purpose of reclamation. As such, the abandonment performance objective was not considered applicable to further alternative evaluation.

The review of alternatives involved 3 Project Packages that included various permutations of isolation dam construction, dewatering of the north basin of Three Nations Lake, rerouting of Three Nations Creek, the construction of a lake replacement basin through excavation or flooding, and the alteration of shorelines to accommodate the overall works.

The preferred alternative, Project Package 2 involved cost an effective isolation dam implementation measure, and an excavated lake replacement basin that would minimize the potential issues associated with lake replacement through flooding. This alternative was preferred as it facilitates a competitive return on investment with predictably effective with contingencies if the alternative does not perform as expected; acceptably minimizes adverse

effects on the natural environment with mitigation; acceptably minimizes negative effects to the socio-economic environment with mitigation.

4.0 DESCRIPTION OF THE ENVIRONMENT

Physical/Chemical

Climate

Cold winters and hot summers characterize the climate surrounding the proposed project. The winter months are characterized by relatively low precipitation.

Geology

The Pamour Mine is located along the Keewatin-Timiskaming Unconformity where older mafic and ultramafic metavolcanics to the north (Keewatin-Tisdale Group) structurally overlie younger metasediments to the south (Timiskaming Group).

Terrain and Soil

The area around the Pamour site is relatively flat and underlain by fill and overburden with occasional outcroppings of bedrock. Original site elevations ranged from roughly 285 m adjacent to Three Nations Lake, to 293 m in the northwest corner of the property. Landforms and surficial soils within the study area are of continental glacial origin from the Wisconsin ice sheet that covered the area approximately 10,000 years ago. Much of the overburden consists of a beat layer underlain by thick clays.

Surface Water

The project site is located in the Three Nations Creek subwatershed of the Porcupine River. This system ultimately drains to the Moose River-Abitibi-Frederick House River system. The Pamour drainage area covers approximately 2,290 ha and is located in the upper reaches of Three Nations Creek.

Three Nations Lake receives surface runoff from the former mine site and annual mean concentrations of key parameters at this location have remained consistently below effluent limits of Ontario Regulation 560/94 since cessation of operations. The lake is slightly alkaline with hardness at the upper limits of concentrations observed in regional background lakes. Dissolved oxygen levels were suitable at all depths in both the 1996 and 2003 summer surveys, but become limiting particularly at depth in the winter. Overall water quality within Three Nations Lake has been fairly stable since 1996.

Three Nations Creek receives some seepage and runoff from the existing mine site. Upstream reaches of Three Nations Creek exhibits water chemistry that is near neutral with concentrations of nickel, copper, zinc, lead, and cyanide similar to those observed in the lake headwater. Annual mean concentrations of these parameters are near or exceed PWQO, but no mean concentrations exceed PWQO by an order of magnitude.

Groundwater

Groundwater flow in the vicinity of the Pamour site can be conceptually separated into a shallow unconfined groundwater flow system and deep confined groundwater flow system. The glaciolacustrine clays and silts that are found over most of the site separate these systems. Groundwater flows between the systems are considered to be low due the confining layer of glaciolacustrine clays and silts. Deep groundwater has been depressed for over 50 years of mining, and presently (September 2004), the water table in the underground workings is 230 m below the pit crest elevation.

Air Quality and Noise

The area around the proposed pit is considered a "Class 2 Area" according to MOE definition. A Class 2 Area is an area that has qualities representative of both Class 1 and Class 3 areas, and in which a low ambient sound environment defined by natural environment and infrequent human activity will typically be realized as early as 19:00 hours. Ambient noise levels closest to the area affected ranged between L_{min} 32 to 35. The governing guideline limit is 45.

Natural Environment

Vegetation

Habitat types within the study area included deciduous forest, coniferous forest, mixed forest, thicket, barren and stream. In general, disturbance within the semi-natural forest areas through long-term land use practices (past mining, transportation corridors, utility corridors, forestry and recreation) has likely lead to a reduction in plant and animal richness, (approximately 50% of the study area has been previously disturbed). No species, which are listed within the Species At Risk Act (SARA), were recorded within the study area.

Wildlife

A variety of bird species were observed to be within their breeding range throughout the study area. These included species typical to wetlands, forest edge and forest interior habitat. The forest interior species were utilizing the extensive contiguous forest of the study area. Mammal signs within the study area included moose, fox, wolf, bear, marten, otter, muskrat, beaver, lynx and a variety of small mammals/rodents (mice, shrews and voles). Red squirrel and Snowshoe Hare were particularly abundant with concentrations in the mixed and deciduous forest habitats.

Fisheries and Aquatic Ecosystems

Three Nations Lake is a relatively shallow lake (6 m) and provides habitat for walleye, northern pike, yellow perch, and white sucker. Walleye spawning habitat was observed to be limited. Three Nations Creek provides habitat for forage fish that prefer conditions associated with homogeneous vegetated areas such as the abundant cattail marshes characteristic through the length of the creek. Granular substrates that could be used for spawning by several other species such as white sucker, are virtually absent. Limiting influences on the aquatic corridor function and fisheries in Three Nations Creek include: mining, base flows, beaver activities, and spawning habitat availability.

Socio-Economic Environment

Health

Occupational health is an important aspect of PJV's Safety Management System. PJV believe that employees who are physically and mentally healthy are more productive and lead a balanced life style. Therefore the PJV has a medical team on a retainer that allows for expedited assessments and treatment of injured employees. The team consists of a doctor, a physiotherapist, a chiropractor and a psychologist. PJV also has a-fully funded Employee and Family Assistance Program (EFAP). This is a 24-hour confidential service offered to all employees and their families. There are no community or extended care facilities within 5 km of the mine site but are available with 15 km in the City of Timmins.

Labour and Economy

Since it was founded in the early 1900's, Timmins has been reliant on resource-based industries. This observation continues to be true today, with approximately 25% of the workforce directly employed by mining and forestry. The Project represents a considerable resource to maintain the continuing strength and vibrancy of this mining community.

Land Use/Ownership and Timber Ownership

The majority of mining and surface rights around the Pamour are held by the PJV within Whitney and Hoyle Townships, with notable exceptions held by Drew (Schumacher Estate), the Ontario Northland Railway (ONR), Korba, and the Province of Ontario (the Crown).

The timber ownership has been based on the Land Titles Registry (September 3, 2003). There are 35 parcels of land within the study area. There are approximately 14 parcels of land that will be affected by the Project. The majority of the land within the study area is controlled by PJV, with pine reserve to Crown. Four parcels of land have all trees reserved to Crown.

Community and Recreational Activities and Traditional Pursuits

A boat launch is located on the northern shore of Three Nations Lake. Access to the lake for local recreational angling opportunities is an important resource value to the community. To the south of Three Nations Lake, an organized snowmobile trail system provides linkage to both a local and regional network of trails that service the greater Timmins area. Three trappers have traplines within the area of the Pamour Project. In general traditional pursuits provide direct resources to the community (meat from hunting and fishing, money from hides and furs), and equally or more important, a sense of recreation and culture, linked to traditional ways.

Cultural Environment

No archaeological sites have been registered within the study area. A number of areas with a high or moderate archaeological site potential were identified, however no archaeological sites were encountered.

Navigation

Three Nations Creek was not considered navigable by Transport Canada. Three Nations Lake was recognized as navigable water complete with an available boat ramp. Navigation is largely associated with recreational angling activity.

5.0 GOVERNMENT, FIRST NATIONS AND PUBLIC CONSULTATION

The PJV has developed the Project in accordance with Placer Dome's Sustainability Policy. This is a commitment to contributing to long-term improvements in the benefits for stakeholders while acting as stewards for the environment.

An important step has been taken towards implementing the Sustainability Policy through the involvement of stakeholders at an early stage of project planning. The PJV has facilitated the identification of stakeholder expectations and the opportunity for project design to achieve a balance between the highest possible environmental standard and the economic development of the resource. Stakeholder consultation has encompassed all aspects of the proposed new development and closure planning. The stakeholder consultation program will continue for the life of the project.

Stakeholders were initially identified as government (federal departments and provincial agencies), nearby residents, nearby business owners, First Nations, and local Non-Government Organization (NGOs). Through Open House sessions in 2003, interested stakeholders including the general public of the City of Timmins were presented details of the Project planning and process. Opportunities for comment were provided and were further considered in the project plan development. Consultation with area First Nation's groups including meetings with the Wabun Tribal Council, Chiefs from the local First Nation communities and proposed visits to interested communities. The stakeholder consultation program is a continuing process that is intended to involve input through all phases of the Project Development.

6.0 IDENTIFICATION OF VALUED ECOSYSTEM COMPONENTS

The selection and rationalization of VECs in any environmental assessment is both a critical and subjective process. It is generally recognized that there is a need to focus the environmental assessment on valued components of the environment that have the relevance to the final environmental assessment decision. The biophysical VECs selected for this assessment, to the extent possible, are reflective of issues and a broader, more holistic ecosystem approach used in the assessment. Part of the justification for selecting more ecosystem relevant, or holistic VECs, was a review of the environmental baseline data, the applicable legislation regarding species with special conservation status and consultation with key resource managers/agencies and the general public. On this basis the selected VECs were as Biophysical VECs: Three Nations Lake, Three Nations Creek, Groundwater, Mature/Semi-Mature Mixed and Coniferous Forest; and Socio-Economic VECs: Angling Opportunities and Trapping Opportunities.

7.0 ADVERSE ENVIRONMENTAL EFFECTS

This CSR contains a summary of the potential adverse environmental effects, proposed mitigation measures, significance of residual adverse environmental effects, comments and concerns from the stakeholder consultation process, and PJV's response to address issues and concerns. In general, standard mitigation practices are available and will be applied by PJV during the construction, operation, maintenance, and abandonment stages to address project related aspects of clearing and stripping, excavation and earth moving, and vehicular activity. With respect to project activities that involve larger scale potential adverse environmental effects and warranted relative to the VECs, the following key adverse environmental effects, mitigation measures and RAs conclusions were identified:

Three Nations Lake

The required pit perimeter, the isolation dam/lake infill, the partial dewatering of the lake basin, the alteration of existing lake shoreline, and the construction of the lake replacement basin will directly affect Three Nations Lake.

In order to compensate for the HADD estimated at 13.3 ha of fisheries habitat altered as a result of isolating the north lake basin, Three Nations Lake would be expanded in adjacent lowlands to the southeast of the existing lake basin. Enhancements will be provided in the form of biotechnical shoreline treatments, the placement of walleye spawning substrate and the emphasis on providing suitable depths for overwintering.

In terms of cumulative adverse environmental effects, other ongoing and proposed project activities include the Highway 101 realignment and the Haul Road. These two features will remain well separated from Three Nations Lake and no additional impacts to the waterbody are expected.

The RAs conclude that the residual adverse environmental effects and cumulative adverse environmental effects are not considered significant and that the Three Nations Lake habitat compensation measures as proposed, provide appropriate replacement habitat for that displaced as a result of the Pit Expansion. It is acknowledged that the design will provide habitat enhancement opportunities over the long-term. The proactive construction of the lake replacement in advance of the need to reroute flows through the new basin due to existing lake infilling, would be a benefit that provides local fish with more suitable habitat conditions from the onset. The RAs conclude that a fish habitat and fish community monitoring program will be required to confirm that the habitat develops according to the prediction that it will provide suitable habitat, including critical spawning habitat, for a range of species and age classes.

Three Nations Creek

The Pit Expansion will require the rerouting of surface water flows emanating from Three Nations Lake. An approximate length of 600 m of the creek channel will be lost within the area of open pit expansion. Residual adverse environmental effects associated with the habitat

alteration and changes in creek flows will be address by PJV through the provision of appropriate compensation. A required 2.5 km of watercourse replacement will be constructed to the east of Three Nations Lake forming the new outlet for Three Nations Lake. With the exception of the direct loss of 600 m of creek channel, the remaining creek and associated riparian features will remain intact, consequently resulting in a net gain of aquatic habitat area.

In terms of cumulative adverse environmental effects, the Haul Road project is well removed from the existing creek channel or future creek realignment, and the Highway 101 realignment will continue to operate two creek crossings with associated adverse environmental effects remaining essentially the same as the present condition. The Falconbridge Metallurgical Plant has undertaken recent beneficial habitat improvement works and activities in the Three Nations Creek drainage, which will not be constrained or compromised by the Project activities undertaken by the PJV. No adverse environmental cumulative residual effects to the Three Nations Creek system are anticipated.

The RAs agree with the conclusions provided by PJV, that the residual adverse environmental effects and cumulative adverse environmental effects are not considered significant and that the Three Nations Creek mitigation and habitat compensation measures as proposed, provide appropriate replacement habitat for that displaced as a result of the Pit Expansion. It is acknowledged that the design will provide habitat enhancement opportunities over the long-term. The proactive construction of much of the creek realignment in advance of the need to reroute flows, would be a benefit that in terms of allowing for naturalization and stabilization and relative to the provision of suitable fish habitat conditions from the onset, when the channel is connected to the natural system. The RAs conclude that a fish habitat and fish community monitoring program will be required to confirm that the habitat develops according to the design predictions, including during the periods of intermittent flow through establishment of refuge pools. This habitat will serve to provide habitat for a range of species and age classes common to the creek system. In order to establish follow-up monitoring action plans, PJV shall identify the progress of habitat development and system response through regular monitoring reports, and will provide action item recommendations with respect to any deficiencies. This will likely involve an adaptive management strategy approach, where both monitoring and response would adapt accordingly both to beneficial and potentially deficient system reaction until such time that it can be demonstrated that the watercourse systems are functioning according to design objectives.

Groundwater

Presently (September 2004), the groundwater table in the pit expansion areas is 230 m below the pit crest. It has been at this depth or greater for at least the past 10 years. The Pit Expansion will involve increasing the depth of the pit, and with it substantial dewatering of the underground workings. Despite the extensive and extended period of depressed groundwater levels in the area, there has been no discernable adverse environmental effect on the water levels or functions of Three Nations Creek or Three Nations Lake. Likewise, the shallow water table has remained near surface creating very wet soil conditions. This separation between the deep groundwater and the local surface waters is the result of a clay soil confining layer that

underlies the area and is on the order of 10 m in thickness. Consequently, there is no major linkage between the surface waters and deeper groundwater resources. Only minor influence to lake surface water is anticipated due to the expansion of the pit and associated loss flow rates and mitigation flow supplementation strategies have been determined. Through effective monitoring of lake surface waters, creek flows, and changes in groundwater levels, any identified influence of pit operations on surface waters due to reduction of groundwater flux will be identified. Adaptive management to integrate monitoring and implementation/operation of an artificial flow supplementation mitigation strategy will be applied.

The existing groundwater conditions are reflective of the collective influence of past and present activities in the area. Further alteration of groundwater resources through cumulative processes with this Project is not anticipated.

The design of both the lake replacement and the realignment channel has incorporated the highest possible normal water level elevation that will maintain the existing lake habitat. This will assist in minimizing any shallow groundwater in adjacent areas. The perimeter of these replacement features was designed to maintain a 10 m buffer of the lowland shrub community. It is anticipated that the majority of this shrub zone will express a higher adaptability to any changes in water table or soil moisture.

The RAs agree with the conclusions provided by PJV that the residual adverse environmental effects and cumulative adverse environmental effects are not considered significant. Although, expansion of the Pamour pit is not expected to have a significant adverse environmental effect on Three Nations Lake and the adjacent groundwater system, a comprehensive monitoring program with an Adaptive Remedial Action Plan will be applied to address any shallow groundwater issues or changes in deep groundwater interactions with lake surface waters. The RAs conclude that the groundwater-monitoring program, will involve review of fracture zones for seepage, both shallow and deep groundwater levels, lake levels and creek flows to confirm that there is limited groundwater interaction between the pit and the lake basin and limited adverse environmental effect on the Three Nations watershed water balance. It is concluded that a contingency strategy of mitigation flow supplementation to the lake will be appropriate to address any effects that may be realized through the monitoring program.

Mature/Semi-Mature Mixed and Coniferous Forest

The main adverse environmental effect during construction, and that would carry on through the operations phase of the project, would be on the aerial extent of vegetation due to surface disturbance required principally the waste rock disposal areas, and the Pit Expansion facilitation activities associated with the Three Nations Lake replacement and Three Nations Creek realignment. Mitigation measures for protection of the mature and semi-mature forest VEC was incorporated into the project design through minimization of the Project “footprint”.

The existing forest distribution is reflective of the collective influence of past and present activities in the area. In terms of other potential cumulative adverse environmental effects, project activities including the Haul Road access to the site and the Highway 101 realignment,

only represent an additional 2% of forest habitat removal. Relative to other general land use activities occurring within the area, the cumulative adverse environmental effects are minor.

The RAs conclude that the Project designs and associated mitigation strategies, relative to the already extensive land use changes in the area, will maintain habitat functions as per the objectives described by PJV. With the implementation of this project planning, the RAs are satisfied that the potential for adverse environmental effects as a result of the project will not be significant.

Angling Access Opportunities

The existing boat launch will be lost as a result of the Project. There may also be temporary access restrictions to the existing boat launch as a result of safety issues related to the construction of individual project components. The creation of replacement fisheries habitat may influence levels of mercury in aquatic systems following the inundation of terrestrial areas in the lake replacement basin. In order to maintain public access to the lake, a new boat launch will be constructed at the southeast corner of the lake. Mitigation to reduce the possible adverse environmental effect of elevated mercury levels will include removal (by excavation) of overburden and terrestrial soils that might contribute to mercury methylation. Proper signage and monitoring of boaters will be undertaken during construction and operation to insure boater safety is not compromised. Replacement habitat will compensate for angling opportunities temporarily lost due to habitat alteration.

In terms of cumulative adverse environmental effects related to other projects or project activities, Highway 101 realignment has a bearing on the angling access. The highway realignment is considered a positive environmental effect, as it will facilitate the establishment of a new boat launch on Three Nations Lake, thereby maintaining similar physical access to the resource that is well removed from Project activities.

The RAs confirm that PJV has appropriately considered the maintenance of access to angling opportunities in the preparation of their mitigation program that includes habitat replacement and access to navigation (boat launch) as well as proper construction practices and monitoring to ensure navigation safety. The habitat mitigation program has considered the target fish species consistent with the provincial fisheries management objectives for the district, while also considering that the habitat development will also provide habitat opportunities to the remainder of the fish community of Three Nations Lake. They also agree with the conclusions provided by PJV that the residual adverse environmental effects and cumulative adverse environmental effects are not considered significant. The RAs are satisfied that opportunities for angling and angling access and navigation safety have been maintained and potentially enhanced by the Project.

Trapping Access Opportunities

One trapper is active in the area southeast of Three Nations Lakes that may be affected by lake and creek replacement habitat. PJV in the past has successfully negotiated agreements with

potentially affected trappers that will satisfactorily compensated for the lost traps resulting from changes to trap line areas as a result of PJV projects and activities. The construction of the Haul Road and Highway 101 realignment only represent a small proportion of the available forested area in the watershed. The cumulative nature of the Project activities in this context will therefore not appreciably change the Trapping resource opportunities.

The RAs confirm that the overall mitigation strategies will support the sustainability of access to trapping opportunities. The RAs are in agreement with the conclusions provided by PJV, that the residual adverse environmental effects and cumulative adverse environmental effects are not considered significant.

Adverse Effects of Environment on Project

The Project site is located in a temperate environment that represents construction and operations challenges associated with extremes in weather conditions and associated environmental response. Typical conditions that may influence the project include winter temperatures and climate that can influence access road conditions, site water management and earth moving activities. Excessive precipitation may result in short term flooding during construction and potential for overtopping of water management infrastructures, and erosion. Dry conditions can lead to dust management issues and fire hazards. Standard mine construction and operational procedures and associated mitigation and contingency measures, as successfully applied by PJV on their other local mine sites, will be extended to the Project site and activities.

The RAs have concluded that PJV has taken proper measures in developing the engineering design for the pit operations and facilitative works and activities to ensure their long-term durability and stability against adverse environmental effects on the project.

Accidents and Malfunctions

PJV reviewed a number of scenarios with respect to frequency and consequence to determine which to include in our analysis. For operations and construction projects there are a number of accidents, malfunctions, and unplanned events that occur on a daily basis, which are built into the schedule or engineering design to ensure the ongoing safety of the workforce and environment. Issues with higher frequency or potential adverse environmental effect were reviewed in further detail and are dealt with through engineering design and PJV's Emergency Response and Environmental Management Plans as applied on their other project sites.

The environmental management planning procedures and associated contingency responses for the Project site address the following:

- Fuel and/or other hazardous materials spill (on land and in water);
- Isolation Dam Failure;
- Infill /seepage barrier failure with resultant leakage;
- Flooding of work area;

- Erosion and sedimentation control measure failure; and,
- Failure of shoreline vegetation restoration.

The RAs conclude that through the proposed designs and environmental management procedures as described by PJV, significant adverse environmental effects can be avoided. This will involve proper monitoring and action response planning.

Sustainable Use of Renewable Resources

The Project works and activities are principally located in areas that are already relatively disturbed by past mining activity and infrastructure. Consequently, works-related disturbance to the low land areas as proposed will represent removal of land that represents a low potential for forestry practice. The works will largely avoid disturbance to areas of Mature/Semi-mature forest. Any clearing requirements will be arranged such that merchantable timber will be harvested. Therefore, the Project will develop resources that contribute to the social and economic well-being of communities in a sustainable manner. It is of note that all works and activities will be carried out in accordance with the PJV Sustainability Policy.

8.0 MONITORING AND FOLLOW-UP PROGRAMS

The monitoring and follow-up programs are designed to verify the accuracy of the environmental assessment of the Project, and to determine the effectiveness of the proposed mitigation measures of the identified VECs. An attempt has been made to assess potential compliance-related monitoring at a conceptual level and the program will be modified to include any monitoring required according to issued permits and approvals.

Three Nations Lake

General Site Drainage and Surface Waters

Visual inspection of the following will be made; dewatering discharge locations, erosion/ sedimentation control measures, ultimate receiving waters and the turbidity curtain perimeters to confirm integrity and function. General inspections will be completed during the construction period. Data will be reported in an environmental inspection diary maintained on site, with an annual summary report maintained at PJV.

The drainage network will be regularly inspected to ensure effective entrainment of suspended solids. Corrective measures such as replacement of erosion and sedimentation control measures will be implemented as required. Water quality sampling will occur at the receiving waters near the construction sites for any water reporting back to the environment. Samples will be expected to meet Provincial and Federal daily discharge criteria of 30 mg/L total suspended solids. Water quality data will be stored in PJV's Eqwin database.

Stability and Integrity

To confirm the lake level function as per the design, a continuous lake level data logger will be installed. Both the vegetation and rock treatments will be visually inspected each spring for a

period of three years and a summary report will be prepared annually, including any recommendations for corrective actions that may be required. In the event that further corrective actions are required after year three, the monitoring program will be extended for an additional two years.

An experienced engineer will inspect the dam structure semi-annually, and more frequently during the significant stages of the dam construction, or if otherwise deemed appropriate. The inspection will include an examination of the dam, and review of instrumentation data. Data will be reported in an annual summary report available at site.

Fisheries and Aquatic Resources

The following will be periodically assessed to confirm system response and effectiveness of mitigation/compensation measures: the shoreline habitats of the existing lake and lake replacement to confirm the system is responding in a positive manner to result in habitat enhancement; the baseline metals levels (mercury) in edible fish; and, the success of compensatory aquatic systems within the Three Nations Lake replacement basin. This aspect of the monitoring program will be developed with DFO as part of the detailed aquatic habitat compensation package. Monitoring will include aspects related to: water quality including winter profiling, benthos and fisheries communities, critical fish habitat use, vegetation communities and habitat structure. Annual reports will be prepared by PJV.

Three Nations Creek

General Site Drainage and Surface Waters

Inspections will be completed during the construction period including critical in-water work activities. Data will be reported in an environmental inspection diary maintained on site, with an annual summary report maintained at PJV. Water Quality sampling will occur at the receiving waters near the construction sites for any water reporting back to the environment. Samples will be expected to meet Provincial and Federal daily discharge criteria for a single grab of 30 mg/L Total suspended solids. Water quality data will be stored in the PJV database and an annual summary report will be prepared.

Stability and Integrity

Consistent with the continuous water level monitoring of Three Nations Lake, water level monitors will be installed in the existing and new Three Nations Creek channels. In association with flow monitoring, these stations will be calibrated such that the flow response in both systems can be monitored and reported. The drainage network will be inspected to ensure effective entrainment of suspended solids. Corrective measures such as replacement of erosion and sedimentation control measures will be implemented as required. The vegetation will be monitored each spring and fall over the first three years following construction to confirm proper development. These inspections will also include a review of any erosion along the channel. A summary report of channel stability will be prepared annually, including any recommendations for corrective actions that may be required.

Fisheries and Aquatic Resources

The following will be periodically assessed; the character and quality of aquatic resources in Three Nations Creek as defined in the DFO Fisheries Authorization; and, the success of compensatory aquatic systems within the Three Nations Creek. This aspect of the monitoring program will be developed with DFO as part of the detailed aquatic habitat compensation package. Monitoring will include aspects related to: water quality, the benthos, the fisheries community, critical habitat use vegetation communities, and habitat structure. A water level and associated flow monitoring station will be installed in the realignment channel to assist in evaluating the performance of this constructed habitat. The progress of both channel naturalization, and biotic colonization of the realignment channel will also serve as indicators of successful ecosystem function.

Groundwater

A series of pneumatic piezometers will be installed along the perimeter of the isolation dam and pressures will be regularly monitored. Seepage water contributions to the pit will also be visually monitored along the southern pit face exposure. To further monitor and confirm that the pit expansion itself will not have a groundwater related effect on Three Nations Lake, a series of monitoring piezometers will be positioned around the lake and water levels of the lake will be recorded. This data will be incorporate with flow monitoring data to establish a calibrated water balance.

Mature/Semi-Mature Mixed and Coniferous Forest

No monitoring is required.

Angling Access Opportunities

During days when production blasting will be carried out, PJV site safety personnel will observe if anglers and boaters are abiding by the safety notification regarding separation distance from the site are being honoured. In the event that they are not, warnings will be issued such that there will be no safety concerns associated with the daily blast. Since mercury methylation has been expressed as a concern by Health Canada, periodic sampling of the edible fish of the lake will be undertaken to confirm that flesh (typically consumed component of fish by local anglers) mercury levels are not increasing. This monitoring will be undertaken in conjunction with the other fish population monitoring programs developed for assessing the habitat performance.

Trapping Access Opportunities

Monitoring will only be undertaken during construction to confirm that site contractors appropriately salvage any traps encountered such that hey can be returned to the rightful owner. Once the habitat corridor associated with the Three Nations Creek realignment is established, no additional monitoring relative to trapping activity will be undertaken.

CONCLUSIONS

A variety of baseline investigations and secondary source information, along with a stakeholder consultation process was applied in the planning and design of the Pamour Pit Expansion Project. This information was carried forward to evaluate the potential effects of the project on the existing environment with the conclusion that the key effects are associated with changes to the habitat of Three Nations Lake and Three Nations Creek. Other effects associated with terrestrial features are relatively minor given the extensive land use activities that have previously occurred. Substantial mitigation/compensation measures have been proposed by PJV to address the effects to the surface water features, and include both lake replacement and creek realignment. These works will provide “like for like” habitat or an enhancement over existing conditions taking ecosystem limitations into account. General mitigation measures applied to the construction and operation of the mine site, as practiced by PJV at all their sites in Timmins, are suitable to meet provincial and federal guidelines where required.

The RAs have concluded that the information provided is suitable for identifying effects to the selected VECs. The mitigation/compensation strategies to be applied will effective address those identified effects and it is concluded that there will be no significant residual adverse effects as a result of the project. The follow-up program proposed by PJV is suitable to evaluate the CSR predictions and confirm mitigation performance. It is agreed that it will be part of an adaptive monitoring program that will allow PJV to respond to and correct any malfunctions.

TABLE OF CONTENTS

Page

TABLE OF CONTENTS (Cont'd)

Page

TABLE OF CONTENTS (Cont'd)

Page

TABLE OF CONTENTS (Cont'd)

Page

TABLE OF CONTENTS (Cont'd)

Page

TABLE OF CONTENTS (Cont'd)

Page

TABLE OF CONTENTS (Cont'd)

Page

LIST OF FIGURES

Page

LIST OF TABLES

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

1.1 Project Overview and Background

The Porcupine Joint Venture (PJV) intends to undertake a major expansion of the existing Pamour Pit located along Highway 101, 5 km east of Porcupine, Ontario, in Whitney Township (Figure 1.1).

Porcupine Joint Venture (PJV)

The PJV was formed in July 2002 to combine the assets of Placer Dome (CLA) Limited (51%) (Placer), and Kinross Gold Corporation (49%) (Kinross). These assets include the Dome underground and open pit mine and mill, the Hoyle Pond mine, Bell Creek mill, and a large land package in the Timmins camp (assets are shown on Figure 1.1). The PJV was formed to maximize the value of resources of both partners.

PJV Corporate Profile

The Timmins Mining camp is one of the largest gold mining camps in the world producing over 65 million ounces of gold since the first mining activities commenced in 1909 at the Dome Mine. Over the following 95 years, numerous gold deposits were mined including the Hollinger (1910 to 1968: 19.3 million oz produced), McIntyre (1912 to 1988: 10.8 million oz produced), and Pamour (1936 to 1999: 4.5 million oz produced). The most recently opened mine was the Joint Venture's Hoyle Pond Mine.

The Joint Venture operates pursuant to a contractual agreement and both parties receive their share of gold output in kind. Capital, exploration and operating costs are funded in proportion to each party's ownership interest. Upon creation of the joint venture, Placer contributed the Dome mine and mill and Kinross contributed the Hoyle Pond, and Pamour mines, exploration properties in the Porcupine district as well as the Bell Creek mill.

The PJV, through its members, is the proponent of the proposed Pamour Pit Expansion and bear financial responsibility for the planning, design and construction of the project. The Pamour Pit Expansion is the most significant PJV resource. The Dome Mine and Hoyle Pond Mine will continue to represent short-term resources for the foreseeable future.

The Porcupine Joint Venture is committed to being an environmentally and socio-economically responsible member of the community and to implementing a policy of mining and sustainability. The PJV Sustainability Policy (2003) was developed to create a framework for dealing with issues involving stakeholders throughout every stage of the mining process. Further details on the PJV Sustainability Policy are provided in the PJV Environmental Management Plan (PJV 2003f).

Project History

Land was first staked in the Pamour area in 1910. Limited gold production was achieved on the Pamour property from 1911 to 1914 and different owners operated the Pamour Mine continuously from 1936 until September 1999. During this period, the mine reached a maximum production rate of approximately 2,800 tonnes (3,100 tons) of ore per day from both underground and open pit sources. The former site infrastructure, included a hoistroom, mill, crushing plant, headframe, mine dry, office and warehouse, existing site features, is shown on Figure 1.2. The site infrastructure was demolished in 2003.

In May 1996, Royal Oak Mines Inc. (Royal Oak) initiated Pamour pit expansion investigations for the open pit. During a period of approximately 18 months, Royal Oak undertook studies and external agency consultation regarding the mine expansion.

After acquiring the assets of Royal Oak in December 1999, Kinross has since maintained the Pamour Mine and commissioned several studies to re-evaluate the Pamour Pit Expansion including a detailed pre-feasibility study in early 2001. After the formation of the PJV in July 2002, the Pamour Mine was identified as the main longer-term contributor to continue the PJV's existing resource of gold ore. The Dome Mine and Hoyle Pond continue to represent a shorter-term resource as their ore reserves are diminished over the next 1 to 8 years, respectively.

The Planned Pamour Pit Expansion

The pit expansion will combine the previously mined No. 3 Pit and West Pit of the Pamour Mine site, as well as the Hoyle Pit, into one large open pit. The former Hoyle Pit is located east of Highway 101 (Figure 1.1), and involved both underground and open pit mining that ran intermittently from 1941 to 1999. All that remains of the former mine is the dry open pit and various building foundations.

This proposed pit expansion represents a mineral resource of approximately 45 million tonnes containing up to 54 million grams of gold and a mine life of up to 11 years. The ore will be milled at the existing operational off-site custom milling facility of the Dome Mine at a rate consistent with the presently approved mill throughput of up to13,000 tonnes/day.

The proposed open pit expansion will extend across the current alignment of Highway 101 into Three Nations Lake and through a section of Three Nations Creek. To access the ore reserves through pit expansion, it is proposed to build a dam across Three Nations Lake to isolate and remove approximately 14 ha of the lake's north basin. This will also result in the indirect alteration of approximately 2.5 km of the headwaters of Three Nations Creek due to diversion of flows. A direct loss of 600 m of creek habitat will result from the increased footprint of the open pit. The construction of the dam on Three Nations Lake will require approval from Transport Canada under Section 5 (1) of the Navigable Waters Protection Act. The proposed shoreline alteration, isolation of the north basin and alteration of 2.5 km of Three Nations Creek will require authorization from Fisheries and Oceans Canada. Under Section 35 of the *Fisheries Act*, no **H**armful **A**lteration, **D**isruption or **D**estruction (HADD) to fish habitat can proceed without

this authorization. The Fisheries and Oceans Canada Habitat Management Policy requires "no net loss" of fish habitat (DFO, 1986) and as such, any alterations to Three Nations Lake and Three Nations Creek habitat will require compensation. In keeping with Fisheries and Oceans Canada's Policy for the Management of Fish Habitat (1986), an authorization will be issued where the HADD is considered acceptable and provided that acceptable measure to compensate for the habitat loss are developed and implemented.

To accommodate the recognized HADD and *Fisheries Act* requirements, excavation of a new lake replacement basin is proposed to occur adjacent to the southeastern side of Three Nations Lake in order to compensate for the habitat loss of the lake. A new Three Nations Creek re-alignment will drain this lake replacement basin and reinstate lake outlet flows to tie into the existing Three Nations Creek system at a point 4.6 km downstream. The proposed Pamour Pit Expansion components are shown on Figure 1.3.

With the requirement for *Fisheries Act* and *Navigable Waters Protection Act* Authorizations, the *Canadian Environmental Assessment Act* (CEAA) process is triggered. Consistent with the CEAA Comprehensive Study List, and the need for the works and activities required to facilitate the pit expansion (identified below), a Comprehensive Study is required. This study is scoped to include aspects of the works and activities (the "Project"), required to facilitate the pit expansion that will directly require the HADD of local fish habitat features and associated environments.

Additional information on the scope of the Project is provided in Fisheries and Oceans Canada/Transport Canada (May 2004). Consistent with the guidelines, the Project being assessed in the CSR involves:

The Pamour Pit Expansion, which consists of the following undertakings:

- Pit Overburden Stripping including existing Pamour tailings;
- Ore and waste rock mining; and,
- Waste Rock Management and Disposal.

And the following key works and activities to facilitate the proposed pit expansion:

1) Construction of an isolation dam across Three Nations Lake;
2) Partial dewatering of Three Nations Lake;
3) Relocation of a portion of Three Nations Creek;
4) Alteration of Three Nations Lake shoreline; and,
5) Extension of Three Nations Lake.

Other Local Project Activities

Various other local projects activities that accommodate mining activity at the Pamour Pit Expansion Project site have previously been approved through Provincial process. These approved projects are outside the scope of this assessment with the exception of consideration for cumulative effects. These local projects are administered by PJV and are in various stages

of development. The local projects are described as follows in the context of the Pamour Pit Expansion:

- Dome Mill Facility;
- Dome Tailing Management Area;
- Haul Road; and,
- Highway 101 realignment.

Dome Mill Modernization

The Dome Mill is located approximately 12 km from the Pamour Pit Expansion. The Dome Mill was modernized last in 1994 in order to handle the addition of the Dome Open Pit mine. A new mill modernization is presently in progress in order to increase efficiencies of the mill and recovery of gold in the milling process. Ore will continue to be received from the Dome Mine and Hoyle Pond Underground sources until they are functionally depleted from the perspective of presently identified ore reserves. The Dome Mill will also be used to process the ore from the Pamour Pit expansion and represents an example of the resource efficiencies and use of available infrastructure accomplished through the establishment of the Porcupine Joint Venture.

The Dome Mill, which uses a conventional gravity concentration and gravity tailings cyanidation circuit, will be modernized to include the addition of three large leach tanks to increase residency time in the mill circuit and a new rod mill to assist in crushing the ore to a smaller grain size. This modernization is governed under a Certificate of Approval (#4-0038-83-980) through the Ministry of Environment that was issued February 9, 1998 and amended October 5, 2004. This Certificate of Approval applies conditions that control the volume and characteristics of the tailings solids and wastewater stream emanating from the mill. The mill is also subject to Closure requirements of the Ministry of Northern Development & Mines. The construction work associated with the mill modernization was initiated in the summer of 2004 and will be competed prior to yearend.

The Dome Mill currently operates at 11,400 tonnes per day. It is permitted through the indicated Ministry of Environment Certificate of Approval to operate at up to 13,000 tonnes per day. This permitted maximum processing rate will continue following the completion of the mill modernization. Until May 2004, the mill was also processing ore from the Dome Underground operations. Ore from the Dome Open Pit operation will continue to feed the mill including the period following the completion of pit development in July 2005. Upon Dome Open Pit completion, 1 to 2 million tonnes of medium and low-grade ore stockpiles will be processed as required for a period of approximately 6 months during the start up of the Pamour operations. The Hoyle Pond underground mine will continue to feed the mill for the next 8 years.

With the increased efficiencies associated with the mill modernization, no increase in tonnage is planned to process ore from the indicated existing sources or the proposed Pamour Pit Expansion project. Similarly, the geochemical nature of the ore from the Pamour Pit is largely consistent with other ore reserves that presently feed the mill, and consequently no chemically driven process adjustments are required to the circuit for the purpose of accepting this ore

source. Accordingly, the chemistry of mill wastewater will remain consistent and will fall within the effluent quality conditions as outlined in the Certificate of Approval.

With the permitted Dome Mill facility presently operated to mill ore from a variety of sources as indicated above, and with modernization maintaining the characteristic mill processing circuit or rate irrespective of ore sources, it has been considered as an independent project that will precede development at the Pamour Pit expansion.

Dome Tailings Management Area

The Dome Tailings Management Area has been in operation since the mid 1980s. It has been receiving tailings solids and wastewater from the Dome Mill that are representative of various ore sources originating from the Porcupine camp. Principally, it has served as a storage facility for the milling end product of the Dome underground and open pit mines. This facility is governed under Certificate of Approval (#4-0038-83-980, dated February 9, 1998 and amended October 5, 2004) through the Ministry of Environment. In coordination with the modernization of the Dome Mill, the tailings area has recently undergone modification to enhance the capacity. The facility is also subject to Closure requirements of the Ministry of Northern Development & Mines.

In close proximity to the Dome Mill, the Dome Tailing Management Area is located approximately 12 km from the Pamour Pit Expansion project. Once in operation, the Pamour Pit ore will be processed at the Dome Mill with respective tailings solids and wastewater stored in the Dome Tailing Management Area. Given that there are no geochemically required adjustments to the mill process, the characteristics of the tailings and wastewater derived from processing Pamour Pit ore will remain consistent with the conditions of the existing Certificate of Approval. No adjustments to the operation of the tailings area are required as a consequence of processing the Pamour Pit ore. The capacity increase also does not involve a change in the footprint of this facility beyond the facility improvements that were previously approved by MOE and MNDM.

In summary, the Dome Tailing Management Area is operated in coordination with the mill facility as an existing permitted facility supporting the treatment of tailings solids and wastewater, and there is no requirement to modify the footprint or treatment operation for the purpose of receiving Pamour Pit Expansion ore. Accordingly, the facility has been considered as an independent project that will precede development at the Pamour Pit expansion.

Haul Road Construction

The Dome to Pamour Haul Road is required to truck the ore from the pit expansion to the Dome Mill for processing. The haul road project includes: a two-lane underpass at Langmuir Road including relocation of affected utilities, a single underpass at Sixth Avenue extension, a level, gated crossing at the Alarie Pit Road, and a realignment and crossing of the local snowmobile trail system, details of which have been reported in AMEC (2003j). The project followed the approved planning process for Category “B” projects under the Class Environmental

Assessment for MNR Resource Stewardship and Facility Development Projects (2003), with the opportunity for public input throughout. Following consultation with MNR and other external agencies, and through input received from the public in response to advertised Public Information Centres on April 4, and July 29, 2003, it was determined that this project will not result in any significant adverse environmental effects AMEC (2003j). With approval of this project, construction was initiated in February 2004 and was completed in October 2004.

Given the mine related function of this Haul Road, it was also addressed through the Closure Plan amendment process through the Ministry of Northern Development & Mines.

The Haul Road partially falls within the spatial boundary of the Pamour Pit Expansion project at the eastern terminus. A segment of the road runs parallel to Three Nations Lake, and represents the possibility that this project, in combination with the Pamour Pit Expansion, may influence the local environment. As such, the Haul Road project was considered in the evaluation of cumulative effects within this Comprehensive Study.

Highway 101 Realignment

The existing Highway 101 runs through the middle of the Pamour Open Pit Expansion area. As a result, it will be realigned to the south of the project. The PJV is the proponent of the proposed 6 km Highway 101 realignment project, required to accommodate the Pamour Pit expansion, which includes the Preliminary and Detail Design Study and Class Environmental Assessment. The Preliminary Design study, which resulted in the selection of a preferred realignment alternative and design, was completed in the fall of 2003 and detailed design studies were initiated in 2004. The highway realignment project includes: a two lane (4 lane ultimate platform) highway realignment; relocation of commercial, industrial and recreational facility entrances; drainage and watercourse crossing of Three Nations Creek; closure of the existing Highway 101 alignment through Pamour; relocation of affected utilities; and grade separation for the ore haul road.

The Highway 101 study followed the approved planning process for Group “B” projects under the Class Environmental Assessment for Provincial Transportation Facilities (2000), with the opportunity for public input throughout (AMEC 2003i). Following contact with external agencies and the public, and review with MTO, it was determined that this project will not result in any significant adverse environmental effects and the EA process was considered completed in December 2003. The highway realignment works are scheduled to be undertaken in 2005. MTO will assume this new highway segment following an inspection and approval of the works undertaken by PJV.

The Highway 101, falls within the spatial boundary of the Pamour Pit Expansion project study area. The highway realignment will run south of Three Nations Lake, through the existing Three Nations Creek valley, and through the area of the proposed Three Nations Creek realignment. Consequently, this project represents the possibility that in combination with the Pamour Pit Expansion, it may influence the local environment. As such, the Highway 101 realignment was considered in the evaluation of cumulative effects in this Comprehensive Study.

1.2 Purpose of the Project

The purpose of the Project is to undertake several works and activities including pit expansion, isolation of Three Nations Lake from the pit, and associated local habitat and watershed drainage replacement such that gold bearing ore, of sufficient tonnage and throughput, can be mined. The Project will be completed in an environmentally sustainable and socially responsible manner.

1.3 Project Need and Justification

As the existing nearby PJV Dome mine approaches exhaustion, new mine developments are required to replace or increase the supply of gold to sustain existing operations and infrastructure. Mining comprises an integral part of the northern Ontario economy within the Timmins mining camp and the City of Timmins was founded and is largely supported by the base metal mining industry. The City of Timmins Official Plan (1993), recognizes mining as the cornerstone of the local economy, and accordingly promotes the continuation of mining throughout the Plan area.

As ore bodies are mined out, there is a need to locate and develop new ore bodies to maintain the existing economy. In addition, mining generates a considerable proportion of spin-off employment for support supply and services as well as other related employment. It is estimated that, over a period of 11 years, development of the Pamour Mine will create or maintain a direct total of 270 jobs for the PJV, which will sustain a trained workforce. These will include approximately 16 site management staff, 40 technical staff, 203 hourly employees and 11 maintenance staff. Additional employment will be realized during the construction/operation phase. It is anticipated that the majority of the work force will be derived from the City of Timmins as well as surrounding communities.

The ore reserves accessed following completing of the Project will sustain mining operations for up to 11 years. This will provide an extended period of time for local Timmins area mine exploration. During the period of Pamour operations, the opportunities will be available to explore and identify future ore reserves to sustain the local mining economy.

1.4 Regulatory and Planning Context

A number of Federal and Provincial environmental approvals, permits and authorizations will be required for the Project to proceed. There is some overlap between Federal and Provincial jurisdictions, but there is a co-operative working relationship between the Federal and Provincial regulators, as to specific responsibilities and mandates.

1.4.1 Federal Process Requirements

Key environmental authorizations, approvals and licenses that are anticipated to be required from the Federal government, before the Project (identified in Section 1.1) can proceed, are

listed in Table 1-1. Prior to any Federal department issuing approvals, an Environmental Assessment (EA) will need to be prepared and reviewed by regulators and the public pursuant to the CEAA. This Comprehensive Study Report (CSR) partially fulfills the overall EA requirements of the Project.

TABLE 1-1
KEY FEDERAL ENVIRONMENTAL AUTHORIZATIONS FOR THE PROJECT

Government Body	Project Component	Permit/Approval
Department of Fisheries and Oceans Canada *'Fisheries Act'*	Authorization for the dam isolation, and loss of 14 ha basin at Three Nations Lake and alteration to 5 km of Three Nations Creek;	Authorization for work effecting fish habitat
Transport Canada *'Navigable Waters Protection Act'*	Application for new dam and construction activities in Three Nations Lake;	Approval of work in navigable waters

The EA process is used to describe the natural and socio-economic environment that could potentially be affected by the Project (identified in Section 1.1) and describes ways of protecting the environment. A key component of the CEAA process is consultation. Through careful study and consultation with government agencies, the local communities, stakeholders, the local First Nations, and others, the objective will be to develop a Project plan that will protect the environment, while at the same time providing economic benefits to PJV and to the local and regional economies.

The triggers to initiate the CEAA process and the EA relate to the key authorizations required as indicated in Table 1-1. The Project requires a Comprehensive Study level of investigation, as defined by the CEAA Comprehensive Study List Regulations. The Project falls within the project definition on the Comprehensive Study List (Part V – paragraph 17 (c) of the *Canadian Environmental Assessment Act*), '*an existing gold mine, other than a placer mine, that would result in an increase in its ore production capacity of 50 per cent or more, or 300 t/d or more if the increase would raise the total ore production capacity to 3000 t/d or more*'.

Federal agencies that will participate in the CEAA process include the Fisheries and Oceans Canada (DFO), as the lead Responsible Authority (RA), and Transport Canada (CCG) as a RA. Natural Resources Canada (NRCan), Health Canada, and Environment Canada (DOE) have indicated that they would be Federal Authorities (FA's) and provide technical advice and review as required. The Canadian Environmental Assessment Agency (Agency) will provide advice to the RA regarding the requirements of the Canadian Environmental Assessment Act.

The principal steps in the CEAA Comprehensive Study process include, or potentially include, the following:

- Preparation of a Project description for review by potentially involved Federal authorities;
- Pre-consultation with Federal and Provincial authorities, stakeholders and members of the general public and First Nations that could potentially be affected by the Project;
- Development of Project scope to define those aspects of the Project that should be included in the EA, the focus and boundaries of the EA, stakeholders in the CEAA process (affected and interested parties, including government agencies, First Nations, and members of the general public, possibly including non-governmental organizations - NGOs), consultation needs, and the extent of co-ordination with Provincial regulatory requirements;
- Preparation of a draft Comprehensive Study Report (CSR);
- Review of the draft CSR and related materials by Federal and Provincial regulators;
- Response by the proponent to comments received from government departments;
- Preparation of a final CSR taking into consideration comments on the draft CSR;
- Publication of the final CSR for the mandatory public review period;
- Public consultation on the final CSR;
- Response by the proponent to comments received from government agencies and other stakeholders;
- Recommendation to the federal Minister of the Environment on the significance of the adverse environmental effects;
- Ministerial decision on the CSR and the adequacy of the proponent's obligations under the CEAA process; and,
- Authorization by DFO and Transport Canada for construction.

The pathway defined immediately above provides for stakeholder consultation at four specific points:

- Pre-consultation in advance of issuing the Project Description;
- Consultation on the Project Description;
- Consultation on the draft CSR; and,

- Consultation on the final CSR.

Of these four consultation phases, only the final consultation phase (consultation on the final CSR) involves mandatory public review.

As the environmental assessment of this project commenced prior to October 30, 2003, DFO and TC is proceeding under the Canadian Environmental Assessment Act (1992) as opposed to the Canadian Environmental Assessment Act (as amended in 2003). Due to the transition clause in Section 33 of the Act to Amend the Canadian Environmental Assessment Act, environmental assessments of projects that commenced prior to the coming into force of the amended CEA Act are allowed to proceed under the 1992 CEA Act.

1.4.2 Provincial Process Requirements

Several Provincial approvals will be required for the Project. These approvals will require the participation of the Ministry of Northern Development and Mines (MNDM), the Ministry of the Environment (MOE), the Ministry of Natural Resources (MNR), the Ministry of Transportation (MTO) and the Ministry of Labour (MOL). Interested agencies shall also be involved in the CEAA consultation process, as required.

The key Provincial environmental permits that are likely to be required for the Pit Expansion are listed in Table 1-2. The shaded permits/authorizations shown in the table are associated with the Project addressed in this Comprehensive Study that have not been submitted and/or received through previous provincial process. It is envisioned that much of the information required for Provincial approvals will be included in the Federal EA and that Provincial approval applications would be made in parallel to the Federal approvals process.

The Highway 101 Realignment is also required as a component of the pit expansion. Through the pre-consultation process, it was identified by MTO that the Class EA for Transportation Facilities would be required. As such, through further discussions between the Federal RAs and MTO it was determined that the Highway Realignment component would be most effectively and comprehensively addressed in the Provincial EA process. This process would be run in parallel to the Federal EA process. Correspondingly, the formal Provincial EA process was initiated and a Transportation Environmental Study Report (PJV 2003a) was submitted for public review and cleared. Consistent with Provincial EA process, all relevant Provincial and Federal agencies were involved in the consultation process. Consistent with the noted process, the Highway 101 realignment has been identified as one of the Other Local PJV Project Activities as outlined in Section 1.1, and is dealt with in the context of CEAA and the defined Pamour Pit Expansion Project under cumulative effects assessment.

TABLE 1-2
PROVINCIAL ENVIRONMENTAL PERMITS AND APPROVALS FOR MINE PRODUCTION

Government Body	Project Component	Permit/Approval
Ministry of Environment *'Ontario Water Resources Act'* and *'Environmental Protection Act'*	Dewatering of isolated Three Nations Lake basin and dam construction area;	Permit to Take Water
	Dewatering of the Three Nations Lake replacement basin;	Permit to Take Water
	Emergency standby generator emissions;	Certificate of Approval Air
	Landfill (amendment);	Certificate of Approval
	Dewatering wells/open pit sumps (Amendment);	Permit to Take Water
	Water for operations/potable water (Amendment);	Permit to Take Water
	Industrial sewage works for mine water and operations facilities (e.g. domestic sewerage) (Amendment);	Certificate of Approval – Industrial Sewage works
Ministry of Natural Resources *'Lakes and Rivers Improvement Act' and 'Environmental Assessment Act' 'Public Lands Act'*	Construction of isolation dam and change to north basin in Three Nations Lake;	Work Permit
	Construction of new lake basin and realignment channel for Three Nations Creek;	Work Permit
	Removal of fish from isolated basin of Three Nations Lake;	Scientific Collectors Permit
	Site clearing for the Three Nations Lake basin replacement construction and stream realignment	Work Permit, License to Harvest
Ministry of Northern Development and Mines *'Mining Act'*	Mine Closure	Pamour Closure Plan.
MTO Process Class Environmental Assessment for Transportation Facilities	Highway 101 Realignment (Recognized as "Other Local PJV Project Activity" and followed noted provincial process)	-Transportation Environmental Study Report

Note: Shaded areas indicate new permits or authorizations related to the project that will be received on completion of CEAA process. Other permits/authorizations are in place or follow separate parallel provincial process.

Federal approval is required for the Highway 101 watercourse crossing at the existing Three Nations Creek. The DFO have confirmed the requirement of a screening level CEAA review for these works. This confirmation was based on PJV presentations at an interagency meeting held on August 26, 2003, regarding the potential impacts to Three Nations Creek where PJV identified that the watercourse crossing involved a HADD of fish habitat. DFO also confirmed, during the meeting of August 26, 2003, that the boat launch would be addressed as a Letter of Advice (LOA). The Letter of Advice indicates that no authorization is required for the work, and establishes standard conditions on how construction activities within the waterbody are to be

conducted. Since the boat launch will not be considered fish habitat destruction, it will be kept separate from the Three Nations Creek screening.

1.5 Roles of the Federal Departments and Provincial Agencies in the Comprehensive Study Process

The federal departments as identified above, have a mandate to review any and all aspects of the EA, at its discretion and without restriction. Accordingly, it is recognized that the different departments have specialized interests, which relate to other mandates and responsibilities. To this extent, the various departments typically bring a more specific, or specialized, focus to their respective reviews.

Provincial agencies also have expertise that can be used by the RAs in the environmental assessment. Details on the role of the provincial agencies involved in this comprehensive study are explained in Section 1.5.2

1.5.1 Federal Departments

Among the Federal departments, the role of the CEA Agency in the comprehensive study is to:

- Review the CSR for procedural compliance with CEAA Comprehensive Study process;
- Provide opportunity for public comments on the CSR; and,
- Advise the Minister of Environment of the next steps in the environmental assessment process.

The mandate of the Agency typically does not extend to detailed technical review.

The Responsible Authorities (RA) role will be to co-ordinate the input of all other Federal, Provincial, and municipal agencies. The DFO and Transport Canada will be the RAs for this assessment. DFO's primary technical interest is to ensure that all Project components, which relate to the aquatic environment, and hence to fisheries habitat and resources, are thoroughly addressed. This includes consideration of surface water and groundwater hydrology, water quality, and fish habitat, all in accordance with its mandate under Section 35(2) of the *Fisheries Act*.

Under Section 35 of the *Fisheries Act*, no HADD to fish habitat can occur unless authorized by the Minister of Fisheries and Oceans. The DFO habitat management policy requires "no net loss" of fish habitat (DFO, 1986). This document states that '*DFO are guided by the following hierarchy of preferences to achieve no net loss of productive capacity:*

1. *For the application of the no net loss principle, the first preference of the Department will be to maintain without disruption the natural productive capacity of the habitat(s) in question by avoiding any loss or harmful alteration at the site of the proposed project or*

activity. This will be especially important where local communities rely on specific fisheries stocks. It may be achieved by encouraging the proponent to redesign the project, to select an alternate site, or to mitigate potential damages using other reliable techniques, such as by installing adequate pollution control equipment.

2. *Only after it proves impossible or impractical to maintain the same level of habitat productive capacity using the approaches outlined above would the Department accede to the exploration of compensatory options. First of all, the possibilities for like-for-like compensation should be assessed; that is replacing natural habitat at or near the site. Should this not be feasible, then secondly it might be possible to consider either moving off-site with the replacement habitat, or increasing the productivity of existing habitat for the affected stock, if reliable techniques are available. Compensation options will not be possible as a means of dealing with chemical pollution and contamination problems; reliable control techniques must be installed and operated to mitigate such problems from the outset.*

3. *In those rare cases where it is not technically feasible to avoid potential damage to habitats, or to compensate for the habitat itself, the Department would consider proposals to compensate in the form of artificial production to supplement the fishery resource, provided the following conditions are met:*

    a) *such a solution will be in accordance with the objectives established in the local fisheries management plan, assuming one is available;*

    b) *genetic and other biological factors are satisfied; and,*

    c) *practical and proven techniques are available.*

4. *The costs associated with providing facilities or undertaking measures to mitigate and compensate for potential damages to the fisheries resource will be the responsibility of proponents, as will the costs to operate and maintain such facilities.'*

As such, in accordance with item number 2 above, any alterations to Three Nations Lake and Three Nations Creek habitat would require compensation.

Transport Canada's technical interests are pursuant to their responsibilities under subsection 5(1) of the Navigable Waters Protection Act, which relates to construction of works in navigable waters. Subsection 5(1) of the Act states:

(1) No work shall be built or placed in, on, over, under, through or across any navigable water unless

    (a) the work and the site and plans thereof have been approved by the Minister, on such terms and conditions as the Minister deems fit, prior to commencement of construction;

(b) the construction of the work is commenced within six months and completed within three years after the approval referred to in paragraph (a) or within such further period as the Minister may fix; and

(c) the work is built, placed and maintained in accordance with the plans, the regulations and the terms and conditions set out in the approval referred to in paragraph (a).

The roles of Health Canada, NRCan and DOE are to provide technical review of the Project, and specifically to assist the RAs in the review of technical aspects of the Project, which are outside of, or peripheral to, DFO's and Transport Canada's mandate under the *Fisheries Act* and *Navigable Waters Protection Act*, respectively. No single agency can be expected to be able to provide expert opinion on all Project aspects. DOE's review will primarily involve consideration of hydrology, water and air quality, and the protection of terrestrial habitats and wildlife, including provisions for overall site restoration, following the completion of mining. NRCan's review will be focused more on the technical aspects related to groundwater assessment and seismicity and Health Canada's role will focus on health issues that relate to the Project including country foods and noise.

1.5.2 Provincial Agencies

The Provincial agencies bring considerable technical expertise to the Project review process particularly with respect to specific knowledge of local conditions and potential community concerns. MNR, MOE, MNDM and MOL are all based locally in South Porcupine.

The MOE grants permits that address Project aspects dealing with water and air quality (including noise), and waste management. MOE's review of the Project will be primarily focused on these aspects. It will also ensure harmonization of provincial and Federal requirements in these areas, including the development and implementation of monitoring programs, and overall environmental management.

The MNR has a broad mandate that includes the administration and management of Crown Land, and the associated resources. This includes aggregates, timber, fish, wildlife resources and surface waters, as well as more generalized aspects related to overall ecosystem quality, function, and management. MNR's role in the review of the Project will therefore be to ensure the protection and wise use of Crown resources, and that communities associated with permitting requirements are clearly identified and documented.

The MNDM has a responsibility to ensure the orderly development of mineral resources in the Province. MNDM plays a fundamentally important role in the Timmins area, given that mining is the primary economic base for Timmins and much of the surrounding area. As part of its general mandate, MNDM has primary responsibility for mine closure activities, and is consequently interested in those aspects of the CEAA Comprehensive Study process that involve site decommissioning and reclamation, following the completion of mining activities.

MTO is currently involved in the Class EA for the Highway 101 realignment and is predominantly ensuring that their requirements are met thorough that process. Once the new Highway 101 realignment is in place and the effective closure and/or abandonment of the original Highway 101 route is complete, MTO concerns with respect to the Comprehensive Study and associated Project related activities would be minimal. MTO will continue to be kept informed of project details consistent with stakeholder consultation requirements.

The MOL is primarily concerned with mine safety aspects, construction projects, and adherence to labour codes and practices.

1.6 Scope of the Project and Environmental Assessment

For the purpose of this environmental assessment the Project comprises the physical works/ activities associated with the following elements:

- Pamour Open Pit Expansion;
- Construction of an isolation dam across Three Nations Lake;
- Partial dewatering of Three Nations Lake;
- Relocation of a portion of Three Nations Creek;
- Alteration of Three Nations Creek shoreline; and,
- Extension of Three Nations Lake.

DFO and Transport Canada, in consultation with the FAs, are responsible for defining the factors to be considered in the environmental assessment, pursuant to Section 16 of CEAA, and the scope of those factors. The factors and the scope of the factors, together, constitute the scope of the environmental assessment.

The guideline issued by DFO and Transport Canada (May 18 2004) provides a point of reference to the Porcupine Joint Venture for the conduct of a comprehensive study, which will satisfy the requirements of the *Canadian Environmental Assessment Act,* to prepare a Comprehensive Study Report (CSR).

1.7 Report Organization and Structure

The report organization and structure follow the general format defined by the CEA Agency for Comprehensive Study level EAs. The purpose in structuring the EA and CSR in this manner is to ensure that all aspects relevant to the Project undertaking and to CEAA legislative requirements are fully and properly addressed.

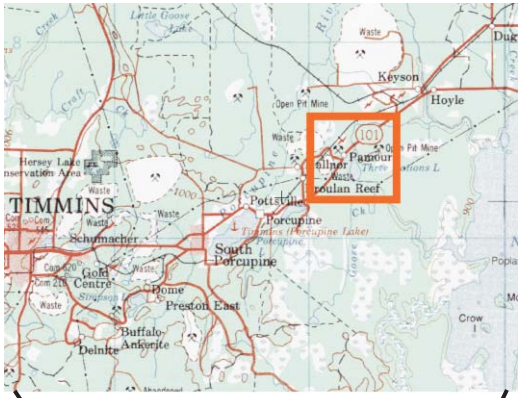
As per the table of contents, the CSR report sections are structured into the following sequence:

1.0 Introduction
2.0 Project Description
3.0 Assessment Methodology and Project Alternative Means

4.0 Description of Existing Environment
5.0 Consultation Program
6.0 Identification of Valued Environmental Components and Environmental Assessment Methods
7.0 Environmental Effects
8.0 Monitoring and Follow-up Programs
9.0 References

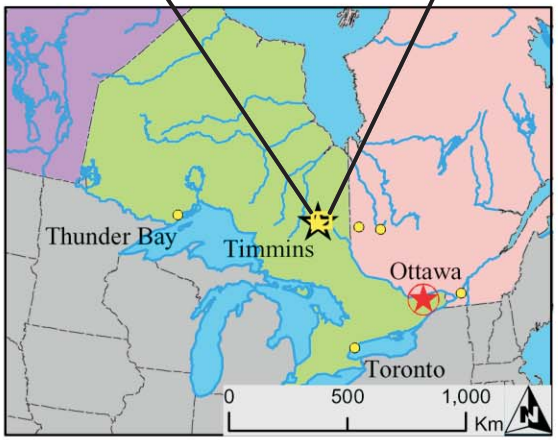
1.8 Technical and Support Documents

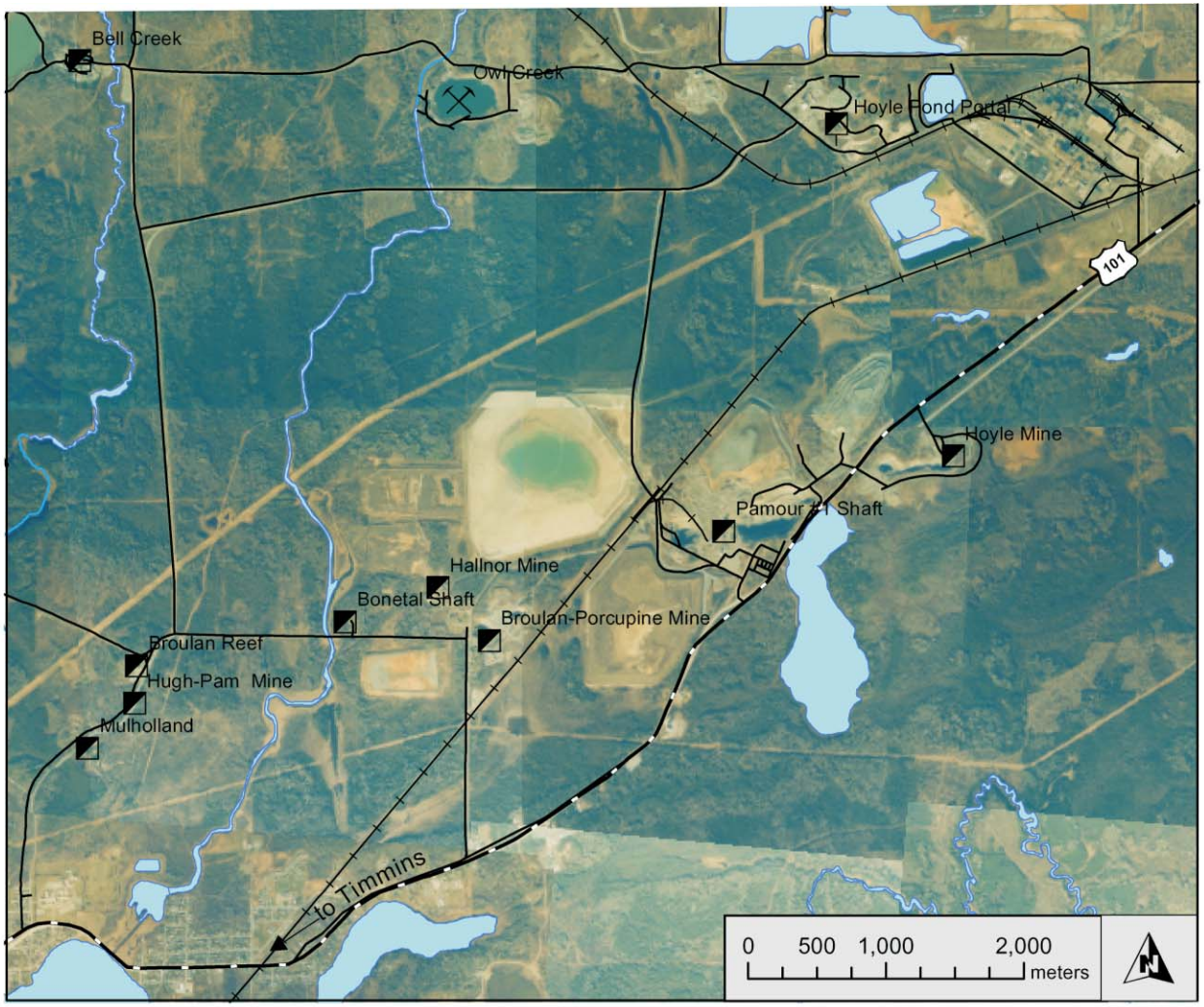
Technical documents are not provided with this CSR document, but can be obtained on request. Copies of all technical documents have been provided to the relevant Federal and Provincial regulators for their review. Technical documents are listed in the CSR references.



Timmins

Ontario





amec

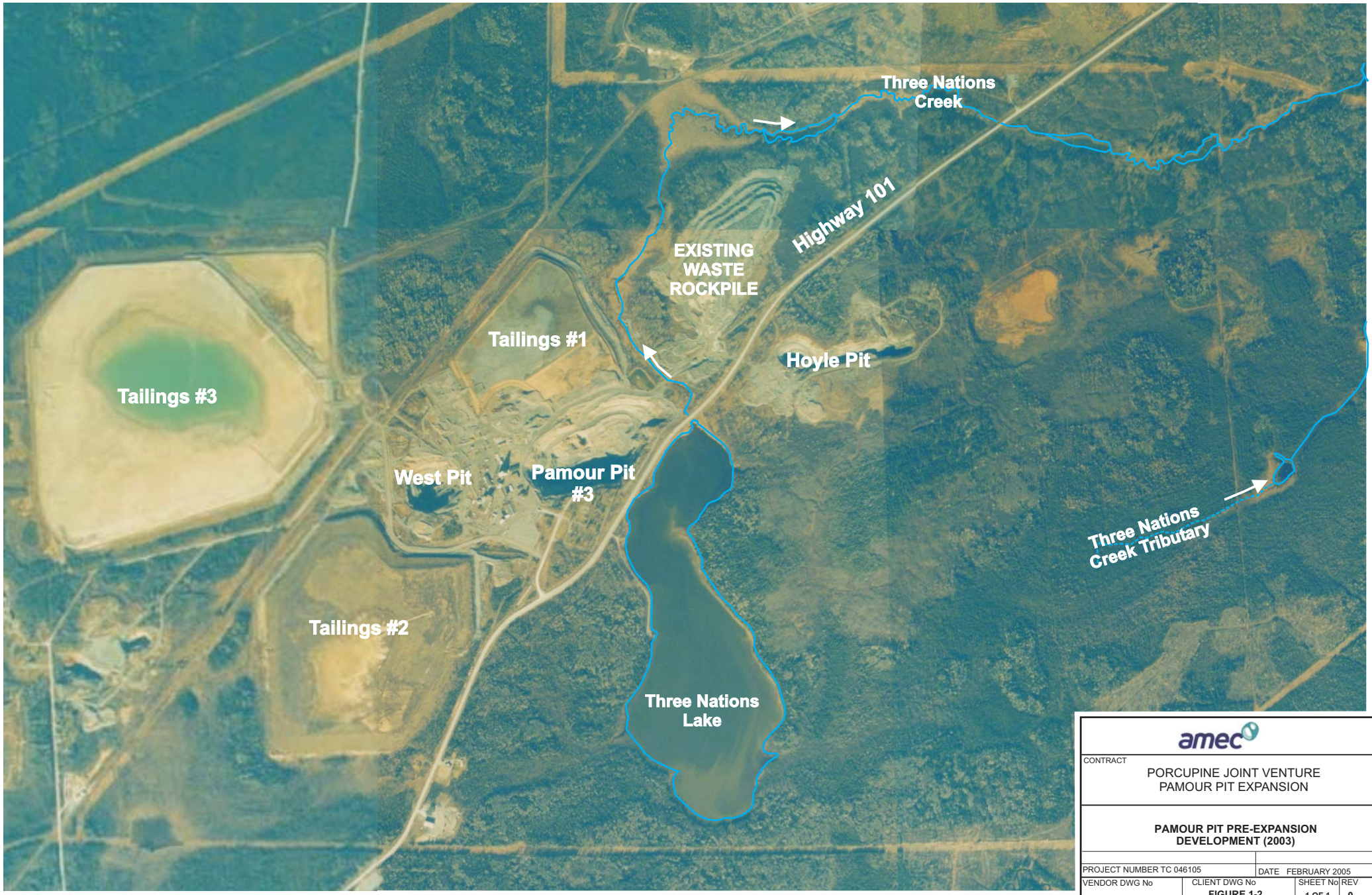
CONTRACT

PORCUPINE JOINT VENTURE
PAMOUR PIT EXPANSION

SITE LOCATION MAP

PROJECT NUMBER TC 046105	DATE FEBRUARY 2005

VENDOR DWG No	CLIENT DWG No	SHEET No	REV
	Figure 1-1	1 OF 1	0



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CONTRACT

PORCUPINE JOINT VENTURE
PAMOUR PIT EXPANSION

PAMOUR PIT PRE-EXPANSION DEVELOPMENT (2003)

PROJECT NUMBER TC 046105		DATE FEBRUARY 2005	
VENDOR DWG No	CLIENT DWG No **FIGURE 1-2**	SHEET No 1 OF 1	REV 0

N

PORCUPINE RIVER

COMMERCIAL ACCESS

EXISTINGS THREE NATIONS CREEK

PAMOUR POWER FEED FROM HOYLE POND

FORMER HWY. 101

FORMER WASTE ROCK PILE

POND

TAILINGS #1

PROPOSED PIT

TAILINGS #3

TAILINGS

TAILINGS

TAILINGS

PROPOSED PIT PERIMETER

PROPOSED EAST WASTE ROCK PILE

PROPOSED HIGHWAY 101 RE-ALIGNMENT

PROPOSED PIT DEWATERING LOCATION

ISOLATION DAM (ROCK INFILL /SEEPAGE BARRIER)

PROPOSED POND

ONR RAIL LINE

PROPOSED FUEL STORAGE

PROPOSED SIREN

PROPOSED OFFICE

THREE NATIONS CREEK REALIGNMENT

HALLNOR TOWNSITE

TAILINGS #2

PROPOSED NO. 2 WASTE ROCK PILE

PROPOSED MEDIUM GRADE STOCKPILE

THREE NATIONS LAKE

THREE NATIONS LAKE REPLACEMENT

TAILINGS

BOAT LAUNCH

HAUL ROAD

GOOSE CREEK

BOB'S LAKE

LEGEND

FOOTPRINT OF PROPOSED SURFACE STOCKPILES

PROPOSED ADDITIONS

amec

PORCUPINE JOINT VENTURE
PAMOUR PIT EXPANSION

PAMOUR PIT POST EXPANSION DEVELOPMENT

SCALE	DATE
1:20000	FEBRUARY 2005
PROJECT NO.	FIGURE NO.
TC046105	1-3

P:\GEO\PJV\CEAA\CEAA FIGURES 2\SECTION 1\FIGURE 1-3.DWG

TABLE OF CONTENTS

Page

2.0 PROJECT DESCRIPTION

2.1 Project Definition

The proposed Pamour Pit Expansion involves an open pit mine development with minimal surface infrastructure. The scale of the open pit allows mining of lower grade ore zones around the historic underground and existing open pit operations and will result in mining through some of the old workings. The ultimate pit limit will be significantly larger than the limits of the three existing pits and will encroach upon existing features such as mine-owned access roads, tailings dams, waste rock piles, as well as provincial Highway 101 (AMEC October 2003i) and Three Nations Lake and Creek. Many of the existing mine-site features will be removed or stabilized during the development of the open pit. To facilitate the pit expansion, supportive work activities will include isolation of the pit from Three Nations Lake and Creek, intrusion into the Three Nations Lake basin, replacement habitat construction and rerouting of flows within the Three Nations Creek watershed.

2.1.1 Summary of Project Requirements

The major works and activities required to undertake the expansion of the Pamour Pit involve both the works that are directly related to open pit mining, as well as the activities that must be applied to facilitate the pit expansion. The project undertakings that are associated with each of these two major components are summarized as follows:

The Pamour Pit Expansion, which consists of the following undertakings:

- Pit overburden stripping including existing Pamour tailings;
- Ore and waste rock mining; and,
- Waste rock management and disposal.

And the following works and activities to facilitate the proposed pit expansion:

- Construction of an isolation dam across Three Nations Lake (Lake Infill);
- Partial dewatering of Three Nations Lake;
- Relocation of a portion of Three Nations Creek;
- Alteration of Three Nations Lake shoreline; and,
- Extension of Three Nations Lake.

The undertakings as indicated above are illustrated in Figure 1-3.

2.1.2 Project Background

Project history has been described in Section 1.1. Historically, Pamour Mine production came from two underground sources of ore and in the latter stages of operations additional ore production was provided from open pits. During the past operating life of the mine, there have been five separate open pits at the Pamour property some of which were combined to arrive at

the present pit configurations. The three main pits represented by the West Pit, Pit #3 and the Hoyle Pit to the east of Highway 101, as shown in Figure 1-2, will be encompassed by the new pit development.

2.1.3 Key Project Related Technologies

Key project related technologies are associated with the lake infill and pit isolation dam development, the overburden and hard rock mining, waste rock disposal, progressive rehabilitation of the mining works and activities, and the habitat replacement implementation. The Project will use conventional technologies for mining, and apply an ecosystem-based approach to the objective of habitat restoration, as developed through consultation with the stakeholder agencies.

Labour Force and Service Requirements

Construction Labour Force

The Pamour Pit Expansion workforce shall be drawn from within the PJV where practical. Staffing for the mining and pit facilitation works and activities, has been divided into the following categories:

Supervision
Overall supervision for the mining operation will be the responsibility of a Mine Superintendent with support from a Construction General Foreman.

Technical
Staff numbers in the engineering/geology group reflect the need to be self-sufficient and multi-skilled in geological modelling, design, scheduling and application of computers for engineering purposes. A project engineer will support Project Management for construction activities.

Operations
Operators will be scheduled 24 hours per day, 7 days per week, and 365 days per year. Four crews will work a rotating schedule. The roster will be working 12-hour shifts on a 4 days on/4 days off schedule.

Maintenance
Mine maintenance personnel are currently set to work the same schedule as the operators. This schedule will require modification to suit the final schedule that is adopted for site maintenance personnel.

The majority of service requirements will be drawn from the local community of Timmins and surrounding municipalities to continue to support the local economy. Specialty services may, on occasion, be retained from a regional, provincial or national base of expertise.

2.1.4 Project Development Schedule

The new pit will proceed in three generally congruent phases over a combined mine life of 11 years and will include the construction and operations stages of the project. The closure and abandonment phase of the project will proceed throughout the mine life through progressive rehabilitation. Ultimate abandonment through pit flooding will require over 25 years as the underground workings and pit fill with groundwater. The following outline summarizes the Phases and associated time frame:

Phase 1:

- Overburden stripping (Q1 2005);
- Resumption of mining in No. 3 Pit in a westerly direction to connect to the West Pit and recover the shaft pillar and additional localized reserves and initiation of waste rock disposal to west pile (Q1 2005 to Q2 2008); and,
- Lake replacement and creek realignment pre-construction (Q1 2005).

Phase 2:

- Overburden, tailings stripping and old Highway 101 removal (2007);
- Lake replacement and creek realignment connection and construction of isolation dam/ lake infill (Q3 2005);
- Pit expansion into old Three Nations Lake basin (2007 to 2011); and,
- Initiation of waste rock disposal to east pile (2011).

Phase 3:

- Extension and deepening of the pit to the east eventually encompassing the Hoyle Pit (2009 to 2016); and,
- Abandonment (2016 + >25 years for flooding).

2.2 Detailed Project Description – Pit Expansion: Mining

The undertakings associated directly with the mining of the pit expansion reflect the requirements for uncovering overburden material to access the ore bearing bedrock zone, the actual mining of the resulting bedrock zone to produce gold bearing ore and residual waste rock, and the management of the excess material or waste rock. A variety of work elements are required to accomplish each of these undertakings and reflect activities in the construction, operation/maintenance and abandonment phases of the project. The following discussions

outline those undertakings and associated elements of the project that are directly related to these mining activities.

2.2.1 Pit Overburden Stripping Including Existing Pamour Tailings

Before mining of ore can commence at the Pamour site, a number of undertaking elements must occur:

- Site clearance (to date, all surface buildings have been removed)
- Overburden removal and relocation of existing tailings;
- Relocation of existing waste rock; and,
- Establishment of pit infrastructure.

Overburden Removal and Relocation of Existing Tailings

Overburden is comprised of soil overlying solid bedrock. It may consist of different material including sand, silt, clay and peat/muskeg. In order to mine the rock below, this material must be moved and stockpiled on site. This material will be saved and reused in construction and reclamation of the mine site. Stockpiles will be maintained beyond 50 m of any watercourse and will include drainage collection systems diverting runoff to the mine water control and management system.

In order to accommodate the west end of the pit expansion in Phase 1, a portion of the existing Tailings No. 2 Dam must be moved. The tailings will be excavated and placed further back in the existing facility. Waste rock from existing stockpiles and the mine operation will be used to buttress the newly excavated slope. This berm will be used to ensure the tailings dam is physically stable and prevent the migration of material towards the open pit operation. Acid Base Accounting (ABA) test results for Dam No. 2 indicate that the tailings are not acid generating. The Net Neutralization Potential (NP) for most of the tailings samples is 100 t $CaCO_3$/1000t or greater. In addition, the results indicate that the tailings could provide some neutralizing capacity to other acid generating materials. Results from the Synthetic Precipitation Leaching Procedure (SPLP) tests show low concentrations for all of the parameters analysed as summarized in the PJV Pamour Closure Plan (AMEC 2003f).

In order to accommodate the north end of the pit expansion in Phase 2, the existing Tailings #1 facility must be moved. The currently accepted method will be to move the material into the middle of Tailings Dam No. 3 as detailed in the Pamour Closure Plan (AMEC 2003f). Testing has shown that the upper layers of the tailings produce Acid Rock Drainage. The general sequence of events to complete the relocation of Dam No. 1 and associated tailings to accommodate the fraction of acid generating tailings to Dam No. 3 and to improve the closure management of this material are as follows:

- Construct rock-fill buttress berms, complete with suitable filter material;

- Complete the removal of water from Dam No. 3 through approved provincial Industrial Sewage Works Certificate of Approval to the Porcupine River;

- Decommission all decant structures within Dam No. 3 to mine closure standards;

- Place relocated Tailings Dam No. 1 in the central part of the main area on Dam No.3. The acid generating tailings located within the upper section and centre of No. 1 Dam will be relocated first and subsequently encapsulated with the remaining acid consuming tailings from the lower sections of No. 1 Dam;

- Complete final grading of Dam No. 3 to promote surface runoff;

- Cover the entire tailings facility with locally sourced and provincially approved pulp and paper biosolids and establish permanent vegetation groundcover for dust suppression and overall rehabilitation; and,

- Construct perimeter runoff/seepage collection ditches to direct water away from the tailings facility and through existing drainage channels leading to the Porcupine River.

ABA test results for Dam No. 3 indicate that the tailings are not acid generating. The Net NP for most of the tailings samples is 100 t $CaCO_3$ /1000t or greater. In addition, the results indicate that the tailings provide neutralizing capacity to other acid generating material such as tailings from Tailings Dam No. 1. These proposed closure activities have been approved under provincial process.

Relocation of Existing Waste Rock

Existing waste rock piles are principally located to the east of the existing No. 3 pit. Material within the new pit perimeter will be salvaged for various constructions related activities where rock fill is required including access roads, berms and infills, or will be rehabilitated through progressive closure measures.

Establishment of Pit Infrastructure

Pit infrastructure development will include the construction of access roads to, and surrounding, the open pit, establishment of a site water management system, and installation of a mine groundwater dewatering system. This infrastructure will be constructed in areas that have been previously disturbed as a component of both the previous mining and processing facilities. The site drainage collection system, through a series of ditches and bermed areas, will be oriented to intercept all stormwater runoff from the site such that it is captured in the mine water management system (Sections 2.2.2 and 2.2.3).

2.2.2 Ore and Waste Rock Mining

The mine plan involves the removal of ore and waste rock in the 3 phases as described in Section 2.1.4. Mining operations will include the following activities undertaken in sequence:

- Drilling and blasting;
- Loading and hauling of the ore and waste rock; and,
- Water Management.

Mining

Mining will be by a conventional open pit method. Pit slopes will be dependent on rock type with bench heights of 9 m in ore and waste. Most pit ramps have been designed at a 26.5 m width and 10% grade to accommodate 136-tonne, 6.64 m wide haul trucks and to optimize haul fleet productivity. The final benches of each phase are accessed using a 13.25 m wide ramp, with a maximum grade of 12%.

Mining in waste rock will be carried out with a P&H 2300 rope shovel and in ore by a new or used 21 cubic yard front-end loader. The loader is used to facilitate grade control at ore-waste contacts, within areas of tighter digging conditions at depth and to provide flexibility due to the geometry of the pit. An auxiliary loader (CAT 992G wheel loader) will be used in the event of other equipment down time.

A fleet of 14 Caterpillar 785 haul trucks will haul waste rock to disposal areas and ore directly to the Dome Mill via the previously constructed haul road. This includes one additional truck to facilitate the transport of Hoyle Pond ore, which will effectively remove approximately 25-haul trucks/day from the Highway 101 route that presently passes adjacent to residential areas of Porcupine and South Porcupine.

Ancillary equipment will consist of a combination of new and used units to develop and service the roads, dumps, pit floors and drilling patterns. The specifications, status (new vs. used), and the number of each type machine required are listed below.

Dozers – D9R	2 new, rebuild 1 existing D9N
RTD – CAT 824	1 conversion of existing CAT 992D
Road Graders – CAT 16H	2 new, rebuild 1 existing 16G
Backhoe – CAT 385	1 new
Service trucks	4 new (includes buses for crew transportation)
Tire handler – CAT 966	New or rebuild existing
Water carts	1 used with tank refurbish

New equipment units were selected to replace some of the older units in the current Dome equipment fleet, with additions being made to enhance fleet capabilities in some areas. All equipment will be fully maintained in the most efficient operational condition, consistent with provincial standards, to minimize unnecessary generation of additional noise and air emissions.

Water Management

The Pamour mine discontinued operations in September 1999 at which point the underground workings began to flood. The last water elevation taken at the Pamour shaft in September 2004 indicated a water elevation of about 230 m below the shaft collar for a rise of approximately 687 m in 5 years. As multiple large historical openings are encountered in the upper levels the mine workings, including adjacent abandoned mining complexes, water rise is expected to be slower in the future. Water level measurements will be ongoing throughout the project development and operation.

Pamour pit dewatering will accomplish two goals; to keep the mine water from affecting pit operations, and for use as an onsite source of water for dust control along the site access haul roads and pit ramps. Past historical operating performance at Pamour indicated reasonable water quality meeting MISA (O. Reg. 560/94) effluent quality criteria. As such, the discharge water for the pit expansion will continue to be pumped from a large diameter borehole drilled in the vicinity of the Pamour West Zone into the existing effluent management and discharge system. The water will be directed to the Tailings No. 3 pond for settling prior to discharge to the Porcupine River through a series of decants towers and diversion channels as per an existing Certificate of Approval issued by the Ministry of Environment.

The overall site grading will direct all runoff from areas of the pit perimeter and the waste rock disposal areas to the pit opening, underground workings or the mine water pond. In this fashion, the mining operation will be fully contained to control all site water, maintain treatment and discharge through existing permitted facilities, and eliminate the need for discharges to Three Nations Creek.

2.2.3 Waste Rock Management and Disposal

The open pit expansion will generate a significant amount of waste rock for storage at the Pamour Mine site. The waste rock piles will be designed to store up to 157.6 million tonnes of material (AMEC 2003f). Potential storage areas, which are shown on Figure 1-3, include:

- No. 2 Main Waste Rock Pile that will encapsulate the No. 2 Dam and associated tailings; and,

- East Waste Rock Pile, a new pile to be located south of the Hoyle Pit and east of Three Nations Lake.

Rock will be stored in a series of lifts, guided by the physical limitations of the underlying soils. Rock will be moved by haul trucks from the open pit to the designated waste rock storage pile

The No. 2 Main Waste Pile is located to the west of the open pit and will encompass No. 2 Dam in its entirety. The waste rock pile will ultimately contain 87.6 million tons of waste rock from the Pamour open pit. The site was selected as it facilitates a short waste rock haul, and provides

the opportunity to progressively rehabilitate and stabilize the existing No, 2 Tailings dam. This was recognized as an environmental benefit. The pile will be developed in a manner such that each layer will be completely developed prior to the initiation of the next layer. Geotechnical stability investigations within the footprint of the dump (Knight Piésold 2002, 2003) have been conducted to assess the underlying soil conditions and provide a design basis for ensuring long-term stability of the combined waste rock tailings structure. The initial buffer layer encompassing the No. 2 Dam will contain 4.2 million tonnes of waste rock. An additional 8.5 million tonnes of waste rock will be added to form the foundation for the entire waste rock dump. Subsequent layers will contain 30.5, 28.8, and 16.4 million tonnes of waste rock, respectively. The majority of material within the No. 2 Main Waste Rock Pile will originate from Phase 1 and 2 of the mining sequence.

The waste rock pile will be developed with an overall slope of 5:1 horizontal to vertical (Knight Piésold, 2002). In doing so, any requirements for resloping and recontouring of the dump upon final closure will be minimized. Progressive reclamation measures will be maximized during mine operation to minimize post closure reclamation efforts and costs. These will include covering the outer slopes with 15 to 30 cm of overburden and broadcast seeding to initiate a self-sustaining permanent vegetative cover.

The East Waste Rock Pile is located to the south of the proposed ultimate open pit and east of Three Nations Lake. The waste rock pile will receive approximately 50 million tonnes of waste rock. The majority of material in the pile will originate from Phase 3 of the mining sequence. The waste pile footprint has been designed to be a minimum of 200 m from all surface waters including the future Three Nations Lake replacement basin and new outflow channel.

Similar to the No. 2 Main Waste Rock Pile, the East Waste Rock Pile will be developed with an overall slope of 5:1 horizontal to vertical (Knight Piésold, 2002). In doing so, any requirements for resloping and recontouring of the pile upon final closure will be minimized. Progressive reclamation measures will be maximized during mine operation to minimize post closure reclamation efforts and costs. These will include covering the outer slopes with 15 to 30 cm of overburden and broadcast seeding to initiate a self sustaining vegetative cover.

The piles were designed using 25° side slopes, with construction performed in 30 m lifts. The piles may be segregated to allow for retrieval of marginal grade material for processing at a later date should economic conditions change.

Existing and future waste rock for the Pamour mine has been sampled on a number of occasions and has been summarized in (Knight Piésold 2003). All rock types from the Pamour site were sampled. The Acid Base Accounting data indicates that over 97% of the samples to be acid consuming. As a result, there is no concern for any acid generation potential from the waste rock.

2.2.4 Key Activities Associated with Pit Expansion: Mining

The following descriptions are provided to summarize the key activities that are associated with the undertakings associated with each phase (COMA) of the pit preparation for uncovering overburden material to access the ore bearing bedrock zone, the mining of waste rock and gold bearing ore, and the management of the excess material or waste rock.

2.2.4.1 Key Activities: Construction

The majority of elements associated with the pit overburden stripping are considered construction related and will be undertaken at various phases in the project development as the pit outline expands towards the ultimate configuration. The key activities associated with overburden removal and relocation of existing tailings, relocation of existing waste rock, and establishment of pit infrastructure include the following:

Vegetation Clearing and Removal: The majority of the area to be stripped has already been disturbed by previous mining activity, therefore vegetation clearing is a minimal aspect of this work.

Excavation and Earth Moving: This aspect of the work represents the major activity of construction. Over the life of the mine, approximately 12.5 million tonnes of overburden will be stripped from the open pit area and up to 5.4 million tons of tailings from the No. 1 dam will be moved to the No. 3 tailings area. Existing waste rock piles located within the proposed pit perimeter will also contribute 1,321,000 tonnes of material. These materials will be removed using conventional mining equipment consisting of large tonnage excavators, loaders, and haul trucks. Finer grading of overburden stockpiles, tailings placement and capping, and overburden perimeter sideslopes will be undertaken with dozers.

In order to ensure the long-term physical stability of excavations through less competent materials and minimize the requirements for resloping of the pit perimeter at the end of mining operations, slopes will be developed at 18^{o} and 25^{o}, respectively, using overburden materials and existing waste rock piles. In doing so, revegetation measures can be implemented as a progressive reclamation initiative thereby minimizing post mining abandonment activities.

Water Management: During the earth moving operation, any site runoff will be directed to the mine water management system (Section 2.2.2), which will report to the No 3 dam (as per previously permitted mine operations). This runoff interception will also serve the function of erosion and sedimentation control. Groundwater levels are presently estimated to be about 264 m below the pit crest elevation and as such, no major groundwater management will be required. Any minor shallow groundwater within the shallow overburden area of the pit perimeter will also report to the mine water system.

Vehicle Activity: The excavators will be active within the pit perimeter, while the haulers and dozers will be moving between the stripping and stockpiling/disposal locations. These activities will be carried out within the confines of the existing mine infrastructure layout and will make use

of existing and newly constructed access roads. Interference with local traffic will be avoided with the ultimate relocation of Highway 101, another PJV activity approved through Provincial process.

With roads constructed of rock materials, dust generation is anticipated. Water spraying or other dust suppressants acceptable to MOE will be used as required during drier months to prevent any dusting issues.

2.2.4.2 Key Activities: Operations/Maintenance

Drilling: Blasthole drilling will be performed by 20 tonne and 40 tonne track mounted production rotary drill rigs in ore and waste, respectively, producing 20 cm diameter holes. The blastholes drilling pattern typically involves a 6 x7 m grid pattern to a depth of about 11 m.

Blasting: Blasting will be conducted by a qualified external contractor who will load the drill holes with ammonium nitrate fuel oil (ANFO) explosive, and then detonate. ANFO typically consists of 94% ammonium nitrate and 6% diesel fuel. The ANFO will be mixed in the hole, followed by packing of the hole with drill cuttings. Any spilled ANFO will be mixed with the hole cuttings for packing such that all spilled material is available for blast consumption. Typical performance at the Pamour Mine resulted in approximately 5% of the ANFO remaining undetonated in dry conditions. This is a minor residual amount that will report to the minewater management system through runoff. Explosive combustion products also contribute to air emissions, but these are typically minor with no environmental effects.

Blast vibration monitoring conducted at other similar open pit operations have shown that production blasting of waste rock and ore will not be an issue. As a supplemental measure, a blast vibration monitoring program will be implemented in proximity to the Pamour Pit.

Vehicle Activity: Ore and waste rock loading, ore and waste rock haulage and waste rock dumping in disposal areas will be the principal mining activities that include extensive vehicular use as specified in Section 2.2.3 and 2.2.4. Principal air emissions associated with this vehicular use and associated activities include fugitive dust and emissions from diesel fuel combustion including particulates, SO_2 and NO_x.

In terms of fugitive dust (diameter <30 µm), dry open pit mining operations generate a conservatively estimate of 2.5 kg/tonne of ore produced (EAG and Kilborn 1992). This fugitive dust is largely generated by the haul trucks travelling on site access roadways. As a regular component of the mine operations, the open pit ramp and haul roads are treated with water or surfactants as dust suppression mitigation to comply with MOE standards.

Typical open pit gold mining operations utilize approximately 4 litres of diesel fuel per tonne of ore produced (EAG and Kilborn 1992). Relative to Pamour Pit production rates, this would result in daily fuel consumption on the order of 52,000 litres. Through application of USEPA 1993 emission factors from diesel fuel combustion, daily emission rates at the Pamour mine would be 22 kg of particulates, 354 kg of SO_2, and 1128 kg of SO_x . Based on the experience gained from

similar work activities at the Dome Open Pit, effects of combustion emissions from vehicles is not expected to be significant as emissions disperse to the atmosphere.

Noise emissions will also be principally generated by the vehicular activity of the diesel operated mobile equipment operated in the pit and the haul roads between the pit and waste rock disposal area. The Dome Mine operation, which is similar to that proposed at the Pamour Pit expansion, has indicated that the loudest sources of noise produced at a distance of 15 m range from 78 dBA while idling, to as high as 97 dBA during the noisiest operation. The noisiest operations include accelerating upgrade, lifting haul truck boxes, and dumping loads. Additional audible noise sources associated with the vehicular activity includes safety regulated warning and signalling devices such as horns and back-up beepers, and the sound of falling rock while dumping.

Noise assessment studies completed by Valcoustics Canada Ltd. (2003) indicate that noise levels from the open pit operation, including the waste rock piles, can be mitigated with the construction of rockfill attenuation berms. The berms would be constructed along the western perimeter of the open pit until the pit is operating below ground surface. Construction of rockfill berms along the western perimeter of the waste rock piles will also be adequate to attenuate noise levels. The effectiveness of noise attenuation measures will be confirmed via a noise monitoring program for the site.

Mine Water Management: The dewatering strategy is to establish a pump line consisting of three 200 horespower submersible rotary type pumps in 300 mm diameter boreholes into the mine workings at the Pamour West Zone adjacent to the south berm of the #3 Tailings Pond. These boreholes would be drilled to a point below the ultimate pit depth to maintain the underground water level below the ultimate pit bottom, and allowing for additional surge capacity for spring freshet and unusual storm conditions.

Past historical operations at Pamour indicated an overall yearly average flow of 400 US gpm into the mine workings. The last water measurement taken in April 2003 indicated that the shaft water level was at 333 m below the collar. As the expanded pit will be in direct contact with the same underground workings in Phase 3, the overall pit inflow will likely not vary from that historically experienced.

Mine water will be pumped into a surface mine water settling pond system established at the southwest side of the Pamour Pit for use in dust suppression activities during the dry summer months. All excess water will be pumped into the No. 3 Tailings Pond basin and ultimately discharged to the environment through the existing conveyance system to the Porcupine River as per previous mining operations.

As in past historical operations at Pamour, final effluent water quality will not be expected to be an issue and is anticipated to meet provincial Certificate of Approval and MISA requirements. As well, the effluent will be subject to the monitoring requirements of the federal Metal Mining Effluent Regulations.

All indications show that the water that will be pumped from the mine workings for discharge will be of a better quality than the water that was being discharged from the former Pamour operation. This is anticipated due to the fact that milling of ore is not a component of the Pit Expansion activities.

Based on historical site performance, it is expected that total suspended solids may be the principal effluent water quality concern. Permitted effluent discharge limits will be consistent with both the provincial and federal regulations at 15 mg/L as a monthly average, and 30 mg/L as a daily limit.

Under the proposed additional settling treatment that will be available in the surface mine water pond combined with the existing detention time available in the No. 3 Tailings Pond, these standards can be fulfilled. Total ammonia levels are also anticipated to be low at <5 mg/L, similar to other PJV operations.

2.2.4.3 Key Activities: Abandonment

Excavation, Earth Moving and Revegetation: Major site features such as the waste rock piles and certain parts of the pit and accessible underground access features will be abandoned through a process of progressive rehabilitation throughout operations.

Features that can not be accommodated through progressive rehabilitation such as the pit perimeter access roads, service yards and laydown areas, will be top-dressed with overburden materials and fine graded to establish the vegetation covers for closure. Sideslopes of waste rock piles will also be covered with a 30 cm layer of overburden material such that a permanent vegetation cover can be established.

Ditches and drainage features that previously directed water to the mine water management pond or open pit, will be rerouted to ensure that drainage is directed to the pit.

These activities will all involve some minor grading and earth hauling intended to be completed by a limited fleet of dozers and haulers.

Vehicle Activity: As indicated above, a minor fleet of small earth moving equipment will be remain on site to final grade features, place final covers and establish permanent vegetation cover. This will be an intermittent process following the final year of mining until such time as the works are complete and the site stabilized. Light vehicle activity will also be required during the follow-up period to fulfill ongoing monitoring requirements.

Mine Water Management: The Pamour pit is intended to fill with water through natural processes. With mine dewatering activity halted, and all site drainage to be directed to the pit, the enclosed system will passively fill over an extended period of time (>25 years). The ultimately flooded pit has not been specifically targeted as a habitat feature in the abandonment design, however, with stable sideslopes developed in the overburden, the facility will be permitted to naturalize to become a surface water feature adjacent to Three Nations Lake.

2.2.4.4 Key Potential Accidents, Malfunctions and Unplanned Events

The following accidents, malfunctions and unplanned events are recognized as potential activity related incidents, associated with the mining activities, which could influence the environment in the event of their occurrence during the Project life:

Construction:	Fuel and/or other hazardous materials spills (on land and in water) Flooding of the work area Erosion and sedimentation control measure failure
Operation/Maintenance:	Fuel and/or other hazardous materials spills (on land and in water) Isolation Dam Infill /seepage barrier failure with resultant leakage;
Abandonment:	Fuel and/or other hazardous materials spills (on land and in water)

2.3 Detailed Project Description – Works and Activities Required to Facilitate Pit Expansion

Key elements of work anticipated to successfully facilitate the Pamour Pit Expansion project include five works and activities associated with a compensation program for the fish and fish habitat required for authorization under the *Fisheries Act*. Although such compensation is considered environmental mitigation for the alteration of fish habitat and resources, the work activities and engineered structures required to satisfactorily complete the compensation plan constitute activities and processes that in themselves could cause potential adverse environmental effects on the receiving environment. Accordingly, the following sections briefly describe those anticipated activities associated with the Project broken down into the major phases (construction; operation, maintenance; and abandonment of the Project for the purposes of meeting the requirements of the *Canadian Environmental Assessment Act*.

For the context of this assessment it is important to identify activities that, although they may be typical of similar construction projects, are not anticipated as part of these Project elements and are summarized as follows:

- There is no requirement for drilling and blasting;
- There are no process waste water or effluent discharges;
- There will not be any construction camp requirements;
- Water and sewage services are already in place or as per typical construction practices; and,

- Small amounts of construction wastes, if any, will be handled through existing practices at the PJV at an approved landfill site.

While the presentation of information on activities associated with each of the Project phases for consideration in the assessment may be repetitive (as many activities are common to more than one phase), they provide context for the environmental effects analysis later in Section 7 and allows the reviewer to easily check that project activities anticipated were fully assessed and each Valued Ecosystem Component (VEC) identified as a result of the assessment methods.

2.3.1 Three Nations Lake Replacement: Alteration of Shoreline and Lake Extension

In order to compensate for the loss of fish and fish habitat due to the planned pit expansion, PJV proposes to replace the dewatered portion of the lake with new lake habitat southeast of Three Nations Lake in a lowland area. The proposed new habitat will offer a similar or enhanced habitat to that which presently exists and will include spawning areas and shallow littoral zone habitat. The maximum excavation for the lake is anticipated to be 3 m, with an overall average of 1.5 m. The habitat alterations and the proposed compensation and enhancement measures to accommodate for the alterations have been summarized by AMEC (2004e) and clarified in PJV (2004b)

General Lake Replacement Design

The volumes of Three Nations Lake proposed for dewatering due to the isolation dam construction were calculated using a detailed bathymetry survey (AMEC 2003h). In order to compensate for the loss of fisheries habitat as a result of the isolated lake area, Three Nations Lake would be expanded in lowlands to the southeast of the existing lake basin consistent with concepts presented in AMEC 2004a and PJV (2004b).

A key criterion for alternative lake replacement configuration was that the altered surface area of the existing lake basin would be as closely approximated as possible (13.3 Ha). The proposed perimeter of the lake replacement was also delineated based on ground truthing (AMEC 2004e) that accounted for protection of prominent natural features such as the stands of mature coniferous forest (black spruce/larch) that would maintain terrestrial corridor/linkage and habitat functions along the new lake basin. The lake volume and the shoreline perimeter will be greater in the lake replacement than the existing lake section to be lost resulting in a long-term net enhancement.

Lake Level Control

The designed lake replacement would involve stabilizing the normal lake water level at 285.6 m. Presently, the water level fluctuates based on seasonal conditions and is controlled by an outlet weir. During intermittent summer conditions, typical low water levels were noted at approximately 285 m. The lake level control feature would be constructed at the new lake outlet, which would drain to the proposed Three Nations Creek realignment. The new grade control structure, constructed of infilled rock scour protection, would essentially have a natural floodplain cross-section allowing more natural and moderated lake level fluctuations.

Lake Replacement Depth Profile
A maximum basin depth of 3 m was established based on a preferred maximization of fish over-wintering habitat, a feature somewhat limiting in the existing lake basin. Wet clays beyond this 3 m depth were also considered materials that would be an impediment to efficient excavation and fine grading with heavy equipment.

General Excavation
The perimeter of the firm brown clay excavation would be undertaken at 1.5H:1V side slopes. To maintain access for excavation and accommodate long-term organic slope adjustments, a 5 m bench was also included around the perimeter of the clay excavation. Excavation in organic soils would be undertaken at minimum stable sideslopes of 5:1.

Lake Connection and Associated Shoreline Alteration
Ultimately, the Three Nations Lake Replacement will require connection to the existing Three Nation Lake basin. This connection will result in removal of the earth plug separating the two basins and excavation of lakebed material to establish a contoured channel that will permit a functional connection for both ecosystem integration and recreational use such as navigation as described in AMEC 2004a.

2.3.1.1 Key Activities: Construction

The key activities associated with the Construction aspects of these elements include:

Vegetation Clearing and Removal: The vegetation clearing will largely be undertaken in lowland forest dominated by shrub growth and kept to a minimum to meet the design “footprint’ of the Lake replacement. The lake perimeter was delineated to protect the majority of adjacent mature semi-mature forest. Clearing will be undertaken in the winter outside of the migratory bird nesting period. Merchantable timber and other shrubs and woody vegetation will be removed using mechanical methods under a License to Harvest through the Ontario Ministry of Natural Resources.

Excavations and Earth Moving: Once local vegetation has been removed, heavy equipment will be used to excavate and remove topsoil and overburden. Topsoil will be stored separately from overburden for use in the reclamation/revegetation plan for this Project and/or as required in other local activities of the PJV. Similar activities using heavy equipment will be required for the placement of materials to meet the design specifications for the new habitat (e.g., clay, rock/ aggregate etc.) constructed. To the extent possible, work will be done in the dry, with work areas dewatered as required to minimize the potential for the release of fines and other sediments into adjacent waterbodies. A temporary earth plug consisting of a 30 m wide section of shoreline will be maintained between the existing and lake replacement basin to isolate the work activities and provide the new basin a period of time to stabilize before connection. This plug will be removed once the lake replacement has stabilized, allowing the habitat to be accessed by the Three Nations Lake aquatic biota.

Where the use of heavy equipment is required in watercourse, an approved erosion and sedimentation control plan will be applied (AMEC 2004a). There will be no equipment refuelling near or adjacent to watercourses and, as well, no fuel or other hazardous material stored near any waterbodies. Earth moving will be a conventional load-haul-dump operation and the temporary placement of topsoil and overburden will be only at designated locations that follow procedures of the erosion and sedimentation control plan to prevent the uncontrolled release of fine materials into nearby watercourses.

Large scale alterations to ground elevations as a result of excavations for the creation of new fish habitat and the alteration and management of surface flows will alter the local shallow groundwater. This is important to establish new drainage patterns through the channel diversion.

The plug and connecting channel construction would be conducted in the wet with isolation of the work area with a floating boom turbidity curtain that will be extended into the existing Three Nation Lake basin and new basin to encircle the work area. A similar turbidity curtain will also be extended in the lake replacement basin to protect the newly stabilized habitat. Light duty silt fence may be applied along temporary access road leading to the work area to capture any storm water runoff. Excavated material will be hauled off site to be stockpiled and used in other mine related rehabilitation activities as required. Stockpiles will not be located within 100 m of either the new or original basin. The turbidity curtain shall remain in place following removal of the earth plug and connection channel construction until such a time that the suspended solids have settled and shorelines are deemed to be stabilized. Disturbed soils along with shoreline will be seeded with a nurse crop to provide temporary ground cover that will promote recolonization of the native riparian vegetation. The excavation of the earth plug between the work area and Three Nations Lake would not occur between April 1 to June 30 to accommodate a warmwater fisheries timing constraint (unless otherwise authorized by MNR) to protect fish spawning and incubation periods;

Vehicle Activity: Heavy equipment will be used in the construction of Project elements and to the extent possible traffic will be controlled to PJV access/haul roads and property with no or minimal intrusion on public roads and thoroughfares. Construction activities will also generate minor, short-term noise, dust, and combustion emissions t as a result of vehicle movements and operations. Construction will take place during typical working hours and will be quite isolated from any residential receptors. Noise from the vehicles will be no different than in any other typical short-term construction utilizing a small fleet of excavators, dozers and haulers. Proper maintenance controls on the equipment will ensure excess noise due to mechanical problems will be reduced or eliminated. Due to the high groundwater table, and construction activities largely confined to winter, it is not anticipated that dust will be an issue. Fuel and other hazardous materials will not be stored near waterbodies and vehicles/boats will not be refuelled near the water.

2.3.1.2 Key Activities: Operation/Maintenance

The key activities associated with the operation and maintenance phase of the Project include the following:

Sedimentation/Erosion Control: Once the key elements of the compensation plan are in place, the key activity during the operation/maintenance phase of the Project will include the monitoring and management of all erosion and sedimentation control devices and features including ground repair, silt removal and revegetation of disturbed areas. This will minimize and reduce long-term release of sediments into surface drainage and waterbodies. It is recognized that some degree of natural erosion is anticipated as a component of functioning waterbodies and shorelines.

Vehicle Activity: Vehicles will be operated in the project area during operation and maintenance activities, as well as small boats used during follow-up programs to investigate the success of the compensation plan, as well as monitoring to ensure regulatory compliance is being achieved for all relevant permits, authorizations and approval. Similar to the Construction phase, fuel and other hazardous materials will not be stored near waterbodies and vehicles/ boats will not be refuelled near the water.

Vehicle activity will result in noise, dust and exhaust emissions, however these will be very minor and infrequent. Noise from the vehicles will be no different than for any other typical local traffic. Proper maintenance controls on the equipment will ensure excess noise due to mechanical problems will be reduced or eliminated.

2.3.1.3 Key Activities: Abandonment

For the purposes of this assessment, there are no activities anticipated that require assessment during the abandonment or decommissioning phase. The Project is anticipated to yield a successful and long-term (in perpetuity) naturally functioning system as compensation for alterations to fish and fish habitat as negotiated under the *Fisheries Act*, and as such will not be removed or decommissioned during project abandonment.

2.3.1.4 Key Potential Accidents, Malfunctions and Unplanned Events

The following accidents, malfunctions and unplanned events are recognized as potential activity related incidents, associated with the lake replacement, which could influence the environment in the event of their occurrence during the Project life:

Construction:	Fuel and/or other hazardous materials spills (on land and in water) Earth plug failure Flooding of the work area excavations Erosion and sedimentation control measure failure
Operation/Maintenance:	Fuel and/or other hazardous materials spills (on land and in water)

Abandonment: Not considered applicable for the purposes of this assessment since feature is designed to function naturally in perpetuity.

2.3.2 Three Nations Creek Relocation

In order to compensate for the direct physical habitat loss represented by the isolation dam requirements (0.6 km^2), the indirect habitat alterations associated with flow reductions considered to represent a HADD (2.1 km^2), and provide for a new outlet for Three Nations Lake, a creek realignment has been proposed. This creek realignment will commence at the east end of the proposed lake replacement and will flow in a north-easterly direction through the new Highway 101 culvert crossing, then terminate into an existing beaver pond which represents the upstream extent of an existing tributary of Three Nations Creek.

The proposed creek realignment, shown on Figure 1-3, will exhibit a length of 2.6 km and a wetted surface area of approximately 8,925 m^2. The proposed channel was designed to be consistent with the general diagnostic features of existing Three Nations Creek reaches that exhibited a well defined meandering channel. An objective of the design process was to provide a defined channel to promote suitable habitat conditions for the resident forage fish community and sustain multi-season availability of this habitat. The habitat alterations and the proposed compensation and enhancement measures to accommodate for the alterations have been detailed by AMEC (2004d), and PJV (2004b).

Collectively, the proposed 2.6 km realignment and 2.1 km flow enhancement of the receiving tributary represent habitat compensation opportunities that approach the approximately 5.6 km of intermittently flowing creek habitat that are both directly or indirectly influenced by the proposed works and activities. In evaluating the compensatory measures it should be noted that in addition, approximately 3.1 km of the original Three Nations Creek channel will continue to maintain aquatic habitat functions consistent with the intermittent flows that are observed for much of the summer and winter.

The evaluation of habitat alterations and proposed compensation measures indicates that the channel realignment will accommodate the basic criteria of “like-for-like” and “no-net-loss” of habitat for compensation requirements, with the potential for an overall net enhancement. Essentially, the creek realignment will achieve the creation of a new aquatic corridor reach that no longer passes directly through areas of major mining related land use.

2.3.2.1 Key Activities: Construction

The key activities associated with the construction aspects of this element are similar to those anticipated for the alterations and modifications for Three Nations Lake, and include:

Vegetation Clearing and Removal: It is anticipated that vegetation will be cleared in an area kept to a minimum to meet the design “footprint’ of the realignment of Three Nations Creek. Merchantable timber will be removed using hand held equipment and other shrubs and woody

vegetation will be removed using mechanical methods under a License to Harvest through the Ontario Ministry of Natural Resources. The work will be conducted so as to minimize disturbance to the proposed new channel and floodplain area.

Excavations and Earth Moving: Once local vegetation has been removed, lightweight excavation and hauling equipment will be used to excavate and remove topsoil and overburden in the design limits for the creek realignment. Topsoil will be stored separately from overburden for use in the reclamation/revegetation plan for this Project and/or will be sidecast in low profile mounds intended to naturalize. Heavy equipment will be required for the placement of materials to meet the design specification for the new habitat (e.g., clay, rock/aggregate, etc.) constructed and grade control features. To the extent possible, heavy work will be done in the dry and work areas dewatered as required, to minimize the potential for the release of fines and other sediments into adjacent waterbodies. Where work is required to connect design features at the terminal ends of the realignment, an approved erosion and sedimentation control plan will be applied (AMEC 2004a). There will be no equipment refuelling near or adjacent to watercourses and, as well, no fuel of other hazardous material stored near any waterbodies. Appropriate drainage control and erosion and sedimentation control measures as approved by DFO and MNR will be in place to prevent the uncontrolled release of fine materials from any temporary stockpiles into nearby watercourses.

Vehicle Activity: Both light and heavy equipment will be used in the construction of Project elements and to the extent possible traffic will be controlled to PJV access/haul roads and property with no or minimal intrusion on public roads and thoroughfares.

Vehicle activity will result in noise, and exhaust emissions. The equipment used in this element of the Project is similar to the equipment used in the Three Nations Lake modifications, however the work anticipated for the creek relocation is at a comparatively reduced scale. Noise from the vehicles will be no different than in any other typical construction activities. Proper maintenance controls on the equipment will ensure excess noise due to mechanical problems will be reduced or eliminated. Due to well-saturated soil conditions, and scheduled winter work, it is not anticipated that dust will be an issue. Fuel and other hazardous materials will not be stored near waterbodies and vehicles/boats will not be refuelled near the water.

2.3.2.2 Key Activities: Operation/Maintenance

The key activities associated with the operation and maintenance aspects of this element of the Project include:

Sedimentation/Erosion Control: Once the key elements of the compensation plan are in place, the key activity during the operation/maintenance phase of the Project will include the monitoring and management of all erosion and sedimentation control devices and features along the creek realignment including ground repair, silt removal and revegetation of disturbed areas to minimize and reduce long-term release of sediments into surface drainage and waterbodies.

Vehicle Activity: Vehicles will infrequently access the project area during the operations and maintenance phase, as well as small boats and ATVs used during follow-up programs to investigate the success of the compensation plan, as well as monitoring to ensure regulatory compliance is being achieved for all relevant permits, authorizations and approval. These activities will be of a minor scale and infrequent. Only minor construction related activities are anticipated for touch up of erosion and sedimentation control features along the realignment as required. Similar to the construction phase, fuel and other hazardous materials will not be stored near waterbodies and vehicles/boats will not be refuelled near the water.

Vehicle activity will result in minor noise and exhaust emissions, however these would be related only to sporadic presence of small vehicles. Proper maintenance controls on the equipment will ensure excess noise due to mechanical problems will be reduced or eliminated. Due to wet ground conditions it is not anticipated that dust will be an issue.

2.3.2.3 Key Activities: Abandonment

For the purposes of this assessment, there are no activities anticipated that require assessment during the abandonment or decommissioning phase. The Project is anticipated to yield a successful and long-term (in perpetuity) naturally functioning system as compensation for alterations to fish and fish habitat as negotiated under the *Fisheries Act*, and as such will not be removed or decommissioned during project abandonment.

2.3.2.4 Key Potential Accidents, Malfunctions and Unplanned Events

The following accidents, malfunctions and unplanned events are recognized as potential activity related incidents that could influence the environment in the event of their occurrence during the Project life:

Construction:	Fuel and/or other hazardous materials spills (on land and in water)
Operation/Maintenance:	Fuel and/or other hazardous materials spills (on land and in water)
Abandonment:	Not considered applicable for the purposes of this assessment since feature is designed to function naturally into perpetuity.

2.3.3 Isolation Dam Installation and Partial Dewatering of North Lake Basin

The pit expansion requires the construction of an isolation dam/lake infill across Three Nations Lake and the partial drainage of the lake (north basin). This will affect the lake drainage outlet to Three Nations Creek, which will require a rerouting of flows.

Geotechnical investigations in support of the dam foundation design (TROW 2003b), indicated that the underlying clays are highly plastic and require long time frames to relieve pore pressures. Design models recommended the following:

1) Infill the northern portion of the lake with waste rockfill generated from the open pit expansion. Place rockfill in the wet starting from the northern shore of the lake working south.

2) Excavate a portion of the rockfill material and install a clay core for water retention.

The following is the general preferred construction sequence for the isolation dam/infill:

- Remove the earth plug separating the lake replacement basin from the existing Three Nations Lake, such that flows are diverted to the constructed Three Nations Lake channel realignment. This will permit the partial dewatering of the north lake basin to occur passively during subsequent stages through displacement;

- Installation of a turbidity curtain across north end of lake for sediment and fish control. . Fish will be netted and relocated to the southern portion of the lake. Advance the curtain southward ahead of the rock infill. It is intended that this approach will essentially push any fish out into the remaining lake basin to avoid a major active capture/transfer program (reduces potential for incidental mortality of fish). As such the turbidity curtain will achieve a dual function and will continue to isolate the work area while the dam is constructed. A second turbidity curtain may be installed for further work area isolation function. A detailed fish-netting program will be determined with the help of DFO and Ministry of Natural Resources;

- Complete infill of the north lake basin. With fill in place upper watershed drainage will be rerouted to the constructed Three Nations Creek realignment;

- Construct an impervious seepage barrier within the mine waste rockfill to prevent water migration north into the open pit expansion. Clay material will subsequently be placed to form the seepage barrier, thus achieving the impervious core requirements of an earth filled dam, and incorporating the impermeable nature of the existing clay under the core alignment. Water will be pumped away as the core is placed, and diverted to mine water settling ponds for quality control and monitoring, prior to discharge. Packed clay will be placed at the east and west abutments of the core area to ensure a hydraulic seal around the edges of the dam. Organic material encountered in the lake bottom will be segregated upon excavation, prior to clay placement, and stockpiled for future reclamation use; and,

- Develop the open pit mine expansion.

The detailed design that has been considered as part of these works has been based on analyses including a detailed slope stability analysis of the lake infilling including the south face; a detailed slope stability analysis of the in-situ material adjacent to the open pit; and a detailed seepage analysis of the seepage barrier including slope stability assessment.

To ensure compliance with the Canadian Dam Safety Association Criteria, each aspect of the dam construction was evaluated for static or steady state stability, end of construction stability, rapid drawdown stability, seismic and blasting stability, seepage or piping failure, liquefaction potential, and estimated settlements (TROW 2003b). To effectively monitor the construction, prior to the initial mine waste rock material placement along the north portion of the lake, several pneumatic piezometers will be installed at various elevations within the native clay material to monitor for the actual pore pressure response, and any potential material failure and augment/ mitigate the construction accordingly. Also, slope inclinometers will be installed near the top of the slope adjacent to the open pit expansion. These will extend through the rock fill, any underlying native material and bedrock, to monitor downstream dam and pit wall stability.

The detailed design will be reviewed and approved by the Ministry of Natural Resources, and the Ministry of Labour to meet provincial standards. DFO will review the final design to approve the habitat restoration measures along the infill shoreline margin. These measures will include biotechnical treatments and rock placements.

As pit operations do not require the dam in place until the second phase of mining, construction of the dam will not be initiated until year two of the project. The final rock infill face will cross the lake at the narrowest point approximately 500 m south of the northern tip of the lake. Road access will be maintained across the infilled area as access to the pit, and along the seepage barrier to permit regular inspections and monitoring of structural components and wells.

2.3.3.1 Key Activities: Construction

The key Construction Phase activities associated with placement of the infill and seepage barrier dam in Three Nations Lake and the consequential partial dewatering of Three Nations Lake (north basin) include:

Excavations and Earth Moving: Once local vegetation has been removed, heavy equipment will be used to excavate and remove sediments, topsoil and overburden in the design limits for the permanent dam/infill area. Topsoil will be stored separately from overburden for use in the reclamation/revegetation plan for this Project and/or as required in other activities of the PJV. Heavy equipment will be required for the placement of the lake rock fill and the seepage barrier. Seepage barrier placement will be done in the dry and work areas will be dewatered as required. Water removed from the work areas will be collected and directed to sediment containment basins where particulate matter can settle out and the water monitored prior to release to the environment.

The Lake infill and seepage barrier construction materials will be brought to site from existing facilities (e.g., waste rock and overburden stockpiles) on PJV property and no new sources for quarried rock or borrow materials will be required.

There will be no equipment refuelling near or adjacent to watercourses and, as well, no fuel or other hazardous material stored near any waterbodies. Earth moving will be a conventional load-haul-dump operation and the temporary placement of topsoil and overburden will be only at

designated locations that allow for natural buffer zones between stockpiles and waterbodies and, depending on the size of the stockpile, appropriate drainage control measure in place to prevent the uncontrolled release of fine materials into nearby watercourses.

Vehicle Activity: Heavy equipment will be used in the construction of Project elements and to the extent possible traffic will be controlled to PJV access/haul roads and property with no or minimal intrusion on public roads and thoroughfares. Construction activities will also generate noise and dust emissions, as well as exhaust as a result of vehicle movements and operations. Noise from the vehicles will be no different than in any other typical construction activities. Minor disturbances may also be associated with boats required to effectively install and maintain the required turbidity curtain in the lake. Proper maintenance controls on the equipment will ensure excess noise due to mechanical problems will be reduced or eliminated. Due to the high groundwater table and characteristically wet soils, it is not anticipated that dust will be an issue. Fuel and other hazardous materials will not be stored near waterbodies and vehicles/boats will not be refuelled near the water.

Sedimentation/Erosion Control: An important component of the lake infill will be the application of erosion and sedimentation control. The work area will be isolated from the lake surface waters with a turbidity curtain. This will be maintained in place until the lake infill is completed and the shoreline habitat features are considered stabilized.

Water Management: Three Nations Creek upper watershed surface water flows will be permanently altered at this stage of the project. Surface flows within the subwatershed will be rerouted through the Three Nations Creek channel realignment. Site drainage north of the Three Nations Lake seepage barrier will be directed to the mine water management system.

2.3.3.2 Key Activities: Operation/Maintenance

The key activities anticipated during the Operation/Maintenance phase with placement of the temporary lake infill and the seepage barrier include:

Sedimentation/Erosion Control: Once the main infill is in place, the key activity during the Operation/Maintenance phase of the Project will include the monitoring and management of all erosion and sedimentation control devices and features including ground repair, silt removal and revegetation of disturbed and restoration areas to minimize and reduce long-term release of sediments into surface drainage and waterbodies. A turbidity curtain will remain in place along the Three Nations Lake shoreline until the fill placement has effectively been stabilized.

Vehicle Activity: Vehicles will be operated in the project area during Operation/Maintenance as the infill will provide continuous vehicle access to portions of the PJV operations. Dam inspection and monitoring activities will occur in on a regular basis over the life of the dam. Similar to the Construction phase, fuel and other hazardous materials will not be stored near waterbodies and vehicles/boats will not be refuelled near the water. Construction activities will also generate noise and dust emissions, as well as exhaust as a result of vehicle movements and operations. Standard road and vehicle maintenance measures will be applied.

2.3.3.3 Key Activities: Abandonment

For the purposes of this assessment there are no activities anticipated that require assessment during the Decommissioning or Abandonment phase. The Project is anticipated to yield a successful and long-term (in perpetuity) compensation for alterations to fish and fish habitat as negotiated under the Fisheries Act, including the permanent rerouting of upper watershed flows, and as such will not be removed or decommissioned. The maintenance requirements over the long-term will be minimal as the infill development and shoreline treatment is intended to represent a walk-away solution. The infill areas and access roads beyond the naturalized component of the infill shoreline will be decommissioned and abandoned as per activities outlined similar to those described under Operation/Maintenance. The Pamour Closure Plan for the PJV has been modified and approved to include these elements of the Project.

2.3.3.4 Key Potential Accidents, Malfunctions and Unplanned Events

The following accidents, malfunctions and unplanned events are recognized as potential activity related incidents that could influence the environment in the event of their occurrence during the Project life:

Construction:	Erosion and sedimentation through failure of turbidity curtain Fuel and/or other hazardous materials spills (on land and in water)
Operation/Maintenance:	Infill/seepage barrier failure with resultant leakage Fuel and/or other hazardous materials spills (on land near water) Failure of shoreline vegetation restoration
Abandonment:	Not considered applicable for the purposes of this assessment since feature is designed to function naturally into perpetuity.

TABLE OF CONTENTS

Page

LIST OF TABLES

3.0 PROJECT ALTERNATIVES ASSESSMENT

3.1 Alternatives Assessment Methodology

In accordance with the CEAA process, alternatives associated with the Pamour Pit Expansion Project, the mining of the pit, and the five facilitative works and activities that support the pit expansion must be evaluated. Given that the majority of accessible ore reserves were mined over a 50-year period at the Pamour and Hoyle sites, alternatives to this project are simple. The evaluation to this affect has been undertaken accordingly.

The evaluation of various mining scenarios has been reviewed independently of the other facilitation works and activities, as certain alternatives do not require them as part of the project. Based on the selection of the preferred mining alternative, the other activities were collectively evaluated. The evaluation of alternatives of the project, mining scenarios and of the five facilitative works and activities organized as specific project packages as presented in Section 3.2 of this document, are based on the development of a series of performance objectives and evaluation criteria. The performance objectives as applied in the alternative means evaluation represent considerations that reflect Project success in terms of economic, natural environment and ecosystem values and socio-economic attributes. These performance objectives provide a basis for distinguishing between the alternative means. Each Project alternative is assessed for the indicated performance objectives according to three criteria:

- Preferred;
- Acceptable; and,
- Unacceptable.

The alternatives are then given an overall or summary evaluation, taking all the performance objectives into consideration.

The approach to summary evaluation as applied to the Pamour Pit Expansion mining and the facilitative works and activities is based on the assumption that all performance objectives are essential to the decision making process. Consequently, the evaluation is facilitated through the conclusion that any alternative attaining an “unacceptable” rating for any single performance objective is considered rejected.

With this approach, the alternative that receives the greatest number of preferred ratings is also not necessarily recognized as representing the most preferred, overall alternative. The relative importance of the individual performance objectives is considered as well. It is possible through this summary evaluation, that one or two performance objectives are recognized as being more important, and consequently override all other objectives that are, at a minimum, considered “acceptable”. The final summary evaluation of the alternatives is therefore a rationalized process, in which the basis for the final selection of alternatives is easily understood at all levels.

An important aspect of the alternative development was Health & Safety. Alternatives were only considered that satisfied PJV’s requirements for both employee and community health and

safety. All mining related infrastructure development represents some unavoidable on-site safety risks, as do most construction and mining operation activities. The PJV is very conscious of this fact, and has placed emphasis on worker health and safety consistent with each of their project sites in the Timmins mining camp. Health and safety risks are governed by engineering design, employee training and by the availability of on-site and off-site emergency response and medical facilities.

3.1.1 Project Performance Objectives and Selection Criteria

Project Alternatives

Performance objectives considered for the Pamour Pit Expansion mining element, and the five key physical works and activities that facilitate the proposed pit expansion, as well as the associated criteria for determining preferred, acceptable, and unacceptable performance levels are as follows:

Cost-effectiveness:

- Facilitates a competitive return on investment (preferred);
- Facilitates an acceptable return on investment (acceptable); and,
- Cannot be financially supported by the Project (unacceptable).

Cost-effectiveness relates to overall Project costs, including capital, operation, maintenance, and closure/reclamation costs. Each aspect of the Project has cost implications and thus cost-effectiveness is a performance objective common to all aspects. This includes the facilitative five works and activities as scoped in this CEAA process, and their associated implications to supporting overall open pit expansion opportunities.

Technical applicability and/or system integrity and reliability:

- Predictably effective with contingencies if the alternative does not perform as expected (preferred);

- Appears effective based on modelling/theoretical results; contingencies are available if the alternative fails to perform as expected (acceptable); and,

- Effectiveness appears dubious or relies on unproven technologies (unacceptable).

Technical applicability and ‘system integrity and reliability’ are used interchangeably, as appropriate to the issue, to describe the suitability or expected performance of a given alternative.

Effects (adverse) to the natural environment:

- Minimizes adverse effects to the natural environment without mitigation (preferred);

- Minimizes adverse effects to the natural environment with mitigation and/or compensation (acceptable); and,

- Causes adverse effects to the natural environment that cannot be mitigated and/or compensated accordingly (unacceptable).

The 'natural environment' referred to in this performance objective is a broad term used to describe the air, soil and water (surface and ground). In regard to the location of the facilitative five physical works and activities, it describes more specifically the natural environmental factors that include the aquatic and terrestrial habitats and the attributes that are considered Valued Ecosystem Components (VECs).

Effects (negative) to the socio-economic environment:

- Minimizes negative effects to the socio-economic environment without mitigation and provides positive effects (preferred);

- Minimizes negative effects to the socio-economic environment with mitigation; (acceptable); and,

- Causes negative socio-economic effects that cannot be mitigated (unacceptable).

The Pamour Pit Expansion Project represents clear economic benefits to the mining based communities in the region and this is an important overall consideration of the summary evaluation. Additional economic benefits are also directly associated with the infrastructure work represented by the five facilitative works and activities. Generally, more minimal issues are associated with alteration or infringement of land use activities within the Three Nations Creek drainage basin beyond the existing limits of previous mining activity, and are also evaluated in the context of the facilitative works and activities.

Amenability to reclamation:

- Causes disturbance to the natural environment that requires limited reclamation (preferred);

- Causes disturbance to the natural environment that requires moderate to extensive reclamation (acceptable); and,

- Mitigation of past/present disturbance to the natural environment is not practical, feasible or attainable (unacceptable).

This performance objective is applied accordingly to evaluate the decommissioning, reclamation and abandonment of the project alternative.

3.2 Project Alternatives

As identified in Section 1.0, the Pamour and adjacent Hoyle Mines, which collectively represent the area of the proposed Pamour Pit Expansion, have been mined since the early 1900s. Over this period of time, ore extraction efforts were initiated with narrow vein mining through underground techniques and ended with open pit development. The underground mining was continued until the higher-grade ores were exhausted. Pit development represented the application of mining techniques to access lower grade ore and reserves closer to surface.

Through consolidation of mining resources, the PJV can feasibly access the remaining low-grade ore that persists between the Pamour and Hoyle Pits, and below the old mine/milling facility infrastructure of the Pamour Mine. As this represents the final phase of feasibly accessing the remaining ore reserves, it is considered that there is no other reasonable alternative to this Project. Consequently, the alternatives are represented by either No Mine development, or expansion of the Pamour Pit.

3.2.1 No Mine

The No Mine scenario would involve leaving the existing Pamour pits as is with no mining and subsequently implementing closure measures including rehabilitation of existing open pits and associated site infrastructure as per the No Mine Scenario of the Pamour Open Pit Expansion Closure Plan.

3.2.1.1 Performance Objectives and Evaluation

In the evaluations provided in this section, the applicable criteria, as they pertain to the noted performance objective, are indicated in italics and bold text. A subsequent rationalization is also provided to outline the evaluation.

Performance Objectives - Cost-effectiveness; Technical Applicability

Preferred: *facilitates a competitive return on investment, predictably effective with contingencies if the alternative does not perform as expected.*

Acceptable: *facilitates an acceptable return on investment, appears effective based on modelling/theoretical results; contingencies are available if the alternative fails to perform as expected.*

Unacceptable: ***cannot be financially supported by the Project, effectiveness appears dubious or relies on unproven technologies.***

With the No Mine scenario there would be no further mining at the Pamour mine site. When the Dome Open Pit completes production in 2005 there would be a layoff of 270 workers and potentially another 200 workers due to the shutdown of the Dome Mill. Site closure implementation at the Pamour would begin with costs in the order of $13,700,000 with no

generated revenue from the available resource. This would represent a direct capital cost to the PJV. Based on no return from accessible ore reserves, this alternative would not be considered economically justifiable.

Performance Objective - Minimize Effects to the Natural Environment

Preferred: *minimizes adverse effects to the natural environment without mitigation.*

Acceptable: ***minimizes adverse effects on the natural environment with mitigation.***

Unacceptable: *causes adverse effects to the natural environment that cannot be mitigated.*

Without the need for encroachment into Three Nations Lake or Three Nations Creek, the alteration of both aquatic and terrestrial habitat associated with the Pit Expansion (as well as the five indicated facilitative works and activities) would not be required. Consequently, the majority of further development related effects on the natural environment would be avoided. However, the number of historic mine workings and tailings facilities that would not be progressively rehabilitated during operations could continue to represent a negative effect on the environment and public safety. Operation of the mine will also allow the rehabilitation of the mine hazards in a timely, environmentally conscious fashion and prevent public safety hazards.

Performance Objective - Minimize Effects to the Socio-economic Environment

Preferred: *minimizes negative effects to the socio-economic environment without mitigation; provides positive effects.*

Acceptable: *minimizes negative effects to the socio-economic environment with mitigation.*

Unacceptable: ***causes negative socio-economic effects that cannot be mitigated.***

As the existing nearby PJV mine resources approach exhaustion, no new mine developments, as required to replace or increase the supply of gold to sustain existing operations and infrastructure, will be readily available. Without the accessibility to access readily available ore reserves, an important component of the northern Ontario economy and the City of Timmins economy will be significantly affected. This would adverse effects to the immediate PJV mining team as well as the considerable proportion of spin-off employment for support supply and services, as well as other related employment. It is estimated that without the Pamour Pit development, up to 270 jobs for the PJV, will not be sustainable and a loss of trained workforce will result. Effects to the majority of the work force will be localized in the City of Timmins, as well as surrounding communities.

With the "Do Nothing" alternative severely limiting the future of the PJV, the potential negative effect to the socio-economic environment of Timmins would be considerable both in the short and long-term.

Performance Objective - Amenability to Reclamation:

Preferred: *Causes disturbance to the natural environment that requires limited reclamation.*

Acceptable: *Causes disturbance to the natural environment that requires moderate to extensive reclamation.*

Unacceptable: ***Mitigation of past/present disturbance to the natural environment is not practical, feasible or attainable.***

Consistent with the evaluation of Cost-effectiveness and Technical Applicability, the only activity that would be represented by this alternative would be closure. Site closure implementation at the Pamour would require a capital expenditure of $13,700,000 with no generated revenue from the available resource. The inability to undertake progressive reclamation while the pit expansion development is being undertaken represents a considerable barrier to effectively approaching an amenable reclamation. Without the ability to integrate engineering solutions and eliminate stability issues and hazards over the long-term, the site would continue to represent a public safety issue. As such, this is considered an unacceptable alternative.

3.2.2 Expansion of the Pamour Pit

The expansion of the Pamour Pit would permit the extraction of the remaining low grade ore reserves found between the existing old workings. This would meet the objectives of maintaining an ore supply to the Dome Mill on completion of mining activities at the Dome Mine, and permit ongoing exploration to establish future reserves in the Timmins mining camp.

3.2.2.1 Performance Objectives and Evaluation

In the evaluations provided in this section, the applicable criteria, as they pertain to the noted performance objective, are indicated in italics and bold text. A subsequent rationalization is also provided to outline the evaluation.

Performance Objectives - Cost-effectiveness; Technical Applicability

Preferred: ***facilitates a competitive return on investment, predictably effective with contingencies if the alternative does not perform as expected.***

Acceptable: *facilitates an acceptable return on investment, appears effective based on modelling/theoretical results; contingencies are available if the alternative fails to perform as expected.*

Unacceptable: *cannot be financially supported by the Project, effectiveness appears dubious or relies on unproven technologies.*

With the Pit Expansion scenario mining and access to the remaining ore reserves at the Pamour mine could be accessed. When the Dome Open Pit completes production in 2005, an existing trained mine workforce of 270 workers and potentially another 200 workers at the Dome Mill could be retained. Site closure implementation at the Pamour could be integrated with the ongoing mining activities in a cost effective manner and available resource would provide a source of capital. Given that this alternative meets the objectives of effectively managing the overall resources and infrastructure of the PJV, which represents a benefit to the mining community of Timmins, this is considered the preferred project alternative.

Performance Objective - Minimize Effects to the Natural Environment

Preferred: *minimizes adverse effects to the natural environment without mitigation.*

Acceptable: ***minimizes adverse effects on the natural environment with mitigation.***

Unacceptable: *causes adverse effects to the natural environment that cannot be mitigated.*

The Pit Expansion would involve alteration to the existing environment as outlined below, however, suitable mitigation strategies could be applied to mitigate effects. As such no significant residual effects, irrespective of the means of carrying out the project, are anticipated. With progressive reclamation of the mine workings, environmental benefits will also be realized through the pit expansion. Given that effective mitigation can be applied to address environmental effects, this project alternative is considered acceptable.

Performance Objective - Minimize Effects to the Socio-economic Environment

Preferred: ***minimizes negative effects to the socio-economic environment without mitigation; provides positive effects.***

Acceptable: *minimizes negative effects to the socio-economic environment with mitigation.*

Unacceptable: *causes negative socio-economic effects that cannot be mitigated.*

As the existing nearby PJV mine resources approaches exhaustion, new mine developments are required to replace or increase the supply of gold to sustain existing operations and infrastructure. Mining comprises an integral part of the northern Ontario economy within the Timmins mining camp, and the City of Timmins was founded and is largely supported by the base metal mining industry. As ore bodies are mined out, there is a need to locate and develop new ore bodies to maintain the existing economy. In addition, mining generates a considerable proportion of spin-off employment for support supply and services, as well as other related

employment. It is estimated that, over a period of 11 years, development of the Pamour Mine will create or maintain a direct total of 270 jobs for the PJV, which will sustain employment of a trained workforce. These will include approximately 16 site management staff, 40 technical staff, 203 hourly employees and 11 maintenance staff. It is anticipated that the majority of the work force will be derived from the City of Timmins, as well as surrounding communities.

The ore reserves generated as a result of the full pit expansion as proposed, will sustain mining operations for over 11 years. In addition to benefiting the economy of Timmins and the surrounding area, this mine life would also provide an extended period of time for local Timmins area mine exploration. During the period of Pamour operations, the opportunities will be available to explore and identify future ore reserve to further sustain the local mining economy. The PJV has a long-term objective to sustain their infrastructure and professional investments in the Timmins Mining Camp through discovery of new ore reserves, which ultimately provides long-term socio-economic benefits to the local communities.

With the Pit Expansion representing the above noted benefits that fulfill both the objectives of the PJV, and the socio-economic conditions in Timmins, this is considered the preferred alternative.

Performance Objective - Amenability to Reclamation:

Preferred: ***Causes disturbance to the natural environment that requires limited reclamation.***

Acceptable: *Causes disturbance to the natural environment that requires moderate to extensive reclamation.*

Unacceptable: *Mitigation of past/present disturbance to the natural environment is not practical, feasible or attainable.*

Consistent with the evaluation of Cost-effectiveness and Technical Applicability, the ability to apply progressive reclamation during pit expansion activities, allows a more effective closure that can drawn on available capital from the existing resource. This is considered the preferred alternative.

3.3 Alternative Means of Carrying Out Pamour Pit Expansion: Mining

Alternative means of carrying out the PJV Pamour Pit Expansion, with specific reference to the mining aspects of the project as described in Section 2.2, were evaluated. The alternative means were represented by two alternative mine scenarios that included:

- Phase 1 and Partial Phase 2; and,
- Mining Phases 1,2 & 3 – Complete Pamour Pit Expansion.

These three alternatives were reviewed as per the performance objectives and evaluation criteria that include:

- Cost-effectiveness;
- Technical applicability;
- Minimize effects to the natural environment;
- Minimize effects to the socio-economic environment; and,
- Amenability to reclamation.

General capital cost estimates have been included in this evaluation such that the relative economic implications of alternative mine scenario application can be demonstrated and effectively compared relative to the anticipated environmental effects. This provides a clearer evaluation of the economic implications to the Pamour Open Pit Expansion Project in efforts to maintain the sustainability of the local community economy, as well as the local natural environment.

3.3.1 Phase 1 and Partial Phase 2

The Phase 1 and partial Phase 2 Alternative involve a pit expansion that would be restricted to the north side of Highway 101 and Three Nations Lake. This scenario would nvolve expansion of the No. 3 pit in a westerly direction to connect the adjacent West pit, and recover the shaft, crown pillar and additional reserves located under the previous Pamour Mine site and tailings area.

With no encroachment into Three Nations Lake, there would be no requirement for an isolation dam, a loss of fish habitat in the north lake basin, an alteration of the shoreline, or the construction of a replacement lake basin. Three Nations Creek would also be maintained in its existing location.

3.3.1.1 Performance Objectives and Evaluation

In the evaluations provided in this section, the applicable criteria, as they pertain to the noted performance objective, are indicated in italics and bold text. A subsequent rationalization is also provided to outline the evaluation.

Performance Objectives - Cost-effectiveness; Technical Applicability

Preferred: *facilitates a competitive return on investment, predictably effective with contingencies if the alternative does not perform as expected.*

Acceptable: *facilitates an acceptable return on investment, appears effective based on modelling/theoretical results; contingencies are available if the alternative fails to perform as expected.*

Unacceptable: ***cannot be financially supported by the Project, effectiveness appears dubious or relies on unproven technologies.***

With an expansion of the existing pit limited to the ore reserves scheduled for production under Phase 1 of the proposed mine plan, approximately 15% of the available ore reserves would be made available, leaving 85% unattainable. These unattainable ore reserves to the east of the existing pit and under Three Nations Lake also represent higher grade ore with an estimated value of $709,891,000, or 84% of the net revenue estimated from this mine. Based on this considerable restriction on the net available return from accessible ore reserves, this alternative would not be considered acceptable.

Performance Objective - Minimize Effects to the Natural Environment

Preferred: *minimizes adverse effects to the natural environment without mitigation.*

Acceptable: ***minimizes adverse effects on the natural environment with mitigation.***

Unacceptable: *causes adverse effects to the natural environment that cannot be mitigated.*

Without the need for encroachment into Three Nations Lake or Three Nations Creek, the alteration of both aquatic and terrestrial habitat associated with the five indicated works and activities would not be required. Consequently, the majority of project related effects on the natural environment would be minimized. However, the number of historic mine workings and tailings facilities that would not be rehabilitated during operations would have a negative effect on the environment. Operation of the mine will allow the rehabilitation of the mine hazards in a timely, environmentally conscious fashion.

Performance Objective - Minimize Effects to the Socio-economic Environment

Preferred: *minimizes negative effects to the socio-economic environment without mitigation; provides positive effects.*

Acceptable: *minimizes negative effects to the socio-economic environment with mitigation.*

Unacceptable: ***causes negative socio-economic effects that cannot be mitigated.***

As detailed in the previous alternative, without the Pamour Pit Expansion, the PJV will be severely limited in the opportunity for further investment into exploration and new mining. With minimal production from other existing operations there would be a large number of job losses and subsequent effect on the support services sector in Timmins.

With this alternative limiting the mining activity to Phase 1 and partial Phase 2 only, and consequently rendering the project unacceptable as it does not facilitate a competitive return on

investment, the potential negative effect to the socio-economic environment of Timmins would be considerable both in the short and long-term.

Performance Objective - Amenability to Reclamation:

Preferred: *Causes disturbance to the natural environment that requires limited reclamation.*

Acceptable: *Causes disturbance to the natural environment that requires moderate to extensive reclamation.*

Unacceptable: ***Mitigation of past/present disturbance to the natural environment is not practical, feasible or attainable.***

The site closure implementation at the Pamour would require a capital expenditure of $13,700,000 with only minimal potential to generated suitable revenue from the available resource. The inability to undertake progressive reclamation while the pit expansion development is being undertaken represents a considerable barrier to effectively approaching an amenable reclamation. Without the ability to integrate engineering solutions and eliminate stability issues and hazards over the long-term, the site would continue to represent a public safety issue. As such, this is considered an unacceptable alternative.

3.3.2 Mining Phases 1, 2 & 3 – Complete Pamour Pit Expansion

The complete Pamour Pit Expansion scenario would include mining of all 3 proposed phases. This would include mining under Highway 101 and into Three Nations Lake.

3.3.2.1 Performance Objectives and Evaluation

In the evaluations provided in this section, the applicable criteria, as they pertain to the noted performance objective, are indicated in italics and bold text. A subsequent rationalization is also provided to outline the evaluation.

Performance Objectives - Cost-effectiveness; Technical Applicability

Preferred: ***facilitates a competitive return on investment, predictably effective with contingencies if the alternative does not perform as expected.***

Acceptable: *facilitates an acceptable return on investment, appears effective based on modelling/theoretical results; contingencies are available if the alternative fails to perform as expected.*

Unacceptable: *cannot be financially supported by the Project, effectiveness appears dubious or relies on unproven technologies.*

With an expansion of the existing pit to its full resource potential, it would be an economically viable option. Based on this full available return from accessible ore reserves, this option is the preferred mining alternative.

Performance Objective - Minimize Effects to the Natural Environment

Preferred: *minimizes adverse effects to the natural environment without mitigation.*

Acceptable: ***minimizes adverse effects on the natural environment with mitigation.***

Unacceptable: *causes adverse effects to the natural environment that cannot be mitigated.*

Mining the complete Pamour Pit Expansion (Phases 1-3) will affect Three Nations Lake and Creek and will require compensation as per the effective measures that are available through lake replacement and creek realignment (AMEC 2004a). Historic mine tailings, waste rock and mine hazards will be rehabilitated during construction and operations and all new waste materials will be progressively rehabilitated.

Performance Objective - Minimize Effects to the Socio-economic Environment

Preferred: ***minimizes negative effects to the socio-economic environment without mitigation; provides positive effects.***

Acceptable: *minimizes negative effects to the socio-economic environment with mitigation.*

Unacceptable: *causes negative socio-economic effects that cannot be mitigated.*

Mining the complete Pamour Pit Expansion (Phases 1-3) will allow the PJV to continue it's long mining tradition in the Timmins area for the next 11 years and into the future. A long mine life will allow time for the PJV Exploration Group to find the next underground and open pit mines that will continue to provide Timmins with 500 to 600 full time jobs and three times this in spin-off jobs.

Performance Objective - Amenability to Reclamation:

Preferred: ***Causes disturbance to the natural environment that requires limited reclamation.***

Acceptable: *Causes disturbance to the natural environment that requires moderate to extensive reclamation.*

Unacceptable: *Mitigation of disturbance to the natural environment is not practical or feasible.*

With access to available ore resources and associated capital, and with a mine infrastructure framework in place that would support progressive reclamation activities and enhanced application of engineering solutions to address stability and hazard issues, this Project alternative permits effective closure and abandonment of the Project site.

3.3.3 Conclusions

The review of the various mining scenarios shows that the full Pamour Pit Expansion is the preferred and only viable alternative as it is the only one that allows for the continuing project operation beyond 2005 and does not represent a significant adverse effect on the Timmins economy. As a result, an alternative review of the pit facilitation works and activities were completed on the assumption of a full mine scenario that includes all proposed mining phases.

3.4 Alternative Means of Carrying Out the Pit Facilitation Works and Activities

Alternative means of carrying out the five facilitation works and activities required to support the preferred PJV Open Pit Expansion mining scenario are described in this section. The works and activities, although identified as five individually identifiable components of work that will result in some form of HADD with associated compensation measures in Three Nations Lake or Creek, are all interrelated and would not necessarily be undertaken in isolation. This is reflected in the need for certain works and activities to occur, such as realignment of Three Nations Creek and the alteration of Three Nation Lake shoreline, irrespective of other works and activities. With a proposed pit expansion, Three Nations Creek must be rerouted no matter which approach is applied to isolating the pit from the lake basin. Accordingly, the works and activities have been organized collectively into specific alternative Project Packages that could logically be reviewed from the perspective of infrastructure implementation, as well as from environmental and economic perspectives. These implementation alternative Project Packages represent the alternative means of carrying out the facilitation components of the Pit Expansion that can be critically evaluated for the purpose of this environmental assessment.

The alternative means in the form of the three Project Packages were reviewed as per the performance objectives and evaluation criteria and include:

- Cost-effectiveness;
- Technical applicability;
- Minimize effects to the natural environment; and,
- Minimize effects to the socio-economic environment.

With respect to the pit facilitation five works and activities that support the Pamour Pit Expansion Project, these elements have the fundamental design intention of representing long-term (in perpetuity) habitat replacement, creation, or enhancement. The design criteria include the integration of these features in the landscape to become functional components of the ecosystem. This includes the isolation dam construction on Three Nations Lake that integrates a lake-side dam face that will be fully naturalized to represent a permanent new shoreline feature. With respect to the overall pit expansion project, these works and activities are therefore

considered to represent “walk away’ development related scenarios that would not require further abandonment consideration for the purpose of reclamation. As such, the abandonment performance objective was not considered applicable to further evaluation of these alternatives.

It should also be recognized that certain works and activities such as the lake-basin replacement and realignment of Three Nations Creek, are directly related to compensatory measures to address recognized HADDs and potential residual effects. These have been conditionally acknowledged by DFO as feasible approaches relative to the degree of predicted effect. As such, particular details or alternatives of these individual works and activities are not a component of this evaluation.

General capital cost estimates have been included in this evaluation such that the relative economic implications of alternative package application can be demonstrated and effectively compared relative to the anticipated environmental effects. This provides a clearer evaluation of the economic implications to the Pamour Open Pit Expansion Project in efforts to maintain the sustainability of the Timmins economy, as well as the local natural environment.

The following discussions identify the subject Project Package alternatives and summarize the evaluation based on the performance objectives and criteria.

3.4.1 Pit Facilitation Project Package 1 – Alternative

The implementation of Pit Facilitation Project Package 1 would include the following project works and activities that would support expansion of the existing open pit to access ore reserves located under the Three Nations Lake north basin:

- Construction of an isolation dam across Three Nations Lake with the installation of a sheet pile cofferdam;
- Permanent dewatering of Three Nations Lake to the north of the isolation dam;
- Relocation of 2.0 km of Three Nations Creek;
- Extension of Three Nations Lake through the construction of a lake replacement basin and maintenance of a normal water level elevation of 285.6 m; and,
- Alteration of the Three Nations Lake shoreline associated with lake replacement construction.

3.4.2 Performance Objectives and Evaluation

In the evaluations provided in this section, the applicable selected criteria, as they pertain to the noted performance objective, are indicated in italics and bold text. A subsequent rationalization is also provided to outline the evaluation.

Performance Objectives - Cost-effectiveness; Technical Applicability

Preferred: *facilitates a competitive return on investment, predictably effective with contingencies if the alternative does not perform as expected.*

Acceptable: ***facilitates an acceptable return on investment, appears effective based on modelling/theoretical results; contingencies are available if the alternative fails to perform as expected.***

Unacceptable: *cannot be financially supported by the Project, effectiveness appears dubious or relies on unproven technologies.*

Based on the results of field investigation and the slope stability assessment, (TROW 2003b) an embankment type dam would be difficult to construct at this site due to the soft silty clay material observed. With the 10 m of soft silty clay material observed below the lake bottom, a staged construction approach for the embankment with a costly cofferdam construction would likely be necessary to ensure adequate dissipation of excess porewater pressure. The dissipation of the porewater pressure to an acceptable level is estimated to require several years, which could be undertaken during Phase 1 of the mine plan. The costs of implementing the required cofferdam such that the dam may be constructed in the dry, represents a considerable capital costs ($6 million), that although not prohibitive from an overall pit expansion feasibility perspective, requires review from a cost benefit evaluation relative to other alternatives.

Therefore this alternative was considered to be technically acceptable subject to further alternative evaluation.

Performance Objective - Minimize Effects to the Natural Environment

Preferred: *minimizes adverse effects to the natural environment without mitigation.*

Acceptable: ***minimizes adverse effects on the natural environment with mitigation.***

Unacceptable: *causes adverse effects to the natural environment that cannot be mitigated.*

A review of the project works and activities and available opportunities for mitigation and compensation strategies, indicated that the loss of the north lake basin aquatic habitat could be effectively accommodated through like-for-like replacement of habitat in a newly constructed lake basin to the south east of the existing Three Nations Lake. The estimated capital cost for the lake replacement would be $900,000. Initial estimates and associated concepts to compensate for any habitat alterations, were presented to DFO as a component of preconsultation meetings in December 2002 and April 2003. Subsequently, a report titled, “Porcupine Joint Venture, Pamour Mine Expansion Project, Preliminary Fish Habitat Compensation Concepts for Three Nations Lake and Three Nations Creek” (AMEC 2003L) was submitted to the Department of Fisheries and Oceans in August 2003, and preliminary details

regarding the concepts were presented at a Core Agency stakeholder meeting on August 26/27, 2003 in Timmins. The concepts served to demonstrate that through the construction of a lake basin replacement and channel realignment to the east of the existing Three Nations Lake basin, suitable like-for-like habitat compensation would be achievable in principle.

Three Nations Creek habitat losses associated with cut-off of the Three Nations Lake outflow can be fully accommodated through a newly constructed realignment channel. This realignment channel would drain the proposed lake replacement and ultimately report within the same watershed to the Three Nations Creek mainstem further downstream. The implementation of a 2.5 km creek realignment is estimated to represent $100,000.

Shoreline habitat losses along the connection of the lake replacement would be accommodated and enhanced through construction of walleye spawning habitat, observed to be limiting in the existing Three Nations Lake basin at a cost of about $180,000.

Application of a sheet pile cofferdam will permit the north lake basin dewatering to be conducted in a controlled manner such that isolated/trapped fish can be captured and transferred live to the remaining lake basin, and such that all construction work can be conducted in the dry. It also permits construction of the dam to effectively dissipate porewater pressure. Working in the dry permits isolation of work activities from the remaining fish habitat, avoiding potential releases of sediment laden water or upsets to the environment. It does, however, involve a relatively instantaneous isolation of the habitat promptly rendering it unavailable as habitat.

The lake isolation also requires considerable effort to salvage and transplant the trapped fish community to minimize incidental fish mortality. This effort during the dewatering activities represents an additional short-term comprehensive effort to ensure fish survival.

Sheet piles would be removed on completion of the construction, which would require additional mobilization of barging equipment and could result in some further short-term disturbance of water quality.

The ultimate face of the dam structure, which will be exposed to the remaining Three Nations Lake basin, will be designed to accommodate fish habitat features. These features will include strategically graded and placed rock material (shoals and projections), and a bio-engineered slope face (vegetated buttress) that will provide a naturalized vegetated shoreline margin. Since this treatment approach would be applied in each of the works and activities alternatives described herein, the costs are considered net neutral.

The preferred alternative with respect to natural environment effects would be no dam construction as identified in the “Do Nothing” alternative. However, with appropriate dam alteration mitigation, as described in the following sections, environmental factors can be appropriately addressed to maintain the economic viability of a full open pit expansion.

Given that isolation of the north Three Nations Lake basin, such that important ore reserves may be accessed, is required in order to render the pit expansion project as acceptable, then

this package of project work activities and associated mitigation strategies that address effects were considered acceptable.

Performance Objective - Minimize Effects to the Socio-economic Environment

Preferred: *minimizes negative effects to the socio-economic environment without mitigation; provides positive effects.*

Acceptable: **minimizes negative effects to the socio-economic environment with mitigation.**

Unacceptable: *causes negative socio-economic effects that cannot be mitigated.*

The five works and activities as indicated will support the feasibility of undertaking the three phase Pamour Open Pit Expansion. With the sustained mining of the Pamour facility, employment opportunities will be maintained for the community of Timmins and the surrounding area, and mine related job losses will be minimized. Additional employment and specialty services requirements will be represented by the implementation of the five works and activities.

With an available Health and Safety Program and infrastructure to service the present PJV workforce, no additional load or service compromise is anticipated given the maintenance of the existing workforce. Likewise no additional service load is anticipated on the local municipal health services.

The terrestrial and aquatic area to be influenced by the five works and activities presently provides recreational opportunities in the form of hunting, fishing and snowmobiling. With the mitigation and habitat compensation strategies targeted to maintain the local ecological function of the Three Nations Creek watershed, these recreational opportunities should not be significantly compromised. Likewise these mitigation and compensation strategies will maintain opportunities for trapping, which presently occurs in the general area.

The access to Three Nations Lake for boating and angling opportunities is presently situated at the proposed isolation dam location. This access will be relocated to a more favourable location along the south side of the lake such that these activities can be maintained during and after construction. The staged construction activities may represent a short-term disturbance to these recreational activities in the form of construction noise and aesthetics. However, the long-term restoration treatments to the dam face and shoreline areas will improve the isolation of mining operations from lake user view.

Through discussions with First Nations, it was identified that the areas to be disturbed due to the five project works and activities are not presently used for subsistence or traditional use purposes.

3.4.3 Pit Facilitation Project Package 2 – Alternative

The implementation of Pit Facilitation Project Package 2 would include the following project works and activities, which would support expansion of the existing open pit to access ore reserves located under the Three Nations Lake north basin:

- Construct of an isolation dam across Three Nations Lake through the implementation of a rock infilling program with isolation dam (seepage barrier) construction within the backfill;
- Permanent dewatering of Three Nations Lake to the north of the isolation dam through infilling;
- Relocation of 2.0 km of Three Nations Creek;
- Extension of Three Nations Lake through the construction of a lake replacement basin and maintain a normal water level elevation of 285.6 m; and,
- Alteration of the Three Nations Lake shoreline associated with lake replacement construction.

3.4.4 Performance Objectives and Evaluation

In the evaluations provided in this section, the applicable selected criteria, as they pertain to the noted performance objective, are indicated in italics and bold text. A subsequent rationalization is also provided to outline the evaluation.

Performance Objectives - Cost-effectiveness; Technical Applicability

Preferred: ***facilitates a competitive return on investment, predictably effective with contingencies if the alternative does not perform as expected.***

Acceptable: *facilitates an acceptable return on investment, appears effective based on modelling/theoretical results; contingencies are available if the alternative fails to perform as expected.*

Unacceptable: *cannot be financially supported by the Project, effectiveness appears dubious or relies on unproven technologies.*

Based on the results of field investigation and the slope stability assessment, (TROW 2003b) as indicated above, an embankment type dam would be difficult to construct at this site due to the soft silty clay material observed. As an alternative to the staged construction approach for the embankment with a costly cofferdam construction it is proposed that the north lake basin be infilled with suitable overburden and waste rock material. This infilling would extend to the proposed isolation dam location. With the infill in place, a trench would be excavated in the fill

material and a clay core placed for water retention. Mitigation strategies to protect the natural features are summarized below.

With a progressive lake infilling program, the engineering complexities of the dam construction and the associated cost, including omission of cofferdam installation, can be considerably reduced to an estimated ($3.1 million). Therefore, this alternative was considered to be technically acceptable with a preference relative to the associated cost reductions of implementation.

Performance Objective - Minimize Effects to the Natural Environment

Preferred: *minimizes adverse effects to the natural environment without mitigation.*

Acceptable: ***minimizes adverse effects on the natural environment with mitigation.***

Unacceptable: *causes adverse effects to the natural environment that cannot be mitigated.*

As confirmed in Pit Facilitation Project Package 1 Alternative, the loss of the north Three Nations Lake basin aquatic habitat can be effectively accommodated through like-for-like replacement of habitat in a newly constructed lake basin to the south east of the existing Three Nations Lake. It was also concluded that supplemental habitat features could be included in this replacement basin implementation to address lake limitations and provide enhancement opportunities (e.g., walleye spawning habitat) as outlined in the lake replacement design (AMEC 2004b). Shoreline habitat losses at the dam and at the connection between the existing and replacement lake basins would be accommodated through the enhancement of newly constructed shorelines to address walleye spawning habitat limitations.

Three Nations Creek habitat losses associated with cut-off of the Three Nations Lake outflow by the eastward extension of the pit can be fully accommodated through a newly constructed realignment channel draining from the proposed lake replacement basin to the east, ultimately reporting within the same watershed to the Three Nations Creek mainstem further downstream.

The approach of infilling the north lake basin would be conducted in a relatively slow progression over 4 to 6 months outside of the warm/cool water fisheries timing constraints of March 31 to July 1. Given that the infilling would be undertaken in the wet, consideration to maintain surface water quality of Three Nations Lake would involve the application of a mobile turbidity curtain in the water column to be progressively moved into the lake basin as the infilling operations proceed. This approach would result in a temporally incremental loss of the north basin habitat, with the displacement of resident fish ahead of the turbidity curtain into the main basin of the lake that will be retained. This avoids the “one time” instantaneous isolation of the north lake basin (as with the sheet piles) habitat, and the need for an extensive fish trap and transfer program.

As with the Pit Facilitation Project Package 1 Alternative, the ultimate face of the dam structure, which will be exposed to the remaining Three Nations Lake basin, will be designed to

accommodate fish habitat features in the form of strategically graded and placed rock material (shoals and projections), and bio-engineered slope face (vegetated buttress) that will provide a vegetated shoreline margin. This mitigation was considered cost neutral due to its application in each alternative.

The construction of the isolation dam, or the placement of a clay core within the backfilled area for water retention as described previously, will permit the work to be undertaken from stable surrounding terrain and in complete isolation from Three Nations Lake (setback of approximately 50 m). This infilling and dam setback avoids the additional activities within the lake basin required for removal of sheet pile as identified in the Pit Facilitation Project Package 1 Alternative, but does involve in-water work with challenges for infill placement of habitat features and the use of a turbidity curtain.

The preferred alternative with respect to natural environment effects would be no dam construction as identified in the "Do Nothing" alternative. However, with appropriate infilling and dam construction mitigation, as described, environmental factors can be appropriately addressed to maintain the economic viability of a full open pit expansion.

Performance Objective - Minimize Effects to the Socio-economic Environment

Preferred: *minimizes negative effects to the socio-economic environment without mitigation; provides positive effects.*

Acceptable: **minimizes negative effects to the socio-economic environment with mitigation.**

Unacceptable: *causes negative socio-economic effects that cannot be mitigated.*

The evaluation findings and rationale relative to the socio-economic environment are consistent with those outlined for Pit Facilitation Project Package 1.

3.4.5 Pit Facilitation Project Package 3 – Alternative

The implementation of Pit Facilitation Project Package 3 would include project works and activities that would support expansion of the existing open pit to access ore reserves located under the Three Nations Lake north basin. Works and activities Item 4 (identified below), were originally conceived in order to provide compensation for the proposed loss of the north basin in a previous pit expansion proposal (ESG 1997b), and provide a generally similar objective to the lake replacement identified in Pit Facilitation Project Package 1 and 2 Alternatives. The works and activities in this project package alternative include:

- Construct of an isolation dam across Three Nations Lake through the implementation of a rock infilling program with isolation dam construction within the infill;

- Permanent dewatering of Three Nations Lake to the north of the isolation dam through infilling;

- Relocation of 2.0 km of Three Nations Creek;

- Expansion of Three Nations Lake through the elevation of existing lake levels by 2 m and inundation of lowland areas adjacent to the lake; and,

- Alteration of the Three Nations Lake shoreline associated with lake replacement through inundation.

3.4.6 Performance Objectives and Evaluation

In the evaluations provided in this section, the applicable criteria, as they pertain to the noted performance objective, are indicated in italics and bold text. A subsequent rationalization is also provided to outline the evaluation.

Performance Objectives - Cost-effectiveness; Technical Applicability

Preferred: *facilitates a competitive return on investment, predictably effective with contingencies if the alternative does not perform as expected.*

Acceptable: ***facilitates an acceptable return on investment, appears effective based on modelling/theoretical results; contingencies are available if the alternative fails to perform as expected.***

Unacceptable: *cannot be financially supported by the Project, effectiveness appears dubious or relies on unproven technologies.*

The same general rationalization applies to this alternative as that presented in Pit Facilitation Project Package 1 Alternative, with the exception that the ultimate infill or clay core water retention structure would require additional height to accommodate the proposed increase in water level elevation by 2 m. This introduces design elements for the dam raise consideration with incremental implementation cost adding approximately $2 million, above those identified for Pit Facilitation Project Package 1 and 2.

However, the flooding scenario that provides lake replacement to address the north basin loss would eliminate the construction costs, associated with excavation of a new lake basin to the southeast such that the dam raise associated costs would be reduced by half. Despite this cost saving, the dam raise would represent a $1 million increase over the infill scenario of Pit Facilitation Project Alternative 2, was considered in the realm of cost feasibility.

Performance Objective - Minimize Effects to the Natural Environment

Preferred: *minimizes adverse effects to the natural environment without mitigation.*

Acceptable: *minimizes adverse effects on the natural environment with mitigation.*

Unacceptable: ***causes adverse effects to the natural environment that cannot be mitigated.***

The increase in water levels of Three Nations Lake was considered an option that would assist in compensating for the approximately 14 ha loss of aquatic habitat in the north lake basin (ESG 1997b). A 2 m water level elevation increase would result in a lake surface area that would account for the north basin loss with the exception of about 1 ha. Mean depths would increase from 2.4 m to 4.0 m, providing additional deep water habitat available during the open water period. Due to progressively depleted dissolved oxygen levels at depth during the winter, this deep water habitat would become unavailable following ice cover.

Although a similar lake surface area can be achieved through flooding, the approach results in a direct effect to the entire existing Three Nations Lake wetted perimeter. With an increase by 2 m, it can be anticipated that all lake margin habitat would be temporarily destroyed or significantly altered. It can be anticipated that there would be a considerable period of time required for the new lake shoreline to evolve to the extent that it serves to functionally replace the existing littoral habitat to be lost and achieve like-for-like replacement. This would essentially, disrupt the ecological function of the lake, as it presently exists, for a prolonged period of time.

Temporary and permanent shoreline habitat losses would be accommodated through enhancement of walleye spawning habitat through placement of appropriate substrates in strategic locations along the newly inundated shorelines. Walleye spawning habitat is considered to be limiting in Three Nations Lake (ESG 1997, AMEC 2004b). The placement of spawning substrates represents a cost of approximately $5,000 (estimate for 500 sq. m) to establish an approximate replacement of what represents potential spawning habitat in the existing Three Nations Lake basin.

The construction of the isolation dam within the backfilled area is consistent with that described and evaluated for Pit Facilitation Project Package 2, since the limits of the fill face would be the same.

Three Nations Creek habitat losses associated with cut-off of the Three Nations Lake outflow can be fully accommodated through a newly constructed realignment channel draining to the east, ultimately reporting within the same watershed to Three Nations Creek. Under the inundation approach for lake-habitat replacement, approximately 1 km of additional channel realignment would be required relative to the lake replacement alternative identified in Pit Facilitation Project Package Alternatives 1 and 2. This would represent an additional creek realignment cost of approximately $150,000.

This alternative implies a complete alteration of the entire lake basin, as opposed to simply the north basin, and that the potential loss of habitat during the interim period required for the

approximately 12 ha of flooded shoreline area habitat to evolve would be difficult to mitigate or compensate. It was determined that this approach was not preferred through discussions with DFO (DFO/PJV meeting April 2003), who also expressed some concern with respect to terrestrial soil flooding as opposed to excavation (as per the other alternatives) and the potential for mercury methylation.

Performance Objective - Minimize Effects to the Socio-economic Environment

Preferred: *minimizes negative effects to the socio-economic environment without mitigation; provides positive effects.*

Acceptable: *minimizes negative effects to the socio-economic environment with mitigation.*

Unacceptable: ***causes negative socio-economic effects that cannot be mitigated.***

The five works and activities as indicated would support the feasibility of undertaking the three phase Pamour Open Pit expansion as described in Section 1.0 and 2.0. With the sustained mining of the Pamour facility, employment opportunities will be maintained for the community of Timmins and the surrounding area, and mine related job losses will be minimized. Additional employment and specialty services requirements will be represented by the implementation of the five works and activities.

The terrestrial and aquatic area to be influenced by the five works and activities presently provides recreational opportunities in the form of hunting, fishing and snowmobiling. With the mitigation and habitat compensation strategies not significantly influencing the local land base, these recreational opportunities should not be significantly compromised over the long-term. However, given the short-term period that will involve a complete change of the lake shoreline and potential disruption to the lake margin ecosystem, it can be anticipated that there will be changes to both wildlife and fish community distribution and productivity during this time frame. With other more favourable alternatives available that minimize the effect to Three Nations Lake, this inundation alternative was considered to be unfavourable relative to the resource based socio-economic values of Three Nations Lake.

3.4.7 Summary Evaluation

Evaluations for the performance objectives are summarized in Table 3.1. As described in the evaluation methodology, an unacceptable rating for any performance objective involves rejection of the alternative.

TABLE 3-1
PERFORMANCE EVALUATION

Alternatives			
Performance Objective	**Pit Facilitation Project Package 1 Alternative**	**Pit Facilitation Project Package 2 Alternative**	**Pit Facilitation Project Package 3 Alternative**
Cost-effectiveness and Technical applicability	Permits full open pit expansion supporting feasibility of mine development. Challenge to construct in soft silty clays with added cost for cofferdams and dam structure ($6 million). Requires expenditure for lake replacement and channel realignment ($1.41 million)	Permits full open pit expansion supporting feasibility of mine development. Facilitates cost effective construction of isolation dam or clay water retention core ($3.1 million). Requires expenditure for lake replacement and channel realignment ($1.41 million)	Permits full open pit expansion supporting feasibility of mine development. Facilitates cost effective construction of isolation dam but additional engineering considerations and cost associated with dam raise ($5.1 million). Eliminates cost associated for a lake replacement basin excavation with incremental increase in creek realignment costs (overall cost $560,000).
Estimated Cost	**$7.41 million** ***Rating – Acceptable***	$**4.51 million** ***Rating - Preferred***	**$5.7 million** ***Rating – Acceptable***
Minimize effects to the natural environment	Will influence natural environment due to habitat loss in Three Nations Lake. Suitable short and long-term mitigation measures available to address potential effects. Instantaneous removal of north lake basin and associated effects and mitigation risks/costs for fish salvage. ***Rating – Acceptable***	Will influence natural environment due to north basin habitat loss in Three Nations Lake. Suitable short and long-term mitigation measures available to address potential effects. Progressive removal of north lake basin as opposed to instantaneous removal and associated costs. ***Rating - Acceptable***	Will influence natural environment due to direct habitat loss in Three Nations Lake north basin, as well as the extensive alteration of the entire shoreline habitat perimeter of the remaining lake basin. Temporally protracted near shore habitat development following inundation, with limited mitigation/compensation opportunities. Progressive removal of north lake basin as opposed to instantaneous removal and associated costs. ***Rating - Unacceptable***
Minimize effects to the socio-economic environment	Permits open pit expansion to proceed with resulting economic benefits to the local communities. Short and long-term mitigation available to address natural resource use activities in and around Three Nations Lake. ***Rating – Acceptable***	Permits open pit expansion to proceed with resulting economic benefits to the local communities. Short and long-term mitigation available to address natural resource use activities in and around Three Nations Lake. ***Rating - Acceptable***	Permits open pit expansion to proceed with resulting economic benefits to the local communities. Short and long-term mitigation opportunities limited with undefined assurance of passive/active continued availability and suitable use of natural resources in and around significantly altered shoreline of Three Nations Lake. ***Rating - Acceptable***
SUMMARY EVALUATION	***RATING – ACCEPTABLE***	***RATING - PREFERRED***	***RATING - UNACCEPTABLE***

The “Do Nothing” alternative is considered preferred from a natural environment perspective since none of the proposed works and activities and associated effects to Three Nations Lake or Three Nations Creek will be required. However, with the severe restriction on accessibility to

available ore reserves, the project would be rendered unacceptable from the perspective of a return on investment. This would represent a considerable consequence to PJV's ability to maintain a viable mining presence in Timmins and with severe consequences to the economy of the municipality and the surrounding communities. Consequently, the "Do Nothing" alternative was rejected as unacceptable.

The Pit Facilitation Project Package 1 Alternative would permit the open pit expansion to proceed with recognized benefits to PJV's investment and the overall economy of Timmins. The approach would require an instantaneous removal of the north basin of Three Nations Lake through development of a costly cofferdam system to permit works to be undertaken in the dry and to allow soft clay porewater pressure to dissipate. The dam construction is also somewhat restricted due to geotechnical considerations, which could influence both cost and schedule. An extensive fish salvage operation would be required with associated comprehensive technical efforts. Otherwise, acceptable mitigation measures are available to address the potential effects to the north lake basin through development of a lake replacement basin and realignment channel. Both these strategies represent a considerable project capital cost but were considered within project feasibility. Overall this alternative was considered to represent an acceptable means of undertaking the works and activities.

The Pit Facilitation Project Package 2 Alternative would represent similar considerations as Pit Facilitation Project Package 1, with the exception that the north lake basin would be progressively claimed through a controlled infilling procedure as opposed to instantaneous isolation and dewatering behind a cofferdam. This would prolong the availability of north basin habitat and passively displace the fish community to the remaining lake basin. This approach provides both economic and engineering benefits in terms of facilitated construction through avoidance of a sheet pile cofferdam, facilitated/expedited geotechnical stability, and the construction of a clay core retention structure within the fill as opposed to an engineered dam structure. Environmental benefits are also realized as identified above. Collectively, these benefits were considered acceptable and preferred in relation to the performance objectives.

The Pit Facilitation Project Package 3 Alternative would limit construction activities to the infilling, dam considerations, and channel realignment. This alternative avoids the need and cost for the extensive 14 ha lake replacement basin to be constructed southeast of Three Nations Lake, albeit additional incremental costs would be required for raising the dam elevation and constructing an extra kilometre of creek realignment. Consequently, this alternative is preferred from the perspective of providing a beneficial return on investment for the overall open pit expansion and associated five works and activities. However, the alternative requires lake level increases that result not only in the loss of the north lake basin, but also the alteration of the entire shoreline perimeter of Three Nations Lake. Fundamentally, the entire Three Nations Lake basin habitat will be altered and is considered a significant and extensive alteration that would be difficult to mitigate in a predictable manner in terms of physical, biological or temporal considerations. Consequently, it was concluded that this alternative would not be acceptable, which was confirmed through discussions with DFO.

The Pit Facilitation Project Package 2 Alternative, which represents technical feasibility and cost effective solutions for undertaking the five works and activities, and provides appropriate strategies for addressing natural feature effects, was considered the preferred alternative to carry forward for preliminary design and evaluation in this environmental assessment process.

TABLE OF CONTENTS

Page

4.0 DESCRIPTION OF EXISTING ENVIRONMENT

Environmental data for the Project study area has been reported in detail in the Environmental Baseline Studies (AMEC 2003 - 2004). Baseline data was obtained from: literature sources, air photo interpretation, site-specific investigations (geology, geochemistry, soils, hydrology, hydrogeology, water quality, sediment quality, vegetation and wildlife communities, and aquatic studies) and from discussions with other study team members.

4.1 Physical/Chemical

4.1.1 Climate

The climate surrounding the proposed project is characterized by cold winters and hot summers. The winter months are characterized by relatively low precipitation. Summer months are damper with frequent cyclonic storm fronts advancing from the west. Precipitation records for 1955 to 1990 provide a total mean precipitation range from a low of 44 mm in February to a maximum of 100 mm in July. The maximum daily rainfall recorded at the Timmins airport is listed as 87.6 mm and annual average precipitation is 873 mm. Prevailing winds range from the northwest in the winter to the southwest in the summer, with mean wind speeds ranging from 10.9 kph to 13.0 kph, respectively. Maximum hourly wind speeds range from the southwest at 51 kph in February to 71.9 kph from the south in August. The average amount of snowfall for Timmins during 1971 to 2000 was 313.4 cm. Snowfall was highest in December at 65.4 cm and no snowfall was recorded in July and August. The average annual snow depth for 1971 to 2000 was 20 cm, with the deepest amount recorded in February at 66 cm.

4.1.2 Geology

The Pamour Mine is located along the Keewatin-Timiskaming Unconformity where older mafic and ultramafic metavolcanics to the north (Keewatin-Tisdale Group) structurally overlie younger metasediments to the south (Timiskaming Group) (AMEC 2003g and TROW 2003a). The Pamour property covers a length of slightly over 3 km of the Keewatin-Timiskaming contact. From north to south (oldest to youngest), the main lithologies are:

- Keewatin Metavolcanics - Pillowed and massive basalts up to 200 m thick;
- Agglomerate - A dark chloritic unit with mafic and ultramafic clasts. This may be a basal volcanic breccia. It averages 6 to 9 m thick;
- Timiskaming Metasediments - Sequences of greywacke and conglomerate. The North Greywacke lies below the Pamour Conglomerate and may reach up to 18 m in thickness. The Pamour Conglomerate is up to 30 m thick and thins out at depth and to the east. The South Greywacke lies stratigraphically above the Pamour Conglomerate and averages 240 m in thickness; and,

- Intrusives - Matachewan diabase dykes are the only known intrusive rocks. They occur at the east end of the Pamour property and post-date all other structures.

4.1.3 Terrain and Soils

The area around the Pamour site is relatively flat and underlain by fill and overburden with occasional outcroppings of bedrock. Original site elevations ranged from roughly 285 m adjacent to Three Nations Lake, to 293 m in the northwest corner of the property. Development at the mine has been superimposed on this original landscape, so that the highest point on the property is now found on the No. 2 Tailings Dam (310 m) while the lowest point is found at the bottom of No. 3 Pit (195 m). On a regional basis, the terrain slopes gently from an elevation of 315 m near South Porcupine to 285 m at Three Nations Lake.

Landforms and surficial soils within the study area are of continental glacial origin from the Wisconsin ice sheet that covered the area approximately 100,000 years ago. According to Trow 2003a, there is a surficial layer of peat across the site. This peat was considerably saturated due to a high water table in low-lying areas. The native non-organic soils underlying the peat are generally a silty clay with low frost susceptibility, underlain with silt to clayey silt with a high frost susceptibility. Below the silt to clayey silt is a deposit of silty sand till overlying suspected bedrock. The AMEC (2003g) study supported these findings.

4.1.4 Surface Water

The project site is located in the Porcupine River subwatershed of the Moose River-Abitibi-Frederick House watershed, a tributary area of the Hudson Bay/James Bay Lowlands basin. The Pamour drainage area covers approximately 2,290 ha and is divided into 9 subcatchments (AMEC 2003d). The key drainage features in the study area are the Porcupine River, Three Nations Lake and Three Nations Creek.

Porcupine River

The Porcupine River system originates through several branches and combines into a single channel immediately west of South Porcupine where it flows into Porcupine Lake. The Porcupine River discharges from Porcupine Lake approximately 2 km west of the Pamour site. From the outlet of Porcupine Lake, the Porcupine River passes under Highway 101 and turns to the north flowing just west of the Pamour site. Upstream of Pamour, the River receives effluent from the South Porcupine sewage treatment plant. The drainage channel carrying discharge from the Pamour No. 3 Tailings Dam and seepage from the No. 2 Tailings Dam enter the River immediately upstream of seepage and runoff inputs from the inactive Broulan Reef and Hallnor sites. Further north the River receives inflows from Hoyle Pond, Bell Creek and Owl Creek Mines and the Kidd Metallurgical Division. Three Nations Creek discharges into the Porcupine River 4 km east of Pamour and 3 km upstream from the mouth of the Porcupine River at Nighthawk Lake.

Three Nations Lake

Three Nations Lake (TNL) is located at the southeast side of the Pamour site is the headwater of Three Nations Creek. The lake has no major tributaries, a limited watershed of 280 ha exclusive of the surface area of 60.4 ha, and an estimated volume of 1,469,937 m^3 (ESG 1997a). The maximum depth is 6.1 m and the mean depth is 2.4 m. The lake is oriented in a north to south direction and is approximately 1.6 km in length with a shallow (2 m) basin to the north and one main deeper basin (4 to 6 m) in the mid to southern area of the lake basin. Drainage from the mine/mill drainage channel and the southeast No.2 Tailings Dam drainage channel enters the lake on the northwest shore upstream of the discharge to Three Nations Creek.

Three Nations Creek

TNL drains into Three Nations Creek (TNC) then flows approximately 5.2 km northwest then southeast before discharging into the Porcupine River. Following discharge from TNL, TNC passes under Highway 101 and flows through a series of low lying wetland areas between the No. 1 Tailings Dam and a large waste rock and overburden stockpile. This stretch of TNC receives inflow from the northeast drainage channel including discharge from No. 3 Tailings Dam Tower 1A. The wetlands continue around the north side of the waste rock pile and south of Kidd Creek Metallurgical site before turning southeast and remerging as a small meandering stream that passes back under Highway 101 to the south. The Creek discharges into the Porcupine River approximately 2.5 km east of this second road crossing.

4.1.4.1 Hydrology

Tailings

There are three tailings dams associated with the Pamour site: No. 1 Tailings Dam (No.1 Dam), No. 2 Tailings Dam (No. 2 Dam) and No. 3 Tailings Dam (No. 3 Dam). No. 1 Dam drains to Three Nations Creek, No. 2 Dam drains to both the Porcupine River and Three Nations Lake and No. 3 Dam drains to both the Porcupine River and Three Nations Creek. No. 1 Dam was designed as a zero discharge facility with water losses resulting from seepage, evaporation or ground water movement. Surface runoff from the north and east slopes, as well as the majority of seepage from the dam drains along the toe of the dam into Three Nations Creek. Surface runoff from No. 2 Dam drains to the toe of the facility and is directed in a southwesterly direction towards the Hallnor Mine Road and subsequently the Porcupine River. A small amount of seepage and surface runoff from the east and southeast side of the dam drains along the toe in a southeasterly direction under Highway 101 and enters Three Nations Lake. Since the cessation of operations, water impounded on No. 3 Dam has been pumped or siphoned to the environment at the discharge of decant Tower No. 3.

Waste Stockpiles

The main waste stockpile is located on the east side of the property and contributes the greatest amount of surface runoff to local natural drainage systems. Sheet flow from the top of the waste stockpile during storm events is routed along the main access road into Three Nations Creek. Runoff from the small waste stockpiles located west of the mine/mill complex drains into the channel at the toe of No. 2 Dam and joins the southwesterly flow to the Porcupine River.

Open Pits

There are five open pits associated with the Pamour site: No. 1 Pit/No. 3 Pit, No. 2 Pit, No. 4 Pit, No. 5 Pit, and West Pit. All open pits drain to the underground workings with no discharge to surface.

4.1.4.2 Surface Water Quality

Three Nations Lake

The northwest corner of the lake receives surface runoff from the former mine site via a low swampy area, as well as seepage and surface runoff from the east and southeast side of No. 2 Dam. Annual mean concentrations of key parameters at this location have remained consistently below effluent limits of Ontario Regulation 560/94 since cessation of operations.

Water quality in Three Nations Lake was monitored monthly at the outlet to Three Nations Creek or at the northwest pump house (both designated TNL). The lake is slightly alkaline (pH generally >7.5) with hardness at the upper limits of concentrations observed in regional background lakes (ESG, 1997 and AMEC, 2003i). Dissolved oxygen levels of 10 to 14 milligrams/liter (mg/L) were suitable at all depths in both the 1996 and 2003 summer surveys, but become limiting particularly at depth in the winter (4.2 to 5.9 mg/L) (AMEC 2004b). Overall water quality within Three Nations Lake has seen little improvement since the 1996 sampling completed by ESG.

Three Nations Creek

Three Nations Creek receives seepage and runoff from the north and east slopes of No. 1 Dam, effluent from No. 3 Dam Tower 1A, inflow from the northeast drainage channel, and seepage and runoff from the main waste rock pile.

Water quality monitoring of Three Nations Creek upstream of No. 1 Dam and input from the northeast drainage channel was initiated in 1992 (ESG 1997a). Upstream of No. 1 Dam, Three Nations Creek water is near neutral with concentrations of nickel, copper, zinc, lead, and cyanide at concentrations similar to those observed at upstream station TNL. Annual mean concentrations of these parameters are near or exceed PWQO, but no mean concentrations exceed PWQO by an order of magnitude.

The downstream monitoring location for Three Nations Creek is located upstream of potential inputs from the Kidd Metallurgical Division. Downstream of Pamour operations, Three Nations Creek water remains near neutral with concentrations of metal and nitrogen parameters similar to those observed at the upstream station. Annual mean concentrations of these parameters are near or exceed PWQO, but no mean concentrations exceed PWQO by an order of magnitude.

Porcupine River

The Porcupine River receives inputs from the Pamour No. 3 decant Towers No. 2 and No. 3, and seepage from the No. 2 Dam. From the eastern side of the property, the Porcupine River receives discharge from Three Nations Creek 4 km east of Pamour and 3 km upstream from the mouth of the Porcupine River at Nighthawk Lake. Along this route the river also receives inputs from the Hallnor, Broulan Reef, Kidd Metallurgical site, Hoyle Pond, Bell Creek, Marlhill, Owl Creek Mines and the Tailing Management Area at the Kidd Metallurgical Division.

Drainage to the Porcupine River from the western section of the Pamour property is monitored at a station located where the drainage ditch crosses the Hallnor Road upstream of the discharge to the Porcupine River. Annual mean concentrations of key parameters at this location have remained consistently below effluent limits of Ontario Regulation 560/94. Annual mean concentrations of nickel, copper, zinc, lead, arsenic and cyanide are near or exceed PWQO, but no mean concentrations exceed PWQO by an order of magnitude. Lead and zinc concentrations appear to be declining following cessation of operations.

Monitoring upstream and downstream of the monitoring station was initiated in 2000. Water quality in the Porcupine River west of the Pamour site remains near neutral, with concentrations of copper and arsenic above provincial water quality objectives. Weak acid dissociated cyanide concentrations are above the “free” cyanide guideline of 0.005 mg/L. Lead, zinc, nickel, free cyanide and ammonia show no consistent variance in annual mean concentrations between upstream and downstream sampling locations. Total suspended solids concentrations are consistently higher at the downstream location, but the magnitude of the difference appears to be declining with time. Mean concentrations of copper and arsenic are consistently elevated at the downstream location.

The western section of the Porcupine River downstream of the Pamour property shows elevated concentrations of hardness and sulfate relative to the upstream station, but metal concentrations remain unchanged or are lower.

4.1.5 Groundwater

4.1.5.1 Groundwater Flow

Groundwater flow in the vicinity of the Pamour site can be conceptually separated into a shallow unconfined groundwater flow system and deep confined groundwater flow system (Knight Piésold 2002 and AMEC 2003g). The glaciolacustrine clays and silts that are found over most of

the site separate these systems. Groundwater flows between the systems where the glaciolacustrine clays and silts are absent.

The shallow unconfined groundwater flow system can be further separated into three subsystems based on the inferred ultimate receptor of groundwater flowing in the subsystem. These include the Porcupine River Subsystem, Three Nations Subsystem and Mine Workings Subsystem.

The deep confined flow system includes flow within the glaciolacustrine sands and gravels, till and fractured bedrock. Knight Piésold (2002) expects that the overlying and underlying confining units control groundwater flow within the deep confined flow system. Groundwater is expected to recharge the deep confined system where the glaciolacustrine clays and silts are absent. Groundwater is expected to discharge from the deep confined system to the underground workings and open pits at the Pamour site, or to regional surface water features that intersect the deep confined system.

4.1.5.2 Groundwater Quality

Knight Piésold (2002) reviewed existing groundwater quality data for two monitoring wells installed adjacent to Three Nations Lake, two monitoring wells installed between No. 1 Dam and Three Nations Creek, and three monitoring wells installed on No. 1 Dam. The groundwater quality data was compared against the Ontario Ministry of the Environment publication *Guidelines for Use at Contaminated Sites in Ontario (1997)* criteria.

Monitoring wells were installed to monitor: 1) the tills under the glaciolacustrine clay, and 2) the upper sands above the glaciolacustrine clay. Cyanide was detected in groundwater samples collected from both wells at concentrations ranging from 0.002 to 0.011 mg/L, which are below the Table A criterion of 0.052 mg/L. Cyanide does not typically occur naturally, indicating that groundwater likely originated from combined or cyanide leach tailings. Groundwater likely flows through the shallow unconfined flow system from No. 2 Dam, which contains combined tailings. Groundwater likely infiltrates from No. 2 Dam into the deep confined flow system near the bedrock outcrop along the east side of the dam then flows eastward. Groundwater might also flow from No. 2 Dam to the deep confined flow system through the water supply well that is reportedly located within the footprint of No. 2 Dam (MOE well record 16-03017). Groundwater elevations measured in the tills and glaciolacustrine clay are above ground surface (Klohn-Crippen, 1998) indicating that groundwater recharge occurs at a topographically higher location. No. 2 Dam is likely that location. Based on estimated hydraulic parameters, it is reasonable to expect that groundwater has flowed from No. 2 Dam since deposition started about 1950. Samples from these wells exceeded the respective Table A or ODWO criteria for copper, lead, iron and arsenic.

Monitoring wells were also installed to characterize groundwater conditions between No. 1 Dam and Three Nations Creek (Klohn-Crippen, 1998). One monitoring well monitored glaciolacustrine sand under glaciolacustrine clay and silt, while a second monitoring well monitored the upper part of the glaciolacustrine clay. Cyanide was detected in both wells at

concentrations ranging from 0.008 to 0.026 mg/L. Samples from these wells exceeded the respective Table A or ODWO criteria for nickel, copper, lead, iron, arsenic and sulphate. Groundwater likely infiltrates through the east side of No. 1 Dam and flows eastward through the shallow unconfined flow system. Groundwater likely flows into the deep confined flow system near the southeast corner of No. 1 Dam then flows northeastward.

4.1.6 Air Quality and Noise

Valcoustics Canada Ltd. assessed the potential impact of sound emissions and ground vibration associated with reactivation of the Project site (Valcoustics Canada 2003 and 2004). The receptors potentially include existing residences close to the open pit, as well as residences that are beyond the zone of influence of the open pit operations but are close to the proposed haul road (AMEC 2003j). The area around the proposed pit is considered a “Class 2 Area” according to MOE definition. A Class 2 Area is an area that has qualities representative of both Class 1 and Class 3 areas, and in which a low ambient sound environment defined by natural environment and infrequent human activity will typically be realized as early as 19:00 hours. Ambient noise levels closest to the area affected ranged between L_{min} 32 to 35. The governing guideline limit is 45. The closest receptors to the proposed works and activities are Hallnor residents, who live on North side of Highway 101, approximately 1 km from pit.

AMEC conducted dust modelling to assess the effects on ambient levels of dust from the haul road. According to the modelling results, the proposed haul road alignments would require the design and implementation of a comprehensive dust suppression program to ensure compliance with Provincial Ambient Air Quality Criteria (AAQC). The required dust suppression will be applied during the haul road operation to comply with the AAQC. The Pamour pit operation will be of a similar magnitude to current operation at the Dome mine, therefore, similar mitigation strategies to those already in place at Dome will be applied at the Pamour site. Monitoring at the Dome mine for ongoing quarterly compliance reports shows that AAQC guidelines are consistently met outside the property.

4.2 Natural Environment

4.2.1 Terrestrial Ecosystems

Vegetation Communities

Six different habitat types and 19 different ecosites were observed within the study area, no vegetation was observed within the pit expansion area. The vegetated study area covered a total area of 6.4 km^2 (deciduous forest 1.37 km^2, coniferous forest 1.75 km^2, mixed forest 2.30 km^2, thicket 0.86 km^2, barren 0.04 km^2 and stream 0.07 km^2), dominant species within these communities included balsam poplar (*Populus balsamifera*), trembling aspen (*Populus tremuloides*) and black spruce (*Picea mariana*). Vegetation communities are discussed in detail within a Terrestrial Existing Conditions Report (AMEC 2004c). Approximately 5.5 km^2 of the study area, relative to the Three Nations Creek watershed, has been disturbed by past mining activity. There is also disturbance from transportation corridors, utility corridors, forestry and

recreation. Therefore, approximately 50% of the study area has been previously disturbed. In general, disturbance within the semi-natural forest areas through long-term land use practices has likely lead to a reduction in plant and animal richness.

All of the vegetation species, which were observed within the Project area, fall within a Global and Provincial ranking of 4 (fairly uncommon to common) or 5 (very common). No species, which are listed within the Species At Risk Act (SARA), were recorded within the study area. In addition, all of the vegetation species encountered are common to abundant in their respective habitats and are well represented from a regional perspective. No Federally, Provincially or Municipally designated habitats were recorded within the study area. The Project area is located at the northerly extent of a relatively contiguous forest system that extends to the south. Some fragmentation of the forest has occurred as a result of timber harvests, and infrastructure corridors, but wildlife corridors have been maintained between the major forest blocks. With the generally intact forest system to the south of the site, considerable habitat is available for wildlife.

4.2.1.1 Wetlands

A wetland complex was located adjacent to Three Nations Lake and an inundated wetland located north of Highway 101 (ESG 1997a). The study undertaken by ESG in 1996 concluded that, using the Wetland Evaluation System criteria, the wetland would not be considered of provincial significance. Therefore constraints to development would not be applied to this wetland based on its importance on a Provincial scale. It is of note that this wetland does not meet the criteria for local significance.

AMEC field investigations identified that much of the lake surface is open water (AMEC 2004c). The most conspicuous vegetation is represented by stands of hard-stemmed bulrush (*Scirpus acutus*). In many cases, the stands of bulrushes are intermingled with growth of water-celery (*Vallisneria americana*). Common cattails (*Typha latifolia*) stands were recorded in the shallowest parts of the lake. Scattered Water Smartweed (*Polygonum amphibium*) was flowering along the west side of the lake. Floating foliage of fragrant water-lily (*Nymphaea odorata*) was encountered at scattered locations off the north shore. The submergent vegetation species included curly-leaved pondweed (*Potamogeton crispus*), flat-stemmed pondweed (*Potamogeton zosteriformis*), whorled water-milfoil (*Myriophyllum verticillatum*), and Canada waterweed (*Elodea canadensis*).

4.2.1.2 Wildlife

Bird point counts, which followed standard methodologies, were undertaken within the study area (AMEC 2004c). Abundance data showed that, in general, ovenbird and red-eyed vireo where the most abundant species within the study area. A variety of bird species were observed to be within their breeding range throughout the study area. These included species typical to wetlands, forest edge and forest interior habitat. The forest interior species were utilizing the extensive contiguous forest of the study area. Typical species observed in the various habitats included: alder flycatcher, American redstart, black and white warbler, black capped chickadee,

common yellowthroat, ovenbird, red-eyed vireo and white throated sparrow, American crow, American robin and blue jay.

Mammal signs observed within the study area (AMEC 2004c) included moose, fox, wolf, bear, marten, otter, muskrat, beaver, lynx and a variety of small mammals/rodents (mice, shrews and voles). Red squirrel and Snowshoe Hare were particularly abundant with concentrations in the mixed and deciduous forest habitats. The relatively dense areas of spruce forest to the east of Three Nations Lake also indicated signs of overwintering moose, however, track densities did not suggest a high concentration of individuals. In general, the tracking data showed a well-distributed pattern of mammals utilizing the study area. The species composition was considered consistent for the area characteristic of the boreal forest region and previously reported (ESG 1997a).

4.2.2 Fisheries and Aquatic Ecosystem

In 2003 AMEC undertook supplemental fisheries and aquatic ecosystem field investigations and produced an Aquatic Ecosystems Existing Conditions Report (AMEC 2004b), results are summarized below.

4.2.2.1 Three Nations Lake

Habitat Conditions

Approximately 80% of the lake shoreline is forested, 15% fronts onto the existing Highway 101 road embankments, and 5% exhibits wetland characteristics. Shoreline banks are stable, with 1% woody debris in-water cover rimming the lake margin. The dominant substrate found within the Three Nations Lake is a silt-clay mix. This substrate was almost exclusive at depths greater than 2 m. The littoral zone substrates consisted of large areas of fine organic and sand substrates, and a more limited or sparse representation of mixed gravel, cobble and boulders. Aquatic vegetation represented approximately 20% of the entire lake surface area (ESG 1997a).

Benthic Community

A total of 79 taxa were collected and identified from Three Nations Lake. This is a high number of taxa for a lake, indicating a very healthy and diverse benthic community. The most common taxa, found at all sampled stations, were aquatic worms (immature tubificids without hair chaetae), mayflies *(Hexagenia* and *Caenis)*, biting midges (*Ceratopogonidae*), the phantom midge *(Chaoborus albatus)*, the midge *(Procladius)*, and the pea clam *(Pisidium)*. Amphipods *(Hyalella azteca)*, midges *(Cryptochironomus, Dicrotendipes, Tanytarsus,* and *Clinotanypus)*, and snails *(Gyraulus* and *Valvata tricarinata)* were present at five of the six sampled stations. Generally, ESG (1997a) concluded that the community assemblage of benthic macroinvertebrates in Three Nations Lake is characteristic of a shallow, clear lake with an abundance of aquatic vegetation.

Community and Fisheries Classification

Fish species found within Three Nations Lake included common white sucker (*Catostomus commersoni*), northern pike (*Esox lucius*), yellow perch (*Perca flavescens*) and walleye (*Stizostedion vitreum*) (ESG 1997a). These species represent a coolwater fish community. The Ontario Ministry of Natural Resources manages Three Nations Lake as a northern pike/walleye fishery.

Fisheries Limitations and Other Influences

Several factors that could limit potential fisheries include winter dissolved oxygen, suitable spawning habitat, and mining activity. Dissolved oxygen levels in Three Nations Lake indicate a constriction of optimal habitat available for the present fish community as winter progresses (AMEC 2004e).

A review of the habitat indicated a general availability of spawning habitat for northern pike, yellow perch, and white sucker. Walleye spawning habitat was largely limited within Three Nations Lake (AMEC 2004b; 2004e). Adjacent mine-related industrial facilities and associated activities have influenced lake sediment and water quality as reported by ESG (1997b). Current water quality monitoring programs indicate that elevated values for certain metals (i.e., copper and zinc). However, it is of note that, based on the observations identified above, there is a functional aquatic ecosystem within Three Nations Lake irrespective of limitations represented by physical habitat and water quality.

4.2.2.2 Three Nations Creek

Habitat Inventory

Past and present beaver activity throughout the study area has resulted in a wide variation in channel configuration. Reaches were classified on the basis of morphological criteria and biophysical features including: channel section, gradient, substrate composition, riparian vegetation structure, overhead cover (shading), and instream cover. Based on the AMEC 2003 spring assessments, five reach types were identified within Three Nations Creek (AMEC 2004b).

Benthic Community

A total of 16 taxa were collected and identified from two sites along Three Nations Creek in September 1998 by the MOE. The common taxa found at these two stations included aquatic worms (immature tubificids without hair chaetae, and *Dero nivea*), biting midges (*Ceratopogonidae*), and midges *(Procladius*) (MOE 1998). Based on the percentage of Chironomidae, Olichaeta, and Mollusca, there is a very low benthic diversity represented by pollution tolerant species.

Community and Fisheries Classification

Fish sampling efforts conducted by AMEC during the spring of 2003 resulted in the capture and identification of a diverse community consisting of pearl dace (*Margariscus margarita*), golden shiner (*Notemigonus crysoleucas*), fathead minnow (*Pimephales promelas*), northern redbelly and finescale dace (*Phoxinus* spp.), brook stickleback (*Culaea inconstans*), Iowa darter (*Etheostoma exile*) and white sucker (AMEC 2004b). In general, the watercourse habitat supports a forage/baitfish community. The creek appears to have a relatively low habitat productive capacity and does not contribute significantly to fish production.

Fisheries Limitations and Other Influences

Probable limiting influences on the aquatic corridor function and fisheries in Three Nations Creek include: mining, base flows, beaver activities, and spawning habitat availability. As reported by ESG (1997b), adjacent mine-related industrial facilities and associated activities have influenced creek sediment and water quality. However it is of note that, based on the observations identified above, there is a functional aquatic ecosystem within Three Nations Creek irrespective of limitations represented by physical habitat and water quality.

A review of the habitat in Three Nations Creek generally indicates an availability of potential spawning habitat for certain species that prefer conditions associated with homogeneous vegetated areas such as the abundant cattail marshes through the length of the creek. Granular substrates used by several other species such as white sucker, are virtually absent (AMEC 2004b).

4.2.2.3 Porcupine River

Benthic Invertebrates

Triplicate Benthic invertebrate samples were collected at three stations in the Porcupine River (ESG 1997b). A total of 38 taxa were collected and identified from three stations on the Porcupine River. The most common taxa, found at all three stations, were roundworms (*Nematoda*), the midge *(Procladius)*, and the pea clam *(Pisidium)*. Aquatic worms, the midges *(Chironomus)* and *(Polypedilum)*, and the snail *(Amnicola*) were next most abundant taxa encountered.

Water Quality

The channel width averaged 20 m and the maximum and mean water depth was 2 and 1.3 m, respectively. Flow velocity was approximately 0.07 m/s. Stream morphology was comprised of 80% pool and 20% flat. Dissolved oxygen and water temperature averaged approximately 7.3 mg/L and 20.7^{0}C. Conductivity and pH averaged 670 μmhos/cm and 7.5, respectively. Water quality within the Porcupine River is characterized as having elevated concentrations of ammonia, colour, manganese, nitrite, nitrate and phosphorus. This was mostly due to industrial and municipal inputs.

Vegetation

The banks were stable and well vegetated by grasses and alder, with upland spruce and poplar. Dense floating duckweed (*Lemna minor*) and algae cover much of the near shore. Other aquatic macrophytes present include cattail (*Typha* sp), coontail (*Ceratophyllum demersum*) and sago pondweed (*Potamogeton pectinatus*).

Fish Community

The OMNR reports warmwater fisheries values for the Porcupine River including the presence of Northern Pike (*Esox lucius*), White Sucker (*Catostomus commersoni*) and Yellow Perch (*Perca flavescens*) (ESG 1997a). Additionally, walleye (*Stizostedion vitreum*) are reported to occur in Porcupine Lake. The ESG study found large numbers of benthic organisms in the Porcupine River. However, there were indications that the river is being stressed by organic inputs from the municipal sewage plant at South Porcupine.

4.3 Socio-economic Environment

4.3.1 Health

4.3.1.1 Current Health Status of Communities within and Adjacent to the PJV Mine Expansion Study Area

Health services within the Project study area are provided by The Porcupine Health Unit. The city of Timmins is the largest community in the Health Unit area, where close to half (49%) of the population reside. The Porcupine Health Unit has produced a report that describes the population profile (Hohenadel July 1999). The report highlights the demographic characteristics of the residents living in the geographic area serviced by the Porcupine Health Unit. The main findings are summarized below:

- The area has seen a slight decline in its population between 1991 and 1996 censuses. However the City of Timmins population remained stable, with a 0.1% increase;

- The population in the area is gradually aging. There has been a gradual increase in the proportion of the population in the 45 to 64 years of age group and the 65 and over age group. This is a common trend across the county;

- With respect to education the area has a higher proportion of the population with grade 9 education or less and a lower proportion of the population with a university degree compared to all provincial residents and Canadians; and,

- The unemployment rate (in 1995) was higher in this area than in the province of Canada, particularly for males. For 1998, the unemployment rate for the whole Northeast region (11.8%) was higher than Ontario (7.2%) and Canada (8.3%).

4.3.1.2 Health Issues in Timmins

Smoking rates in the District and major illnesses associated with smoking have been discussed in a report produced by the Porcupine Health Unit (Hohenadel December 2000). Smoking rates are higher in Northern Ontario than in other parts of the province. To go along with this are higher rates of lung cancer, hospitalizations due to respiratory system diseases and deaths due to lung cancer.

The report states that the leading cause of death to Timmins area residents is diseases of the circulatory system. These diseases account for 37% of deaths to Timmins area residents. Cancer is the second leading cause of death in the Timmins area residents, accounting for 29% of deaths. Disease of the respiratory system accounts for the third most number of deaths to Timmins area residents (11%).

4.3.1.3 Health of PJV Employees and Their Families

The PJV is committed to providing a safe and healthy working environment for its employees and families. The PJVs Health and Safety Policy states: '*Placer Dome (CLA) Limited – Porcupine Joint Venture (PJV) will provide safe and healthy working environments, develop, promote and maintain safe conditions and work practices in all departments and comply with all applicable laws governing its activities. The Porcupine Joint Venture considers the safety and health of its works to be of utmost importance*.'

Occupational health is an important aspect of PJV's Safety Management System. PJV believe that employees who are physically and mentally healthy are more productive and lead a balanced life style. Therefore the PJV has a medical team on a retainer that allows for expedited assessments and treatment of injured employees. The team consists of a doctor, a physiotherapist, a chiropractor and a psychologist.

PJV also has a fully-funded Employee and Family Assistance Program (EFAP). This is a 24-hour confidential service offered to all employees and their families. In 2003 it was reported that 104 employees and their families utilized this program. In 2001 a kinesiologist was hired to prepare physical demands analysis (PDA) for all jobs involving physical exertion. This continued by hiring kinesiology students each summer to continue updating the PDAs and educating the workforce about back care and office ergonomics. There are also Occupational Health Centres located at the Dome and Hoyle Pond sites. These have continued to offer influenza vaccinations to employees on a voluntary basis. In 2003, 235 employees received flu shots. In addition, employees can update their adult boosters for tetanus, diphtheria, and polio. In addition, on site health fairs have proven to be an asset for employees wishing to obtain information about general health agencies available to them within the community.

4.3.2 Labour and Economy

Timmins represents the largest northeastern Ontario community north of Sudbury. This concentration of population, as well as the distance to other major cities, has allowed Timmins to develop into a regional centre. Since it was founded in the early 1900's, Timmins has been reliant on resource-based industries. This observation continues to be true today, with approximately 25% of the workforce directly employed by mining and forestry.

Employment in the mining sector has declined in recent years. The Project has brought new hope for the continuing strength and vibrancy of the mining community.

The economic development of the City of Timmins is currently facing a number of challenges (KPMG 2000a) related to factors such as:

- Educational concerns at the junior level;
- Aging population;
- Remote location and associated transportation costs;
- Limited access to rail transportation (limited local network/access); and,
- Increased automation and robotics in mining industry, and resulting decrease in employment numbers.

In its strategic perspective for the Timmins economy, the City of Timmins also identified a number of factors representing opportunities for future economic development (KPMG 2000b). In an effort to ensure that Timmins continues to be a viable community, the City of Timmins has entered the process of developing a strategic economic plan with the objective to attract new investments, retain existing employment, and diversify the economic base.

The Project will have a positive impact on job creation. Once the mine expansion goes into production many new long-term engineering, mining and equipment maintenance jobs will be created and last for the life of the project (approximately 11 years). Indirect jobs supporting the mine industry from general retail to heavy equipment sales and service will also be created. Therefore, the overall socio-economic impact of the proposed Pamour expansion project will be positive for the City of Timmins and its residents.

4.3.3 Land Use and Ownership

The Pamour Mine had been in continuous operation from 1936 until 1999 at which time the site was transitioned to care and maintenance. In addition to the mine infrastructure, 3 km of Highway 101 runs across the southeastern corner of the property, and the Ontario Northland Railway (ONR) tracks run northeast through the centre of the property.

According to the **City of Timmins Zoning By-Law No. 1977- 850 as Amended** (February 1997), the majority of the Pamour site and surrounding area is zoned as "Industrial-Mining" (IM), but portions of the property are zoned as "Agriculture" (AT), "Rural-Wilderness (AW) and "Highway Commercial" (DCH). Immediately west of the property, two small areas are zoned as "Residential" (RE1). An area along Highway 101, immediately south of the property, has been zoned as "Industrial-Light" (IL).

According to the **City of Timmins Official Plan** (1999) the Pamour Mine falls within the Whitney Rural Planning Unit. According to Schedule F9 of the plan, a portion of the property has been designated for "Future Highway & Service Commercial" use while limited areas west of Three Nations Lake have been designated for "Agriculture" use.

Land Tenure

The Project extends over five townships: Whitney, Tisdale, Deloro, Shaw, and Hoyle. A complex pattern of mining and surface rights exists in the vicinity of the Pamour site, with surface and mining rights often assigned under different parcel numbers for the same area. The majority of mining and surface rights around the Pamour are held by the PJV within Whitney and Hoyle Townships, with notable exceptions held by Drew (Schumacher Estate), the Ontario Northland Railway (ONR), Korba, and the Province of Ontario (the Crown). Property ownership and land title searches are ongoing since November of 2002, with acquisitions occurring on small private parcels, and negotiations for easements in other areas.

4.3.4 Timber Ownership

The timber ownership has been based on the Land Titles Registry (September 3, 2003). There are 35 parcels of land within the study area. There are approximately 14 parcels of land that will be affected by the Project. The majority of the land within the study area is controlled by PJV, with pine reserve to Crown. Four parcels of land have all trees reserved to Crown.

4.3.5 Commercial and Industrial Facilities

Norfab, an industrial custom manufacturing/fabrication facility, is located at the southwesterly limit of the Project study area. Woodgreen is located just west of the Hydro alignment. Proximate to the eastern limit of the study area is the Kidd Metallurgical facility operated by Falconbridge Limited.

4.3.6 Community and Recreational Facilities/Activities

A boat launch is located on the northern shore of Three Nations Lake. Through discussions with the MNR and members of the public during the consultation process, it was noted that access to the lake for local recreational angling opportunities was an important resource value to the community.

To the south of Three Nations Lake, an organized snowmobile trail system provides linkage to both a local and regional network of trails that service the greater Timmins area. This system is used to a lesser extent by all terrain vehicles (ATVs) in the summer, and to access hunting opportunities in both the Three Nations Creek and Goose Creek watersheds to the south and east of Three Nations Lake.

4.3.7 Hunting and Trapping

Aerial moose inventories were undertaken in 1998 to 1999 (NWST Technical Report TR-127, May 2000). Timmins falls within Wildlife Management Units (WMU) 29 and 30 (the northern area of Timmins falls within WMU 30 and southern area in WMU 29). Population estimates within these WMU included approximately 1,300 moose observations in WMU 29 and 1,500 moose observations in WMU 30.

Hunting occurs on a regular basis within the study area. Levels of hunting have been reported in the 1999 to 2000 Moose Harvest in Ontario (NWSI Technical Report, TR-131, March 2002). Within WMU 29 and 30 the estimated number of hunters was 3,382 and 1,982, respectively, with 243 and 197 animals harvested in each unit. The estimated number of hunters for 2000 was 2,749 for WMU 29, and 2,047 for WMU 30, with approximately 200 animals harvested in each unit.

Trapline locations were obtained from MNR resource inventory mapping (MNR 1998). Three trappers clarified that they have traplines within the area of the Pamour Project (identified as T1 21 - Dome Mine area, T1 26 - South Haul Road Area, and T1 36 - Hoyle Pond, Pamour, Falconbridge areas). Two of the above trap lines are located approximately 600 m directly south of the lake (TI-36 and TI-26).

4.3.8 First Nations Culture and Traditional Pursuits

Traditional pursuits (hunting, fishing, trapping, and to a lesser extent gathering) are practiced by a proportion of the population. These activities provide direct resources to the community (meat from hunting and fishing, money from hides and furs), and equally or more important, a sense of recreation and culture, linked to traditional ways. Furbearers are harvested within trapline boundaries. Hunting is less structured, as hunting is viewed as a basic right of survival, and less as a commercial activity. Hunting is most heavily focused on caribou, moose, and waterfowl.

4.3.9 Cultural Environment

Adams Heritage undertook an archaeological assessment and archaeological field examination (Stages 1 and 2) of the areas affected by the proposed Project in June 2003 (Adams Heritage June 2003). This study was undertaken in a manner consistent with the Ministry of Culture's "Archaeological Assessment Technical Guidelines (1993)". The Ontario Ministry of Culture's Archaeological Data Base contains no entries for archaeological sites within the study area (Borden Blocks DdHh and DcHh). A review indicated that no archaeological sites have been registered within the study area. A number of areas with a high or moderate archaeological site

potential were identified within the areas to be affected by the proposed routes. No archaeological sites were encountered.

4.3.10 Navigation

PJV and DFO met on site in 2003 to discuss potential navigation issues within Three Nations Lake and Three Nations Creek. Based on communication between Transport Canada and DFO (February 20, 2004), Three Nations Creek was not considered navigable. Three Nations Lake was recognized as a navigable water, complete with an available boat ramp. Consideration for navigation issues was confirmed by Transport Canada in subsequent correspondence (Transport Canada October 2004).

TABLE OF CONTENTS

Page

LIST OF TABLES

5.0 CONSULTATION PROGRAM

5.1 Government, First Nations and Public Consultation

The PJV has developed the Pamour Pit Expansion, which includes the Project identified in Section 1.1, in accordance with Placer Dome's Sustainability Policy. This is a commitment to contributing to long-term improvements in the benefits for stakeholders while acting as stewards for the environment.

An important step has been taken towards implementing the Sustainability Policy through the involvement of stakeholders at an early stage of project planning. The PJV has facilitated the identification of stakeholder expectations and the opportunity for project design to achieve a balance between the highest possible environmental standard and the economic development of the resource. Stakeholder consultation has encompassed all aspects of the proposed new development and closure planning. The stakeholder consultation program will continue for the life of the project.

Stakeholders were initially identified as government (federal departments and provincial agencies), nearby residents, nearby business owners, First Nations, and local Non-government Organization (NGOs). Through Open House sessions in 2003, interested stakeholders, including the general public of the City of Timmins, were asked to submit their personal contact information to ensure they were contacted for future review and discussion as required. This is a continuing process.

The planning process has and will continue to involve a high degree of consultation and participative planning. This is being achieved by actively pursuing consultation with stakeholders, federal departments and provincial agencies in parallel with the development and refinement of project concepts during the feasibility, detail design and construction stages.

The process has involved the following:

- Stakeholder identification and establishment of consultation and participation;

- Initial project briefing to government departments and agencies by distribution of a summary document detailing the current knowledge about the project area and the forecast activities and inferred environmental effects which could reasonably be described at that time;

- Letters were sent to the stakeholders, government departments, and provincial agencies at the beginning of the project to announce the start of the preliminary design phase, seek comments and obtain available information;

- Stakeholder meetings including site visits, presentation of information on project concepts, environmental studies, assessment of effects, discussion of options available for effects management and identification of preferred management options;

- Facilitating a series of open house meetings with the stakeholders and the general public to allow focus on areas of concern for specific groups, relevant to the Project and other ongoing PJV project activities;

- Meeting with key government departments and agencies to review their requirements and have them interact with one another to reduce redundancy in Environmental Assessments and other government (Municipal and Provincial) requirements coming from different aspects of the overall project; and,

- Consultation with area First Nation's groups including meetings with the Wabun Tribal Council, Chiefs from the local First Nation communities and proposed visits to interested communities.

5.1.1 Federal Government Department Consultation

5.1.1.1 Pre-consultation Phase

Extensive consultation was undertaken with federal government departments during the Prefeasibility and Feasibility phases of the Project planning process. Letters were sent to each of the identified participants at the beginning of the process to announce the start of the preliminary design phase, seek comments and obtain available information.

External department consultation meetings were held at various stages of the process (Table 5-1). The first session on December 17, 2002 represented a pre-consultation to permit general input regarding federal department requirements early in the planning process. The departments were also notified of Project Initiation and Public Information Centres. Contacts included:

- Fisheries and Oceans Canada (DFO);
- Natural Resources Canada (NRCAN);
- Canadian Environmental Assessment Agency (CEAA); and,
- Environment Canada (DOE).

The process identified DFO and Transport Canada as the Federal Responsible Authorities (RAs) and the other federal departments as Federal Authorities (FAs). DFO undertook consultation with NRCAN and the other federal departments identified, to confirm their involvement in the process, and to make determinations including the scope of the project and the scope of the assessment.

TABLE 5-1
PRE-CONSULTATION MEETINGS AND FEDERAL GOVERNMENT DEPARTMENT ATTENDEES

Date	Attendees
December 17, 2002	DFO
April 9, 2003	DFO
August 26, 2003	DFO, CEAA, DOE
April 28, 2004	DFO

5.1.1.2 Draft Comprehensive Study Report Submission Consultation

A draft CSR that included project details, baseline information and effects assessment was submitted to the RAs and FAs in July 2004. The RAs and FAs provided technical comments on the draft CSR that reflected their own technical and procedural perspectives, as well as those of the other stakeholders. Based on these reviews, and any other materials and discussions, the RAs prepared a list of clarification and information detail recommendations. The PJV provided technical and process responses to the RAs and FAs in October 2004 (Porcupine Joint Venture October 2004a-d). Discussions were also held with various RAs to address the comments, agency recommendations and outstanding issues before the final Comprehensive Study Report was submitted for review by the RAs, CEA Agency, and public review and sign-off by the Minister of Environment.

5.1.2 Provincial and Municipal Government Agency Consultation

5.1.2.1 Pre-consultation Phase

Extensive consultation was undertaken with provincial government agencies during the preliminary design phase. Letters were sent to each of the identified participants at the beginning of the planning process to announce the start of the preliminary design phase, seek comments and obtain available information.

External agency consultation meetings were held at various stages of the process (Table 5-2). The first session on December 17, 2002 represented a pre-consultation to permit general input regarding agency requirements early in the project development process. The agencies were also notified of Project Initiation and Public Information Centres. Contacts included:

- Ministry of Environment (MOE);
- Ministry of Natural Resources (MNR);
- Ministry of Northern Development and Mines (MNDM);
- Ministry of Labour (MOL);
- Ministry of Culture;
- Ministry of Tourism and Recreation (MTR);
- City of Timmins; and,
- Mattagami Region Conservation Authority (MRCA).

TABLE 5-2
PRE-CONSULTATION MEETINGS AND PROVINCIAL GOVERNMENT AGENCY ATTENDEES

Date	Attendees
October 28, 2002	MNDM, MOE, MNR
December 17 2002	City of Timmins, MNDM, MNR, MOE, MOL, MTO, MRCA
January 8, 2003	City of Timmins, DFO, MNDM, MNR, MOE, MOL, MTO, MRCA
May 20, 2003	MNR
June 23, 2003	MNR
June 24 2003	Northwatch, Porcupine Watchful Eye
June 25, 2003	MRCA
August 26 2003	MOE, MNDM, MNR, DFO, DOE, CEAA
September 4, 2003	MNR
October 8, 2003	MOE
October 14, 2003	MNR
December 15, 2003	MNR
January 28, 2004	MNR

5.1.2.2 Post-EA Submission Consultation

As with the Federal RAs, it is anticipated that the Provincial ministries (MNDM and MNR) may provide comments on the environmental assessment that reflect their own technical and procedural perspectives, as well as those of the other stakeholders that are consistent with their regulatory mandates. Key input from the provincial agencies, however, has been and will continue to be associated with the submission of conceptual and detailed designs of the various Project infrastructure elements through the provincial permitting process.

5.1.3 First Nations Consultation

A comprehensive effort is being conducted to provide accurate and up-to-date information to representative First Nation communities about a wide variety of PJV activities within the Timmins area. A variety of correspondence has been issued to First Nations soliciting their input and feedback about the Pamour Open Pit Expansion project and related infrastructure developments.

More recently, a series of meetings between PJV representatives and First Nation community leaders have been completed. Additional meetings and community presentations are planned for providing a forum and framework for open and meaningful dialogue with First Nation communities about these, as well as future projects. A summary of the steps taken, to date, by PJV is provided as follows:

- Completed initial contact (January 2003) with Ministry of Natural Resources (MNR) representatives to determine which First Nation communities in the Timmins area would have concerns with the Pamour Project. MNR suggested that PJV contact both Mattagami and Matachewan First Nations.

- Contacted Wabun Tribal Council on March 27, 2003 to invite their representatives to the April 3 Public Open House. Wabun Tribal Council was of the position that they did not normally participate in open houses of this nature and that PJV should contact the First Nation communities directly.

- Several letters were sent to Mattagami and Matachewan First Nations, on a number of different occasions, offering invitations to attend open houses, soliciting community meetings and obtaining environmental knowledge and input from each community about the Pamour Project. This included letters dated February 10, March 7, April 30, and June 23 (all were addressed in 2003).

- Personal phone calls were made to the Chiefs of the Mattagami and Matachewan First Nations, inviting them to the public open house session on April 3, 2003.

- Written invitations were provided to Wabun Tribal Council, Mattagami First Nation, and Matachewan First Nation, inviting representatives from each to attend the April 3, June 11, and July 29, 2003 public open houses.

- A brief summary of the Pamour Pit Expansion was provided to representatives of MNR. A letter from MNR, dated August 6, 2003, with the summary information attached, was then provided to the Matachewan and Wahgoshig First Nations informing them of the project and presenting a description. A second letter, dated August 11, 2003, providing the same project summary information, was provided to the Brunswick House, Chapleau Cree, Chapleau Ojibway, Flying Post Moose Cree, and Taykwa Tagamou First Nations.

- A meeting was held on September 8 with representatives of Wabun Tribal Council to initiate a liaison with the First Nation communities, as Wabun Tribal Council will represent the First Nation Communities as a technical advisor for the project. Wabun Tribal Council invited PJV to give a presentation to the Chiefs Council on September 15, 2003 to discuss the projects and related issues.

- A meeting was held on September 15, 2003 with the Chiefs of the Wabun Tribal Council. Discussions focussed on the Environmental Assessment process being undertaken by the PJV in relation to the Pamour Pit Expansion and which allowed stakeholder involvement including First Nation communities. A presentation was delivered to the group discussing the projects. The PJV offered to deliver a similar presentation to the individual communities if requested.

- A meeting was held on August 23, 2004 with Wabun Tribal Council and representatives from PJV and Placer Dome (CLA) Ltd. The Pamour Project was discussed and no environmental issues were determined. The discussion went on to focus on economic opportunities between the First Nation communities and Porcupine Joint Venture as well as Placer Dome.

5.1.4 Interest Groups and Municipal Organizations

The group of non-government organizations contacted by the PJV includes the Timmins Fur Council (trappers), Timmins Snowmobile Club, Northwatch, Porcupine Watchful Eye, Local Citizen's Committee and the City of Timmins.

5.1.4.1 Porcupine Watchful Eye

The PJV is actively involved with a community group, the Porcupine Watchful Eye (PWE). The PWE mandate is to be an informed sounding board in liaison with PJV to assist in problem solving and to work towards building a sustainable community.

The Dome Watchful Eye (DWE) was the name given to a stakeholder group that has been formed in support of Placer Dome's company wide Sustainable Development Policy introduced in 1998. On July 1, 2002 the DWE group took on an increased challenge when a joint venture was formed between Placer Dome (CLA) Ltd and Kinross. The company name was changed to the Porcupine Joint Venture and the property more than tripled in land size. Therefore to reflect the sustainability of the joint properties, a name change was also required for the DWE. As of November 2002, the liaison group was named Porcupine Watchful Eye (PWE). The main goal of this relationship is to recognize and understand the requirements, expectations, and concerns of all parties. The group will seek to critically examine identified issues and work with mine management to develop strategies by consensus that meet the mutual needs of the stakeholders, community, and company throughout and beyond mine life.

The PJV keeps the PWE up to date on project activities on a monthly basis. There is a continual sharing of information and feedback from the group that has been taken into consideration with respect to lake habitat replacement and potential monitoring requirements for the operations.

5.1.4.2 City of Timmins

The PJV presented their Pamour Open Pit Expansion project to the Timmins City Council on March 17, 2003 at their council meeting.

The presentation provided an overview of the Porcupine Joint Venture, the history of the Pamour Mine, the proposed Pamour Pit Expansion and its socioeconomic benefit to the City.

A meeting was held on April 1, 2003 with the City of Timmins to review various aspects of the open pit operation and potential closure scenarios. The City of Timmins' Mayor and Council passed a resolution promising the PJV their full support for this Project, as it will provide great benefit to the ongoing success of the community.

5.1.4.3 Timmins Fur Council

The Timmins Fur Council held their Annual General Meeting on September 11, 2003 at the Mountjoy Centennial Hall, 782 Park Avenue in Timmins. Approximately 50 trappers were in attendance.

The PJV attended the meeting to discuss the Pamour Pit Expansion to the trappers and determine who might be affected by the expansion. An aerial map of the Pamour Pit Expansion was displayed and compared to the trap line map. It was determined that three trappers have traplines in the area.

The main issues brought forth at this meeting included:

- Must ensure access to the trap lines; and,

- Moose should be able to pass through transportation crossing culverts associated with the Haul Road to permit north south passage opportunities (Haul Road represents another ongoing PJV local Project as described in Section 2.0).

5.1.4.4 Local Citizen's Committee

A presentation was made to the Local Citizens' Committee (LCC) on July 16, 2003 at the Timmins Gold Mine Tour Boardroom. An overview of the Pamour Pit Expansion was delivered. The LCC is a group of people, from several different backgrounds in the community, including some experts from the Ministry of Natural Resources. The group focuses on water habitat and associated environmental issues.

5.1.4.5 Northwatch

A site tour of the Pamour mine site and surrounding area was given for Northwatch and the PWE chairpersons on June 24, 2003. A power-point presentation was delivered to the two parties overviewing the Pamour Pit Expansion. Many questions were asked about potential effects on the environment.

The PJV identified that the pit expansion represents an opportunity to achieve a comprehensive integration of historic mining features at the Pamour site in the closure plan. A progressive rehabilitation of the site during operations will permit improvements to local site safety and environmental conditions. This would include the removal of hazardous mine workings, resloping, stabilizing, and revegetation of existing tailings and waste rock facilities and demolition of existing site infrastructure.

5.1.5 General Public and Interested Parties

Public Consultation regarding the Pamour Pit Expansion was initiated at a pre-consultation Open House in Timmins on April 3, 2003. This Open House was intended to introduce the

public to the plans for the mine expansion and related activities very early in the planning process such that informed feedback could be received as the project progresses. Approximately 170 visitors attended the project presentation.

Public consultation was undertaken during the Preliminary Design Study as two Public Information Centres (PICs) were held. The first took place on June 11, 2003 and the second was held on July 29, 2003. All open house advertisements were published (in English and French) in local newspapers including the Timmins Times, Timmins Daily Press, and Les Nouvelles.

The purpose of the PIC was to provide interested members of the public the opportunity to review project information and environmental data. Both sessions provided the opportunity to solicit public input through both verbal and written comments regarding the project.

Both PICs were organized as Open House sessions with a “drop-in” format. Interested parties could informally review the presentation material with the opportunity to discuss details with representatives of the PJV. The first Open House was specific to the proposed Highway 101 relocation (AMEC 2003m). In order to provide a more comprehensive understanding of the Pamour pit expansion project, the second Open House included all components of the proposed project (AMEC 2003n).

The presentation material included poster displays describing the pit expansion, the planning process, and summary information on the existing site conditions.

Thirty-seven people signed the registration sheet provided at the first Open House session and 85 people signed the registration sheet provided at the second Open House session. During both sessions people were generally supportive of the project.

Key comments regarding the Pamour Pit Expansion and the corresponding five works and activities, related to:

- Upkeep of the Three Nation Lake dam;
- Potential for a future lake in Pamour Open Pit;
- Access to traplines; and,
- Maintaining public access to Three Nations Lake for recreational fishing opportunities.

All of the concerns brought up by stakeholders were documented on comment sheets and responses were provided at individual requests. All of the concerns have been incorporated into the engineering designs of the various components of the project and were weighed heavily during the decision-making process and alternatives analysis of the major project components.

5.1.6 Record of Government Agency, First Nations and Public Consultation

Copies of all submissions, correspondence and records of meetings with the Federal and Provincial government agencies, First Nations, and the general public are provided in the Public Information Centre Summary Reports (AMEC 2003m and AMEC 2003n).

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

6.0 IDENTIFICATION OF VALUED ECOSYSTEM COMPONENTS AND ENVIRONMENTAL ASSESSMENT METHODS

6.1 Valued Ecosystem Component (VEC) Selection

6.1.1 Selection Considerations

6.1.1.1 Potential Project–Environment Interactions

A critical step in the evaluation of concerns and issues, prior to the final determination of VECs to focus the environmental assessment, is a high level analysis of the potential Project-environment interactions. An analysis of the Project-environment interactions, along with the consideration of other projects and activities considered in the environmental assessment is provided in Figure 6-1. Professional judgement, along with the results of the consultation process and the environmental baseline and supporting technical studies, is used to support the information in Figure 6-1. Potential Project-environment interactions begin to evaluate and focus the environmental assessment by indicating where potential environmental interactions may occur, as well as indicating where the key Project-environment interactions occur, thus helping to develop a focused environmental assessment and allowing for a more detailed environmental effects analysis on any VEC selected.

Emphasis is also provided for the environmental assessment based on the nature of the Project (i.e., pit expansion) located in an area of considerable and ongoing similar land use activities such as exploration, mining, and mineral processing. PJV and nearby residents and communities have a high degree of familiarity related to the construction and operational activities being evaluated. Thus, the environmental assessment principally focuses on potential effects to the biophysical environment and subsequent related potential effects on socio-economic aspects of the environment (e.g., other land uses such as trapping and fishing, and the consumption of fish). Although there are always some level of concerns associated with the health and safety of workers and local residents as a result of Project activities, such potential effects are strictly regulated under a variety of relevant and specific legislation and associated regulations such as: *The Employment Standards Act*, *Occupational Health and Safety Act*, *Mining Act*, etc. As a result, such socio-economic interactions are fully considered but do not necessarily justify full treatment as a VEC.

6.1.1.2 Valued Ecosystem Components

For the purposes of this assessment, VECs are used and include both biophysical and socio-economic components of the environment.

The selection and rationalization of VECs in any environmental assessment is both a critical and subjective process. It is generally recognized that there is a need to focus the environmental assessment on valued components of the environment that have relevance to the final environmental assessment decision (CEAA 1996, Beanlands and Duinker 1983). The selection of VECs needs to take into consideration public concerns, including perceived concerns, as well

as the nature of the Project being assessed and the general environmental setting in which the Project occurs.

The major aspects of the Project being assessed in this environmental assessment include the pit expansion, the associated works and activities and subsequent mitigation for effects to fish and fish habitat, and provides context for the selection of VECs for this assessment.

The biophysical VECs selected for this assessment, to the extent possible, are reflective of issues and a broader, more holistic ecosystem approach used in the assessment. For example, Three Nations Lake is being assessed as a VEC; however, it comprises other environmental attributes that are important such as forage fish and game fish populations, water quality, and benthic communities. Thus potential environmental effects on a range of environmental attributes are fully considered and assessed but the adverse residual environmental effects are predicted on the lake overall. Similarly, a VEC has been selected based on a range of considerations regarding the Project, the Project area and public concerns to represent the forested areas, Mature/Semi-Mature Mixed and Coniferous Forest. As such, the VEC fully considers the potential environmental effects on a wide range of attributes such as forest songbirds, large game, small mammals and representative vegetation types, but the adverse residual environmental effects are predicted on the forest overall.

Part of the justification for selecting more ecosystem relevant, or holistic VECs, was a review of the environmental baseline data, the applicable legislation regarding species with special conservation status (e.g., rare, threatened or endangered) and consultation with key resource managers/agencies and the general public. No species with special conservation status occur in the Project area, and only one transient species was noted as a provincial species of concern. Any such designation, and anticipated common or regular use of the study area by a species at risk would likely have resulted in the identification of a VEC specific to such a species or population.

Based on the considerations identified above, along with information presented within previous sections of this report (project description, evaluation of alternatives, existing environment and consultation program), it was demonstrated that certain components of the environment are not particularly susceptible to adverse environmental effects. Consequently, the following physical, chemical, natural environment, and socio-economic components of the environment are not considered to be VECs for the purpose of this assessment: climate, geology and geochemistry, terrain and soil, air quality and noise, health, labour and economy, land ownership, commercial and industrial facilities, First Nations' culture and traditional pursuits, and cultural environment. Relatively broad project scale and non-VEC related activities or project/environment interactions such as noise/vibration, mine and site drainage; dust dispersion and waste management were considered in the general effects assessment.

The following sections summarize the VECs for this assessment and the rationale for their selection. Figure 6-2 shows the conceptual process to VEC selection and treatment specific for this environmental assessment.

6.1.2 Biophysical VEC Selection

6.1.2.1 Three Nations Lake

Three Nations Lake provides a number of ecosystem functions that are related to hydrology (e.g., hydrologic conveyance), fish habitat, aquatic and terrestrial corridors and linkage, and aquatic habitat for wildlife species. The Project will principally involve construction activities within Three Nations Lake; namely the removal of lake habitat and replacement of lake habitat. This requirement will remove 13.3 ha of the northern lake basin, and the consequent loss of flow from the upper 4 km^2 watershed.

Fish species found within Three Nations Lake included common white sucker, northern pike yellow perch and walleye (ESG 1997). The latter three species comprise game fish species characteristic of a coolwater fish community. The Ministry of Natural Resources stocked walleye adults and eggs in 1947, with no known prior knowledge of whether walleye were originally within Three Nations Lake (ESG 1997b). Subsequent lake studies have shown that they have successfully persisted for over 50 years.

In terms of local socio-economic values, Three Nations Lake is a readily accessible water body, which local anglers regularly fish. In brief discussions with anglers, walleye appear to be the target species. The Ontario Ministry of Natural Resources manages Three Nations Lake as a northern pike/walleye fishery (ESG 1997b).

6.1.2.2 Three Nations Creek

The Three Nations Creek surface water system provides critical ecosystem functions that are related to hydrology (e.g., hydrologic conveyance), fish habitat, aquatic and terrestrial corridors, and aquatic habitat for wildlife species. The Project activities will be concentrated in the Three Nations Creek watershed and principally involve construction activities within the Creek, namely the realignment of Three Nations Creek. As a result, 13.3 ha of Three Nations Lake and the consequent loss of flow from the upper 4 km^2 watershed to Three Nations Creek will occur.

Baseline studies in Three Nations Creek only identified brook stickleback and pearl dace as being present (ESG 1997b). Fish sampling efforts conducted during the spring of 2003, resulted in the capture and identification of a more diverse community consisting of pearl dace golden shiner, fathead minnow, northern redbelly and finescale dace, brook stickleback, Iowa darter, and white sucker.

6.1.2.3 Groundwater

Detailed soils and terrain descriptions were provided by Trow (2003a), suggesting a relatively well-distributed clay soils strata is located under the Project area associated with the Project. This appears to provide an effective aquitard between the shallow groundwater and bedrock aquifer. The effective isolation function of this clay layer, in association with relatively competent rock, is evident in the presence of functional habitats in both Three Nations Lake and Three

Nations Creek, immediately adjacent to an approximately 100 m deep dry existing Pamour Open Pit. The groundwater in the underground mine workings was recently (September 2004) recorded at about 230 m below the crest of the pit. Water levels in both waterbodies are maintained by the hydrologic function of their watershed, the confining clay layer, and a series of grade controls. No discernable losses of shallow groundwater or surface water are noted to the pit suggesting a negligible linkage between surface and deep groundwater. Through a review of water balance data and assumed groundwater flux changes that may occur under a worst case scenario of pit effects, consideration of potential lake drawdown effect was reviewed.

Although shallow water tables are relatively close to the surface, in the terrain surrounding Three Nations Lake, local well yields are generally low. According to MOE water well records, there are 4 wells located at the west end of the study limits that are associated with residential and industrial facilities (located outside the area of the Project but representing PJV property holdings). Domestic wells appear to be located within a till zone from about 8 to 15 m, while the industrial well is located in bedrock at about 150 m. The rates of these wells range from 2 to 25 GPM. No municipal or residential use is presently made of the local groundwater in the Project area.

6.1.2.4 Mature/Semi-mature Mixed and Coniferous Forest

Vegetation and wildlife, within the study area, affected by the Project, is not considered to be notably species rich. The most abundant bird species observed were Ovenbird and Red-eyed Vireo, which are typical species of forest interiors. In general, the Boreal forest, which was typical of the area, formed the northernmost point of a more contiguous block of forest to the south. To the immediate north, a broad area has been fragmented by extensive mining activity, urban development related infrastructure, transportation, utility corridors, and industrial/ commercial development. In addition, the majority of the area affected by the Project has also been disturbed by mining and logging in the past. The mature/semi-mature mixed and coniferous forest cover types are considered valued, since they provide the principal wildlife habitat opportunities within the Three Nations Creek watershed, and contribute to the northern extent of the contiguous forest representation along the southern border of the otherwise disturbed Project site. These forests also represent a common landscape feature within the Project area.

6.1.3 Socio-economic VECs

6.1.3.1 Angling Access Opportunities

Fishing is a common recreational activity for Timmins residents. This activity provides a direct resource to the community and equally a sense of recreation and culture. Although Three Nations Lake is a relatively small waterbody from a regional context, the ease of accessibility off Highway 101 makes this a readily used angling location, largely involving watercraft and associated navigation. Lake access to navigation and the angling opportunities is an important resource value to the community. Another issue addressed by this VEC relates to the potential effect of increased mercury into Three Nations Lake due to the new creation of lake habitat.

Through potential flooding of terrestrial soils, mercury methylation may lead to bioaccumulation of mercury in game fish tissue that are considered a country food and may be consumed by anglers.

6.1.3.2 Trapping Access Opportunities

Two trap lines are located in the area around Three Nations Lake and include TI-36 and TI-26 (located approximately 600 m directly south of the lake). During field investigations in March 2003, it was noted that a series of marten traps were installed and flagged along the power utility corridor located south of Three Nations Lake in largely mixed forest habitat. At the time of field studies in 2003, these traps did not appear to be active. Given the economic value of the local trapping, access to trapping in the Project area, and maintenance of the trapping opportunities is considered a valued interest.

6.2 Environmental Assessment Methods

The environmental assessment of the Project has been conducted in a holistic manner with an extensive description of the existing environment and a detailed consultation process to identify issues and concerns from a broad range of interested parties and stakeholders. However, the detailed analysis of potential adverse environmental effects resulting from the Project is nonetheless focused on Valued Ecosystem Components (VECs), determined by the project team after full consideration of potential Project-environment interactions and a good understanding of the nature of the Project and the local area. VECs have been identified and justified to allow for a focused environmental assessment on particular issues, in the context of a previously permitted mine site and extensive land use modification over 75 years of mining activity. Also the focussed evaluation reflects the issues and interests that were identified through consultation with the general public, government agencies, First Nations, and stakeholders.

The environmental effects analysis of the Project, in combination with other projects and activities (past, present and planned) on each VEC, is presented in its own section, along with defensible significance criteria with which to make clear predictions of potential residual adverse environmental effects for each of the major phases of the Project. Key elements of the existing conditions for each VEC are contained within the description of the existing environment chapter (Section 4.0). In the analysis of each VEC the following was reported:

- Key aspects of the environmental effects analysis such as existing conditions, relevant matters with respect to the consideration of boundaries and the establishment of environmental assessment uses for each VEC;

- An evaluation of potential environmental effects associated with the various Project phases using an integrated approach to considering cumulative effects;

- VEC-specific significance criteria;

- Summary of mitigation either designed into the Project mitigation, or to meet contemporary practice in construction and operations of such projects;

- Clear predictions of the significance of residual adverse environmental effects for the project overall and in combination with other local projects and activities; and,

- Comments and Issues Identified, Proponent Response, and Responsible Authority Conclusions.

The full consideration of cumulative environmental effects is integrated into the environmental effects analysis rather than making a separate cumulative effects statement.

6.2.1 Environmental Baseline Studies and the use of Models

Environmental baseline studies were conducted to determine existing conditions and provide key information regarding the scoping of issues and identification of VECs. Most of the environmental baseline studies comprised scientific fieldwork, but much available background data and information regarding existing conditions was obtained from reviewing available published and unpublished literature and through consultation with key government regulators and resource managers. As well, supporting information associated with past operations by the PJV and its parent companies in the area with respect to the Project and previous activities and operations in the area contributed to this environmental assessment. As a result of past activities and experience in the area, previous environmental assessments conducted on aspects of existing and future planned activities (e.g., the Haul Road, and Highway 101 Realignment), specific environmental baseline studies for this Project and the extent of consultation and issues scoping, there is a good knowledge base with which to adequately assess the potential adverse effects of the Project on the VECs identified for detailed analysis.

The environmental baseline studies are referenced and available upon request along with other technical and background reports associated with the pit expansion. While some of this material may not be specific to this assessment, it is being provided for consistency purposes as it has been provided in the review of some projects and activities that will act in combination with the Pit Expansion Project.

PJV has conducted a variety of computer and statistical modelling exercises to assist in defining and/or predicting baseline conditions and potential issues. Specifically, air quality and noise assessment modelling have been completed to further evaluate the extent of potential Project-environment interactions and predictions of the nature of the potential effect. Hydrology and groundwater modelling have been conducted to permit the development of effects identification and mitigation design preparation.

6.2.2 Environmental Assessment Steps

The environmental assessment and evaluation of potential adverse environmental effects for each of the VECs identified are provided in the summaries provided in Section 7.0. Each VEC was identified and evaluated on the basis of the following assessment approach.

6.2.2.1 Existing Conditions and Boundaries

Each VEC was reviewed relative to baseline existing conditions, with emphasis on relevant boundaries-related issues for the VEC that, depending on the VEC, may include spatial, temporal, technical, and/or administrative boundaries. The existing conditions and relevant boundaries-related information are used to describe the general environmental assessment area specific for each VEC.

6.2.2.2 Environmental Effects Analysis

The potential adverse environmental effects of the Project, as summarized in Section 7.0, were provided for each VEC. Potential adverse environmental effects were determined for each phase of the Project and evaluated in context with cumulative environmental effects associated with other Project activities relevant to the VEC. Many factors were considered in the analysis of the potential adverse environmental effects of the Project on each VEC. These factors include the magnitude, geographic extent, duration, frequency, reversibility, and ecological and socio-economic context.

Much of the detail associated with the VEC environmental effects analysis were evaluated through preparation of analysis matrices for each Project phase, as well as for accidents, malfunctions, and unplanned events. This allowed for the presentation of comprehensive information associated with the analysis of effects and provided a confirmatory review that all the factors that need to be considered in the analysis have been addressed.

6.2.2.3 Factors Considered

The following text briefly describes the factors considered in the effects analysis for this Project and the VECs selected. Some factors such as duration, geographic extent, and frequency, are straightforward, while others such as magnitude, reversibility, and ecological and socio-economic context can be more subtle, and need to be described for this specific environmental assessment. The definitions for the evaluation criteria were established to provide a qualitative context for the general effects and interaction of a work activity and its associated mitigation strategy. This provided a clearer understanding of the relevance of the residual effect when evaluating the significance through the application of criteria described in Section 6.2.3. The factors considered in the analysis of potential adverse environmental effects therefore are not necessarily the same as the criterion established for each VEC to determine whether potential adverse environmental effects are significant or not.

Magnitude

Project-specific definitions for magnitude were established for this environmental assessment to help describe the anticipated nature of the potential interactions. Generally, definitions for magnitude used in this environmental assessment emphasized the biophysical aspects of the VECs selected. Definitions used for varying degrees of the magnitude of potential environmental effects include:

High: An environmental effect affecting an entire stock or population of valued resources within a VEC (e.g., game fish population) or specific parameter(s) of contaminants or deleterious substances permanently exceed natural variability such that natural resources, that definable groups of people (e.g., anglers, trappers) depend on, are lost permanently.

For environmental attributes that are not population based, such as surface or groundwater quality or quantity, environmental effects are widespread and affect an entire watershed.

Medium: An environmental effect affecting a portion of an entire stock or population over one or two generations, or specific parameter(s) of contaminants or deleterious substances temporarily exceed natural variability, such that natural resources that definable groups of people (e.g., anglers, trappers) depend on, are inaccessible for one or two generations.

For environmental attributes that are not population based, such as surface or groundwater quality or quantity, environmental effects are confined to a portion of a watershed and does not affect water supply in the region.

Low: An environmental effect affecting a specific group of individuals in a population or stock in a localized area, over one generation or less; or where changes in specific contaminants or deleterious substances fall within the range of natural variability resulting in no measurable changes to resource users.

For environmental attributes that are not population based, such as surface or groundwater quality or quantity, environmental effects are localized and remain within the general footprint of the project.

Geographic Extent

The geographic extent factor is simply presented as a range or scale of approximate geographic areas that are used to help describe the area over which any particular potential interaction is anticipated to occur. A level of conservativeness is used with the geographical extent factor to include a range of issues. For example, areas of direct physical disturbance due to vegetative clearing may be relatively small but other effects such as the avoidance of habitat by wildlife may encompass a larger area than the areas directly altered or lost.

Frequency

The frequency factor is used to help describe the nature of the interaction being analyzed and comprises a range of events/year from a few to continuous activities. For example, noise from blasting may occur relatively infrequently, whereas noise associated with vehicle movements would be more frequent.

Duration

The duration factor is used to help describe how long any potential interaction causing adverse effects may occur within the phase of the Project being assessed. For example, environmental effects associated with vehicle operations will have a shorter duration during construction, compared to operation/maintenance based on the anticipated construction schedule and life of mine.

Reversibility

The reversibility factor is used to provide an indication as to whether or not the anticipated adverse effect is reversible or recoverable. The factor is largely based on a combination of experience, professional judgement, and/or previous research. For this Project and this assessment, the potential interactions were described simply as ones that are reversible or irreversible. An example of an effect that would be considered reversible could include the avoidance of habitat by wildlife species and moose due to noise disturbances since the effect will likely be reversed if the noise disturbance ceases, or perhaps moose habituate to the disturbance.

An interaction that may be considered irreversible would include the loss or alienation of terrestrial habitat as a result of waste rock disposal area created as part of the pit expansion mining program.

Ecological and Socio-economic

This factor is used to help provide reviewers and decision-makers with an indication of the potential effect on the VEC. This factor provides an indication of any key local or regional ecological or socio-economic features. This factor is described for the Project over the assessment area for the VEC and provides an indication of any special features that need to be considered in this analysis (e.g., pristine or unique ecological features, rare and endangered species habitat, parks or special areas). The criteria selected generally reflect the state of land use in the area, providing context for the range of conditions from relatively pristine to highly altered as a result of previous land development activities.

Cumulative

Cumulative environmental effects are addressed in each VEC section. The area where the Project will be developed comprises a highly altered landscape with a long history of exploration and mine development, as well as timber harvesting activities and transportation infrastructure development and use. Additional local project activities are also either planned or under construction. As such, best professional judgement is typically used to consider the potential residual adverse environmental effects of this Project in combination with other projects and activities.

6.2.3 Residual Environmental Effects Methods – Determination of Significance

Residual adverse environmental effects are those environmental effects predicted to remain after the application of mitigation outlined in the environmental assessment. Following the analysis in the Environmental Effects assessment of each VEC, including consideration of cumulative effects, the significance of environmental effects for a particular VEC was determined for each project phase (construction, operation/maintenance, decommissioning/post decommissioning).

Wherever possible, each residual adverse environmental effect significance rating integrates cumulative environmental effects. The rationale for this approach is that the existing conditions for each VEC are reflective of past and present activities and the VEC will be affected by a number of factors experienced simultaneously (e.g., adjacent land use, habitat alteration, changes to habitat quality, *etc.*). It is therefore the cumulative environmental effect of all project activities occurring within a particular time period of a project phase that could result in an adverse environmental effect on the VEC.

For each VEC, a significance criterion is established on which to determine whether the anticipated potential residual adverse environmental effects are significant or not significant. The significance criteria used in this environmental assessment are specific for the VECs being analyzed and are defined using professional judgement and reflect the nature of the VEC, the scope and scale of the Project; and with the intent that they can be monitored in a practical way.

The significance criteria are not simply formula-based or equation-based using the factors considered in the effects analysis, as the effects analysis and determinations of significance are two distinctly different steps in an environmental assessment, and are not necessarily directly linked, although they may be related. Definitions of significance for residual adverse environmental effects that are relevant to the VEC were determined for each VEC. For each VEC where significant adverse environmental effects are predicted, following all practical mitigation, the likelihood of occurrence was reviewed in a general context of both probability of occurrence and scientific uncertainty.

Definitions for likelihood ratings are shown in Table 6-1. This approach is consistent with the three steps outlined for determining whether environmental effects are adverse, significant and likely, as specified in “A Reference Guide for CEAA: Determining Whether A Project is Likely to

Cause Significant Adverse Environmental Effects" included within the "Responsible Authority's Guide" (CEAA 1994:1871).

TABLE 6-1
DEFINITIONS FOR LIKELIHOOD AND SUSTAINABLE USE OF RENEWABLE RESOURCES AS APPLIED TO SIGNIFICANT RESIDUAL ENVIRONMENTAL EFFECTS RATINGS

Rating	Likelihood	Sustainable use of Renewable Resources
High	An environmental effect is probable and there is no uncertainty based on previous scientific research/experience	Previous research/experience indicates that the environmental effect on the VEC would not reduce biodiversity or the capacity of resources to meet present and future needs
Moderate	An environmental effect may occur but there is some uncertainty based on previous scientific research/experience	Previous research/experience indicates that the environmental effect on the VEC may, to a certain extent, reduce biodiversity or the capacity of resources to meet present and future needs
Low	An environmental effect has a small probability of occurring and there is little uncertainty based on previous scientific research/experience	Previous research/experience indicates that the environmental effect on the VEC would reduce biodiversity or the capacity of resources to meet present and future needs
Nil	An environmental effect has no probability of occurring and there is no uncertainty based on previous scientific research/experience	Previous research/experience indicates that the environmental effect on the VEC would eliminate biodiversity or the capacity of resources to meet present and future needs
Unknown	There is insufficient research, experience, Aboriginal knowledge to predict the likelihood of an environmental effect occurring	There is insufficient research/experience to indicate whether the environmental effect on the VEC would reduce biodiversity or the capacity of resources to meet present and future needs

The sustainable use of resources (the capacity of an affected resource to meet present and future needs) was reviewed for those renewable resources that are likely to be significantly affected. This approach is specified in the "Responsible Authority's Guide" (CEAA 1994: 84). Concepts such as ecosystem integrity, productive capacity, carrying capacity, and assimilative capacity are considered. Definitions for the sustainable use of resources are shown in Table 6-1.

6.2.4 Key Mitigation

The nature of the Project will result in alterations to the landscape and watershed function particularly with respect to the alteration of aquatic habitat function. Compensation for such adverse environmental effects (HADDs) that are likely to be considered significant, was concluded to be adequate mitigation for reduction of the potential adverse environmental effects to a level that was acceptable or no longer represented a significant effect. Such compensation, however, is negotiated on a project-by-project basis with the federal Department of Fisheries and Oceans and for the purposes of the CSR the identification of compensation for mitigation of key environmental effects was considered adequate. Mitigation/compensation designs are included as part of the review and will be approved before final authorization of the HADD is given.

A variety of other standard construction and operational mitigation strategies, consistently used on open pit mining projects, as well as for works that are undertaken adjacent to watercourses, were considered in the effects assessment. The objective of PJV was to apply both the standard procedures and other more site specific innovative procedures where possible, to ensure that the residual effect was duly addressed. The application of both individual and collective mitigation strategies targeted the overall objective of the Project not resulting in residual adverse effects either in a general sense or with respect to the selected VECs in the assessment analysis.

FIGURE 6-1
IDENTIFICATION OF POTENTIAL PROJECT-ENVIRONMENT INTERACTIONS

KEY PROJECT ACTIVITIES/ PROCESSES / ENVIRONMENTAL COMPONENTS	**CONSTRUCTION**	Clearing (Noise, Dust, Loss of Habitat)	Grubbing, Excavations and Earth Moving	Vehicle Activity	Placement of Fill / Construction Materials	Fuel and other Hazardous Materials (Storage and Handling)	Overburden Stripping and Tailings Removal	Water Diversion	**OPERATION / MAINTENANCE**	Vehicle Activity	Blasting	Ore and Waste Rock Mining	Waste Rock Management and Disposal	Replacement Fish Habitat	**DECOMMISSIONING / ABANDONMENT**	Vehicle Activity	Boat Activity	**ACCIDENTS, MALFUNCTIONS AND UNPLANNED EVENTS**	Fuel and Hazardous Materials Spills	Dam, Seepage Barrier, Channel, Berm Failure	Flooding of Work Areas	Erosion and Sedimentatin Control Failure	**OTHER PROJECTS AND ACTIVITIES**	Forestry and Agriculture	Mining Related Operations	PJV Haul Road	Hwy. 101 Relocation
ATMOSPHERIC ENVIRONMENT:																											
Air quality (emissions, noise)		○	○	○	○					○	○	○	○													C	C
GROUNDWATER ENVIRONMENT:																											
Shallow groundwater levels			●		○	○	○	●						○													
AQUATIC ENVIRONMENT:																											
Water quality		○	○		●	○	○	○					○	●					○	●	○	○			C	C	C
Surface flow patterns		○	○		○		○	●					○	●						●	○	○			C	C	C
Fish and fish habitat			●		●	●		●						●					○	●	○	○					C
Aquatic furbearers		○			○	○		○																			
TERRESTRIAL ENVIRONMENT:																											
Vegetation		●											●	●										X		C	C
Wildlife (mammals)		○		○	○					○			○	○										X		C	C
Wildlife (birds)		○			○								○	○										X		C	C
SOCIO-ECONOMIC ENVIRONMENT:																											
Trapping		●	○	○	○			●		○			○			○			○					X		C	C
Angling					○	○		●		○				●		○	○		○	●	○	○					
Country Foods (Fish)														○													
Health and safety - worker										○	○									○	○						
Health and safety - residents				○						○	○	○				○			○								

Legend: ○ - Interaction
● - Key Interaction for planned activities (potential for VEC effect assessment consideratic
X - Interaction of the Project in consideration of other projects and activities (Not considered for VEC review due to no planned activity within study boundary at this
C - Interaction of the Project in consideration of other projects and activities (Considered for VEC review due to planned activity within study boundary)

FIGURE 6-2
CONCEPTUAL APPROACH TO VEC SELECTION AND TREATMENT IN THE ENVIRONMENTAL ASSESSMENT

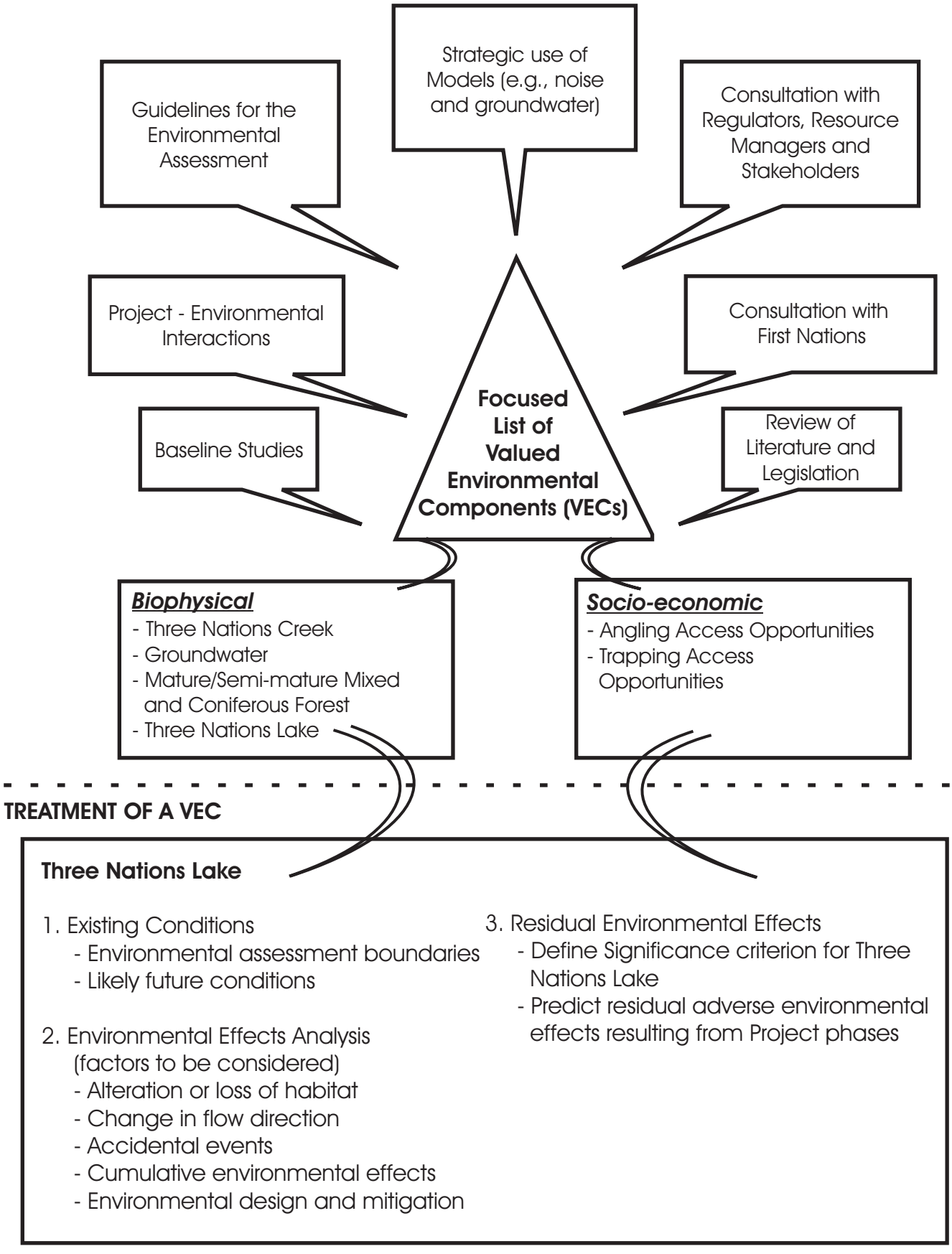

TABLE OF CONTENTS

LIST OF TABLES

7.0 ADVERSE ENVIRONMENTAL EFFECTS

This section of the CSR provides more detail on the potential adverse environmental effects of the Project on the VECs identified through the issues scoping process. The VEC analysis will provide for a balanced review of potential adverse environmental effects to support PJV's Project planning and design refinement, as well as the EA review process. The adverse environmental effects of each phase of the Project was assessed, as well as the Project overall, in consideration of adverse environmental cumulative effects (Effects Assessment Report [AMEC 2004a1]).

The Project comprises activities associated with the expansion of the Pamour Pit, as well as Pit Facilitation works and activities that include requirements to successfully compensate for adverse environmental effects on fish and fish habitat. Although all VECs and all phases of the Project are assessed, the majority of potential adverse environmental effects occur during construction and the most substantial adverse environmental effects occur in VECs associated with aquatic ecosystems, with emphasis on fish resources and fish habitat.

The Project activities entail design principles, construction methods and construction materials that are considered standard for such an operation, particularly in consideration of the available infrastructure that is already on site from the previous historic mining activity. PJV has considerable experience in the area using such technology and principles, and will achieve high levels of environmental performance through the application of proven and readily available mitigation measures and design considerations for this Project. These mitigation measures are summarized under each VEC sub-section.

Following the assessment of the potential adverse environmental effects and appropriate mitigation strategies to address those adverse environmental effects, the assessment established the significance of any residual adverse environmental effects. In review of the assessment, and through the duration of a 2-year consultation process, certain key issues and concerns were raised by stakeholders. These issues and concerns have been considered by PJV through the development of the mine plan, and the mitigation strategy designs that have been developed. To further demonstrate the effectiveness of the designs and mitigation strategies, to confirm effective environmental protection, and to verify PJV's assessment of the significance of adverse environmental effects, a follow-up monitoring program commitment has been established and will be refined during the permitting and detailed design process as identified in Section 8.

Based on the reported findings of PJV, the RAs have evaluated the study conclusions and the effectiveness of the mitigation strategies to confirm the significance of the residual adverse environmental effects. Although the mitigation strategies are fully expected to minimize the risk of significant project effects, they do not necessarily guarantee that the proponent will not be at risk of compromising federal legislation. In the event that the PJV operations result in a compromise of such legislation, then the responsible federal agencies may pursue enforcement actions. Any information and advice provided by the federal departments should not be

construed as a fettering of the federal government's ability to make decisions and/or enforce any applicable regulations.

The following discussions provide a summary of the adverse environmental effects analysis and the conclusions of the PJV, and subsequently the RAs, relative to the selected VECS.

7.1 Three Nations Lake

7.1.1 Adverse Environmental Effects

Three Nations Lake will be directly affected by the isolation dam, the partial dewatering of the lake basin, the alteration of existing lake shoreline and the implementation of the lake replacement basin. The isolation dam construction and associated dewatering of the north lake basin through fill placement will directly result in the HADD that translates to approximately 14 ha. This area provides productive littoral zone habitat for various life stages of the fish species. The HADD includes 1,300 m of littoral shoreline habitat and a total lake volume of 207,400 m^2 (AMEC 2004a, 2004e). The loss of this habitat represents approximately 23% of available habitat within the lake basin. No threatened or endangered species, or species of special concern as identified in the *Species at Risk Act* (2003) were identified in the Three Nations Lake area (AMEC 2004b, 2004c). Likewise no rare or uncommon plant or animal species have been noted in reviewing site-specific data from AMEC (2004c) and the MNR NHIC database, with the exception of the horned grebe. This aquatic species was briefly observed on Three Nations Lake outside of the nesting period and was considered to be staging during a seasonal migration. This species, along with other migratory bird species, may periodically make use of lake habitat and adjacent terrestrial areas that will be influenced by the pit expansion.

The shoreline alteration associated with the plug removal between the lake replacement and the existing Three Nations Lake basin involves the alteration of approximately 90 m of littoral zone habitat with some alteration of the existing lakebed to accommodate the depths required to connect the two lake basins (AMEC 2004a).

The requirement to remove approximately 14 ha of the northern Three Nations Lake basin represents a considerable alteration to aquatic habitat. This has a bearing on the ecosystem function of the lake in terms of hydrology, water quality and alterations to aquatic habitat that supports a variety of fish life stages. The hydrologic pattern of the lake will be changed with a reorientation and new design of the outlet structure. This will essentially generate a more natural and moderated condition than the present constriction (AMEC 2004a1). These permanent and irreversible changes are considered to be high in magnitude but localized within a small component of the watershed. With a short duration and extensive mitigation as outlined below the adverse environmental effects can be addressed accordingly.

The short-term Construction activities within Three Nations Lake may result in the mobilization of sediment and suspended solids loading to the lake. Construction activities that represent a potential source of suspended solids include placement of rock infill material in the north basin

over a 4-month construction period, and removal of the south-eastern lake shoreline to connect the proposed lake replacement basin with the existing lake basin. This potential effect is of low magnitude, extent and duration and is reversible over a short timeframe.

Mine rock will be used as construction materials for the dam, temporary access roads, shoreline stabilization in the lake replacement, and grade controls in the Three Nations Creek realignment. The sources of this rock have been extensively evaluated in terms of acid rock drainage and net neutralizing potential in order to confirm that the available material is suitable for construction purposes. The rock is net neutralizing and does not represent a short or long-term concern with respect to geochemistry and potential water quality adverse environmental effects (AMEC 2004a1).

Water quality in Three Nations Lake may also be influenced due to soil exposure to flooding, a result of the new lake basin construction. As described previously, with minimization of organic soil flooding, the potential for elevated methylmercury levels are not anticipated to occur nor is the bioaccumulation anticipated to occur in the predatory fish that may be consumed as country food. Water quality adverse environmental effects as a result of runoff from the Pit Expansion project area was determined not to be a concern in Three Nations Lake, as all mine related infrastructure will be design to direct runoff to the mine water management system that reports to provincially permitted treatment facilities (AMEC 2004a1).

In terms of cumulative adverse environmental effects, other ongoing and proposed PJV project activities include the Highway 101 realignment and the Haul Road. These two features will remain well separated from Three Nations Lake and no additional adverse environmental effects to the waterbody are expected. Potential adverse environmental effects relate to water quality associated with stormwater drainage, in particular suspended solids. Both projects are located within the Three Nations Lake watershed and will drain through natural conveyance features that would provide buffering capacity in the form of terrestrial and riparian vegetation. Haul road and Highway design will apply Best Management Practices, consistent with provincial road development guidelines to minimize potential road sourced suspended solids (AMEC 20041).

7.1.2 Key Mitigation

In order to compensate for the HADD estimated at 13.3 ha of fisheries habitat altered as a result of isolating the north lake basin, Three Nations Lake would be expanded in adjacent lowlands to the southeast of the existing lake basin. A key criterion for alternative lake replacement configuration was that the altered surface area of the existing lake basin would be as closely approximated as possible. The resulting lake replacement basin would accommodate 13.3 ha to be consistent with the “no-net-loss” objectives. With the development of a more diverse shoreline length, the lake basin perimeter was also enhanced from an existing 1,300 to 2,900 m.

A design basin depth of 3.0 m was established based on the objective of maximization of fish over-wintering habitat, a feature somewhat limiting in the existing lake basin due to depressed dissolved oxygen levels. This would represent a lake basin enhancement with the generation of

14,200 m^3 of additional lake volume at this depth. Overall the lake basin volume would be increased by 54,000 m^3 (Table 7.1). Based on this summary it is evident that the lake replacement will provide a minimum of the same surface area and an enhancement of overall volume. The habitat mitigation/compensation strategies are outlined in AMEC 2004a and 2004e.

TABLE 7-1
HABITAT REPLACEMENT COMPARISON

Depth (m)	Isolated Lake Basin			Lake Replacement		
	Elevation (m)	Area (ha)	Volume (m^3)	Elevation (m)	Area (ha)	Volume (m^3)
0	285.0	13.3	207,400	285.6	13.3	261,400
0.5	284.5	11.4	147,200	285.1	11.0	201,100
1.0	284.0	9.5	94,900	284.6	9.3	150,400
1.5	283.5	6.9	54,700	284.1	7.8	107,200
2.0	283.0	4.9	25,200	283.6	6.8	70,200
2.5	282.5	3.2	9,000	283.1	4.9	38,400
3.0	282.0	0.4	-	282.6	4.7	14,200

The lake replacement would include enhancement of spawning habitat for Walleye. Presently, walleye spawning habitat is limited. To accommodate this limitation, rock substrates would be placed at strategic locations around the replacement basin perimeter resulting in an enhanced area totalling 880 m of shoreline, and covering a surface area of 17,600 m^2.

Mitigation was also considered with respect to accommodating a loss of fish habitat along the dam or infill abutment shorelines locations. The face of the dam along the existing lake basin would be modified to include fish habitat features.

The fish habitat features would include the integration of woody vegetation material (willow shrubs) within a matrix of riprap and soil. The treatment would be extended above the normal water level to the crest of the dam in order to promote the development of a dense shrub community on this constructed shoreline. Additional native trees (trembling aspen) would be planted at the crest of the rock fill face to promote a naturalized shoreline as encountered around the remaining perimeter of Three Nations Lake.

Below the lake water surface, additional rock substrate material would be extended in the shallow water zones (<2.0 m) to establish rocky shoals that could serve as spawning areas for the resident walleye population, or more general habitat with increased bed diversity over the present clays characteristic of the lakebed. This treatment is intended to provide the restoration of 240 m of the existing Three Nations Lake shoreline.

In terms of short adverse environmental effects associated with the temporary in-water works required for connecting the constructed basin with Three Nations Lake or the placement of the infill material, would involve the application of BMPs and installation of a turbidity/silt curtain system within the existing Three Nations Lake. The use of such mitigation will reduce potential sedimentation due to in-water grading/filling activities.

Construction staging will also assist in mitigating potential long-term shoreline and lakebed erosion issues. It is intended to construct the proposed lake replacement basin in advance of the required HADD in Three Nations Lake and allow the constructed habitats to naturalize and stabilize prior to permitting a lake connection. In this manner the lake will be in an advanced stage of naturalization/stabilization when the habitat is connected to the main lake basin.

Aquatic wildlife species that have been reported to make use of Three Nations Lake, including potential periodic use by the Horned grebe for staging purposes, will also benefit from the aquatic habitat compensation measures as described. To avoid disturbance of such wildlife, as well as migratory birds that nest in the areas, the major works and activities that will directly influence existing habitat will be undertaken during the winter months when these species are absent.

7.1.3 Significance of Residual Adverse Environmental Effects

A significant adverse residual environmental effect on Three Nations Lake was defined as one which affects a key (e.g., game fish) fish population or stock in such a way as to cause a change in the abundance or distribution of the population or stock over more than two generations beyond which natural recruitment or replacement habitat may or may not re-establish the population. Such an effect may be caused directly from physical disturbances or indirectly through changes in water quality and quantity.

Most direct adverse environmental effects occur during Construction and largely entail the physical alteration and loss of aquatic habitat and resources. The focus of the criterion used to determine the significance of the adverse environmental effects of the Project on Three Nations Lake is the game fish species present in the lake, although many environmental attributes can contribute to lake fish populations and conditions such as water quality, productivity, benthic communities and forage fish communities. The significance criterion used was developed to represent a threshold of recovery of the affected fish populations and aquatic habitat and performance objectives for the replacement habitat required to mitigate such adverse environmental effects, as well as a simple criterion to be monitored through follow-up programs. The reestablishment of new and considerably enhanced aquatic habitat (long-term) that will sustain a similar game fish population and structure compared to pre-Project conditions, provides indications that the general habitat (e.g., water quality, productivity, benthic communities and forage fish communities) has been adequately replaced, and ecosystem function has returned.

Effective erosion and sedimentation control BMPs during all phases of the work, including other adjacent works and activities, should provide suitable mitigation of potential water quality impacts.

Due to the nature of the mitigation proposed and the criterion selected for determining significance, PJV concluded that the residual adverse environmental effects of the Project on

Three Nations Lake, in combination with other projects and activities, is considered not significant (AMEC 2004a1).

7.1.4 Comments and Issues Identified

Based on the stakeholder consultation process general thematic comments and issues identified for consideration by PJV included:

- The requirement for the application of the federal Habitat Management Policy in the determination of compensation strategies for lost fisheries habitat and the need to sustain the fisheries resources of Three Nations Lake;

- Consideration for the development of the Three Nations Lake replacement in advance of the actual need for flow rerouting such that the constructed habitat would have the opportunity to stabilize and naturalize as a habitat prior to it being made available to the local fish community;

- Concern that the change in local hydrology of Three Nations Lake would significantly alter residency time and lake levels and that the system should be monitored;

- Concern with respect to potential failures of BMPs during construction and how they would be addressed;

- Concern over the potential for Three Nations Lake to drain into the pit through rock fractures;

- Concern that the open pit will alter the local groundwater flux such that Three Nations Lake levels will decrease over time thereby effecting the aquatic ecosystem of both the existing lake basin and the future lake and creek habitat replacement measures; and

- To avoid potential adverse environmental effects to navigation, any tools, vehicles, equipment, and temporary infrastructure required to build the in-water Project components, must be removed on completion of the project. Likewise, any debris materials that have been deposited in the navigable water must also be removed on completion of the works.

7.1.5 Proponent Response

PJV's response to the comments and issues was as follows (AMEC 2004a2, PJV 2004a, 2004b, 2004c, 2004d, PJV 2005a, 2005b, 2005c):

- The fisheries habitat mitigation and compensation strategies identified above were prepared and discussed with the stakeholder agencies throughout the plan development process. This resulted in the development of a plan that not only accommodated the habitat that was to be removed, but also addressed observed lake habitat limitations and

integrated enhancement strategies. This achieved the “no net loss” of habitat policy, and effectively accommodated the residual adverse environmental effects represented by the physical habitat alterations.

- Through initiation of the pre-consultation process early in the mine planning phase, and reviewing project schedules, the opportunity to construct the lake replacement feature prior to the need for flow rerouting was recognized. Consequently, this approach has become a key objective of the PJV mine plan, and property transfers, designs and construction staging plans have all been developed to facilitate this opportunity.

- The expansion operation proposes to infill about 13.3 ha of the existing Three Nations Lake. The Lake will be expanded in the southeast by an area of 13.3 ha. The existing drainage area to the Lake is (335 ha) and will be reduced to about (310 ha) after Lake reconstruction. This is a minor reduction. As such, inflow volumes and flushing frequencies should remain consistent after construction.

- It was recognized that failures of design features and BMPs could occur during construction. The majority of the designed features are intended to be constructed in isolation, such that any failures can be contained. Each design feature will also be an explicit component of a provincial permit or federal authorization, and as such will require construction and implementation as per the design details. This represents an important aspect of the construction administration duty and is a commitment of PJV to have their contractors and representatives deliver the project as designed. This quality assurance will be affirmed through effective inspection and monitoring throughout the Project life.

- The current water level within the existing underground workings is approximately 230 m below grade (September 2004). These underground workings extend along the centre axis of the proposed pit expansion throughout all three phases. Theoretically, the above referenced fault zones would be intersected by the underground workings. Given the existing conditions (i.e., the depth to water within the existing underground workings), the presence of a surficial confining layer and the stable water level within TNL it is not interpreted that features are hydraulically connected (i.e., there is a significant confining layer). It is also to be noted that the existing Pamour Pit and the adjacent Hoyle Pit are completely dry, as is to be expected given the extent of the underground workings and their interconnectivity. This is a condition that has persisted for several decades without detriment to the natural maintenance of either Three Nations Lake water levels or to the wetland habitat that runs between the two pits along the course of Three Nations Creek.

  Through the preparation of a Three Nations Lake water balance, based on secondary source information, an assessment of potential deficiencies of available flow associated with groundwater flux was completed (AMEC 2004a2, PJV 2005a; 2005b and 2005c). On suggestions of NRCan (2005a), it was considered that a rough estimate of the interaction could be determined from the available data sources, and that this would serve to provide an indication of any potential residual adverse environmental effects to

existing lake levels and the proposed lake habitat. The water balance suggested that during seasonal low flows, a deficiency in flow could result in a decrease in water level elevations. The magnitude of the drop could be quite variable depending on the range of flow losses that were calculated based on the Three Nations Lake water balance (NRCan 2005a; PJV 2005b and 2005c). The water level decreases associated with the flow losses could range from being consistent with or greater than those presently observed during the intermittent surface water flows as described for Three Nations Creek.

Based on the comparison of the water balance results and existing habitat records, such minor anticipated lake level fluctuation would not be significant relative to the bathymetry of the lake basin and littoral zone habitat characteristics. In terms of the proposed mitigation/compensation designs of the lake replacement and the creek realignment, similar water level fluctuations would have a negligible effect to the lake surface area or the proposed habitat features, and is consistent with the design criteria applied based on diagnostic lake margin records.

In the event that the proposed Pamour Pit expansion were to influence any groundwater flux on the maintenance of water levels in Three Nations Lake (determined through monitoring), then the objective of a mitigation design would be to apply a conservative approach to address the seasonal flow deficiency period. Through the supplementation of flows to the lake from existing surface and groundwater sources, a minimum water level in Three Nations Lake at the future outlet elevation of 285.6 masl would be maintained in consideration of climatic conditions. Any required flow supplementation will be maintained through the mine operation, and post closure period until the groundwater regime has returned to a state of equilibrium or at a minimum, as per existing conditions.

- To avoid potential adverse environmental effects to navigation, any tools, vehicles, equipment, and temporary infrastructure required to build the in-water Project components, will be removed on completion of the project. Likewise, any debris materials that have been deposited in the navigable water will also be removed on completion of the works.

7.1.6 RAs Conclusions

- The RAs agree with the conclusions provided by PJV, that the residual adverse environmental effects and cumulative adverse environmental effects are not considered significant.

- The RAs conclude that the Three Nations Lake habitat compensation measures as proposed, provide appropriate replacement habitat for that displaced as a result of the Pit Expansion. It is acknowledged that the design will provide habitat enhancement opportunities over the long-term. The proactive construction of the lake replacement in advance of the need to reroute flows through the new basin due to existing lake infilling,

would be a benefit that provides local fish with more suitable habitat conditions from the onset.

- The RAs conclude that a calibrated water balance model, hydrogeological model and associated monitoring program will be developed by PJV over the course of Phase 1 Pit Operations in order to establish any observable adverse environmental effects of pit development on lake levels and to finalize any mitigative approach to supplemental flow quantities, should they be required.

- The RAs conclude that a fish habitat and fish community monitoring program will be required to confirm that the habitat develops according to the prediction that it will provide suitable habitat, including critical spawning habitat, for a range of species and age classes.

- The RAs conclude that with appropriate mitigation measures as outlined, no residual adverse environmental effects to navigation will persist on completion of the Project.

7.2 Three Nations Creek

7.2.1 Adverse Environmental Effects

The Pit Expansion will require the rerouting of surface water flows emanating from Three Nations Lake. An approximate length of 600 m of the creek channel is positioned within the area of open pit expansion and associated mining infrastructure development. As opposed to flows reporting to the north, through areas of historic mining and extensive associated land use activity, the channel will require rerouting to the east through an area relatively isolated from extensive land use activities as described below.

The reduced flow from the upper watershed represents a potential alteration of fisheries and aquatic habitat. As described in Section 3.0, the habitat is somewhat limiting and sustains a forage fish community. Construction will largely affect some forage fish habitat, however, the habitat does not support game fish. Nevertheless, appropriate mitigation and compensation will be required and implemented. The mitigation and compensation plan will restore the ecosystem function associated with hydrology.

Approximately 4 km^2 of the Three Nation Creek watershed will be redirected as a component of the isolation dam/lake infill construction. Although it is recognized that there will be changes to the flow regimes of the existing creek due to the realignment and associated rerouting of flows, this is a minor consideration with respect to residual adverse environmental effects. The system is presently intermittent yet maintains the habitat characteristics typical of a marsh and its associated functions.

Given the low flow nature of the creek, average annual flows were applied for the purpose of assessing adverse environmental effects and longitudinal flow recovery. It has been estimated that the overall aquatic habitat function of the creek, which is presently considered rather

limiting, would be maintained generally beyond 2.5 km downstream of Three Nations Lake. At that point an estimated 50% recovery of flow could be anticipated. This distance, with the exception of the 0.6 km infrastructure footprint (direct effect), has been recognized for the purpose of this assessment as an indirect HADD since habitat will be altered through flow reduction as opposed to representing a complete loss. However, for the purpose of accounting for residual adverse environmental effects and providing appropriate compensation, it was concluded that 2.5 km of watercourse would be considered for habitat replacement and maintenance of hydrologic function (AMEC 2004a; 2004d). Based on this evaluation, it was considered that the adverse environmental effects associated with the flow reduction are low in magnitude, limited in extent, and although not reversible, can be address appropriately with the mitigation strategies as outlined in Section 7.2.2.

The realignment channel will discharge into an existing tributary, to the east of Three Nations Lake, which ultimately reports to the Three Nations Creek mainstem. This tributary represents 2,170 m of channel that will convey supplemental flow due to the realignment. The existing subwatershed of 5 km^2 presently reports an average annual flow of 0.075 m^3/s to Three Nations Creek. Under the realignment design, this tributary will now report 0.118 m^3/s. This 56.7% increase in expected flows was assessed relative to the observed channel capacity of this tributary to confirm that there would not be any residual adverse environmental effects associated with channel adjustment. It was determined that the channel section is of suitable capacity to contain both the peak flows of the 2 and the 5 year events. This indicates that the channel is entrenched, likely a reflection of beaver activity and past dam breaches, which eroded a substantially larger channel than anticipated relative to subwatershed area. Peak flows associated with events above the 5 year event will enter the flood-prone area (25 m wide). Consequently, it is concluded that the hydrologic conveyance function of the new channel can be maintained without discernable residual adverse environmental effects (AMEC 2004a1).

During the construction phase of the proposed realignment channel some potential adverse environmental effects to surface water quality can be expected in the form of suspended solids. Medium to long-term influence to water quality can be anticipated as a result of the Three Nations Creek realignment naturalization and adjustment, however, this will be of low magnitude, limited in geographic extent, of short duration and reversible. Since this channel is intended to function as a natural system, some erosion can be anticipated. This process of channel adjustment may result in the mobilization of some bank and bed materials forming a component of the bedload and reflected by periodic increases in suspended solids.

The construction activity for the creek realignment will involve a small fleet of equipment including excavators and haulers working in a limited area of a few kilometres. The work will be of short duration, the majority of which will be conducted in the winter months when frozen ground conditions facilitate work in the wet lowland areas. Air quality and noise emissions associated with the work will result in a minimal effect to surrounding habitats.

The Pit Expansion mining operation will be well separated from either the existing Three Nations Creek or the realignment channel. With a comprehensive site water management plan, the stormwater drainage from the mine infrastructure and facilities will be directed and controlled to

permit passive treatment of potential suspended solids through settling in a permanent wet pond in the Tailings #3 area. As such, discharges to the Three Nations Creek watershed are eliminated, avoiding potential adverse environmental effects to the surface waters.

In terms of cumulative adverse environmental effects, the Haul Road and Highway 101 realignment projects being undertaken by PJV, have the potential for influence on the Three Nations Creek VEC. The Haul Road is well removed from the existing creek channel or future creek realignment. Potential adverse environmental effects to water quality are represented by the construction and operation of the road, and then a small area of runoff that will report from the headwater areas west of Three Nations Lake. With the standard sedimentation control measures to be applied (BMPs), this is of minor consideration. Drainage will also be maintained as per the existing watershed, so there will be no discernable effect to creek hydrology (AMEC 2004a1).

The Highway 101 presently crosses Three Nations Creek at two locations. On completion of the Highway 101 realignment, the Highway will continue to operate with two crossings, albeit in new locations; one immediately downstream of an existing crossing, and the second within the Three Nations Creek realignment (AMEC 2003i). Consequently, highway influence on the creek system will remain essentially the same with respect to quality, as there are no direct highway stormwater management measures other than BMPs where feasible. The crossings have been designed at a higher standard than those previously installed (larger culvert dimensions), and consequently the system will be improved from a hydrologic conveyance function. The designs of both the creek realignment and highway crossing were designed in an integrated manner to ensure appropriate overall function of the stream system. As such, no cumulative residual adverse environmental effects to the Three Nations Creek system are anticipated.

The Falconbridge Metallurgical Plant has been undertaking habitat improvement works and activities in the Three Nations Creek and drainage adjacent to their facility during the course of this assessment. This has included the redirection of site runoff such that it can be accommodated in their effluent treatment system for other process activities, thereby representing a net benefit to surface water quality of the creek. This represents a relatively minor redirection of runoff water from a hydrologic perspective. The Falconbridge related activities and associated creek improvements will not be constrained by the Project activities undertaken by the PJV. In terms of cumulative adverse environmental effects, these drainage and habitat improvement activities, in association with the mitigation and compensation activities undertaken by PJV, represent a further net benefit to the availability of functional aquatic habitat in the Three Nations Creek watershed.

A key objective of the proposed Three Nations Creek realignment is to establish a new aquatic/valley corridor system. This will involve the protection of the mature-semi mature forest areas adjacent to the creek. To maintain this corridor, the availability of these forest resources for future consideration as a timber resource, may become constrained as a component of local resource management planning. This represents a small percentage of timber resource relative to that available to the associated forest industry in Timmins.

7.2.2 Key Mitigation

The portion of the intermittent flow reaches of upper Three Nations Creek watershed that will experience minor flow reductions due to the Project required rerouting of drainage from the Three Nations Lake basin, with the exception of the 0.6 km infrastructure footprint, has been recognized for the purpose of this assessment as an indirect HADD. This HADD reflects a flow reduction as opposed to a complete loss of aquatic habitat, the existing habitat being retained through flow recovery from the remaining watershed and the grade controlled nature of the wetland habitat. However, for the purpose of conservatively accounting for residual adverse environmental effects and providing appropriate compensation, it was concluded that 2.5 km of watercourse would require habitat replacement (AMEC 2004d).

The details of the habitat replacement are provided in Section 2 in relation to the fisheries and aquatic ecosystem of one of the Pit Expansion facilitation works and activities.

Adverse environmental effects are principally associated with the construction phase, as the development of the realignment channel is intended to be a naturalization process with only minor interference where necessary to promote habitat development. Therefore subsequent project phases involve minor follow-up activities that do not require mitigation beyond standard construction practices. During construction, application of standard erosion and sedimentation control measures should suitably minimize the potential sedimentation loading to the new, original and tributary systems of the creek.

7.2.3 Significance of Residual Adverse Environmental Effects

The result of this aspect of the project, in terms of mitigation and compensation for residual adverse environmental effects, is the establishment of a new aquatic corridor removed from the mining activity and drainage that contains design elements intended to improve the fisheries habitat function of the system. Beyond the benefits of the channel realignment as described, the existing creek system will also retain its wetland habitat function, thereby collectively resulting in an overall increase in available aquatic habitat in the Three Nations Creek watershed. Other project activities such as the Highway 101 realignment include integration of designs of the creek realignment and highway crossing to ensure appropriate overall function of the stream system. As such, no cumulative residual adverse environmental effects to the Three Nations Creek system are anticipated. In review of these factors, it was concluded by PJV that there would be no significant residual adverse environmental effects (AMEC 2004a1).

7.2.4 Comments and Issues Identified

Based on the stakeholder consultation process general thematic comments and issues identified for consideration by PJV included:

- A full range of hydrologic conditions and associated project adverse environmental effects could be considered in the project assessment to determine adverse environmental effects to the hydrologic function of Three Nations Creek, including

conditions under extreme high events, low events; and average runoff events, including normal flow fluctuations.

- Similar hydrologic considerations should be included in the design for the realigned channel to ensure that the ecosystem function of the aquatic habitat in this channel system is maintained.

- The design criteria for the isolation dam and design capacity for the outlet channel should consider the environmental consequence of dam overtopping significance, the design criteria may require increase above the Timmins Storm flood criteria, possibly up to the maximum probable flood, taking into consideration adverse environmental effects of climate change of maximum probable precipitation amounts.

- Notwithstanding the discussion included on compensation to address adverse environmental effects on fish habitat in Three Nations Creek downstream of the isolation dam, residual adverse environmental effects include changes to the Three Nations Lake water supply (i.e., affecting inflow volumes and flushing frequency) and changes to existing creek and tributary flow regime.

- Implementation of appropriate monitoring should be undertaken to determine whether changes due to the project on the existing water level regime of Three Nations Lake (notably the increase proposed to the minimum operational water level) results in any adverse environmental effects to its aquatic ecosystem, including shoreline stability and water quality. Implementation of flow monitoring and monitoring of the aquatic ecosystem for the affected section of Three Nations Creek immediately downstream of the expanded pit to its confluence with the tributary connected to the realigned channel should also be undertaken in the follow-up programs.

- Based on the results of the follow-up monitoring program, any required actions necessary to address any deficiencies in the assessment of project adverse environmental effects and/or implemented mitigation should be identified. This may include mitigation measures that assist in maintaining any grade control features and associated creek water levels in the existing channel that promote the continued development of aquatic habitat and wetland functions.

7.2.5 Proponent Response

Based on the stakeholder comments PJV reviewed and addressed issues as follows (AMEC 2004a2, PJV 2004b, 2004c, 2004d):

- Extreme low flows in Three Nations Creek are recognized as being zero (0) as reflected by intermittent flows. Monthly flow data records of 1996, 1997 and 2003; also indicate that the system is seasonally intermittent. The complete loss of flow or representation by marginally discernable flows is a characteristic common to the typical seasonal low flow periods including summer and fall. Despite flows that are not discernable, the wetland

habitat conditions, as reported both in the ESG 1997 and AMEC 2004 aquatic habitat studies continue to persist. This is largely a function of the numerous grade controls throughout the system in the form of beaver dams that serve to develop a series of impoundments. From the perspective of hydrologic function, it is evident that the creek serves a storage function. With numerous locations of cattail growth choking the channel, particularly in the upper reaches it is evident that the conveyance function under existing conditions does not generate sufficient flows to establish a defined channel through the cattail beds. More channel definition is observed in lower creek reaches where additional watershed area contributes to flows, and where beaver activity also serves to maintain open channels.

- During the development of the channel realignment design, the natural features of the existing channel were taken into consideration. An objective of the design was to develop a more defined channel that would be less susceptible to invasion by cattails, at least through major sections of its length. This was accomplished by selecting reaches of the existing creek where the channel was defined and provided reasonable fish habitat opportunities. The planform, cross section and slope of these reaches were applied in the design. Through the applications of these naturally generated diagnostic features, it is generally assumed that the hydrologic and conveyance functions will be emulated. As a reference check, the event based model was applied to identify how the channel responds to frequent storm events (2 year return), up to the regional storm. In the water level profile of the realignment channel during various events, it was confirmed that there is only a minor difference in water level response between the most frequent event and the regional storm. This is evidently a reflection of the small watershed size, and attenuation capacity of the lake, channel and floodplain. As reported in the modeling output, velocities will also remain low, thereby reducing the potential for major channel reconfiguration issues due to erosion.

  Based on this design approach, it is considered that a suitable level of both ecosystem and hydrologic design considerations have been applied to both establish and maintain suitable ecosystem function in the proposed creek realignment.

- The lake outlet grade control structure has been designed as a low head weir with only a 15 cm drop between the lake and downstream water levels. During high flows, this feature will be largely inundated and does not result in any significant water level increase upstream in Three Nations Lake. In terms of concerns regarding overtopping of the lake infill, modeling results indicate that the water level response between the 2 year and Timmins Storm event is only in the order of about 20 cm and demonstrates that there is no significant concern with respect to over topping of the isolation dam/seepage barrier structure that will be built into the lake infill. During the detailed design, a criterion will be applied to maintain a minimum freeboard of to the crest of the lake infill of 1.5 m above the Timmins storm lake level elevation.

- The lake hydrology issue is addressed in Section 7.1.4 and 7.1.5.

- Although it is recognized that there will be changes to the flow regimes of the existing creek due to the realignment and associated rerouting of flows, as indicated above, this is a minor consideration with respect to residual adverse environmental effects. As described above, the system is presently intermittent yet maintains the habitat characteristics typical of a marsh and its associated functions. It should also be recognized that in the post mine development condition, this marsh habitat will be maintained, including potential PJV intervention to maintain existing grade controls, and approximately 2.5 km of new habitat will be created. Collectively, through discussions with DFO, this was considered an enhancement or what can be considered a beneficial residual effect. Likewise, the receiving tributary for the realigned flows will receive additional flows, further enhancing 2.1 km of watercourse habitat opportunities. The events based model has demonstrated that channel diagnostics of this tributary are capable of handling the increased flows, and as such, no adverse environmental effects are anticipated.

- PJV recognizes that follow-up monitoring is an important component of the approvals process, and therefore, PJV will be working closely with DFO to establish the follow-up monitoring program in the aquatic systems. Although the designed lake water level is well within the functional regime of the existing basin, water levels will be monitored accordingly to confirm that the design objectives are met. Likewise, as a component of the fisheries monitoring program, the shoreline habitats of the existing lake, lake replacement and creek realignment system will be monitored to confirm that the system is responding in a positive manner to result in habitat enhancement. PJV will also be monitoring water quality as part of the overall site management program.

- In order to establish follow-up monitoring action plans, PJV will identify the progress of habitat development and system response through regular monitoring reports, and will provide action item recommendations with respect to any deficiencies. This will likely involve an adaptive management strategy approach, where both monitoring and response would adapt accordingly both to beneficial and potentially deficient system reaction until such time that it can be demonstrated that the watercourse systems are functioning according to design objectives as designed.

7.2.6 RAs Conclusions

- The RAs agree with the conclusions provided by PJV, that the residual adverse environmental effects and cumulative adverse environmental effects are not considered significant.

- The RAs conclude that the Three Nations Creek mitigation and habitat compensation measures as proposed, provide appropriate replacement habitat for that displaced as a result of the Pit Expansion. It is acknowledged that the design will provide habitat enhancement opportunities over the long-term. The proactive construction of much of the creek realignment in advance of the need to reroute flows, would be a benefit that in terms of allowing for naturalization and stabilization and relative to the provision of

suitable fish habitat conditions from the onset, when the channel is connected to the natural system.

- The RAs conclude that a fish habitat and fish community monitoring program will be required to confirm that the habitat develops according to the prediction that it will provide suitable habitat, including during the periods of intermittent flow through establishment of refuge pools. This habitat will serve to provide habitat for a range of species and age classes common to the creek system. In order to establish follow-up monitoring action plans, PJV shall identify the progress of habitat development and system response through regular monitoring reports, and will provide action item recommendations with respect to any deficiencies. This will likely involve an adaptive management strategy approach, where both monitoring and response would adapt accordingly both to beneficial and potentially deficient system reaction until such time that it can be demonstrated that the watercourse systems are functioning according to design objectives as designed.

7.3 Groundwater

7.3.1 Adverse Environmental Effects

The groundwater assessment boundary generally comprises the local watershed area in the vicinity of Three Nations Lake and Three Nations Creek. Any additional changes to the local groundwater resources as a result of the Project, beyond those that have already occurred as a result of over 50 years of mining activity and dewatering requirements, will last in perpetuity or until the open pit is completely flooded (>25 years after end of mine operation through natural recovery and redirection of all site surface water flows to the pit).

Presently (September 2004), the groundwater table in the pit expansion areas is 230 m below the pit crest. It has been at this depth or greater for at least the past 10 years. The Pit Expansion will involve increasing the depth of the pit, and with it the groundwater table. Despite the extensive and extended period of depressed groundwater levels in the area, there has been no discernable effect on the water levels or functions of Three Nations Creek or Three Nations Lake. Likewise, based on shallow monitoring wells placed in lowland areas around the lake and observed soil conditions, the shallow water table has remained near surface creating very wet conditions reflected by the plant community. This separation between the deep groundwater and the local surface waters is the result of a clay soil confining layer that underlies the area and is on the order of 10 m in thickness. Detailed soils and terrain descriptions were provided by Trow (2003), confirming the relatively well distributed clay soil strata is located under the Project area. Bedrock is also competent as reported in AMEC (2003g). Consequently, PJV concluded that there is no major linkage between the surface waters and deeper groundwater resources.

In the assessment of the Three Nations Lake water balance as requested by Federal review process, a conservative approach was applied in the determination of potential surface water losses due to a depressed groundwater table. Through calculations undertaken by NRCan (2005a) and PJV (2005b; 2005C), it was determined that a wide range of potential surface water

losses could occur. Without mitigation, the associated effect would be considered to be of moderate to high magnitude, but limited in extent to the lake area where most notable habitat alterations would be expected. With a relatively short mine life, and anticipated recovery time of the groundwater table on completion of mining, the effect is of short to moderate duration and fully reversible. Appropriate contingency mitigation strategies are available to supplement lake water levels (PJV 2005c), as described below, such that potential alteration to aquatic habitat can be avoided.

Local potable water wells are presently located at shallow depths and are low yield (AMEC 2003i). These wells do not appear to be influenced by the existing dewatered pit, and therefore, additional drawdowns at deep levels, will not affect these wells. The closest wells to the site are on PJV property holdings and will not be used as a source of potable water. Other wells are farther a field from the pit (>1 km). Beyond that distance and to the south, residents are on municipal water supply that has recently been extended into the area (2004). Consequently, there will be no adverse environmental effects on potable water supplied by groundwater sources.

In the area of proposed lake replacement and creek realignment, shallow water levels were observed to be within 0.3 m of the ground surface. This is a characteristic of the low-lying shrub lands and spruce forest. It can be anticipated that the implementation of the lake replacement and creek realignment, which represent excavation works and resulting normal water levels below 1 m of the existing ground level, will likely have a low magnitude influence on the shallow water table only through improvement of the local drainage, and no adverse environmental effects are anticipated with deep groundwater resources. The effect will be localized, and of an extended duration depending on the climatic conditions and natural variations in the lake levels and associated nearshore water table. With maintenance of lake and creek water levels as per natural ecosystem designs, the potential water table drop will be largely reversible over much of the area surrounding the constructed habitat replacement features.

The Project will proceed in combination with other projects and activities that may contribute to adverse environmental effects on groundwater. The key activities include nearby mining activities, including open pit operations and associated water management operations on adjacent and nearby property. The existing groundwater conditions are reflective of past and present activities and future pit expansion will not be expected to further alter groundwater resources in the assessment area in combination with the Project. The local Haul Road and Highway 101 realignment are not anticipated to have any bearing on the groundwater resources, relative to the selected VECs (AMEC 2004a1).

7.3.2 Key Mitigation

With potential groundwater adverse environmental effects limited to minor (local and shallow) alterations in the area of lake replacement and creek realignment, the perimeter of these features were designed to maintain a 10 m buffer of the lowland shrub community (AMEC 2004a; 2004e). It is anticipated that the majority of this shrub zone will express a higher adaptability to any changes in water table or soil moisture. The design of both the lake

replacement and the realignment channel has incorporated the highest possible normal water level elevation that will maintain the existing lake habitat. This will assist in minimizing the draw down of adjacent areas.

Any potential adverse environmental effects associated with deep groundwater drawdown and the potential for substantial lake level reduction over the seasonal low flow or flow deficient periods, as further described below, will be closely monitored and addressed through mitigation flow supplementation from readily available surface and/or groundwater sources (PJV 2005c). Any required flow supplementation will be maintained through the mine operation, and post closure period until the groundwater regime has returned to a state of equilibrium or at a minimum, as per existing conditions.

7.3.3 Significance of Residual Adverse Environmental Effects

A significant residual adverse environmental effect on groundwater is defined as one which results in an effect with a high magnitude on key fish (game fish) populations or stocks through major habitat functional diminishment, uncommon plant communities, or potable drinking water supplies to nearby residents.

Environmental effect will occur to the immediate shallow groundwater table during the construction, operation and abandonment of the works and activities that facilitate the pit expansion. Largely due to improvements in drainage associated with the lake replacement basin and the creek realignment, these adverse environmental effects are considered to be local in nature. Deep groundwater flows in the Three Nations watershed will be slightly altered due to the expanded open pit, but the surface waters and deep groundwater aquifer are separated by a distinct confining layer. Any potential drawdown effect can be readily addressed with flow supplementation to Three Nations Lake to maintain habitat form and functions. A contingency water level mitigation strategy including monitoring and response action plans will be implemented to address this effect.

Due to the relative low-connectivity with the open pit operation, the availability of feasible water level mitigation strategies, and the criterion selected for determining significance, PJV concluded that the residual adverse environmental effects of the Project on Groundwater, in combination with other projects and activities, is considered not significant (PJV 2005c).

7.3.4 Comments and Issues Identified

Based on the stakeholder consultation process general thematic comments and issues identified for consideration by PJV included:

- Concern that the expanded pit will capture groundwater that would otherwise discharge to TNL, resulting in a steady decline in the lake water level and ultimately affecting the proposed fish habitat replacement basin and discharge flows to Three Nations Creek;

- Concern that the expanded pit will draw the additional inflow from an expanded upgradient groundwater capture zone underlying TNL which may represent groundwater that currently discharges to TNL; and,

- Concern that the possibility of pervasive fractured bedrock near surface and "north-south trending faults being intersected in the expanded phase 2 and phase 3 pits could potentially give rise to significant groundwater inflows into the pit from Three Nations Lake.

7.3.5 Proponent Response

PJV's response to the comments and issues was as follows (AMEC 2004a2, PJV 2004b, 2004c, 2004d, 2004f, 2004g, 2005a, 2005b, 2005c):

- Based on the findings of the concurrent geotechnical study of the proposed isolation dam/lake infill, the Highway 101 realignment, and area of the Three Nations Lake replacement, there is a significant confining silty clay and clay deposit underlying the lake and adjacent lowland areas. These deposits are approximately 10 m thick and appear to be laterally continuous. As a result, it is PJV's conclusion that the groundwater flux to the lake under existing conditions would be minimal, if not insignificant. In terms of water balance, Three Nations Creek has been identified as a system exhibiting intermittent flows. Very low to no flows were observed immediately downstream of the Three Nations Lake outlet from June through to mid-October in 2003 (average monthly flows of 0.008 cms). This condition persists despite the strong artesian conditions adjacent to the lake as referred to in the agency comment below. The maintenance of aquatic habitat in Three Nations Lake and the wetland systems downstream are predominantly maintained by grade control structures such as the constructed lake outlet control structure and beaver dams. This seasonal flow (i.e., precipitation dependant) would also be consistent with the presence of an underlying confining layer.

  Through the preparation of a Three Nations Lake water balance, based on secondary source information, an assessment of potential deficiencies of available flow associated with groundwater flux was completed. On suggestions of NRCan, it was considered that a rough estimate of the interaction could be determined from the available data sources, and that this would serve to provide an indication of any potential residual adverse environmental effects to existing lake levels and the proposed lake habitat. The water balance suggested that during the low flows in summer, a deficiency in flow results that results in a minor drop in water level elevations. This is consistent with the observed intermittency of surface water flows as described for Three Nations Creek. A review of the groundwater flux also suggested that a net loss of flow through infiltration may occur, which could be reflected in a further diminished lake level, particularly during the identified natural flow deficiency period associated with reduced runoff from the watershed.

Based on the comparison of the water balance results and existing habitat records, minor anticipated lake level fluctuation would not be significant relative to the bathymetry of the lake basin and littoral zone habitat characteristics. In terms of the proposed mitigation/compensation designs of the lake replacement and the creek realignment, similar water level fluctuations would have a negligible effect to the lake surface area or the proposed habitat features, and is consistent with the design criteria applied based on diagnostic lake margin records.

In the event that the proposed Pamour Pit expansion were to influence any groundwater flux on the maintenance of water levels in Three Nations Lake (determined through monitoring), then the objective of a mitigation design would be to apply a conservative approach to address the flow deficiency period in summer. Through the supplementation of flows to the lake from existing surface and groundwater sources, a minimum water level in Three Nations Lake at the future outlet elevation of 285.6 masl would be maintained in consideration of climatic conditions. Storage of early season runoff surplus in the lake basin to provide extended flows at the outlet during the typical seasonal flow deficiency periods could also be achieved through modification of the designed outlet grade control.

To monitor this condition during operations, a lake level and shallow groundwater monitoring program will be implemented to confirm that no adverse environmental effects will develop during pit expansion. An Adaptive Management Strategy would be developed with the RAs to address any issues that can be identified as a result of drawdown effect (e.g., temporary flow replenishment/augmentation). Such a monitoring program would be developed during the permitting phase of the Project.

- TNL is interpreted to be weakly connected, or fully disconnected hydraulically, from the underlying overburden or bedrock aquifers given the presence of the confining layer. The reported artesian heads are more likely related to the horizontal continuity of the confining layer and the associated potentiometric surface, than the discharge of groundwater to the TNL basin.

- The current water level within the existing underground workings is approximately 230 m below grade (September 2004). These underground workings extend along the center axis of the proposed pit expansion throughout all three phases. Theoretically, the above referenced fault zones would be intersected by the underground workings. Given the existing conditions (i.e., the depth to water within the existing underground workings), the presence of a surficial confining layer and the stable water level within TNL it is not interpreted that features are hydraulically connected (i.e., there is a significant confining layer).

- The northwest – southeast trending faults in question have intersected underground workings at the former Pamour mine at several levels. For example, the Pamour fault is observed on 12 mine levels between surface and 22 level (650m). In no instance was water of any significance observed nor was a mitigative grouting program required as

confirmed with personal interviews with former Pamour mine geologists and the chief engineer.

- Relocation of the northernmost portion of Three Nations Lake removes ponded water from the vicinity of the northwest – southeast fault sets thereby reducing the possibility of water flow along these structures.

- The PJV is committed to providing a safe work environment for their pit employees. As such, monitoring of fracture zones and potential seepage areas will be a continuous process as the pit is extended to ensure that effective mitigation requirements are identified and applied in a proactive manner as required.

- It should also be noted that the existing Pamour Pit and the adjacent Hoyle Pit are completely dry, as is to be expected given the extent of the underground workings and their interconnectivity. This is a condition that has persisted for several decades without detriment to the natural maintenance of either Three Nations Lake water levels or to the wetland habitat that runs between the two pits along the course of Three Nations Creek.

7.3.6 RAs Conclusions

- The RAs agree with the conclusions provided by PJV, that the residual adverse environmental effects and cumulative adverse environmental effects are not considered significant.

- The RAs conclude that the potential groundwater losses associated with the pit development as estimated by NRCan (2005c) and PJV (2005 b; 2005c), and any potential aquatic habitat alterations (DFO January 18th, February 15th and February 28th 2005), can be suitably mitigated with a flow supplementation program. Consequently, the expansion of the Pamour pit will not have a significant effect on Three Nations Lake and the adjacent groundwater system. A monitoring program with an Adaptive Management Strategy will be appropriate for addressing any shallow groundwater related issues that may be identified during operations. This strategy will include contingency measures for the supply of supplemental flows to Three Nations Lake from available water sources including but not limited too stored runoff from the watershed, local groundwater sources, and adjacent surface water sources, all of which are readily available and accessible for use by PJV for mitigative purposes (PJV 2005c). Any required flow supplementation will be maintained through the mine operation, and post closure period until the groundwater regime has returned to a state of equilibrium or at a minimum, as per existing conditions.

- The RAs conclude that a groundwater monitoring program will be required to confirm that there is limited infiltration of water to the open pit. Monitoring of fracture zones for seepage will be ongoing throughout the operation. Also, surface water levels in Three Nations Lake and flow measurements in Three Nations Creek will be required to ensure that there is limited effect on the Three Nations watershed water balance.

7.4 Mature/Semi-mature Mixed and Coniferous Forest

7.4.1 Adverse Environmental Effects

PJV assessed the project and cumulative adverse environmental effects on vegetation against baseline conditions. The main effect during construction, and that would carry on through the operations phase of the project, would be on the aerial extent of vegetation due to surface disturbance required for infrastructure of the Pit Expansion, principally the waste rock disposal areas, and the Pit Expansion facilitation activities associated with the Three Nations Lake replacement and Three Nations Creek realignment. Within the context of the Three Nations Creek watershed spatial boundary only about 5.5% of forest would be directly affected by Project infrastructure directly related to mining. No vegetation will be lost as a result of the pit expansion overburden stripping and rock mining, as these activities are limited to the approximately 5.5 km^2 of the Three Nations Creek watershed that has been disturbed by past mining activity. The adverse environmental effects are accordingly considered to be low magnitude and of limited geographic extent. To some extent the vegetation losses would be reversible through the extensive revegetation program associated with rehabilitation measures associated with abandonment of the site following mining, which in the long term would revert to a forested condition. The lake replacement area loss of forest is irreversible, but represents a replacement of one habitat type with another.

There is also additional watershed disturbance from transportation corridors including the existing Highway 101, utility corridors, limited forestry and recreation related activities (e.g., snowmobile trails). Therefore, approximately 50% of the watershed spatial boundary has been previously disturbed. In general, disturbance within the semi-natural forest areas through long-term land use practices has likely contributed to a reduction in plant and animal richness.

No threatened or endangered species, or species of special concern as identified in the *Species at Risk Act* (2003) were identified in the Three Nations Lake area (AMEC 2004b, 2004c). Likewise no rare or uncommon plant or animal species have been noted in reviewing site-specific data from AMEC (2004c) and the MNR NHIC database. The most abundant bird species observed were Ovenbird and Red-eyed Vireo, which are typical species of forest interiors. Such migratory species, including others reported from the study area (AMEC 2004c), are vulnerable to any site clearing activities undertaken during the nesting and fledging period, and mitigation to address this issue will be applied as discussed in Section 7.4.2.

All of the vegetation species encountered are common to abundant in their respective habitats and are well represented from a regional perspective. No Federally, Provincially or Municipally designated habitats were recorded within the study area. The Project area is located at the northerly extent of a relatively contiguous forest system that extends to the south. Some fragmentation of the forest has occurred as a result of timber harvests, and infrastructure corridors, but wildlife corridors have been maintained between the major forest blocks. With the generally intact forest system to the south of the site, considerable habitat is available for wildlife.

In terms of other potential cumulative adverse environmental effects associated with other PJV related local project activities including the Haul Road access to the site and the Highway 101 realignment, only an additional 2% of forest habitat will be removed. Other cumulative adverse environmental effects on Mature/Semi-mature Mixed and Coniferous Forest resources, based on past, present, and future activities within the city limits of Timmins, are widespread and continuous, over a large area as a characteristic of both urban and long-term mining related land use. The additional contribution of the Project to these regional adverse environmental effects is relatively small.

Minor influence of dusting resulting from use of the access roads, may represent a minor influence to adjacent forested area. Other areas of construction including the lake replacement and creek realignment will be brief in duration and conducted in relatively moist soils, therefore no dust issues will be encountered (AMEC 2004a1).

7.4.2 Key Mitigation

Mitigation measures for protection of the mature and semi-mature forest VEC was incorporated into the project design. The Project area of disturbance has been designed to result in a minimum “footprint” to reduce adverse environmental effects to this VEC. The perimeter of the lake replacement basin was delineated such that areas best representing the VEC could be avoided and actually integrated into the design to establish a functioning terrestrial and aquatic corridor between Three Nations Lake and the existing Three Nations Creek corridor (AMEC 2004e). Environmental baseline data was used to identify relatively concentrated wildlife resource use so such areas could be avoided. Where feasible a 10 m natural buffer zone in the shrub lowland will promote protection of these maintained forest communities from wind throw, and provide a buffer area in which the vegetation community can adapt to local changes to drainage and shallow groundwater table adjustments that are likely associated with improving the drainage through the low wet areas selected for construction of the lake replacement and creek realignment. In addition progressive restoration will be undertaken in order to maintain habitat function and best management practice techniques will be used to avoid accidents, malfunctions and unplanned events.

In terms of protecting the migratory birds that are recognized to use these habitat types for nesting and rearing of young, any site clearing requirements will be undertaken outside the critical/vulnerable life stage period that typically extends from about May 16th to July 31st. Most clearing activities are scheduled in the winter when access to the forested areas is facilitated, and migratory birds have vacated the Project area.

7.4.3 Significance of Residual Adverse Environmental Effects

Although permanent in character, habitat loss/alteration has been rated not significant, in light of the amount of previous habitat lost/altered, the disturbance level in the surrounding land use, and the low percentage alterations relative to the watershed spatial boundary. The disturbance is also not considered to be significant as no significant or unusual terrestrial wildlife species were observed during field surveys or have been reported from the watershed. In addition,

adverse environmental effects on a larger corridor and linkage functions context are considered to be not significant since the relatively contiguous natural areas to the south of the Project site are generally isolated from other natural areas to the north by the extensive land use activities. Alternative linkage opportunities through the area are available through the Porcupine River valley system.

The corridor functions within the watershed will be maintained through the Three Nations Creek realignment and associated valley protection plan that has been designed. PJV concludes that the residual adverse environmental effects of the Project on Mature/Semi-mature Mixed and Coniferous Forest, in combination with other projects and activities, are considered not significant (AMEC 2004a1).

During construction, migratory bird resources will be avoided by establishing clearing and construction timing constraints outside the nesting period as indicated previously. Key habitat areas will also be protected through construction area boundary delineation.

7.4.4 Comments and Issues Identified

Based on the stakeholder consultation process comments and issues identified for consideration by PJV included:

- Habitat modification activities should strive to protect terrestrial and associated wildlife habitat opportunities around Three Nations Lake.

7.4.5 Proponents Response

Environmental baseline data was used to identify important areas for wildlife resources so such areas could be avoided, where possible, and the extent of development could be limited and fully considered in the fisheries habitat replacement design. Baseline information will also be used to clearly mark limits of construction. In addition, PJV will ensure that all permits, authorization and approvals, and their associated conditions, are adhered to.

7.4.6 RAs Conclusion

The RAs conclude that the Project designs and associated mitigation strategies, relative to the already extensive land use changes in the area, will maintain habitat functions as per the objectives described by PJV. With the implementation of this project planning, the RAs were satisfied that the potential for adverse environmental effects as a result of the project will not be significant.

7.5 Angling Access Opportunities

7.5.1 Adverse Environmental Effects

The angling access opportunities have been considered from the perspective of physical accessibility to the available fish resource through navigation, as well as the availability of the resource itself. The availability of the resource also reflects the general fishable area, and nature of the habitat features that contribute to the angling experience.

Angling access opportunities in the Project area are presently restricted to a single boat launch located at the northwest end of Three Nations Lake (AMEC 2003i). The existing boat launch will be lost as a result of the Project, in particular the dam construction and partial dewatering of the north basin of Three Nations Lake. There may also be temporary access restrictions to the existing boat launch as a result of safety issues related to the construction of individual project components (isolation dam and lake infill), and during operations in association with blasting (AMEC 2004a1). This effect is considered minor, of relatively short duration, and fully reversible.

In terms of habitat availability, the 13.3 ha of north lake basin will be removed to permit the pit expansion. This will result in a loss of habitat that both provides for the production of the fisheries resource as well as providing fishable area. The loss of this habitat is addressed in discussions regarding the Three Nations Lake VEC outlined in Section 7.1.

Another possible adverse environmental effect that may manifest itself through the creation of replacement fisheries habitat relates to elevated levels of mercury in aquatic systems following the inundation of terrestrial areas in the lake replacement basin. This is considered a minor concern, as the area affected is small. In the event that mercury methylation occurs in the lake replacement basin, the effect may contribute to elevated fish tissue levels of mercury until the new lake habitat water quality levels have stabilized. Such reversibility or stabilization with respect to mercury may take many years. This effect would contribute to placing restrictions on the consumption of the fisheries resource, which is considered to affect the availability of the resource as a country food (AMEC 2004a1). With the design features of the lake replacement as identified in Section 7.5.2, this effect is considered to be of very low potential and would be localized. Levels will likely remain consistent with the typical fish flesh levels found throughout the region.

In terms of cumulative adverse environmental effects related to other projects or project activities, Highway 101 has a bearing on the angling access. The highway realignment is considered a positive effect, as it will facilitate the establishment of a new boat launch on Three Nations Lake, thereby maintaining similar physical access to the resource.

7.5.2 Key Mitigation

In order to compensate for the loss of fish and fish habitat due to the planned pit expansion, PJV proposes to replace the dewatered portion of the lake with new lake habitat southeast of Three Nations Lake in a lowland area as outlined in Sections 2.0 and 7.1. The proposed new

habitat will offer a similar or enhanced habitat to that which presently exists and will include spawning areas and shallow littoral zone habitat. This is intended to enhance opportunities for increases in the predatory fish population that are presently the focus of angling. As such it is anticipated that over the long-term, angling access opportunities will be improved. Likewise, the design of the lake replacement basin, and the shoreline of the lake infill have been designed to establish a riparian function with a natural appearance. This will provide angling access to habitats and shoreline views that are consistent with the present condition.

In order to maintain public access to the lake, a new boat launch will be constructed at the southeast corner of the lake (AMEC 2003i, Transport Canada 2004). To avoid any safety to navigation issues during construction and operation of the Project proper, safety signage on Three Nations Lake and safety zone demarcation for the daily mine blasting will be erected. These are considered short-term restrictions (AMEC 2004a1). Also, to avoid potential adverse environmental effects to navigation, any tools, vehicles, equipment, and temporary infrastructure required to build the inwater Project components, will be removed on completion of the project. Likewise, any debris materials that have been deposited in the navigable water will also be removed on completion of the works (Transport Canada 2004).

The lake replacement at the south east of Three Nations Lake will provide similar or enhanced fish habitat (refer to Section 7.1). The reduction of potential mercury methylation resulting from the lake replacement development was considered in the alternatives evaluation (Section 3.0), and resulted in the preferred concept of excavating the lake basin as opposed to flooding the existing terrestrial habitat. Therefore, mitigation to reduce the possible effect of elevated mercury levels will include removal (by excavation) of overburden and terrestrial soils that might contribute to mercury methylation. Only a narrow lake margin (<2 m depth zone) will receive a covering of organic soils to promote the development of functioning shoreline habitat for benthic invertebrates, aquatic plants and fish. This is a relatively small area for concerns related to mercury methylation.

7.5.3 Significance of Residual Adverse Environmental Effects

Although the Project will result in the loss of the existing boat access to Three Nations Lake, adequate access will be provided to ensure boat access by anglers is maintained. Similar and enhanced habitat area will be provided in the reconfigured Three Nations Lake basin that is anticipated to contribute to maintenance of angling opportunities over the long-term. Mitigation strategies limiting the potential for mercury methylation will also avoid a loss of access to country food due to consumption restrictions.

In consideration of the adverse environmental effects and the implementation of effective mitigation strategies, PJV concludes that the residual adverse environmental effects of the Project on Angling Access Opportunities are considered not significant (AMEC 2004a1).

7.5.4 Comments and Issues Identified

Based on the stakeholder consultation process comments and issues identified for consideration by PJV included:

- Access to the lake for local recreational angling opportunities was an important resource value to the community;

- To maintain navigation access to the lake, a boat launch must be constructed at the south end of Three Nations Lake on completion of the project;

- To avoid safety issues during construction and to permit the lake replacement basin to stabilize as a natural functioning habitat, the installation of the boat launch should be delayed to restrict access;

- To avoid potential adverse environmental effects to navigation, any tools, vehicles, equipment, and temporary infrastructure required to build the inwater Project components, must be removed on completion of the project. Likewise, any debris materials that have been deposited in the navigable water must also be removed on completion of the works;

- The fishery of Three Nations Lake is managed by the province for both walleye and pike and as such, mitigation strategies should address both species;

- Pathways for Contaminants of Potential Concern should be assessed relative to the lake replacement basin, potential mercury methylation and the adverse environmental effects on all species that could represent country food in this lake basin; and,

- Monitoring is required of the muscle of those species of fish caught in Three Nations Lake that are typically consumed by the local residents. This monitoring should include lead, total mercury and arsenic in the suite of metals measured in the filet of these fish. Based on the results of these monitoring studies, assessment(s) would be required of the estimated intakes of the levels of metals found with regard to the potential impact(s) on human health. In addition, it may be necessary to consider the need for establishing consumption advisories for the flesh of certain species of these fish.

7.5.5 Proponent Response

PJV's response to the comments and issues was as follows (PJV 2004a, 2004e):

- Long-term physical access to Three Nations Lake will be provided in the form of a new boat launch. This will support the access to the angling opportunity and navigability of the lake;

- There may be short-term access restrictions with respect to the boat launch. Government agencies have suggested, for safety considerations, a delay in boat launch development until the major construction activities within Three Nations Lake are complete. This will be considered during the detailed design and boat launch approval process and through consultation with the approving agencies;

- To avoid potential adverse environmental effects to navigation, any tools, vehicles, equipment, and temporary infrastructure required to build the inwater Project components, will be removed on completion of the project. Likewise, any debris materials that have been deposited in the navigable water will also be removed on completion of the works;

- The inwater works have all been designed to ultimately establish naturalized lake shoreline features and aquatic habitat. As such, only designed habitat elements will remain on completion of construction. The exception would include rock fill access roads within the lake replacement basin that may be required for construction access. These would remain in place and become integrated as habitat features. These features are only proposed in the areas of the future lake replacement basin, which is presently not an area accessible to navigation;

- Habitat replacement as described in Section 7.1 has largely been focussed on maintaining habitat opportunities for both pike and walleye. With limitations to the walleye spawning habitat, and an expressed interest by the public to pursue this species in Three Nations Lake, additional mitigation/enhancement measures were incorporated in the form of extensive walleye spawning habitat development; and,

- As described in Section 3.0, the preferred alternative for the lake replacement was an excavated basin as opposed to a flooding of terrestrial soils. As such, only a minor area of terrestrial soil required for establishment of lake-margin habitat would be available for mercury methylation. No other Project related pathway of this contaminant into the country food is available, and the effect on country food in the form of all edible fish is considered minor. The process of developing and monitoring fish as a follow-up program will include the monitoring of mercury, lead and arsenic levels in game fish tissues as they relate to country foods and human health issues. This monitoring program will be further developed with DFO during the final design and approval process. Based on monitoring, consumption advisories would be posted if required.

7.5.6 RAs Conclusions

The RAs confirm that PJV has appropriately considered the maintenance of access to angling opportunities in the preparation of their mitigation program that includes habitat replacement and access to navigation (boat launch). This program has considered the target fish species consistent with the provincial fisheries management objectives for the district, while also considering that the habitat development will also provide habitat opportunities to the remainder of the fish community of Three Nations Lake. With respect to navigation access, the PJV

implementation of a boat launch at the south end of Three Nations Lake is consistent with Transport Canada requirements. Effective construction management in Three Nations Lake and removal of any debris and materials used as a component of project development will maintain safe conditions for navigation.

It is recognized that the potential for mercury mobilization as a result of the lake replacement construction is minimal. PJV has accordingly taken into consideration DFO concerns expressed early in the project planning process with respect to flooding of terrestrial terrain to compensate for lost lake habitat. This was addressed in the alternative evaluation process for the works and activities that facilitate the pit expansion. Consistent with Health Canada comments, a monitoring program will be applied to confirm that there is indeed no effect of the Project on country foods represented by edible fish of Three Nations Lake. In the event that levels exceed consumption guidelines, then consumption advisories can be posted as suitable mitigation.

The RAs therefore agree with the conclusions provided by PJV that the residual adverse environmental effects and cumulative adverse environmental effects are not considered significant. The RAs are satisfied that opportunities for angling and angling access have been maintained and potentially enhanced by the Project, and that human health considerations will be suitably addressed through monitoring of country food represented by fish flesh.

7.6 Trapping Access Opportunities

7.6.1 Adverse Environmental Effects

Trap line locations were obtained from MNR resource inventory mapping (MNR 1998). One trapper is active in the area southeast of Three Nations Lakes that may be affected by lake and creek replacement habitat. Trapping activity is presently not available in the area of the Pit Expansion due to previous mining related land use activities and a lack of suitable habitat for furbearers. The anticipated adverse environmental effects to trappers in the Project area will be limited to direct trapping related expenses should traps be lost and need to be replaced, and the potential loss of trapping opportunities in the areas of habitat alteration. The affected area represents a small proportion of the overall aerial extent of the trap line, habitat corridor establishment will address and to some extent reverse habitat losses, and mitigation strategies area available to accommodate any trap losses as described in Section 7.6.2.

Other activities resulting in cumulative adverse environmental effects to trapping resources include mining, forest management, and other development of infrastructure, such as the Highway 101 realignment. Land use in the Project area over recent history has resulted in a highly altered and frequently disturbed landscape, due to such activities, yet the forested areas where habitat has been maintained, supports a trapping resource. The construction of the Haul Road and highway realignment only represent a small proportion of the available forested area in the watershed. The cumulative nature of the Project in this context will therefore not appreciably change the Trapping resource opportunities. The realignment of Highway 101 may facilitate access to trapping areas.

7.6.2 Key Mitigation

The generation of an effectively new Three Nations Lake and Creek valley system associated with the lake replacement and creek realignment bypasses the major mining affected land area and maintains a substantial aquatic/terrestrial corridor. Protection of adjacent mature and semi-mature forested areas contributes to the maintenance of habitat and corridor functions, thereby maintaining the access availability to trappable resources. Over the abandonment phase of the Project, through progressive rehabilitation of mine related infrastructure (e.g., waste rock disposal areas), terrestrial habitats will become re-established, thereby providing habitat opportunities for wildlife. This will promote the sustainability of the renewable trappable resources in the study area.

PJV in the past has successfully negotiated agreements with potentially affected trappers that will satisfactorily compensated for the lost traps resulting from changes to trap line areas as a result of PJV projects and activities. PJV will continue this practice, if applicable, as a result of the Project.

7.6.3 Significance of Residual Adverse Environmental Effects

The extensive habitat rehabilitation efforts proposed by PJV are anticipated to maintain the accessibility to a trappable resource over the long-term. Short-term losses associated with traps within the construction zones will be effectively addressed through salvage or replacement of traps. On this basis, PJV concludes that the residual adverse environmental effects of the Project on Trapping Access Opportunities, in combination with other projects and activities, are considered not significant (AMEC 2004a1).

7.6.4 Comments and Issues Identified

The main issue brought forth by the Timmins Fur Council was:

- Must ensure access to the trap lines.

7.6.5 Proponent Response

The PJV will undertake the key mitigation measures identified in Section 7.6.2 to promote the sustainability of trapping access opportunities within the Three Nations Creek watershed.

7.6.6 RAs Conclusions

The RAs confirm that the overall mitigation strategies will support the sustainability of access to trapping opportunities. The RAs are in agreement with the conclusions provided by PJV, that the residual adverse environmental effects and cumulative adverse environmental effects are not considered significant.

7.7 General Adverse Environmental Effects (Not related to VEC's)

7.7.1 Potential General Adverse Environmental Effects and Mitigation

- Noise/vibration - Major sources of noise from the mining operations will be from blasting, loading and hauling of rock, as well as engine noise and backup beepers from general heavy equipment use. Noise assessment studies completed by Valcoustics Canada Ltd. (2003) indicate that noise levels from the open pit operation, including the waste rock piles, can be mitigated with the construction of rockfill attenuation berms. The berms would be constructed along the western perimeter of the open pit until the pit is operating below ground surface. Construction of rockfill berms along the western perimeter of the waste rock piles will also be adequate to attenuate noise levels. The sound exposures from the daily operations will be in compliance with MOE noise guideline limits. Blast vibration monitoring conducted at other similar open pit operations have shown that production blasting of waste rock and ore will not be an issue. As a supplemental measure, a blast vibration monitoring program will be implemented in proximity to the Pamour Pit.

- Dust - In terms of fugitive dust (diameter <30 µm), dry open pit mining operations generate a conservatively estimate of 2.5 kg/tonne of ore produced (EAG and Kilborn 1992). This fugitive dust is largely generated by the haul trucks travelling on site access roadways. As a regular component of the mine operations, the open pit ramp and haul roads are treated with water or surfactants as dust suppression mitigation to comply with MOE standards.

- Minewater and site drainage - All site drainage and minewater from the pit dewatering activities will report to the Pit Expansion Water Management System and minewater pond. As per past operations, discharges will report to the existing No. 3 Tailings Management area for settling of suspended solids, and then ultimately report to the Porcupine River and removes any mine related discharges to the Three Nations Creek watershed. The No. 3 Tailings Management area is a provincially permitted facility that has a discharge that consistently meets MISA requirements and no additional adverse environmental effects are anticipated. This system will fall under the requirements of the federal Metal Mining Effluent Regulations and associated Environmental Effects Monitoring, in addition to present provincial compliance monitoring requirements.

- Waste management - For future mining, it is not anticipated that a significant amount of solid waste will be generated at the Pamour Mine site and therefore this material will be sent off site. Any used oil on the Pamour site will be contained in 45-gallon drums and removed through a licensed disposal company for handling and removal by licensed contractors. Existing programs at the other PJV mine sites will be implemented to control the collection and disposal or recycling of garbage, paper, wood, steel, used oil and antifreeze, and other materials as per provincial regulation. All waste management will be consistent with PJVs overall Environmental Management Plan as applied to all operations.

7.7.2 RAs Conclusion

The RAs conclude that with the identified mitigation strategies that have been successfully applied at other PJV projects, the Project and cumulative adverse environmental effects relative to dust, noise/vibration, minewater and site drainage, groundwater seepage onto the pit and waste management are not significant.

7.8 Adverse Effects of Environment on Project

As defined in the scoping guidelines (DFO May 2004) the adverse effects of the environment on the proposed project, and activities forming each part of the proposed project must be assessed. The full range of climate conditions, including extreme/severe weather events, wet, dry and normal precipitation, ice damage, flooding and extreme temperature spells, must be considered. The following environmental conditions are discussed below:

- Winter Temperatures and Climate
  - Effect of Winter Climate on Access Road Conditions
  - Effect of Winter Climate on Water Management
  - Effect of Winter Climate on Earth Moving
- Ice Conditions
- Excessive Precipitation
  - Flooding
  - Potential for General Site Flooding During Construction
  - Potential for Flooding of Isolation Dam
- Erosion
- Dry Conditions
- Climate Change
- Fire

7.8.1 Winter Temperatures and Snow Conditions

Freezing conditions in the Timmins area typically begin in October, lasting until April. Daily average temperatures in winter range from -13^0C to -18^0C, with extremes in the range of 14^0C to -46^0C reported over the past 30 years. Extreme cold temperatures have an effect on the productivity of equipment. Trucks (light vehicle and mine haulage), service equipment and heavy production equipment such as excavators and dozers are hampered by cold temperature. There is typically some loss in productivity during these deep freeze time periods, but weather is

not likely so extreme as to shut down operations. Given the wet conditions in the area of certain proposed (e.g., new lake basin and creek realignment) works and activities, work is actually scheduled for the coldest period of the year to facilitate construction through use of frozen ground conditions.

7.8.1.1 Adverse Effect of Winter Climate on Access and Site Road Conditions

The area of pit operations and the associated works and activities is located directly adjacent to Highway 101. The open pit will be accessed via a permanent access road; whereas, the works and activities will be accessed via temporary access roads from Highway 101 using existing access points at the boat launch and the Hoyle Pit. These entrance points will also allow employees access to the work sites.

Temporary construction access roads will involve the use of both multi-season road constructed of rock and winter roads, applying the approach of freezing existing soil. Once established these roads will be maintained by snow removal and material placement to account for freeze thaw cycles.

The Ministry of Transportation maintains Highway 101 during the winter with the aid of area contractors. Contractors are quite responsive to changing weather conditions and maintain access along the Highway corridor during all but extreme conditions. The PJV typically hires local contractors to maintain site access to the mine properties and this effort would be extended to the major temporary access roads. Winter conditions such as snow and ice are not a concern for impeding access to the properties. Snow removal teams are made available 24 hours a day for ploughing and sanding roadways to maintain access to the properties as the need arises.

7.8.1.2 Adverse Effect of Winter Climate on Water Management

During the winter months, all precipitation will be in the form of snowfall. Snow accumulated in stockpiles will be stored until they melt in the spring. Stockpiles are generally placed in areas where subsequent melt water runs into site catchments within the limits of construction such that it can be handled accordingly prior to release to surface waters.

The open pit and underground mine workings will be dewatered to sufficient depth during the fall months in order to allow for storage of infiltration water during the winter and spring months. This will reduce any requirements for water handling operations during freezing conditions. The PJV has used information from the hydrology report (AMEC 2003h) to determine storage requirements for water management.

It is expected that during construction, excavation areas may initially require dewatering during the winter months as the top layers of wet organic soil are removed. The intermittent dewatering during this period may represent a temporary challenge in discharge lines freezing and disrupting the dewatering. Water discharged to the environment at that time can be controlled with snow berms or overland filtration with sufficient separation from surface water receivers.

With sufficiently cold temperatures used strategically to freeze any ground water seepage from the remaining earth works, the issue will be handled as a component of snow removal.

7.8.1.3 Adverse Effects of Winter Climate on Earth Moving

As indicated previously, the majority of the construction of the works and activities will be undertaken in the winter to capitalize on frozen ground conditions. In the lake replacement basin, earth will be removed daily with strategic access roads exposed and permitted to freeze overnight such that excavation can be initiated from frozen access each day. As a contingency, rock roads may be required to address soft soil conditions. Rock roads used for temporary access within the lake replacement basin will be left in place as fish habitat features.

Snowfall will serve as both an advantage and an impediment to the earth moving. Snow will be maintained in certain areas not required for immediate grading such that frost penetration will be minimized and soils can be easily worked. In areas where grading is required, the snow will be removed shortly before the work activities such that soft soils can be accessed. The snow removal will largely be undertaken by dozers that will simply push the snow aside into designated stockpile areas within the excavation limits.

7.8.1.4 Ice Conditions

The lake replacement and creek realignment have been designed to largely emulate the existing natural condition within the water bodies. Given the position in the upper watershed and flat gradient of the creek system, typical ice melts are slow without major breakup and ice movement. Should some minor ice movement and jamming occur in the Three Nations Creek realignment channel then the extensive floodplain and lowland overbank area are able to easily accommodate and attenuate associated flooding. As evidenced by hydraulic modeling, the capacity of the design and construction area can accommodate conditions represented by the Timmins Storm.

At the isolation dam location, the shoreline margin along the lake has been designed of rockfill with a bioengineered rock face treatment (further detail is provided in Section 7.1.2). Rockfill will mitigate shoreline erosion or failure. The bioengineered rock face treatment is designed to accommodate damage through regrowth, a typical process along a natural lake shoreline.

7.8.1.5 RAs Conclusions

The RAs have provided preliminary conclusions that PJV have used proper engineering designs and have the proper contingencies in place to handle the effect of winter climate conditions on the project. Winter conditions will be taken into account in the operating and construction practices to ensure the safety of the workers and environment.

7.8.2 Excessive Precipitation

Excessive precipitation could influence the pit operations and short-term construction operations due to flooding as described below. Typically, construction would be suspended such that effective water management could be undertaken, although operations would likely continue.

The pit expansion operation will always maintain a minimum storage capacity in the mine workings below the open pit invert elevation to allow for the storage of runoff from a high precipitation event. This will ensure that pit operations remain uninterrupted. Properly sized pumps will be available to dewater the operations to the authorized water settling basin, and standby pumps will be on reserve for contingency purposes.

The waste rock disposal areas will be surrounded by diversion ditches to collect runoff water and direct the minewater management system. This includes settling basins and treatment in the No. 3 Tailings Management area to promote settling of suspended solids before final release to the environment.

7.8.2.1 Flooding

As detailed in the previous section, the open pit operations will ensure adequate storage for excess water below the operating level of the pit operations. In the case of excessive flooding, operations will cease until dewatering pumps can move the water to the authorized mine water management system.

With the exception of the dam and shoreline removal all other works are designed to accommodate the natural hydrology of the area. A full range of storm events have been modeled to confirm that the designs will function consistently. Certain failures related to the habitat replacement component of the works and activities that facilitate the pit expansion mining, are anticipated for large events such as the Timmins Storm. These are to be expected but are considered to be a feature of any naturally functioning system which was an objective of the naturalization design.

7.8.2.2 Potential for General Site Flooding During Construction

With most of the work being undertaken in the winter for the habitat design features, flooding is expected to be minimal. In the event of thaws, however, some melt waters can be expected to flood areas of grading. As required, runoff collection sumps would be constructed and temporary pump-outs to controlled areas would be required. Some delays to grading activities could be expected. These responses and delays are considered a typical component of grading activities and do not represent a unique condition relative to this site or work activities. Effective Erosion and Sedimentation Control planning will provide for treatment of the dewatering discharges to avoid adverse environmental effects to local surface waters. Such measures will be outlined as a component of the detailed design approval process.

7.8.2.3 Potential for Flooding of Isolation Dam

The isolation dam/lake infill design is consistent with the naturalized design for the lake replacement and creek realignment and will accommodate water levels in Three Nations Lake that would be anticipated from the Timmins Storm event. The Lake will be contained to the south of the dam, with the pit located 150 m to the north. The property between the open pit and the dam will be infilled with waste rock, which will provide extra stability to the dam and prevent any catastrophic failure and subsequent flooding of the open pit operations. Subsequent hydrologic modeling of the lake replacement and creek realignment have confirmed that the water level increase between frequent and extreme events is actually minimal, and a freeboard of 1.5 m was considered suitable. Consequently, potential for overtopping under the identified design is very low.

7.8.2.4 Erosion

There is no concern for erosion for the open pit and waste rock pile operations. The solid nature of the pit walls and waste rock slopes will prevent erosion. Any small particles mobilized through excess precipitation will have a chance to settle out in the mine water settling pond system.

The lake replacement and creek realignment have been designed to restore a naturally functioning system. Stabilization through establishment of vegetation will be applied to promote this naturalization. Due to wildlife activities (e.g., beavers) and hydrologic conditions of the area, some localized erosion and bank failure can be anticipated. The adaptable natural design, with extensive floodplain, will accommodate any adjustments of channel or basin as a result of erosion, therefore, the system is fully capable of evolving to handle acute or prolonged natural events.

7.8.2.5 RAs Conclusions

The RAs have concluded that PJV has taken proper measures into the engineering design for the pit operations and facilitative works and activities to ensure their long-term durability and stability against certain storm design events. The existing and planned stormwater management features will be adequate to handle all precipitation on site.

7.8.3 Dry Conditions

Dusting in the pit during the summer and fall months will be managed with the use of water trucks, which will spray over the dry road and ramp surfaces. If necessary, excess water will be made available from the authorized mine water management system to handle dry conditions.

Periodically dry conditions can be expected to persist as has been evident in the intermittent flow conditions observed in the existing Three Nations Creek. Such low or non-discernable flows will influence water levels in the lake and new channel realignment. Although water levels may be reduced due to lower inflows, this would not necessarily be any different than the extended periods (4 to 6 months) for existing conditions and the natural system will adapt

accordingly. In the design, the grade controls strategically placed at the lake outlet and along the channel will assist in maintaining a minimum water level in the lake and creek reaches.

7.8.3.1 RAs Conclusions

The RAs concluded that the PJV has properly designed the new Three Nations Lake and Creek system to handle dry conditions to ensure no significant effect on the environment, including fish species and fish habitat.

7.8.4 Climate Change

As indicated for the potential design consideration for the response of restoration features to extreme events, naturalization objectives were applied. Essentially, the system should respond in a manner consistent to the existing lake and channel. With minor climate changes anticipated to the nature of extreme event duration and frequency, adjustments to the natural systems can be expected. The designed plasticity/adaptability of the habitat features will accommodate such changes accordingly.

7.8.4.1 RAs Conclusions

The RAs concluded that the project is not sensitive to changes or variations in climate parameters. There are no VECs affected by the project that might be affected by climate change.

7.8.5 Fire

The forest fire season in Timmins spans from spring to fall, approximately May to September. The mine site is surrounded by several tailings facilities with minor vegetation. Due to historic mining in the area for over 70+ years, there is little forest in close proximity to the property. Since the works and activities are of short duration, construction activities within the vegetation south of the mine site would be evacuated in the event of fire. As a result, the threat of forest fire is considered minimal during operations.

With natural design principles applied, forest fire damage to the shoreline treatments is expected to be temporary, as re-vegetation will re-establish the shoreline community. Since the built features are largely associated with the waterbodies they are not necessarily susceptible to fire damage.

7.8.5.1 RAs Conclusions

The RAs concluded that, due to the nature of the surroundings to the pit operations and construction activities and access to fire fighting facilities and escape routes, fire will not cause any adverse environmental effects on the project or activities.

7.9 Accidents and Malfunctions

PJV reviewed a number of scenarios with respect to frequency and consequence to determine which to include in our analysis. For operations and construction projects there are a number of accidents, malfunctions, and unplanned events that occur on a daily basis, which are built into the schedule or engineering design to ensure the ongoing safety of the workforce and environment. Operation issues such as equipment breakdown were disregarded as they have no effect on the environment and it is planned for with our preventative maintenance schedule.

Issues with higher frequency or potential environmental effect were reviewed in further detail and are dealt with through engineering design and our Emergency Response and Environmental Management Plans.

An evaluation of the following scenarios was completed:

- Fuel and/or other hazardous materials spill (on land and in water);
- Isolation Dam Failure;
- Infill /seepage barrier failure with resultant leakage;
- Flooding of work area;
- Erosion and sedimentation control measure failure; and,
- Failure of shoreline vegetation restoration.

7.9.1 Fuel and/or other hazardous materials spill (on land and in water)

With the number of vehicles and equipment being used in construction and during operations there is a chance that fuel or other hazardous materials may spill to the environment.

7.9.1.1 Adverse Environmental Effects

Due to the nature of the materials being used on site (typically fuel or oil), the potential volume of release (typically < 500 litres) and the containment measures in place, the environmental effect of these materials would be minimal, of short duration, and very localized in extent. The PJV currently uses their Environmental Management Plan and Spill Response Plan to identify risks quickly, which limits the frequency of occurrence, and implement contingency measures accordingly. Proper spill kits are placed strategically on the mine site and will be used on all construction sites to capture any spilled material quickly to reduce any effect on the environment.

7.9.1.2 Comments and Concerns

No comments or concerns were expressed with respect to spills, beyond general considerations for provincial compliance for the prevention, reporting and response to spills.

7.9.1.3 RAs Conclusions

The RAs conclude that using the existing PJV Environmental Management and Spill Response Plan are adequate measures to reduce the risk of environmental effect from spills of hazardous materials. Special care must be taken around construction sites on or in waterways.

7.9.2 Isolation Dam Failure

The isolation dam/lake infill will hold back the waters from Three Nations Lake from infiltrating into the open pit operations. Potential failures could be as a result of overtopping of the dam during a large storm event or the dam becoming compromised due to geotechnical instability.

7.9.2.1 Adverse Environmental Effects

Failure of the dam and infill would result in the slow dewatering of Three Nations Lake, through the infill as seepage and then directly into the open pit operations. This is an added contingency benefit of the rock infill, as it avoids the potential for catastrophic dam failure. With the slow seepage through the infill material, the ability to respond prior to any significant adverse environmental effects occurring to the Three Nations Lake water level or the associated shoreline habitats is high. Accordingly this potential effect is considered highly unlikely, would be of low magnitude should it occur, and would be readily reversible.

7.9.2.2 Comments and Concerns

Environment Canada raised some concern with respect to the hydrology review of the Isolation Dam. They proposed that the design storm criteria used should be increased above the Timmins Storm flood. Hydrologic modelling demonstrates that there is no significant concern with respect to over topping the dam. PJV determined that during the detailed design a minimum freeboard from the crest of the lake infill of 1.5 m above the Timmins storm lake level elevation will be maintained.

7.9.2.3 RAs Conclusions

The RAs agree that this design approach will be adequate to ensure that the risk of any Isolation Dam failure is minimized. The RAs also agree that PJV's monitoring program of the isolation dam will aid in determining early on any potential failure modes and allow for proper mitigation.

7.9.3 Infill/Seepage Barrier Failure with Resultant Leakage

The isolation dam represents a low permeability seepage barrier installed within the infill material. This will serve to retain the surface waters of Three Nations Lake such that they do not infiltrate through the dam and into the pit operations.

7.9.3.1 Adverse Environmental Effects

Seepage through to the open pit could result in the long-term drawdown of Three Nations Lake and subsequent effect on fish habitat. However, it is recognized that the process of any seepage barrier leakage would be at a rather low rate, and that such leakage would also need to pass through the extensive area of rock fill. Again this would impede progress such that any leakage is not considered to represent an abrupt potential lake level drop with associated impacts to fish habitat. Given that maintaining pit slope stability, and a dry work environment for the safety of PJV mine employees is an important objective of PJV, a contingency response to monitor and address the leakage would be a component of day to day operations.

7.9.3.2 Comments and Concerns

NRCan raised various concerns with respect to the various pathways for seepage that could act to dewater Three Nations Lake. There is significant historical proof and geotechnical testing that shows that the lake is well isolated from bedrock and the open pit by a thick continuous confining layer of clay that is 10 m in thickness. Over 70 years of mining next to this watershed has shown little or no effect on the water levels of the receiving waters, which continue to maintain consistent habitat characteristics, and no major grouting or seepage mitigation has been required due to groundwater inflows to the pit. The resulting infill area will also add a distance of about 200 m between the lake and the proposed pit.

Potential groundwater losses associated with the pit development were conservatively estimated by NRCan (2005c) and PJV (2005 b, 2005c) through application of available water balance data. Based on this assessment, it was concluded that there may be a range of minor to high potential surface water losses from Three Nations Lake overall, irrespective of the minor seepage losses that could be expected at the dam.

7.9.3.3 RAs Conclusions

The RAs conclude that with a continuous monitoring program to determine seepage inputs to the open pit through the infill/seepage barrier pathway, and with subsequent mitigative grouting as required, infiltration along this pathway will not cause a significant environmental effect. This seepage pathway relative to the estimated overall surface water losses associated with aquifer drawdown (NRCan 2005c; PJV 2005b; 2005c), would be negligible.

7.9.4 Flooding of Earth Moving Areas

During construction of the various activities and pit operations, there may be occasion where excessive precipitation or snow melt may cause the flooding of work areas.

7.9.4.1 Adverse Environmental Effects

This scenario will unlikely have any significant environmental effect as appropriate erosion and sedimentation control planning, in association with standard construction dewatering mitigation

techniques, as approved during the permitting process, will be sufficient to address such events. Accordingly this potential effect is considered unlikely, would be of low magnitude, limited in extent and duration should it occur, and would be readily reversible.

7.9.4.2 Comments and Concerns

Excess water will be pumped out of the work areas to either the minewater management system or to appropriate sedimentation control features on construction sites. A Sediment and Erosion Management Plan has been prepared for use on PJV construction sites around water bodies, and is a component of the permitting and approvals process submissions.

7.9.4.3 RAs Conclusions

The RAs conclude that there are no significant adverse environmental effects with respect to the flooding of work areas. The PJV Sediment and Erosion Management Plan should be used to handle the discharge of water from the work area back to the environment. The existing Certificate of Approval through the Ministry of Environment covers the handling of operations storm water management.

7.9.5 Erosion and Sedimentation Control Measure Failure

During construction activities, several erosion and sedimentation control features will be utilized when dewatering certain project areas. There is potential for these measures to be overwhelmed with sediment if they are not properly maintained.

7.9.5.1 Adverse Environmental Effects

The potential environmental effect is the temporary release of suspended solids to the environment. This release would only affect a very small area around the construction activity. Effective inspection monitoring will assist in prompt identification and response development to address such malfunctions. The establishment of an environmental inspection monitoring program will be a component of the approvals process. Accordingly potential adverse environmental effects are considered of low magnitude, limited in extent and duration should they occur, and would be readily reversible.

7.9.5.2 Comments and Concerns

Excess water will be pumped out of the work areas to sedimentation basins on construction sites. A Sediment and Erosion Management Plan has been prepared for use on PJV construction sites around water bodies.

7.9.5.3 RAs Conclusions

The RAs conclude that the risk of failure of erosion and sedimentation control measures is low and subsequent potential environmental effect is not significant. Proper inspection of control

measures will be required to ensure that any build-up of sediment in the features is properly disposed of.

7.9.6 Failure of Shoreline Vegetation Restoration

With the development of the new Three Nations Lake basin and Three Nations Creek alignment there is the potential for erosion of the newly formed shorelines. Revegetation and erosion control is planned for the new shorelines and creek tributary.

7.9.6.1 Adverse Environmental Effects

The potential adverse environmental effects include the erosion of shoreline and subsequent deposition of suspended solids into the waterways and fish habitat, and the delayed progress of riparian habitat functional attributes. Accordingly potential adverse environmental effects are considered of low magnitude, limited in extent and duration should they occur, and would be readily reversible.

7.9.6.2 Comments and Concerns

Environment Canada requested information on hydrology and flow in the new lake and creek systems to determine any potential environmental effect on shoreline stability due to different water levels and flows. The isolation dam is designed to generate a naturalized shoreline feature along the northern margin of the lake basin that will develop through the construction and operation phases, and persist as natural habitat upon abandonment. Due to the nature of the system the channel is designed to overflow under heavy rain conditions and flow over into the floodplain, where water is held until it can be naturally released downstream. This flow attenuation capacity will assist in promoting the successful establishment of vegetated shorelines, and avoids losses due to erosion.

7.9.6.3 RAs Conclusions

The RAs conclude that failure of shoreline vegetation restoration is unlikely. In the short-term development of the habitat features as designed, failures in vegetation development will be monitored and a response action plan developed in the vent that the failure results in structural feature compromise or precludes appropriate development of predicted habitat functions. With proper monitoring and action response planning, it is concluded that significant adverse environmental effects can be avoided.

7.10 Sustainable Use of Renewable Resources

Sustainable development is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. Some level of development is needed to create opportunities, wealth, and choices for Canadians. Development must proceed in a way that leaves choices available for future generations.

Mining comprises an integral part of the northern Ontario economy, the Timmins mining camp and the City of Timmins was founded and is largely supported by the base metal mining industry. As ore bodies are mined out, there is a need to locate and develop new ore bodies to maintain the existing economy. In addition, mining generates a considerable proportion of spin-off employment for support supply and services, as well as other related employment. The Project has brought new hope for the continuing strength and vibrancy of the mining community.

Through additional exploration activities in the form of a condemnation drilling program, PJV reviewed the areas proposed for project activities. This effort was undertaken to confirm that future reserves would not require the reinvestment in disturbance and associated mitigation of the constructed facilities, or to render future ore reserves as inaccessible.

The Project works and activities are principally located in areas that are already relatively disturbed by past mining activity and infrastructure. Consequently, works-related disturbance to the low land areas as proposed will represent removal of land that represents a low potential for forestry practice. The works will largely avoid disturbance to areas of Mature/Semi-mature forest. Any clearing requirements will be arranged such that merchantable timber will be harvested. Therefore, the Project will develop resources that contribute to the social and economic well-being of communities in a sustainable manner. It is of note that all works and activities will be carried out in accordance with the PJV Sustainability Policy (2003g).

7.10.1 Comments/Concerns

No issues were raised with respect to the sustainable use of renewable resources.

7.10.2 RAs Conclusion

The RAs believe that the capacity of renewable resources would not be significantly affected by the Project. The RAs believe that the responsibility for developing resources in a sustainable manner is a shared responsibility between governments, organizations and industry.

TABLE OF CONTENTS

Page

LIST OF TABLES

8.0 MONITORING AND FOLLOW-UP PROGRAMS

Monitoring and follow-up programs are an essential aspect of an environmental assessment. Such programs allow decision-makers to gain an understanding of PJV's knowledge and comprehension of the concepts and requirements of both of these types of monitoring, and the commitment to the satisfactory completion of such programs based on the conclusions of the EA review process and the subsequent permitting stage of the Project.

Monitoring, or environmental compliance monitoring, refers to monitoring Project activities to ensure compliance with all regulatory and self-imposed environmental requirements. Typically, environmental performance requirements are established under conditions and clauses of all permits, approvals and authorizations and specify key components of the environment (e.g., water quality) and environmental parameters (e.g., total suspended solids) that must be sampled at specified times/frequencies and monitored at specified locations. This information provides direct feedback into the environmental performance of specific mitigation measures (e.g., sedimentation ponds for dewatering work areas etc.) and corrective measures can be taken, as required, to achieve compliance. As an operator in the area and as a result of the EA process, PJV has a high level of understanding about its Project, the local environment and issues, as well as experience in the environmental compliance monitoring of similar projects and activities at the Pamour and other PJV mines.

Follow-up programs, or environmental effects monitoring and monitoring of project related predictions, refer to programs for (a) verifying the accuracy of the environmental effects assessment of a project and (b) determining the effectiveness of any measures taken to mitigate the predicted adverse environmental effects of the project. Based on the findings of the CSR and the EA review process and in conjunction with provincial and federal regulated programs the RAs deemed various follow-up programs to be appropriate for this project. As such, PJV will institute a follow-up program for this Project, in cooperation with RAs and interested parties. To provide a diligent approach to environmental protection, PJV has also committed to apply its Environmental Management Plan (EMP) (PJV 2003f) for all aspects of the Project, throughout the life of the Project. Implementation of the EMP during operations will be the responsibility of the PJV Environmental Superintendent who will report to the Placer Dome (CLA) Ltd. (majority PJV shareholder) Vice President Sustainability and the PJV Manager of Technical Services.

As previously mentioned, it is recognized that PJV has an extensive knowledge about its properties, its environmental performance from other activities in the area, this Project, and the anticipated environmental effects of the Project. Based on standard application of monitoring and surveillance under their existing EMP, PJV will effectively apply monitoring, issue identification and response planning to their monitoring programs as deemed appropriate by the RAs.

Given the nature of the Project through careful and proactive planning, the predominant follow-up monitoring focus relates to protection of the VECs represented by Three Nations Lake and Three Nations Creek. These VECs receive the most direct and long-term influence of the pit

expansion. Not only will the follow-up programs be directed at confirming the success of the extensive aquatic habitat replacement as mitigation for reducing adverse environmental effects to these water bodies, but also aspects of hydrology, and water quality will be reviewed with similar objectives. PJV will work closely with Fisheries and Oceans Canada and various FAs where required, to achieve effective follow-up programs under condition of the *Fisheries Act* Authorization for the HADDs that are represented by various project elements and commitments as established through the mitigation strategy development as outlined in this EA process. The aim is to demonstrate the satisfactory fish habitat replacement compensation over the life of the Project, with both short and long-term protection of the environment in the Three Nations Lake and Creek watershed.

8.1 Follow-up/Monitoring Program Objectives

The purposes of the follow-up/monitoring programs for the Project are to:

- Continue collection of baseline environmental data to assess environmental effects of day-to-day activities during Construction, Operation, and at Abandonment;
- Detect unanticipated environmental effects (if any);
- Assess effectiveness of proposed mitigative measures and the need for modification to these measures or the requirement for additional measures (particularly in regards to VECs);
- Ensure compliance with applicable regulations and requirements of environmental permits; and,
- Support PJV's objective of continual improvement.

With respect to the Pit Expansion mining related activities, the monitoring and follow-up programs refer to the Construction, Operation, and Abandonment Project phases (immediate temporal boundary). In monitoring the Pit Expansion facilitation works and activities, only the Construction and Operating phases apply. As previously indicated, the Pit Expansion facilitation works and activities have been designed to maintain natural ecosystem form and function into the long-term. With the exception of the period of constructed feature stabilization, roughly over the first five years following construction, it is considered that the features are “walk away” designs and will not require any abandonment activity or associated monitoring.

Proposed follow-up programs and monitoring activities for the Project are grouped generally according to the following (VECs):

- Three Nations Lake;
- Three Nations Creek;
- Groundwater;
- Mature/Semi-Mature Mixed and Coniferous Forest;

- Angling Access Opportunities; and,
- Trapping Access Opportunities.

The monitoring and follow-up programs described herein are designed to verify the accuracy of the environmental assessment of the Project, and to determine the effectiveness of the proposed mitigation measures. An attempt has been made to assess potential compliance-related monitoring at a conceptual level. The program defined herein should not, however, be considered the final monitoring program, as the program will be modified to include any monitoring required according to issued permits and approvals.

In all cases, the results of the monitoring and follow-up programs will not be kept in isolation, but will be summarized on at least an annual basis, and will be used to modify existing procedures/ designs/mitigation measures as appropriate to minimize environmental impacts. Reporting will meet all regulatory requirements as a minimum.

The monitoring/follow-up programs will be implemented by site personnel, and will be supported by internal and external laboratories and specialist consultants as appropriate.

8.2 Three Nations Lake

8.2.1 General Site Drainage and Surface Waters

The Pit Expansion will apply a water management system that is self-contained and controlled through a continuation of new ditches and mine water settling pond. Final mine water discharge will be controlled through existing permitted treatment systems. Both Federal (MMER) and Provincial (MISA) compliance monitoring will apply. Surface drainage from the site will be directed away from Three Nations Lake and Creek watershed.

With respect to the Pit Expansion facilitation works, with the exception of the lake rockfill works isolation dam, seepage barrier, and the removal of the earth plug to complete the connecting channel between the existing and constructed Three Nations Lake basin, the works have been designed to be constructed in the dry during winter months. Since this is normally a wet location in the summer, the Three Nations Lake replacement may require dewatering at times to permit work activities to continue. This aspect of water management will involve dewatering sumps directed to controlled treatment locations consisting of sediment traps, filter bags or overland vegetation filtration techniques. These discharge locations will be positioned a minimum of 50 m from any watercourse and will be varied continually as excavation proceeds. Any required Permits to Take Water would be acquired before the start of any dewatering.

The shoreline works in Three Nations Lake will rely heavily on isolating the work area from the surface waters with turbidity curtains. Any stormwater runoff during the period of construction will likewise be contained within the isolated area. Long-term drainage and runoff will be accommodated by the stabilizing vegetation treatments (or recolonization) at these locations.

Proposed monitoring program:

- Visual inspection of dewatering discharge locations, erosion/sedimentation control measures and the ultimate receiving waters; and,

- Visual inspection of turbidity curtain perimeters to confirm integrity and function.

General inspections will be completed on a minimum weekly basis during the construction period, and monthly after completion of work until winter conditions prevent access. Data will be reported in an environmental inspection diary maintained on site, with an annual summary report maintained at PJV.

One of the main issues during any construction program is the management of sediment/ erosion and drainage. Construction activities will allow solids to be entrained in any water available and causes dust to be created at dry sites. The primary measures to reduce suspended solids and erosion will be constructing drainage works with sediment control measures (e.g., silt fence, turbidity curtains) as outlined in AMEC 2004a. The drainage network will be inspected weekly to ensure effective entrainment of suspended solids, and on an as needed basis during and immediately after storm events. During critical in-water work activities, inspection will be daily. Corrective measures such as replacement of silt curtains or hay bales that are plugged with sediment or excavation of containment areas filled with solids will be implemented as required.

Water quality sampling will occur in compliance with all applicable federal and provincial regulations. In addition to any such requirements, samples will be collected on a monthly basis at the receiving waters near the construction sites, for any water reporting back to the environment, and compared to applicable federal and provincial water quality objectives. Samples at a minimum collected for suspended solids, will be expected to meet a general daily discharge criteria of 30 mg/L total suspended solids. Water quality data will be stored in PJV's Eqwin database.

The RAs conclude that the follow-up program and associated monitoring will suitably address general site drainage and surface water quality related to Three Nations Lake.

8.2.2 Stability and Integrity

Hydrology

The habitat generation in Three Nations Lake has been designed on the basis of a lake outlet grade control elevation of 285.6 m, but recognizing that water levels are anticipated to fluctuate due to natural climatic conditions. To confirm the lake level function as per the design, a continuous lake level data logger will be installed. This device will also confirm the lake response to frequent return periods and possibly extreme events, therefore permitting confirmation of hydrologic response relative to the designed freeboard of the isolation dam/lake infill.

Drainage and Erosion

Stability and integrity from an erosion perspective will be monitored as per Section 8.2.1. It is likely that suspended solids noted in the drainage-monitoring program will reflect a loss of stability or integrity in the built features and, accordingly, this will be traced and rectified.

Lake Shoreline Stabilization Treatments

Natural revegetation and rock scour protection placement along the shorelines of the Three Nations Lake replacement basin is an important component of the lake margin stabilization.

Both the vegetation and rock treatments will be visually inspected each spring for a period of three years and a summary report will be prepared annually, including any recommendations for corrective actions that may be required. In the event that further corrective actions are required after year three, the monitoring program will be extended for an additional two years.

Rock Infill and Associated Lake Margin Revegetation

The Three Nations Lake rockfill margin includes extensive bioengineering treatment to generate a naturalized woody shrub shoreline. This shoreline vegetation will be visually inspected each spring and fall over the first three years following construction to confirm vegetation development. A summary report of stability will be prepared annually, including any recommendations for corrective actions that may be required.

Isolation and Fill Area Dam Seepage Barrier

The dam will be inspected and monitored during construction and operation to assess its performance and safety, and to verify that actual conditions are consistent with the design assumptions and intentions. Inspection and monitoring will also optimize maintenance costs, provide warning of potential impending risks, and provide sufficient time to implement remedial measures, if required.

The dam construction will be supervised by a qualified geotechnical engineer to ensure that the design is appropriately implemented, and design adjustments to suit site conditions variations are made, if required. The frequency of the monitoring program during construction will be established based on the construction requirements and schedule.

The dam will be checked regularly, supervised by the site personnel during operations, and periodically inspected and monitored by a qualified geotechnical engineer who specializes in the design and performance of dams. The frequency of inspections will depend on the performance of the dam structure, and consistent with PJV and relevant Provincial/Federal standards.

Monitoring of the dam structure would include a few or all of the following:

- Pneumatic piezometers installed at selected strategic locations within the dam foundations to monitor pore pressures during and after the construction;
- Inclinometers installed at selected strategic locations through the dam and dam foundations to monitor deformations during and after construction;
- Settlement plates installed at selected strategic locations within the dam to monitor the settlement of the dam foundation during and after construction;
- Surveying the dam crest, downstream slope, and toe to measure the extent of any dam movements that may occur; and,
- Monitoring wells installed downstream of the dams to measure the groundwater levels and monitor the groundwater chemistry.

An experienced engineer will inspect the dam structure semi-annually, and more frequently during the significant stages of the dam construction, or if otherwise deemed appropriate. The inspection will include an examination of the dam, and review of the instrumentation data. Data will be reported in an annual summary report available at site.

The RAs conclude that the follow-up program and associated monitoring will suitably address the stability and integrity of Project components related to Three Nations Lake.

8.2.3 Fisheries and Aquatic Resources

The fisheries and aquatic resources monitoring programs will be developed based on DFO discussions regarding the development of conditions for the *Fisheries Act* authorization. A preliminary plan is outlined below, which will be developed further based on the anticipated requirements for compensation.

The objectives of the aquatic resources monitoring programs are to:

- Determine/confirm the impacts to aquatic life, and assess whether additional mitigative measures are necessary. This will involve an adaptive management strategy approach, where both monitoring and response would adapt accordingly both to beneficial and potentially deficient system reaction;
- Assess the success of aquatic compensation measures (and determine if additional measures are necessary). This will involve an adaptive management strategy approach, where both monitoring and response would adapt accordingly both to beneficial and potentially deficient system reaction; and,

- Provide additional data as required, to support the implementation of fish habitat compensation measures.

- Monitor lake levels and creek flows in associations with the groundwater monitoring program in order to calibrate a water balance model for definition of potential flow deficiencies resulting from pit expansion.

Proposed monitoring program:

- Periodically assess the shoreline habitats of the existing lake and lake replacement to confirm the system is responding in a positive manner to result in habitat enhancement;

- Periodically assess baseline metal levels (mercury, lead and arsenic) in edible fish;

- Periodically assess the success of compensatory aquatic systems within the Three Nations Lake replacement basin. This aspect of the monitoring program will be developed with DFO as part of the detailed aquatic habitat compensation package. Monitoring will include aspects related to: water quality including winter profiling, benthos and fisheries communities, critical fish habitat use, vegetation communities and habitat structure; and,

- Undertake continuous lake level and stream flow monitoring and establish a water balance model.

All aquatic studies will be documented for view on site and submitted to regulators as required.

The RAs conclude that the follow-up program and associated monitoring will suitably address the fisheries and aquatic resource aspects of related to Three Nations Lake.

8.3 Three Nations Creek

8.3.1 General Site Drainage and Surface Waters

As discussed above, the works have been designed to be constructed in the dry during winter months. Since this is normally a wet location during the summer months, the channel realignment may require dewatering at times to permit work activities to continue. This aspect of water management will involve dewatering sumps directed to controlled treatment locations consisting of sediment traps, filter bags or overland vegetation filtration techniques. These discharge locations will be positioned a minimum of 50 m from any watercourse and will be varied continually as excavation proceeds. Required permits will be acquired before the start of construction.

Proposed monitoring program:

- Inspections will be completed on a minimum weekly basis during the construction period and monthly after completion of work until winter conditions prevent access. Critical inwater work activities will be monitored daily. Data will be reported in an environmental inspection diary maintained on site, with an annual summary report maintained at PJV;

- Water Quality sampling will occur on a monthly basis at the receiving waters near the construction sites for any water reporting back to the environment. Samples will be expected to meet Provincial and Federal daily discharge criteria for a single grab of 30 mg/L Total suspended solids. Water quality data will be stored in the PJV database; and,

- Water Quality sampling at strategic locations in the new and old Three Nations Creek system to determine any effects. This information will be compiled in an annual summary report maintained at PJV.

The RAs conclude that the follow-up program and associated monitoring will suitably address general site drainage and surface water quality related to Three Nations Creek.

8.3.2 Stability and Integrity

Hydrology

Consistent with the continuous water level monitoring of Three Nations Lake, water level monitors will be installed in the existing and new Three Nations Creek channels. In association with flow monitoring, these stations will be calibrated such that the flow response in both systems can be monitored and reported.

Drainage and Erosion

As discussed in section 8.5.1 one of the main issues during any construction program is the management of sediment/erosion and drainage. The primary measures to reduce suspended solids and erosion will be constructing drainage works with sediment control measures, as outlined AMEC 2004a. The drainage network will be inspected weekly to ensure effective entrainment of suspended solids, and on an as needed basis during and immediately after storm events. Corrective measures such as replacement of silt curtains or hay bales that are plugged with sediment or excavation of containment areas filled with solids will be implemented as required.

Channel Stabilization Treatments

Natural channel design principles have been applied to the design of the Three Nations Creek Realignment with vegetation establishment being an important component of design stability.

High water velocities are expected at each of the grade control structures. The grade controls have been designed of infilled riprap and are dimensioned accordingly to avoid erosion. The riprap will be extended up the excavated slope to 1 m above the normal water level. Above the riprap geojute will be placed over the exposed slopes and hydroseeded with an annual nurse crop such that a native community can establish the long-term soil stabilization.

The vegetation will be monitored each spring and fall over the first three years following construction to confirm vegetation development. These inspections will also include a review of any erosion along the channel. A summary report of channel stability will be prepared annually, including any recommendations for corrective actions that may be required.

The RAs conclude that the follow-up program and associated monitoring will suitably address the stability and integrity of Project components related to Three Nations Creek.

8.3.3 Fisheries and Aquatic Resources

The fisheries and aquatic resources monitoring programs will be developed based on discussions with DFO. A preliminary plan is outlined below, which will be developed further based on the anticipated requirements for compensation.

The objectives of the aquatic resources monitoring programs are to:

- Determine/confirm the impacts to aquatic life, and assess whether additional mitigative measures are necessary. This will involve an adaptive management strategy approach, where both monitoring and response would adapt accordingly both to beneficial and potentially deficient system reaction;

- Assess the success of aquatic compensation measures (and determine if additional measures are necessary). This will involve an adaptive management strategy approach, where both monitoring and response would adapt accordingly both to beneficial and potentially deficient system reaction; and,

- Provide additional data as required to support the implementation of fish habitat compensation measures, or additional remedial measures if required.

Proposed monitoring program:

- Periodically assess the character and quality of aquatic resources in Three Nations Creek as defined in the DFO *Fisheries Act* Authorization;

- Periodically assess the success of compensatory aquatic systems within the Three Nations Creek. This aspect of the monitoring program will be developed with DFO as part of the detailed aquatic habitat compensation package. Monitoring will include aspects related to: water quality, the benthos, the fisheries community, critical habitat use vegetation communities, and habitat structure; and,

- A water level and associated flow monitoring station will be installed in the realignment channel to assist in evaluating the performance of this constructed habitat. The progress of both channel naturalization, and biotic colonization of the realignment channel will also serve as indicators of successful ecosystem function.

All aquatic studies will be documented for view on site and submitted to regulators as required.

The RAs conclude that the follow-up program and associated monitoring will suitably address the fisheries and aquatic resource aspects of related to Three Nations Lake.

8.4 Groundwater

A relatively shallow watertable in the Thee Nations Lake replacement and Three Nations Creek realignment area may contribute to the dewatering activities during construction. The dewatering may result in localized drawdown of this shallow watertable.

Seepage with respect to shallow and deep groundwater zones is a potential issue for the Pit Expansion works. Identification of any seepage issues at the isolation dam will be a consideration for overall pit water management. The proposed monitoring program that specifically addresses potential seepage at the isolation dam will include the following:

- A series of pneumatic piezometers will be installed along the perimeter of the overall isolation dam work area and pressures will be regularly monitored; and,

- Seepage water contributions to the pit will be visually monitored along the southern pit face exposure.

Data will be reported in the environmental inspection diary available on site, and an annual summary will be prepared and maintained at PJV.

To monitor and confirm that the overall pit expansion itself will not have a groundwater related effect on Three Nations Lake in response to comments received from the RAs and FAs as outlined in Section 7.3, a monitoring program applying an Adaptive Management Strategy will be applied (PJV 2005c). The monitoring program will be integrated with other efforts as described for Three Nations Lake and Three Nations Creek with program components consisting of:

- Water level measurements in Three Nations Lake;

- Outflow measurements near the outlet of Three Nations Lake along Three Nations Creek;

- Visual inspections of the open pit walls for water seepage through faults and fractures;

- Measurement of groundwater levels in piezometers installed in the overburden aquifers and in the shallow bedrock to detect any reduction in water levels; and,

- Refinement of the Water Balance and Groundwater model – ongoing with monitoring data.

The groundwater level monitoring (PJV 2005c) is a key component of the monitoring plan and will include the following:

- The installation of multilevel monitoring wells along the southern margin of the proposed pit expansion for a total of 10 monitoring well locations. Each monitoring well will be constructed with monitors in a) the shallow overburden sediments above the clay aquitard, b) the silt-sand till aquifer horizon, and c) the shallow fractured bedrock;

- The installation of multilevel monitoring wells along the western shoreline of the existing TNL from the existing Three Nations Creek Outlet to the proposed Highway 101 bypass for a total of 6 new monitoring well locations;

- The installation of three multilevel monitoring wells along the proposed Highway 101 route to serve as background monitoring locations; and,

- Continuous to monthly monitoring of water levels in each of the newly constructed monitoring wells and accessible existing monitoring wells.

Should new information indicate that the original estimates of groundwater related leakage from the lake be incorrect, the data will be used to revise the mitigation strategies to store and/or supplement flow as part of the adaptive management process (PJV 2004g; 2005c). Should flow supplementation be required, as identified by the program defined above, then water quality monitoring of the source water will be undertaken to confirm that chemistry is consistent with that required to maintain the aquatic ecosystem function of the lake. Any required flow supplementation will be maintained through the mine operation, and post closure period until the groundwater regime has returned to a state of equilibrium or at a minimum, as per existing conditions.

The RAs conclude that the follow-up program and associated monitoring will suitably address the groundwater related issues associated with change in groundwater flux and potential effects on Three Nations Lake water levels.

8.5 Mature/Semi-mature Mixed and Coniferous Forest

No monitoring is required.

8.6 Angling Access Opportunities

During days when production blasting will be carried out, PJV site safety personnel will observe if anglers and boaters are abiding by the safety notification regarding separation distance from the site are being honoured. In the event that they are not, warnings will be issued such that there will be no safety concerns associated with the daily blast.

Since mercury methylation has been expressed as a concern by Health Canada, periodic sampling of the edible fish of the lake will be undertaken to confirm that flesh (typically consumed component of fish by local anglers) mercury, lead and arsenic levels are not increasing. This monitoring will be undertaken in conjunction with the other fish population monitoring programs developed for assessing the habitat performance.

The RAs conclude that the daily monitoring of project activities along the Three Nations Lake shoreline will be suitable for maintaining safe navigation associated with angling opportunities. The RAs also conclude that the monitoring of fish flesh will be suitable to establish any changes in mercury, lead or arsenic concentrations that may influence consumption associated with angling opportunities.

8.7 Trapping Access Opportunities

Monitoring will only be undertaken during construction to confirm that site contractors appropriately salvage any traps encountered such that hey can be returned to the rightful owner. Once the habitat corridor associated with the Three Nations Creek realignment is established, no additional monitoring relative to trapping activity will be undertaken.

The RAs conclude that the monitoring for trapping hardware will be suitable to identify any mitigation requirements as per consultation process.

8.8 Summary of Follow-up/Monitoring Programs for VECs

An overall general environmental monitoring program will be implemented. This program is intended to ensure that works and activities that were not considered to result in a significant effect or interaction with the local environment as per this assessment, meet their anticipated performance objective. Proposed follow-up/monitoring programs associated with the VECs are summarized in Table 8-1. Additional programs are expected to be developed during consultation with DFO as a component of the *Fisheries Act* authorization.

TABLE 8-1
SUMMARY OF FOLLOW-UP/MONITORING PROGRAMS FOR VECS

VEC	Proposed Follow-up/Monitoring Program	Responsibility
Three Nations Lake	***Site Drainage and Surface Water*** • Visual inspection of dewatering discharge locations, erosion/ sedimentation control measures and the ultimate receiving waters. • Visual inspection of turbidity curtain perimeters to confirm integrity and function and maintenance as required. • Sampling for total suspended solids at the receiving waters. ***Stability and Integrity*** • The drainage network will be inspected weekly to ensure effective entrainment of suspended solids, and on an as needed basis during and immediately after storm events. Corrective measures will be implemented as required. • The shoreline vegetation will be monitored each spring and fall over the first three years following construction to confirm vegetation development. • The dam will be checked regularly, supervised by the site personnel during day-to-day operations, and periodically inspected and monitored by an experienced geotechnical engineer who specializes in the design and performance of dams. The frequency of inspections will depend on the performance of the dam structure, and consistent with PJV and relevant Provincial/Federal standards. ***Fisheries and Aquatic Resources*** • Periodically assess the character and quality of aquatic resources in Three Nations Lake, as defined in the DFO *Fisheries Act* Authorization • Periodically assess the success of compensatory aquatic systems within the Three Nations Lake replacement basin. This aspect of the monitoring program will be developed with DFO as part of the detailed aquatic habitat compensation package. Monitoring will include aspects related to: water quality, benthos and fisheries communities, and vegetation communities and habitat structure.	PJV Environmental Superintendent (annual report will be produced and maintained at site)
Three Nations Creek	***Site Drainage and Surface Water*** • Visual inspection of dewatering discharge locations, erosion/ sedimentation control measures and the ultimate receiving waters. • Sampling for total suspended solids at the receiving waters. ***Stability and Integrity*** • Consistent with the continuous water level monitoring of Three Nations Lake, water level monitors will be installed in the existing and new Three Nations Creek channels. In association with flow monitoring, these stations will be calibrated such that the flow response in both systems can be monitored and reported. • The drainage network will be inspected weekly to ensure effective entrainment of suspended solids, and on a daily basis during and immediately after storm events. Corrective measures will be implemented as required. • The vegetation will be monitored each spring and fall over the first three years following construction to confirm vegetation development. These inspections will also include a review of any erosion along the channel. • Both the vegetation and rock treatments will be monitored each spring and a summary report will be prepared annually, including any recommendations for corrective actions that may be required. ***Fisheries and Aquatic Resources*** • Periodically assess the character and quality of aquatic resources in Three Nations Creek as defined in the DFO *Fisheries Act* Authorization. • Periodically assess the success of compensatory aquatic systems within the Three Nations Creek diversion. This aspect of the monitoring program will be developed with DFO as part of the detailed aquatic habitat compensation package. Monitoring will include aspects related to: water quality, benthos and fisheries communities and vegetation communities and habitat structure.	PJV Environmental Superintendent (annual report will be produced and maintained at site)
Mature/Semi-Mature Mixed and Coniferous Forest	• No monitoring required.	-

VEC	Proposed Follow-up/Monitoring Program	Responsibility

Groundwater	• A series of pneumatic piezometers will be installed along the perimeter of the overall work area and pressures will be regularly monitored.
	• Seepage water contributions to the pit will be visually monitored along the southern pit face exposure.
	• The monitoring program will be integrated with other efforts as described for Three Nations Lake and Three Nations Creek with program components consisting of:
	  • Water level measurements in Three Nations Lake
	  • Outflow measurements near the outlet of Three Nations Lake along Three Nations Creek
	  • Visual inspections of the open pit walls for water seepage through faults and fractures
	  • Measurement of groundwater levels in piezometers installed in the overburden aquifers and in the shallow bedrock to detect any reduction in water levels
	  • Refinement of the Water Balance and Groundwater model – ongoing with monitoring data
	Should new information indicate that the original estimates of groundwater related leakage from the lake be incorrect, the data will be used to revise the mitigation strategies to store and/or supplement flow as part of the adaptive management process (PJV 2004g; 2005c). Should flow supplementation be required, as identified by the program defined above, then water quality monitoring of the source water will be undertaken to confirm that chemistry is consistent with that required to maintain the aquatic ecosystem function of the lake.
		PJV Environmental Superintendent (annual report will be produced and maintained at site)

Angling Access Opportunities	• During days when production blasts are conducted, PJV site safety personnel will observe if anglers and boaters are abiding by the safety notification regrading separation distance form the site are being honoured. In the event that they are not, warnings will be issued such that there will be no safety concerns associated with the daily blast. • Periodic sampling of the edible fish of the lake will be undertaken to confirm that flesh (typically consumed component of fish by local anglers) mercury, lead and arsenic levels are not increasing. This monitoring will be undertaken in conjunction with the other fish population monitoring programs developed for assessing the habitat performance.	PJV Environmental Superintendent (annual report will be produced and maintained at site)
Trapping Access Opportunities	• Monitoring will only be undertaken during construction to confirm that site contractors appropriately salvage any traps encountered such that hey can be returned to the rightful owner. Once the habitat corridor associated with the Three Nations Creek realignment is established, no additional monitoring relative to trapping activity will be undertaken.	PJV Environmental Superintendent (daily inspection logs during construction)

8.9 General Monitoring (Not Related to VECs)

The following monitoring will occur with respect to the pit expansion:

- **Dust Control:** Through appropriate mitigation strategy, it is has been concluded that effects resulting from dust emissions will be appropriately addressed through mitigation (e.g. access road and pit ramp watering). To confirm that the overall Project site dust suppression measures are performing as predicted, a monitoring program will be applied. This will include both regular (weekly) visual inspections of the working areas through all phases of Project development, as well as the placement of samplers at perimeter locations around the site. Sampling will take place on a monthly basis as is

similarly completed at the existing Dome Mine operation. The monitoring stations will be placed strategically around the mine site in between the operations and nearby receptors. Baseline sampling has been ongoing over the past several years. The monitoring results will be documented for review on site and submitted to regulators as required

- **Noise/vibration:** Through appropriate mitigation that will be progressively applied through all phases of the project including scheduled periods of activity overlap, it has been demonstrated that noise levels will meet Federal and Provincial guidelines. A noise-monitoring program that establishes stations at the perimeter of the project site will be carried out during the construction and operations phase. A program that monitors vibration will be implemented to track the effects of pit blasting. Blast (vibration) monitoring stations are currently in place at the Dome mine site. Care is taken to control the blasts due to the close proximity of the mill complex on the Dome site. A similar setup will be in place to ensure there is no effect to any nearby receptors. A noise-monitoring program for site operations is currently being developed to build on the baseline information collected during the Environmental Assessment stages of the Pamour project. This program will be adapted over time to meet the requirements of the mines and potentially any outside receptors and regulators.

- **Minewater and Site Drainage:** Site drainage and minewater from the pit dewatering activities will report to the Pit Expansion Water Management System. This system, which will discharge to the existing No. 3 Tailings Management facility that is a provincially permitted facility and will fall under the requirements of the federal Metal Mining Effluent Regulations. A Site Characterization will be submitted for the site, including discharge water information. This will tie in with the existing Porcupine River Study under the Environmental Effects Monitoring program that is being undertaken for other project sites within the Porcupine Mine Camp. The minewater and overall managed site drainage discharge will also be regulated under an existing Provincial Certificate of Approval through Ministry of Environment and MISA guidelines. As noted, mine site drainage will not discharge to Three Nations Lake or Three Nations Creek and consequently, these water bodies are not subject to the MMER guidelines. This will eliminate mine site related drainage from entering the Three Nations Creek watershed.

- **Groundwater Seepage to Pit**: PJV has indicated its priority commitment to providing a safe work environment for their pit employees. As such, monitoring of fracture zones and potential seepage areas will be a continuous process as the pit is extended to ensure that effective mitigation requirements are identified and applied in a proactive manner as required. Any water infiltrating into the pit that will cause any unsafe conditions will be mitigated instantly with the help of water pressure relief techniques as required.

- **Waste Management**: Management of domestic, industrial, and hazardous waste will be an ongoing program at the Pamour project. Existing programs at the other PJV mine sites will be implemented to control the collection and disposal or recycling of garbage, paper, wood, steel, used oil and antifreeze, and other materials as per provincial

regulation. All non hazardous waste can be disposed of in the already approved Dome landfill.

The RAs conclude that the follow-up and associated monitoring relating to the general Project aspects that do not pertain to any selected VECs, as indicated, are suitable for effective environmental management of the Project.

8.10 Effects of Environment on the Project

No additional monitoring is required with regard to winter temperature and snow conditions, excessive precipitation, dry conditions, climate change, or fire. Day to day monitoring of the site for environmental and safety considerations will be undertaken as a component of the PJV EMP. This will assist in maintaining site conditions in an appropriate manner in response to dynamic environmental influences on elements of the project.

8.11 Accidents, Malfunctions and Unplanned Events

8.11.1 Fuel and/or Other Hazardous Materials Spill (on land and in water)

The RAs concludes that PJV has adequately addressed the environmental effects of a fuel and/or other hazardous material spill (on land or in water). The PJV has existing Environmental Management and Spill Response Plans in place that will be used for the Pamour mine operations that will reduce the risk of environmental effect from spills of hazardous materials. All employees have been trained in spill response and a procedure is in place to quickly identify and contain any spills. Proper spill containment kits will be located in strategic areas around the operating and construction sites.

8.11.2 Isolation Dam Failure

The RAs agree that PJV has designed the isolation dam adequately to ensure a low risk of failure due to geotechnical instability. The RAs also agree that PJV's monitoring program of the isolation dam, as identified in Section 8.2.2, which includes the use of piezometers, visual inspection monitoring and annual engineering inspections will aid in determining early on any potential failure modes and allow for proper mitigation.

8.11.3 Infill/Seepage Barrier Failure with Resultant Leakage

The RAs conclude that the PJV has adequately addressed the potential seepage through the isolation dam. PJV's monitoring program of the isolation dam, as identified in Section 8.2.2, which includes the use of piezometers, daily visual monitoring and annual engineering inspections will aid in determining early on any potential failure modes and allow for proper mitigation. A contingency plan for grouting of fractures into the pit will be in place and will be implemented if required.

8.11.4 Flooding of Work Area

The RAs conclude that the PJV has adequately addressed the environmental effects of flooding of work areas. The PJV Sediment and Erosion Management Plan will be used to handle the discharge of water from the work area back to the environment.

8.11.5 Erosion and Sedimentation Control Measure Failure

The RAs conclude that the PJV had addressed the erosion and sedimentation control measures failure. Proper inspection of control measures will be addressed during construction and operation to ensure that any build-up of sediment in the features is properly handled and disposed of.

8.11.6 Failure of Shoreline Vegetation Restoration

The RAs conclude that PJV has addressed the failure of shoreline vegetation restoration. PJV will perform annual inspections for all newly constructed shorelines and rehabilitation to ensure long-term growth of vegetation and subsequent erosion protection.

TABLE OF CONTENTS

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